eem
electronic
engineers
master

Volume
2

ACTIVE
COMPONENTS

ASSEMBLIES
CIRCUIT

CONTROLS
AND DRIVES

PAGES
989-2008

1971-72

UNITED
TECHNICAL
PUBLICATIONS
Division of
Cox Broadcasting Corp.

Printed in U.S.A.

1971-72 eem
electronic engineers master

Industry-wide catalog
of electronic components,
materials, equipment
and services...
in three distinct volumes

PRODUCT FINDER
Green Section

CATALOGS
White Section

MANUFACTURERS AND
SALES OFFICES DIRECTORY
Yellow Section

TRADE NAME DIRECTORY
Volume 1, Page 957

Volume 2
active components
circuit assemblies
controls and drives

This volume contains pages 989-2008

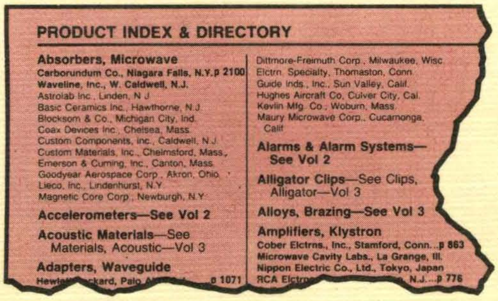
Section		Starting Page
	Product Finder	991
	Index of Manufacturers' Catalogs	1274
	Products	
1100	Amplifiers (Audio, Operational, etc.)	1278
1700	Circuit Assemblies, Circuit Boards & Breadboarding Kits..	1296
2200	Controls, Control Components & Systems	1304
2300	Crystals & Mechanical Tuning Devices; Oscillators	1353
2400	Panel Components (Incl. Lighting & Readouts)..	1435
2700	Filters	1506
3130	Integrated Circuits & Hybrid Microcircuits	1535
3450	Microwave, Laser & Radar (Components/Accessories)	1552
3500	Motors, Rotating Components & Accessories	1572
3700	Photoelectric Equipment & Components	1636
3800	Optical Equipment & Accessories	1641
4500	Relays	1645
4800	Semiconductors & Devices; Rectifiers (Non-Tube Types)	1794
4900	Servomechanisms & Components	1865
5100	Switches, Fuses, Protective Devices	1877
5300	Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.	1963
5500	Transducers & Associated Equipment	1985
5700	Tubes, Tube Parts, Shields, Inserts, etc.	1995
5900	Vibrators, Choppers, etc.	2006

Price: $20.00

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y.p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N J
Basic Ceramics Inc., Hawthorne, N.J
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass
Custom Components, inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass.,
Emerson & Cuming, Inc., Canton, Mass.
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.
Accelerometers—See Vol 2
Acoustic Materials—See Materials, Acoustic—Vol 3
Adapters, Waveguide
Hewl ckard, Palo ...p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif
Alarms & Alarm Systems—See Vol 2
Alligator Clips—See Clips, Alligator—Vol 3
Alloys, Brazing—See Vol 3
Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn...p 863
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctro N.J....p 776

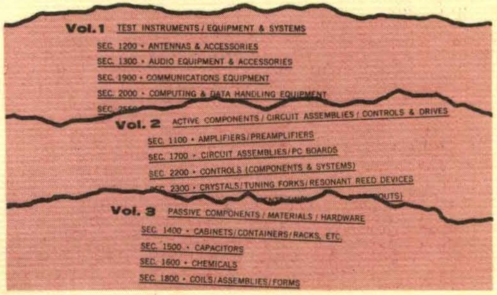
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT
SEC. 255

Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
SEC. 2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES
OUTS)

Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

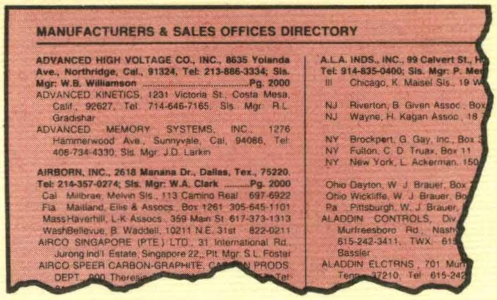
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel. 714-646-7165, Sls. Mgr. R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal, 94086, Tel: 408-734-4330, Sls. Mgr. J.D. Larkin

AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE.) LTD., 31 International Rd., Jurong Ind'l Estate, Singapore 22., Plt. Mgr. S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C N PRODS. DEPT., 00 Theresi Tel

A.L.A. INDS., INC., 99 Calvert St., H
Tel: 914-835-0400; Sls. Mgr: P. Me
Ill Chicago, K. Maisel Sls., 19 W

NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18

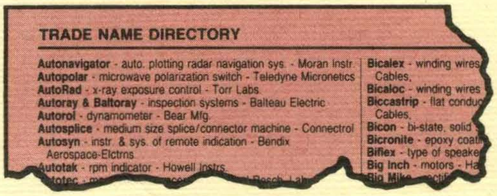
NY Brockport, G. Gay, Inc., Box
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150

Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer, Bo
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-3411, TWX 61 Bassler
ALADDIN ELCTRNS., 701 Mur Tenn. 37210, Tel. 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires Cables,
Bicaloc - winding wires
Biccastrip - flat condu Cables,
Bicon - bi-state, solid
Bicronite - epoxy coati
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

1971-72 eem

55
PRODUCT SECTIONS
IN 3
VOLUMES

TEST INSTRUMENTS EQUIPMENT & SYSTEMS	Vol. 1
ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES	Vol. 2
PASSIVE COMPONENTS MATERIALS / HARDWARE	Vol. 3

eem — Electronic Engineers Master saves you engineering, specifying and purchasing time. Manufacturers' catalogs are grouped under easy-to-remember headings.

The 55 Product Sections categorize related electronics components, equipment, materials, instruments and systems, and fabrication services, enabling you to quickly compare and evaluate similar items.

To find a specific manufacturer's catalog pages refer to the Index of Manufacturers which precedes each Catalog Section (white pages).

These are the 55 eem Product Sections grouped in 3 volumes

Volume Number	Product Section	Page Number	Products
2	1100	1278	Amplifiers, Audio, Operational, etc.
1	1200	307	Antennas & Accessories
1	1300	308	Audio Equipment & Accessories
3	1400	2314	Cabinets, Chassis, Containers, Racks, Boxes, etc.
3	1500	2330	Capacitors (All Types)
3	1600	2478	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
2	1700	1296	Circuit Assemblies, Circuit Boards & Breadboarding Kits
3	1800	2481	Coils (Inductors, Chokes), Assemblies, Forms
1	1900	322	Communications Equipment (Facsimile, Telephone, Television)
1	2000	328	Computing, Data Handling Equipment & Accessories
3	2100	2510	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2	2200	1304	Controls, Control Components & Systems
2	2300	1353	Crystals & Mechanical Tuning Devices; Oscillators
3	2350	2728	Delay Lines (All Types)
2	2400	1435	Panel Components (Including Lighting & Readouts)
3	2500	2754	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
1	2550	388	Environmental Test Equipment
3	2600	2776	Fans, Blowers & Cooling Equipment
2	2700	1506	Filters
3	2800	2809	Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
1	2900	391	Instruments, Measuring & Test
1	3000	587	Instruments, Graphic Recording
3	3100	2810	Insulators, Insulating Materials & Parts
2	3130	1535	Integrated Circuits & Hybrid Microcircuits
3	3150	2814	Manufacturing, Subcontracting, Custom Fabrication
3	3200	2816	Materials, Raw (Metals, Plastics, Glass, Rubber, Cloth, etc.)
1	3300		Medical Electronic Equipment
1	3400	598	Microwave, Laser & Radar (Systems & Subsystems)
2	3450	1552	Microwave, Laser & Radar (Components/Accessories)
2	3500	1572	Motors, Rotating Components & Accessories
1	3600		Nuclear & Radiation Equipment
2	3700	1636	Photoelectric Equipment & Components
2	3800	1641	Optical Equipment & Accessories
1	4000	616	Power Supplies, Converters, Inverters, Batteries, etc.
1	4100	947	Production Machinery & Automation Equipment
3	4200		Engineering Aids (Books, Drafting Equipment, Whiteprinters)
1	4300	950	Recording Equipment (Non-Audio Types)
2	4500	1645	Relays
3	4600		Research, Development, Engineering Services
3	4700	2818	Resistors, Fixed
3	4750	2902	Resistors, Variable (Potentiometers & Rheostats)
2	4800	1794	Semiconductors & Devices, Rectifiers (Non-Tube Types)
2	4900	1865	Servomechanisms & Components
1	5000	951	Studio Equipment
2	5100	1877	Switches, Circuit Breakers, Fuses, Protective Devices
1	5200	953	Telemetering Equipment
2	5300	1963	Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.
3	5400	2933	Tools (Hand & Power); Soldering Supplies
2	5500	1985	Transducers & Associated Equipment
3	5600	2948	Transformers
2	5700	1995	Tubes, Tube Parts, Shields, Inserts, etc.
1	5800		Ultrasonic, Sonic, Subsonic Equipment
1	5850		Vacuum Equipment & Accessories
2	5900	2006	Vibrators, Choppers, etc.
3	6000	2994	Wire, Cable, Harnesses & Accessories

UNITED TECHNICAL PUBLICATIONS, INC. • 645 Stewart Ave., Garden City, N.Y. 11530 • (516) 248-9700

INTRODUCTION

This 1971-72 edition of **eem**/**Electronic Engineers Master** is the fourteenth and largest volume published to date. You will find more catalog data included than ever before, systematically presented for the first time in **three separate volumes.**

Volume 1 — Test Instruments, Equipment and Systems

Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

The 55 **eem** Product Sections have been individually assigned to their appropriate volume. A listing of the product sections within each volume appears on each cover. A complete listing of the 55 product sections appears on the first page of each volume (pages 1, 301, 989, 2009 and inside the back cover).

United Technical Publications' Time-Saving Product Information System

We have drawn upon the experience of hundreds of engineers and purchasing agents to develop a time-saving product/information system. It includes these major elements:

eem / Electronic Engineers Master

This bound catalog file for the complete product data of many huundreds of manufacturers is divided into three volumes with a total of 55 product sections. It includes the **Catalog Section** (white section); an industry-wide **Product Directory** (green section); a verified **Directory of Manufacturers** (yellow section) which can put the products and sales offices of more than 6,000 manufacturers at the user's fingertips; and a **Trade Name Directory** which starts on page 957 in the white pages of Volume 1.

Electronic Products Magazine

The electronic industry's only major magazine devoted 100% to products, product application and product selection, EPM keeps engineers and purchasing agents up to date on all phases of products.

Prices

Prices are furnished for information only — they are not offered as quotations. Participating manufacturers reserve the right to change specifications, revise prices or discontinue items without notice. While every precaution has been taken to assure accuracy in content, the publisher cannot be responsible for manufacturers' claims and representations; nor can any guarantee be made against the possibility of error or omission.

Circulation Policy

eem / Electronic Engineers Master is distributed annually at no charge to qualified engineers and purchasing agents, affiliated with North American manufacturers, research laboratories and government agencies. To qualify for a subscription you must be actively engaged in application, selection, specification, design or procurement of electronic components, materials, equipment and related fabrication services.

Official subscription form may be obtained by submitting the following on your company's letterhead: (1) name and title, (2) job function and duties, (3) main products manufactured or developed by your company, division or laboratory. Please include building number or mail station with address. Letters must be signed personally. Group qualification is not acceptable. The cost of eem to nonqualified personnel is $20.00 per copy.

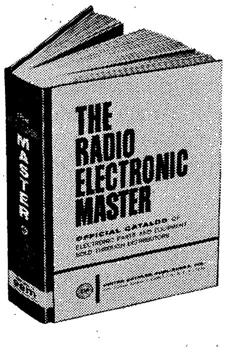
No portion of this book may be reproduced without express permission of the publishers.

Library of Congress Catalog Card Number 58-9813.

©Copyright United Technical Publications, Inc. 1971 • Printed in U.S.A.

eem
electronic engineers master
1971-72

president
ARTHUR I. RABB
executive vice president
ROBERT J. MALES
publisher
ROBERT J. LYDON
editor
CREIGHTON M. MARCOTT
directory editor
WALTER J. MARIANI
circulation manager
DOROTHY RENOUD
production director
HERMAN HOLSTEIN
production manager
LANNY LEVIN
production administrator
GEORGE LANDGARTEN
asst. production administrator
SHIRLEY ZWEBEN
art director
CARL GSCHEIDLE
production assistants
CHRISTINE BENITH
FRANCES BLASKOPF
VIRGINIA EYERMANN
STEPHAN POPIEL
typography manager
DAVE ROSEMAN
sales administration manager
CURT GLANVILLE



Companion volume
THE RADIO-ELECTRONIC MASTER
available from
electronic parts distributors
(See pages 984 or 3072)

PRODUCT INDEX AND DIRECTORY

This Product Index and Directory contains listings for all products in **eem**. Since **eem** consists of three volumes, if a product is shown in this volume, a complete list of its manufacturers appears below the product heading. If the product appears in one of the other two volumes, a cross reference indicates the appropriate volume.

For products which are included in this volume, manufacturers are listed alphabetically in two groups under each product heading. The first group **(shown in bold face)** includes those manufacturers whose catalog pages appear in the white pages of **eem**. Page numbers are included if information on the specific product shown in the heading is included in the manufacturers' pages. The second group includes those manufacturers who make this product but whose catalog pages do not appear in the white section.

eem
electronic engineers master
1971-72

VOLUME 2

Abrasive Belts, Cords, Wheels, etc.—See Vol 1

Abrasive Compounds, Grains, Powders, etc.—See Vol 1

Absorbers, Microwave

Carborundum Co., Niagara Falls, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Airtec, Inc., Roselle, N.J.
Astrolab Inc., Linden, N J
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Core-Tronics, Inc., Orange, N.J.
Custom Comps., Fairfield, N.J.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass.
Electronautics, Littleton, Mass.
Emerson & Cuming, Inc., Canton, Mass.
Filmohm Div., Long Island City, N.Y.
Goodyear Aerospace Corp., Akron, Ohio
Herley Inds., Inc., Syosset, N.Y.
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
McMillan Radiation Labs, Inc., Ipswich, Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Rantec Div., Calabasas, Calif.
Reeve Elctrns., Inc., Chicago, Ill.
Systron-Donner Microwave Div., Van Nuys, Cal.
TDK Elctrns. Corp., Long Island City, N.Y.
Topper Mfg. Co., Inc., Great Neck, N.Y.

Absorbers, Nuclear Radiation —See Vol 1

Absorbers, Shock—See Mounts, Shock & Vibration—Vol 3

Accelerators & Accessories, Particle—See Vol 1

Accelerometers

Bowmar Instr. Corp., Ft. Wayne, Ind.
Dytronics Co., Columbus, Ohio
Metrix Instr. Co., Houston, Tex..... p 518
Schaevitz Engrg., Pennsauken, N.J. p 1990
Teledyne Geotech, Dallas, Tex.
AGAC-Derritron, Inc., Alexandria, Va.
AMBAC Inds., Garden City, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix Corp., Davenport, Iowa
Betzelt GMBH, Trogerstr. 32, W. Germany
Bourns, Inc., Riverside, Calif.
Columbia Resch. Labs., Woodlyn, Pa.
Conrac Corp., New York, N.Y.
Control Data Corp., Minneapolis, Minn.
Delco Electrns. Div., Milwaukee, Wisc.
Dynamic Precision Controls, Hagerstown, Ind.
Emerson & Cuming, Inc., Canton, Mass.
Endevco, Pasadena, Calif.
Engdahl Enterprises, Costa Mesa, Cal.
Ferranti Ltd., Hollinwood, Lancs., England
General Radio Co., Concord, Mass.
Genisco Tech. Corp., Instr. Div., Compton, Cal.
Gulton Inds., Costa Mesa, Cal.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Hughes Aircraft Co, Culver City, Cal.
Humphrey, Inc., San Diego, Calif.
IMPACT-O-GRAPH Div., Bedford, Ohio
Kaman Nuclear, Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Kollsman Instr. Corp., Syosset, N.Y.
Kulite Semiconductor Prod., Ridgefield, N.J.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Litton Sys., Inc., Woodland Hills, Calif.
Marathon Instrs. Div., Pico Rivera, Calif.
Massa Div., Hingham, Mass.
MB Elctrns/Textron Co., New Haven, Conn.
Micro Design Assocs., Burbank, Cal.
Pickering & Co., Plainview, N.Y.
Poly-Scientific, Blacksburg, Va.
Raymond Engrg., Inc., Middletown, Conn.
Reliance Elec. Co., Cleveland, Ohio
Robinson-Halpern Co., W. Conshohocken, Pa.
Roltec, Inc., Minneapolis, Minn.
Sanders Assocs., Inc., Manchester, N.H.
Shure Bros., Inc., Evanston, Ill.
Singer-General Precision, Inc., Little Falls, N.J.
Sparton Southwest, Inc., Albuquerque, N.M.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Sundstrand Data Control, Redmond, Wash.
Systron-Donner Inertial Division, Concord, Cal.
Tyco Instr. Div., Waltham, Mass.
Unholtz-Dickie Corp., Hamden, Conn.
Vibrac Corp., Chelmsford, Mass.
West Coast Resch. Corp., Los Angeles, Calif.

Acoustic Materials—See Materials, Acoustic—Vol 3

Acoustic Noise Generators—See Generators, Acoustic, High Intensity Noise—Vol 1

Acoustic Test Chambers—See Chambers, Acoustical Test, High Intensity Noise—Vol 1

Acrylic Sprays—See Insulating Compounds, Acrylic—Vol 3

Actuators, Servo, Linear

Automation Dev., Culver City, Cal. p 1310
Bafco, Inc., Warminster, Pa.
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1313
Control Technology Co., L.I.C., N.Y. p 1869
EEMCO Div., Los Angeles, Cal.
Globe Div. of TRW Inc., Dayton, Ohio p 1607
Ind'l. Control Co., Farmingdale, N.Y.
Ledex, Inc., Dayton, Ohio
Magnedyne Inc., Carlsbad, Calif.
Precision Mechanisms, Westbury, N.Y.
Rotating Comps., Bay Shore, N.Y.
Advance Gear & Mach., Los Angeles, Cal.
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
Analog General Corp., Oceanside, N.Y.
Anocut Engrg. Co., Elk Grove Village, Ill.
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Barry Controls, Watertown, Mass.
Bendix, S. Montrose, Pa.
Carbonara, Victor E. Inc., Port Washington, N.Y.
Clifton Div., Clifton Hgts., Pa.
Conductron Corp., St. Charles, Mo.
Consolidated Controls Corp., El Segundo, Calif.
Dynamic Precision Controls, Hagerstown, Ind.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Glentek, Inc., Santa Monica, Calif.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
Hughes Aircraft Co, Culver City, Cal.
Hydro-Aire Div., Burbank, Calif.
Instru-Lec Corp., Mt. Vernon, N.Y.
Jordan Controls, Milwaukee, Wisc.
Lear Siegler, Inc., Santa Monica, Calif.
Lisk, G.W. Co., Clifton Springs, N.Y.
LTV Electrosystems, Dallas, Tex.

Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
MB Elctrns/Textron Co., New Haven, Conn.
Mechanical Technology, Inc., Latham, N.Y.
Metal Bellows Corp., Sharon, Mass.
MPC Prods. Corp., Chicago, Ill.
Nat'l. Water Lift Co., Kalamazoo, Mich.
Preferred Electronics, Inc., Westfield, Mass.
Rae Motor Corp., McHenry, Ill.
Raymond Engrg., Inc., Middletown, Conn.
Servo Dev. Corp., Hicksville, N.Y.
Servotronics, Inc., Buffalo, N.Y.
Singer-General Precision, Inc., Little Falls, N.J.
Skinner Polynoid Div., New Britain, Conn.
Smith, Robert Elec. Co., Hartford, Conn.
Task Corp., Anaheim, Calif.
Taylor Instr. Process Control Div., Rochester, N.Y.
Teledyne Gurley, Troy, N.Y.
Teledyne Kinetics, Solana Beach, Cal.
USM Corp., Wakefield, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Western Gear Corp., Pasadena, Cal.
Weston Hydraulics, Div., Van Nuys, Calif.
Weston-Transicoil, Worcester, Pa.
Wolfson, P.J. Co., New Rochelle, N.Y.
Wright Comps., Inc., Clifton Springs, N.Y.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Actuators, Servo, Rotary

Allard Instr. Corp., Westbury, NY
American Precision Inds., Inc., E. Aurora, N.Y.
Automation Dev., Culver City, Cal.
Bafco, Inc., Warminster, Pa.
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1313
Control Technology Co., L.I.C., N.Y. p 1869
EEMCO Div., Los Angeles, Cal.
Ind'l. Control Co., Farmingdale, N.Y. p 1873
Ledex, Inc., Dayton, Ohio
Magnedyne Inc., Carlsbad, Calif.
Precision Mechanisms, Westbury, N.Y. p 1876
Rotating Comps., Bay Shore, N.Y.
Sawyer Inds., Arcadia, Cal.
Abrams Instr., Lansing, Mich.
Advance Gear & Mach., Los Angeles, Cal.
Aeroflex Labs., Plainview, N.Y.
American Elctrns., Inc., Fullerton, Cal.
Analog General Corp., Oceanside, N.Y.
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Bendix, S. Montrose, Pa.
Carbonara, Victor E. Inc., Port Washington, N.Y.
Carco Elctrns., Menlo Park, Calif.
Clary Corp., San Gabriel, Calif.
Clifton Div., Clifton Hgts., Pa.
Conductron Corp., St. Charles, Mo.
Consolidated Controls Corp., El Segundo, Calif.
Dynamic Precision Controls, Hagerstown, Ind.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Gap Instr. Corp., Hauppauge, N.Y.
General Scanning, Watertown, Mass.
Glentek, Inc., Santa Monica, Calif.
Honeywell, Apparatus Controls, Mpls., Minn.
Hughes Aircraft Co, Culver City, Cal.
Hydro-Aire Div., Burbank, Calif.
IMC Magnetics Corp., Maywood, Cal.
Instru-Lec Corp., Mt. Vernon, N.Y.
Jordan Controls, Milwaukee, Wisc.
Lear Siegler, Inc., Santa Monica, Calif.
Lisk, G.W. Co., Clifton Springs, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Lunkenheimer Co., Cincinnati, Ohio
Meltronics Inc., Wantagh, N.Y.
MPC Prods. Corp., Chicago, Ill.
Nat'l. Water Lift Co., Kalamazoo, Mich.
Northern Precision Labs., Inc., Fairfield, N.J.
Pittman Corp., Sellersville,, Pa.
Preferred Electronics, Inc., Westfield, Mass.
Servo Dev. Corp., Hicksville, N.Y.
Singer-General Precision, Inc., Little Falls, N.J.
Smith, Robert Elec. Co., Hartford, Conn.
Task Corp., Anaheim, Calif.
Taylor Instr. Process Control Div., Rochester, N.Y.
Teledyne Gurley, Troy, N.Y.
USM Corp., Wakefield, Mass.
Varo, Inc., Santa Barbara, Cal.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Western Gear Corp., Pasadena, Cal.
Weston Instruments, Inc., Newark, N.J.
Weston-Transicoil, Worcester, Pa.
Wolfson, P.J. Co., New Rochelle, N.Y.

Adapters—See Connectors; Plugs; Sockets; etc.—Vol 3

Adapters, F-M, Recording—See Vol 1

Adapters, Panoramic—See Receivers, Panoramic—Vol 1

Adapters, Waveguide

Hewlett-Packard, Palo Alto, Cal.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Americon Corp., Waltham, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Granite State Machine Co., Inc., Manchester, N.H.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Reeve Elctrns., Inc., Chicago, Ill.
Scientific-Atlanta, Inc., Atlanta, Ga.
Struthers Elctrns. Corp., Mamaroneck, N.Y.

Adhesives (All Types)—See Vol 3

Aging Racks—See Racks, Aging—Vol 1

Air Cleaners & Filters (Shielded & Unshielded)—See Vol 3

Air Conditioners (For Equipment)—See Vol 3

Air Filtering & Ventilating Panels (Shielded & Unshielded)—See Air Cleaners & Filters—Vol 3

Alarms & Alarm Systems

A. D. Data Sys., Inc., Rochester, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Autronics Corp., Pasadena, Calif.
Beckman Instrs., Cedar Grove, N.J.
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Bird Elctrn., Cleveland, Ohio.......... p 421
California Elctrn. Mfg. Co., Alamo, Calif.
Delco Elctrns. Div., Kokomo, Ind.
GC Elctrns., Rockford, Ill.
Harrel, Inc., E. Norwalk, Conn..... p 1973
Metrix Instr. Co., Houston, Tex.
Multitech Automation Prods., Monterey Pk., Cal.
Norman Inds., Chicago, Ill.
North Hills Elctrns., Inc., Glen Cove, N.Y. .... p 1339
Pacific Technology, Renton, Wash. p 830
PPM, Inc., Bedford, Ohio
Quindar Elctrns., Inc., Springfield, N.J.
RDI, Glen Ellyn, Ill.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Triac Elctrn. Sys., N.Y., N.Y.
Wheelock Signals, Long Branch, N.J.
Acromag, Inc., Wixom, Mich.
Action Systems Co., Meriden, Conn.
Aerolite Electronics Corp., Union City, N.J.
Aerospace Resch. Inc., Boston, Mass.
Alert Prods. Div., Costa Mesa, Calif.
Allied Elctrns. Corp., Chicago, Ill.
Alnor Instr. Co., Chicago, Ill.
AMBAC Inds., Garden City, N.Y.
American Elec. Cable Co., Holyoke, Mass.
AMF Electical Prods., Alexandria, Va.
Applied Control Co., Fairfield, N.J.
Applied Systems Corp., Detroit, Mich
Assembly Elctrns. Ltd., Niagara Falls, Can.
Atlas Sound Div., Parsippany, N.J.
AUL Instrs., Inc., Flushng, N.Y.
Autocall Co., The, Shelby, Ohio
Autocon Inds., Inc., St. Paul, Minn.
Avco Corp., Cincinnati, Ohio
Bacharach Instr. Co., Mt. View, Calif.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Advanced Tech., Fullerton, Cal.
Beckman Instrs., (AISSD), Fullerton, Cal.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bionic Instrs., Inc., Bala Cynwyd, Pa.
Bogen Div., Paramus, N.J.
Bourns Security Sys., Smithtown, N.Y.
Bristol Div, Waterbury, Conn
Brooks Instr. Div., Hatfield, Pa.
Burlingame Sci., Burlingame, Cal.
CGS Units, Inc., Rochester, N.Y.
Chatham Controls Corp., Chatham, N.J.
Cognitronics Corp., Mt. Kisco, N.Y.
Columbia Resch. Labs., Woodlyn, Pa.
Components Specialties, Inc., Freeport, N.Y.
Control Prods. Corp., Chicago, Ill.
Controlotron Corp., Farmingdale, N.Y.
De-Tec-Tronic Corp., Chicago, Ill.
Delta Products, Inc., Grand Junction, Colo.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Du Kane Corp., St. Charles, Ill.
Eastcraft Corp., Melbourne, Fla.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Edwards Co. Inc., Norwalk, Conn.
Electro-Alarm Safety Devices, Fresno, Calif.
Electro Devices, Inc., St. Louis, Mo.
Electronic Control Corp., Detroit, Mich.
Elctrn. Control Sys., Fairmont, W. Va.
Elctrn. Modules Corp., Timonium, Md.
Engineering Assocs., Dayton, Ohio
Erdco Engrg. Corp., Addison, Ill.
Executone, Inc., Long Island City, N.Y.
Fedtro, Inc., Rockville Centre, N.Y.
Fenwal, Inc., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
Frost Electronics Corp., Bellingham, Mass.
Fuel Watchman Sls. & Svc., Inc., Bronx, N.Y.
Gas Analysis Sys., Inc., Basking Ridge, N.J.
Gillette Elctrn. Prods. Co., Beverly, N.J.
Gold Line Connector, Inc., Norwalk, Conn.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Guardian California, Culver City, Cal.
Hamilton Inds., Winter Haven, Fla.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
HB Engrg. Corp., Silver Spring, Md.
Heath Co., Benton Harbor, Mich.
Henschel Corp., Amesbury, Mass.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Houston Scientific Inds., Inc., Houston, Tex
Hygrodynamics, Inc., Silver Spring, Md.
Infrared Inds., Inc., Santa Barbara, Cal.
Integrated Controls, San Diego, Cal.
ITT Mackay Marine, Clark, N.J.
Joliet Control Corp., Joliet, Ill.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kahlenberg Bros. Co., Two Rivers, Wisc.
Kidde, Walter & Co., Belleville, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Linear Corp., Inglewood, Calif.
Luft Instrs., Inc., Lincoln, Mass.
Mack Elec. Devices, Wyncote, Pa.
Mag-Con Engrg. Co., St. Paul, Minn.
Maytronics, Inc., Colorado Springs, Colo.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Miller Associates, Mercersburg, Pa.
Mobil Elctrns., Inc., Anderson, Ind.
Mosler Electronic Systems Div., Danbury, Conn.
Motorola, Scottsdale, Ariz.
National Time & Signal, Oak Pk., Mich.
Neill Engrg. Co., Akron, Ohio
On-Guard Corp. America, Carlstadt, N.J.
Paraplegics Mfg., Bensenville, Ill.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Pinkerton Electro-Security Co., Webster, Mass.
Power Conversion Prods. Inc., Crystal Lake, Ill.
Puregas Equip. Corp., Copiague, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Reach Elctrns., Inc., Lexington, Neb.
Robinson-Halpern Co., W. Conshohocken, Pa.
Robot Inds., Inc., Dearborn, Mich.
Rosemount, Minneapolis, Minn.
Rust Corp., Everett, Mass.
Santa Barbara Resch. Ctr., Goleta, Calif.
Scam Instr. Corp., Skokie, Ill.
Secode Elctrns., Dallas, Texas
Shigoto Inds., Ltd., New York, N.Y.
Signatron, Inc., Lexington, Mass.
Southern Avionics Co., Beaumont, Tex.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Standard Elec. Time Corp., Springfield, Mass.
Stevenson Engrg. & Mfg., Portland, Ore.
Strandberg Engrg. Labs., Inc., Greensboro, N.C.
Stromberg Carlson Corp., Rochester, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Superior Continental Corp., Hickory, N.C.
Surface Conduction, Inc., New York, N.Y.
Symbolic Displays, Inc., Orange, Calif.
Telectro Sys. Corp., Corona, N.Y.
Tempo Instr., Plainview, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transystems Elctrn. Co., Fort Lee, N.J.
Universal Transistor Prods., Copiague, N.Y.
Vytell Corp., Arlington Hgts., Ill.
Waveforms, No. Hollywood, Cal.
Westinghouse Elec., Pittsburgh, Pa.
Wharton Unitools, Moosup, Conn.
Winpower Mfg Co., Newton, Iowa
Worner Elctrn. Devices, Rankin, Ill.
Zeigler Controls, Inc., Gardena, Cal.

Alligator Clips—See Clips, Alligator—Vol 3

Alloys, Brazing—See Vol 3

Alloys, Metal - Ceramic—See Vol 3

Alloys, Metal-To-Glass Sealing—See Seals, Glass-To-Metal—Vol 3

Alphanumeric Readout Tubes—See Tubes, Readout

Alphanumeric Readouts—See Readouts As Modified

Alternators—See Generators, A-C—Vol 1

Altitude Chambers—See Chambers, Altitude—Vol 1

Alumina (Incl. High Purity)—See Insulation Materials, Ceramic—Vol 3

Aluminizers, Vacuum—See Deposition Equip.; Evaporation Equip.—Vol 1

Ammeters—See Meters, Ampere—Vol 1

Amplifiers, A-F (Excluding Hi-Fi)

ADC Prods., Minneapolis, Minn.
Allen Elctrns. Div., Macungie, Pa.
Arvee Engrg. Co., Torrance, Calif. p 1278

Autronics Corp., Pasadena, Calif.
Beckman Instrs., Cedar Grove, N.J.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C-COR Elctrns., State College, Pa.
CML-Macarr, Inc., Edison, N.J. p 661-663
Control Technology Co., L.I.C., N.Y.
Crown Int'l., Elkhart, Ind. .... p 951
DDC, Hicksville, N.Y.
Dranetz Engrg. Labs., Plainfield, N.J.
Elctrn. Assocs., W. Long Branch, N.J. p 2381
Elgar Corp., San Diego, Cal.
General Elec. Co., Schenectady, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Ind'l. Test Equip., Port Washington, N.Y.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Krohn-Hite, Cambridge, Mass.
Matrix Corp., Beech Grove, Ind.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Millen, James Mfg., Malden, Mass.
Multitech Communications, Monterey Pk., Cal. .... p 324
North Hills Elctrns., Inc., Glen Cove, N.Y.
Opamp Labs., Los Angeles, Cal. p 1292
Quan-Tech, Whippany, N.J. .... p 548
Quindar Elctrns., Inc., Springfield, N.J.
RF Communications, Rochester, N.Y. p 553
RO Assocs., Menlo Pk., Cal.
Solid State Elctrns., Sepulveda, Cal.
Sonex, Inc., Bethayres, Pa.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Achrodyne Corp., Yorktown, Va.
Acoustronics, Inc., Huntington, N.Y.
Action Systems Co., Meriden, Conn.
Adec, Inc., Newark, N.J.
AGAC-Derritron, Inc., Alexandria, Va.
Alcor, Inc., Ithaca, N.Y.
Altec, Anaheim, Calif.
AMF Electical Prods., Alexandria, Va.
Amplifier Corp. America, Westbury, N.Y.
Amplifier Research Corp., Fairview Village, Pa.
Analog Devices, Inc., Norwood, Mass.
Applied Control Co., Fairfield, N.J.
Applied Electro Mechanics, Alexandria, Va.
Arbor Sys., Inc., Ann Arbor, Mich.
Arvin Sys., Inc., Dayton, Ohio
Audio Instr. Co., Union City, N.J.
Auricord, Long Island City, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
B & W Elctrn. Resch. Labs., Dallas, Tex.
Barker & Williamson, Bristol, Pa.
Bay Labs., Inc., Cleveland, Ohio
Beckman Instrs., (AISSD), Fullerton, Cal.
Bell P/A Prods. Corp., Columbus, Ohio
Bergen Labs., Inc., Paterson, N.J.
Biocom, Inc., Culver City, Cal.
Bogen Div., Paramus, N.J.
Bose Corp., Natick, Mass.
Bozak, R.T. Mfg. Co., Darien, Conn.
Brower Laboratories, Inc., Waltham, Mass.
Browning Labs., Laconia, N.H.
California Instrs. Co., San Diego, Cal.
Clark, David Co., Worcester, Mass.
Clifton Div., Clifton Hgts., Pa.
Clinton Instr. Co., Clinton, Conn.
Coast Elctrns., Manhattan Beach, Cal.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Continental Elctrns., Brooklyn, N.Y.
Control Prods. Corp., Chicago, Ill.
Davis J.W. & Co., Dallas, Texas
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dorsett Elctrns., Tulsa, Okla.
Du Kane Corp., St. Charles, Ill.
Eckel Inds., Inc., Cambridge, Mass.
Edison Elctrns. Div., Manchester, N.H.
Edo Western Corp., Salt Lake City, Utah
Eico Electronic Instrument Co., Inc., Brooklyn, N.Y.
Electron Enterprises, Inc., Berwyn, Ill.
Elctrns., Ltd., Marion, Iowa
Executone, Inc., Long Island City, N.Y.
Fairlane Electronics, Inc., Long Valley, N.J.
Fargo Co., San Francisco, Calif.
Femco Div., Irwin, Pa.
Gai-Tronics Corp., Reading, Pa
General Instr. of Can., Waterloo, Ont., Can.
General Radio Co., Concord, Mass.
Heath Co., Benton Harbor, Mich.
HGA Elctrns., Mt. Vernon, N.Y.
Holt Instr. Labs., Oconto, Wisc.
Hope Elctrns., Clifton, N.J.
Hughes Aircraft Co, Fullerton, Cal.
Incor Instr., Plainview, N.Y.
Instrument Labs. Corp., Chicago, Ill.
Instruments, Inc., San Diego, Calif.
ISC/Telephonics Div, Huntington, N.Y.
ITI Electronics, Inc., Clifton, N.J.
La Pointe Inds., Inc., Rockville, Conn.
Lear Siegler, Inc., Santa Monica, Calif.
Levell Electronics Ltd., High Barnet, Herts,, England
Loral Elctrn. Sys., Bronx, N.Y.
Major Elctrns. Corp., Brooklyn, N.Y.
Marathon Instrs. Div., Pico Rivera, Calif.
MB Elctrns/Textron Co., New Haven, Conn.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Merchant, Robert C. Co., Carmel Valley, Calif.
Midg-Line Instr. Co., Miami, Fla.
Midwest Audio Corp., Chicago, Ill.
Mini-Circuits Lab., Brooklyn, N.Y.
Morey Corp, Downers Grove, Ill.
Motorola Semiconductor Prods., Phoenix, Ariz.
Multi Media Engrg., Inc., Rockville, Md.
Nelson-Hershfield Elctrns., Phoenix, Ariz.
Neptune Elctrns. Co., New York, N.Y.
Newcomb Audio Prods. Co., Sylmar, Calif.
NH Research, Inc., Santa Ana, Calif.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Pacific Electro Dynamics, Bellevue, Wash
Paraplegics Mfg., Bensenville, Ill.
Philco-Ford Corp., Washington, D.C.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Precision Electronics, Inc., Franklin Park, Ill.
Princeton Applied Resch. Corp., Princeton, N.J.
Private Tele-Comms., Inc., Chicago, Ill.
Pulse Techniques, Inc., W. Englewood, N.J.
R-Columbia Prods., Inc., Highland Park, Ill.
Randam Elctrns., Inc., Cincinnati, Ohio
RCA Corp., Camden, N.J.
Reflectone, Inc., Stamford, Conn.
Remler Co., San Francisco, Calif.
RFL Inds., Comms. Div., Boonton, N.J.
RHA-Audio Communications, W. New York, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
SBD Systems, Inc., Amityville, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Shure Bros., Inc., Evanston, Ill.
Signetics Corp., Sunnyvale, Calif.
Singer Co., Somerville, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Solar Elctrns. Co., Hollywood, Calif.
Sparks Communications, Inc., Brownsville, Tex.
Spectra Sonics, Ogden, Utah
Stancil-Hoffman Corp., Hollywood, Calif.
Standard Elctrns. Corp., Freehold, N.J.
Standard Winding Co., Newsburgh, N.Y.
Stark Elctrn. Instrs., Ltd., Ajax, Ont., Canada
Stromberg Carlson Corp., Rochester, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Tabet Mfg. Co., Norfolk, Va.
Tel-Instr. Elctrns. Corp., Carlstadt, N.J.
Telex Comm. Div., Minneapolis, Minn.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Touchmaster Labs., Hollywood, Calif.
Transducer Systems, Inc., Willow Grove, Pa.
Trutone Elctrns., Inc., Van Nuys, Calif.
Ultra Audio Prods., Beverly Hills, Calif.
Unholtz-Dickie Corp., Hamden, Conn.
Universal Resch. Labs., Elk Grove Village, Ill
University Sound, Anaheim, Cal.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Visual Educom, Michigan City, Ind.
Webster Elec. Co., Inc., Racine, Wisc.
Wilder Engrg. Prods., Chicago, Ill.
Wilkinson Elctrns., Woodlyn, Pa.

Amplifiers, Antenna—
See Vol 1

Amplifiers, Biophysical

Clarke - Hess, New York, N.Y.
Gould, Inc., Cleveland, Ohio
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Precision Monolithics, Santa Clara, Cal.
Teledyne Philbrick, Dedham, Mass.
AMF Electical Prods., Alexandria, Va.
Bio-Medical Elctrns., Inc., Rockville, Md.
Biocom, Inc., Culver City, Cal.
Bioelectric Instrs., Farmingdale, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
General Microwave Corp., Farmingdale, N.Y.
Massey Dickinson Co., Inc., Saxonville, Mass.
Statham Instrs., Inc., Oxnard, Cal.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Transidyne-General Corp., Ann Arbor, Mich.

Amplifiers, Charge

Dynamics Instr. Co., Monterey Pk., Cal. p 432
Dytronics Co., Columbus, Ohio
Hybrid Sys. Corp., Burlington, Mass.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y. ....p 1286,1287
Metrix Instr. Co., Houston, Tex..... p 518
Neff Instr. Corp., Duarte, Calif.
Teledyne Philbrick, Dedham, Mass.
AGAC-Derritron, Inc., Alexandria, Va.
Analog Devices, Inc., Norwood, Mass.
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Columbia Resch. Labs., Woodlyn, Pa.
Computer Dynamics, Torrington, Conn.
EDC (Electro Dev.), Lynnwood, Wash.
Endevco, Pasadena, Calif.
Fairchild Semiconductor, Mountain View, Calif.
Gulton Inds., Costa Mesa, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Intech, Santa Clara, Cal.
Johnston Labs., Inc., Cockeysville, Md.
K West, Westminster, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Kistler Instr. Co., Redmond, Wash.
MB Elctrns/Textron Co., New Haven, Conn.
PCB Piezotronics, Inc., Depew, N.Y.
Perry Amplifier, Brookline, Mass.
Princeton Applied Resch. Corp., Princeton, N.J.
SSR Instrs. Co., Santa Monica, Cal.
Statham Instrs., Inc., Oxnard, Cal.
Sundstrand Data Control, Redmond, Wash.
Unholtz-Dickie Corp., Hamden, Conn.

Amplifiers, Compressor

American Astrionics, Hollywood, Cal
Dranetz Engrg. Labs., Plainfield, N.J.
Ithaco, Inc., Ithaca, N.Y. .... p 1286
Melcor Elctrns. Corp., Farmingdale, N.Y.
Opamp Labs., Los Angeles, Cal.
Quindar Elctrns., Inc., Springfield, N.J.
Acoustronics, Inc., Huntington, N.Y.
Altec, Anaheim, Calif.
BF Elctrns., Solana Beach, Calif.
CBS Laboratories, Stamford, Conn.
Comdel, Inc., Beverly, Mass.
Dynascan Corp., Chicago, Ill.
Elctrn. Sys. Engrg., Cushing, Okla.
Executone, Inc., Long Island City, N.Y.
GPS Instr. Co., Framingham, Mass.
Intech, Santa Clara, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Marathon Instrs. Div., Pico Rivera, Calif.
Nelson-Hershfield Elctrns., Phoenix, Ariz.
Optical Elctrns., Tucson, Ariz.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Precision Electronics, Inc., Franklin Park, Ill.
Private Tele-Comms., Inc., Chicago, Ill.
Singer - Tele-Signal, Woodbury, N.Y.
Spectra Sonics, Ogden, Utah
Stancil-Hoffman Corp., Hollywood, Calif.
Ultra Audio Prods., Beverly Hills, Calif.
Unholtz-Dickie Corp., Hamden, Conn.
United Resch. Lab., Corp., New York, N.Y.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Webster Elec. Co., Inc., Racine, Wisc.

Amplifiers, Current

Bowmar Instr. Corp., Ft. Wayne, Ind.
Control Technology Co., L.I.C., N.Y.
Dynamics Instr. Co., Monterey Pk., Cal. p 432
Hewlett-Packard, Palo Alto, Cal.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
Bio-Medical Elctrns., Inc., Rockville, Md.
Coast Elctrns., Manhattan Beach, Cal.
Fairchild Semiconductor, Mountain View, Calif.
GPS Instr. Co., Framingham, Mass.
Halmar Elctrns., Inc., Columbus, Ohio
Isotech Inc., Westford, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Kistler Instr. Co., Redmond, Wash.
Ling Elctrns., Anaheim, Calif.
Moore Inds., Van Nuys, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Newport Labs., Inc., Santa Ana, Cal.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Robicon Corp., Pittsburgh, Pa
Systems Instrs. Resch., Inc., Atlanta, Ga.
Zeltex, Inc., Concord, Calif.

Amplifiers, D-C

ADC Prods., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
American Elctrn. Labs., Inc., Lansdale, Pa.
Arvee Engrg. Co., Torrance, Calif. p 1278
Autronics Corp., Pasadena, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. .... p 1867
California Elctrn. Mfg. Co., Alamo, Calif. p 1315
Chronetics, Inc., Mt. Vernon, N.Y.
Control Technology Co., L.I.C., N.Y. p 1868
Crown Int'l., Elkhart, Ind. .... p 951
DDC, Hicksville, N.Y.
Dynamics Instr. Co., Monterey Pk., Cal. p 432
Ectron Corp., San Diego, Cal....... p 1283
General Elec. Co., Schenectady, N.Y.
General Magnetics, Bloomfield, N.J.
Gould, Inc., Cleveland, Ohio
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Intronics, Inc., Newton, Mass. .... p 1288
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Julie Research Lab., New York, N.Y.
Kepco, Inc., Flushing, N.Y.
Krohn-Hite, Cambridge, Mass.
Magnedyne Inc., Carlsbad, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Millen, James Mfg., Malden, Mass.
Neff Instr. Corp., Duarte, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Opamp Labs., Los Angeles, Cal. p 1292
Precision Monolithics, Santa Clara, Cal.
Preston Scientific, Anaheim, Cal.
Quan-Tech, Whippany, N.J. .... p 548
Quindar Elctrns., Inc., Springfield, N.J.
RO Assocs., Menlo Pk., Cal.
Scientific Columbus, Columbus, Ohio
Solid State Elctrns., Sepulveda, Cal.
Sonex, Inc., Bethayres, Pa.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Tempo/UTI Div., Chatsworth, Cal.
Trio Labs, Inc., Plainview, N.Y.
Achrodyne Corp., Yorktown, Va.
Acromag, Inc., Wixom, Mich.
Advance Instr. Corp., Belmar, N. J.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
Applied Dynamics Computer Sys., Ann Arbor, Mich.
B & W Elctrn. Resch. Labs., Dallas, Tex.
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.

Bay Labs., Inc., Cleveland, Ohio
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Bergen Labs., Inc., Paterson, N.J.
Bio-Medical Elctrns., Inc., Rockville, Md.
Bogen Div., Paramus, N.J.
Bowmar/Ali, Inc., Acton, Mass.
Bourns, Inc., Riverside, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Celtic Inds., Inc., Van Nuys, Cal.
CGS/Lawrence, Southampton, Pa.
Clifton Div., Clifton Hgts., Pa.
Coast Elctrns., Manhattan Beach, Cal.
Cohu Elctrns., Inc., San Diego, Calif.
Collins Radio Co., Dallas, Tex.
Computer Dynamics, Torrington, Conn.
Consolidated Resistance Sls., Yonkers, N.Y.
Control Logic, Natick, Mass.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Dana Labs., Inc., Irvine, Calif.
Datum, Inc., Anaheim, Calif.
De-Tec-Tronic Corp., Chicago, Ill.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dixson, Inc., Grand Junction, Colo.
Dorsett Elctrns., Tulsa, Okla.
EDC (Electro Dev.), Lynnwood, Wash.
Elctrn. Modules Corp., Timonium, Md.
Elctrn. Resources Div., Los Angeles, Cal.
Elctrns., Ltd., Marion, Iowa
Esterline Angus Div., Indianapolis, Ind.
Fairchild Controls, Mountain View, Calif.
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
Foxboro Co., Foxboro, Mass.
Frost Electronics Corp., Bellingham, Mass.
General Computers, Inc., Los Angeles, Calif.
General Devices, Inc., Princeton, N.J.
General Oceanology, Inc., Cambridge, Mass.
Glentek, Inc., Santa Monica, Calif.
Goerz Optical Co., Inc., Pittsburgh, Pa.
GPS Instr. Co., Framingham, Mass.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co, Culver City, Cal.
Incor Instr., Plainview, N.Y.
Inland Motor Corp. of Va., Radford, Va.
Intech, Santa Clara, Cal.
Integrated Controls, San Diego, Cal.
International Light, Newburyport, Mass.
Isotech Inc., Westford, Mass.
K West, Westminster, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Kollsman Instr. Corp., Syosset, N.Y.
Lancer Elctrns. Corp., Norristown, Pa.
Lear Siegler, Inc., Santa Monica, Calif.
Leeds & Northrup Co., No. Wales, Pa.
Levell Electronics Ltd., High Barnet, Herts,, England
Ling Elctrns., Anaheim, Calif.
Locus, Inc, State College, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Marathon Instrs. Div., Pico Rivera, Calif.
MB Elctrns/Textron Co., New Haven, Conn.
McFadden Elctrns. Co., South Gate, Calif.
Medistor Instr. Co., Seattle, Wash.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Midg-Line Instr. Co., Miami, Fla.
Mil Elctrns. Inc., Hudson, N.H.
Monitor Sys., Inc., Ft. Washington, Pa.
Moore Inds., Van Nuys, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Neptune Elctrns. Co., New York, N.Y.
Newport Labs., Inc., Santa Ana, Cal.
Nuclear Resch. Corp., Southampton, Pa.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Philips Elctrn. Instrs., Mt. Vernon, N.Y.
Photron Instr. Co., Cleveland, Ohio
Power Control Corp., Pittsburgh, Pa.
Randtronics, Inc., Palo Alto, Cal.
Rawco Instrs., Inc., Ft. Worth, Tex.
REDCOR Corp., Woodland Hills, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
RIL Elctrns., Inc., Southampton, Pa.
Robicon Corp., Pittsburgh, Pa
Rochester Instr. Sys., Rochester, N.Y.
Rosemount Engrg. Co., Minneapolis, Minn.
Rust Corp., Everett, Mass.
San-ei Instrument Co., Ltd., Shinjuku-ku, Tokyo 160, Japan
Singer Co., Somerville, N.J.
Spectra Sonics, Ogden, Utah
Statham Instrs., Inc., Oxnard, Cal.
Teledyne Taber, No. Tonawanda, N.Y.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Transidyne-General Corp., Ann Arbor, Mich.
Trepac Corp. America, Englewood, N.J.
Tylan Corp., Torrance, Calif.
Unholtz-Dickie Corp., Hamden, Conn.
Viewlex, Holbrook, N.Y.
Westamp, Inc., Santa Monica, Cal.
Westinghouse Elec. Int'l., New York, N.Y.
Weston Instrs., Inc., Archbald, Pa.
Zeltex, Inc., Concord, Calif.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Decade

Arvee Engrg. Co., Torrance, Calif. p 1278
Chronetics, Inc., Mt. Vernon, N.Y.
Clarke - Hess, New York, N.Y. ...... p 426
Hewlett-Packard, Palo Alto, Cal.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Ithaco, Inc., Ithaca, N.Y.
Neff Instr. Corp., Duarte, Calif...... p 1291
Quan-Tech, Whippany, N.J. .... p 548
AMF Electical Prods., Alexandria, Va.
Applied Control Co., Fairfield, N.J.
B & K Instrs., Inc., Cleveland, Ohio
Harshaw Chem. Co., Cleveland, Ohio
Incor Instr., Plainview, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Medistor Instr. Co., Seattle, Wash.
Neptune Elctrns. Co., New York, N.Y.
NH Research, Inc., Santa Ana, Calif.
Optical Elctrns., Tucson, Ariz.
Princeton Applied Resch. Corp., Princeton, N.J.

Amplifiers, Deflection

Beta Instr., Newton Upper Falls, Mass. p 337
Bowmar Instr. Corp., Ft. Wayne, Ind.
CELCO, Mahwah, N.J.
Infodex, Inc., Waterbury, Conn.
Intronics, Inc., Newton, Mass.
Melcor Elctrns. Corp., Farmingdale, N.Y. p 1290
Millen, James Mfg., Malden, Mass.
Syntronic Instrs., Inc., Addison, Ill.
Tektronix, Inc., Beaverton, Ore.
Bud Radio, Inc., Willoughby, Ohio
Cleveland Elctrns., Inc., Cleveland, Ohio
Ferranti Ltd., Hollinwood, Lancs., England
General Atronics, Military Elctrns., Phila., Pa.
Information Displays, Inc., Mt. Kisco, N.Y.
Litton Inds., San Carlos, Calif.
Optimation, Inc., Sun Valley, Calif.
Transducer Systems, Inc., Willow Grove, Pa.

Amplifiers, Delay Line— See Vol 3

Amplifiers, Differential

Airpax Elctrns., Inc., Cambridge, Md.
Anadex Instrs., Inc., Van Nuys, Calif. p 400
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. .... p 1867
California Elctrn. Mfg. Co., Alamo, Calif. p 1315
Computer Prods., Ft. Lauderdale, Fla.
Control Technology Co., L.I.C., N.Y.
Data-Control Systems, Danbury, Conn.
DDC, Hicksville, N.Y.
Dynamics Instr. Co., Monterey Pk., Cal. p 432
Ectron Corp., San Diego, Cal....... p 1283
General Elec. Co., Schenectady, N.Y.
General Magnetics, Bloomfield, N.J.
Gould, Inc., Cleveland, Ohio
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Intronics, Inc., Newton, Mass. ..... p 1288
Ithaco, Inc., Ithaca, N.Y. .... p 1286
Melcor Elctrns. Corp., Farmingdale, N.Y.
Natel Engrg. Co., Canoga Pk., Cal.
Neff Instr. Corp., Duarte, Calif..... p 1291
North Hills Elctrns., Inc., Glen Cove, N.Y.
Opamp Labs., Los Angeles, Cal. p 1292
Preston Scientific, Anaheim, Cal. p 1293
RO Assocs., Menlo Pk., Cal.
Solid State Elctrns., Sepulveda, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass. p 1294
United Detector Tech., Santa Monica, Cal. .... p 1639
Achrodyne Corp., Yorktown, Va.
Acromag, Inc., Wixom, Mich.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
B & W Elctrn. Resch. Labs., Dallas, Tex.
Bay Labs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Bio-Medical Elctrns., Inc., Rockville, Md.
Burr-Brown Resch. Corp., Tucson, Ariz.
Celtic Inds., Inc., Van Nuys, Cal.
Cohu Elctrns., Inc., San Diego, Calif.
Computer Dynamics, Torrington, Conn.
Computer Test Corp., Cherry Hill, N.J.
Consolidated Resistance Sls., Yonkers, N.Y.
Control Logic, Natick, Mass.
Dana Labs., Inc., Irvine, Calif.
Datum, Inc., Anaheim, Calif.
Doric Sci. Corp., San Diego, Calif.
Dorsett Elctrns., Tulsa, Okla.
EDC (Electro Dev.), Lynnwood, Wash.
Elctrn. Modules Corp., Timonium, Md.
Elctrns., Ltd., Marion, Iowa
Fairchild Controls, Mountain View, Calif.
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
Glentek, Inc., Santa Monica, Calif.
GPS Instr. Co., Framingham, Mass.
Gulton Inds., Costa Mesa, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Hughes Aircraft Co, Culver City, Cal.
Incor Instr., Plainview, N.Y.
Intech, Santa Clara, Cal.
Integrated Controls, San Diego, Cal.
Iso-Switch Corp., Costa Mesa, Cal.
Isotech Inc., Westford, Mass.
Jordan Controls, Milwaukee, Wisc.
K West, Westminster, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Lancer Elctrns. Corp., Norristown, Pa.
Lansdale Microelectronics Div., Metuchen, N.J.
Loral Elctrn. Sys., Bronx, N.Y.
Maytronics, Inc., Colorado Springs, Colo.
MB Elctrns/Textron Co., New Haven, Conn.
McKee-Pedersen Instrs., Danville, Calif.
Medistor Instr. Co., Seattle, Wash.
Megadyne Inds., Inc., Rochester, N.Y.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Minnetech Labs., Inc., Minneapolis, Minn.
Moore Inds., Van Nuys, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Calif.
Newport Labs., Inc., Santa Ana, Cal.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Princeton Applied Resch. Corp., Princeton, N.J.
Qualidyne Corp., Santa Clara, Cal.
Ramsay Engrg. Co., Anaheim, Calif.
Raytheon Co., Mt. View, Calif.
REDCOR Corp., Woodland Hills, Cal.
Rochester Instr. Sys., Rochester, N.Y.
Rosemount Engrg. Co., Minneapolis, Minn.
SBD Systems, Inc., Amityville, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Signetics Corp., Sunnyvale, Calif.
Statham Instrs., Inc., Oxnard, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Transidyne-General Corp., Ann Arbor, Mich.
Tylan Corp., Torrance, Calif.
Unholtz-Dickie Corp., Hamden, Conn.
Zeltex, Inc., Concord, Calif.

Amplifiers, Distributed

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y.
C-COR Elctrns., State College, Pa. p 1281
Cober Elctrns., Inc., Stamford, Conn.
Instrs. For Ind., Inc., Farmingdale, N.Y.
RF Communications, Rochester, N.Y.
Altec, Anaheim, Calif.
Amplifier Research Corp., Fairview Village, Pa.
Bud Radio, Inc., Willoughby, Ohio
General Instr. Corp., Hicksville, N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
Hope Elctrns., Clifton, N.J.
Resalab Inc., Advanced Development Lab., Los Angeles, Cal.
Systems Resch. Labs., Dayton, Ohio

Amplifiers, Distribution

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y.
Atomichron, Inc., New Hyde Park, N.Y. p 469
Austron, Inc., Austin, Tex.
Bowmar Instr. Corp., Ft. Wayne, Ind.
C-COR Elctrns., State College, Pa. p 1281
Dynamics Instr. Co., Monterey Pk., Cal.
Fluke, John Mfg. Co., Inc., Seattle, Wash. .... p 478
Frequency Elctrns., New Hyde Pk., N.Y. p 469,1391
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Nippon Electric/NEC America, N.Y., N.Y.
Norman Inds., Chicago, Ill.
Quindar Elctrns., Inc., Springfield, N.J.
RHG Elctrns. Lab., Farmingdale, N.Y.
Vectron Labs., Inc., Norwalk, Conn.
Wavetek, San Diego, Cal.
Aerolite Electronics Corp., Union City, N.J.
Alcor, Inc., Ithaca, N.Y.
Altec, Anaheim, Calif.
Ameco, Inc., Phoenix, Ariz.
AMF Electical Prods., Alexandria, Va.
Ava Elctrns., Upper Darby, Pa.
Avantek, Inc., Santa Clara, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cohu Elctrns., Inc., San Diego, Calif.
Comdel, Inc., Beverly, Mass.
Communication Elctrns., Rockville, Md.
Components Corp., Denville, N.J.
Concord Elctrns., Los Angeles, Cal.
Consolidated Resistance Sls., Yonkers, N.Y.
Cooke Engrg. Co., Alexandria, Va.
Defense Elctrns., Inc., Rockville, Md.
Dynair Elctrns. Inc., San Diego, Calif.
Entron, Inc., Silver Spring, Md.
Essex Int'l., Inc., Decatur, Ill.
Finney Co., Bedford, Ohio
Gavin Instrs., Somerville, N.J.
GBC Closed Circuit TV Corp., New York, N.Y.
General Instr. Corp., Hicksville, N.Y.
Hope Elctrns., Clifton, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Koch Inds., Anaheim, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Lindsay Antenna & Specialty Prods., Lindsay, Ont., Canada
Matrix Sys. Corp., Chatsworth, Cal.
Multi Media Engrg., Inc., Rockville, Md.
Nelson-Hershfield Elctrns., Phoenix, Ariz.
Nuclear Resch. Corp., Southampton, Pa.
Philco-Ford Corp., Washington, D.C.
Precision Electronics, Inc., Franklin Park, Ill.
RIL Elctrns., Inc., Southampton, Pa.
Spectra Sonics, Ogden, Utah
Timing Sys., Inc., Marblehead, Mass.
Tracor, Inc., Austin, Tex.
Varian Assoc., Beverly, Mass
Virginia Elctrns. Co., Inc., Falls Church, Va.
Visual Elctrns. Corp., New York, N.Y.

Wald Sound, Sun Valley, Calif.
Winegard Co., Burlington, Iowa

Amplifiers, Fluidic

Chemical Micro Milling Co, Camden, N.J.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
deHart Mfg. Co., Norristown, Pa.
Lear Siegler, Inc., Santa Monica, Calif.

Amplifiers, I-F

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y. .... p 1554
C-COR Elctrns., State College, Pa. p 1281
DDC, Hicksville, N.Y.
E & M Labs., Westlake Village, Cal.
Electro/Data, Inc., Garland, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
General Elec. Co., Schenectady, N.Y.
Honeywell, Denver, Colo.
Kay Elemetrics, Pine Brook, N.J... p 507
Lorch Elctrns. Corp., Englewood, N.J.
RHG Elctrns. Lab., Farmingdale, N.Y. p 1562
Sierra Sys., Mountain View, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Vega Precision Labs., Vienna, Va.
Aerospace Resch. Inc., Boston, Mass.
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
AMF Electical Prods., Alexandria, Va.
Anzac Elctrns., Waltham, Mass.
Arvin Sys., Inc., Dayton, Ohio
AUL Instrs., Inc., Flushng, N.Y.
Avantek, Inc., Santa Clara, Cal.
Avco Corp., Cincinnati, Ohio
BF Elctrns., Solana Beach, Calif.
B.H. Inds., Los Angeles, Cal.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly, Mass.
Communication Elctrns., Rockville, Md.
Composite Microcircuits, Waltham, Mass.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elcom Sys., Deer Pk., N.Y.
Electrac, Inc., Anaheim, Calif.
Fairchild Semiconductor, Mountain View, Calif.
General Instr. of Can., Waterloo, Ont., Can.
General Radio Co., Concord, Mass.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Int'l. Microwave, Cos Cob, Conn.
Keithley Instrs., Inc., Cleveland, Ohio
Koch Inds., Anaheim, Cal.
La Pointe Inds., Inc., Rockville, Conn.
Loral Elctrn. Sys., Bronx, N.Y.
Major Elctrns. Corp., Brooklyn, N.Y.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Micro-Tel Corp., Baltimore, Md.
Micromega, Los Angeles, Cal.
Microwave Assocs., Inc., Burlington, Mass.
MITEQ, Inc., Hauppauge, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Neptune Elctrns. Co., New York, N.Y.
Oklahoma Aerotronics, Hartshorne, Okla.
Olektron Corp., Dudley, Mass.
Omni-Spectra, Inc., Scottsdale, Ariz.
Optimation, Inc., Sun Valley, Calif.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Randam Elctrns., Inc., Cincinnati, Ohio
Rodale Elctrns., Inc., Garden City, N.Y.
Rodelco, Deer Park, N.Y.
Signetics Corp., Sunnyvale, Calif.
Special Microwave Devices Oper., Waltham, Mass.
Sperry Marine Sys., Charlottesville, Va.
Standard Winding Co., Newsburgh, N.Y.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Wand Elctrns., Inc., Old Bethpage, N.Y.
Western Microwave Labs., Los Gatos, Cal.

Amplifiers, Integrating

Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Control Technology Co., L.I.C., N.Y.
DDC, Hicksville, N.Y.
Dynamics Instr. Co., Monterey Pk., Cal.
Elcor Prods. Welex Elctrns., Silver Spring, Md.
Elctrn. Assocs., W. Long Branch, N.J.
General Elec. Co., Schenectady, N.Y.
Gould, Inc., Cleveland, Ohio
Hewlett-Packard, Palo Alto, Cal.
Hybrid Sys. Corp., Burlington, Mass.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y. .... p 1286
Melcor Elctrns. Corp., Farmingdale, N.Y.
Precision Monolithics, Santa Clara, Cal.
RO Assocs., Menlo Pk., Cal.
Solid State Elctrns., Sepulveda, Cal.
Teledyne Philbrick, Dedham, Mass.
Acromag, Inc., Wixom, Mich.
Analog Devices, Inc., Norwood, Mass.
Bio-Medical Elctrns., Inc., Rockville, Md.
Burr-Brown Resch. Corp., Tucson, Ariz.
Computer Dynamics, Torrington, Conn.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
General Atronics, Military Elctrns., Phila., Pa.
Glentek, Inc., Santa Monica, Calif.
GPS Instr. Co., Framingham, Mass.
Harshaw Chem. Co., Cleveland, Ohio
Hughes Aircraft Co, Culver City, Cal.
HyComp Inc., Maynard, Mass.
Intech, Santa Clara, Cal.
Keithley Instrs., Inc., Cleveland, Ohio
Kistler Instr. Co., Redmond, Wash.
Loral Elctrn. Sys., Bronx, N.Y.
MB Elctrns/Textron Co., New Haven, Conn.
Moore Inds., Van Nuys, Cal.
Optical Elctrns., Tucson, Ariz.
Princeton Applied Resch. Corp., Princeton, N.J.
Randam Elctrns., Inc., Cincinnati, Ohio
Sensor Corp., Greenwich, Conn.
Sundstrand Data Control, Redmond, Wash.
Taylor Instr. Process Control Div., Rochester, N.Y.
Unholtz-Dickie Corp., Hamden, Conn.
Zeltex, Inc., Concord, Calif.

Amplifiers, Isolation

Applied Research Inc., Port Washington, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C-COR Elctrns., State College, Pa.
Control Technology Co., L.I.C., N.Y. p 1868
DDC, Hicksville, N.Y.
Dynamics Instr. Co., Monterey Pk., Cal.
Fluke, John Mfg. Co., Inc., Seattle, Wash.
Hewlett-Packard, Palo Alto, Cal.
Ind'l. Test Equip., Port Washington, N.Y.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Kepco, Inc., Flushing, N.Y.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Neff Instr. Corp., Duarte, Calif..... p 1291
Sierra Sys., Mountain View, Cal.
Solid State Elctrns., Sepulveda, Cal.
Sonex, Inc., Bethayres, Pa.
Teledyne Philbrick, Dedham, Mass.
Acromag, Inc., Wixom, Mich.
Altec, Anaheim, Calif.
AMF Electical Prods., Alexandria, Va.
Applied Control Co., Fairfield, N.J.
Applied Electro Mechanics, Alexandria, Va.
Burr-Brown Resch. Corp., Tucson, Ariz.
Clifton Div., Clifton Hgts., Pa.
Collins Radio Co., Dallas, Tex.
Computer Dynamics, Torrington, Conn.
Dana Labs., Inc., Irvine, Calif.
Defense Elctrns., Inc., Rockville, Md.
Elctrn. Modules Corp., Timonium, Md.
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
General Instr. Corp., Hicksville, N.Y.
Glentek, Inc., Santa Monica, Calif.
GPS Instr. Co., Framingham, Mass.
Hope Elctrns., Clifton, N.J.
Incor Instr., Plainview, N.Y.
Intech, Santa Clara, Cal.
Integrated Controls, San Diego, Cal.
Iso-Switch Corp., Costa Mesa, Cal.
Isotech Inc., Westford, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Litton Inds., San Carlos, Calif.
Magnetics, Inc., Butler, Pa.
MB Elctrns/Textron Co., New Haven, Conn.
Moore Inds., Van Nuys, Cal.
Narco Avionics, Ft. Washington, Pa.
Neptune Elctrns. Co., New York, N.Y.
Newport Labs., Inc., Santa Ana, Cal.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Perry Amplifier, Brookline, Mass.
Private Tele-Comms., Inc., Chicago, Ill.
Randam Elctrns., Inc., Cincinnati, Ohio
Rawco Instrs., Inc., Ft. Worth, Tex.
Rochester Instr. Sys., Rochester, N.Y.
Rosemount Engrg. Co., Minneapolis, Minn.
Singer-General Precision, Inc., Little Falls, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Spectra Sonics, Ogden, Utah
Systems Instrs. Resch., Inc., Atlanta, Ga.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Tylan Corp., Torrance, Calif.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Zeltex, Inc., Concord, Calif.

Amplifiers, Keying—See Vol 1

Amplifiers, Klystron—See Vol 1

Amplifiers, Limiting

Applied Research Inc., Port Washington, N.Y.
Control Technology Co., L.I.C., N.Y.
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Melcor Elctrns. Corp., Farmingdale, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Universal Ad-Yu Elctrns., Inc., Passaic, N.J.
Aertech Inds., Sunnyvale, Calif.
Alcor, Inc., Ithaca, N.Y.
Altec, Anaheim, Calif.
Amplifier Corp. America, Westbury, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly, Mass.
Elctrn. Sys. Engrg., Cushing, Okla.
Fairchild Semiconductor, Mountain View, Calif.
GPS Instr. Co., Framingham, Mass.
Int'l. Microwave, Cos Cob, Conn.
Kahn Resch. Labs., Inc., Freeport, N.Y.
Loral Elctrn. Sys., Bronx, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Optical Elctrns., Tucson, Ariz.
Precision Electronics, Inc., Franklin Park, Ill.
RFL Inds., Comms. Div., Boonton, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Spectra Sonics, Ogden, Utah
Stancil-Hoffman Corp., Hollywood, Calif.
Wilkinson Elctrns., Woodlyn, Pa.
Zeltex, Inc., Concord, Calif.

Amplifiers, Line

Arvee Engrg. Co., Torrance, Calif.
Autronics Corp., Pasadena, Calif.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Control Technology Co., L.I.C., N.Y.
Crown Int'l., Elkhart, Ind.
Data-Control Systems, Danbury, Conn.
DDC, Hicksville, N.Y.
Dynamics Instr. Co., Monterey Pk., Cal. p 432
Honeywell, Denver, Colo.
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Melcor Elctrns. Corp., Farmingdale, N.Y.
Neff Instr. Corp., Duarte, Calif..... p 1291
Quindar Elctrns., Inc., Springfield, N.J.
Re-el Circuits, Inc., Totowa Boro, N.J. p 326,327
Sonex, Inc., Bethayres, Pa.
Teledyne Philbrick, Dedham, Mass.
Alcor, Inc., Ithaca, N.Y.
Altec, Anaheim, Calif.
Ampex Corp., Redwood City, Calif.
Analog Devices, Inc., Norwood, Mass.
Anritsu Electric Co., Ltd., Tokyo, Japan
Arbor Sys., Inc., Ann Arbor, Mich.
Burr-Brown Resch. Corp., Tucson, Ariz.
Clark, David Co., Worcester, Mass.
Collins Radio Co., Dallas, Tex.
Consolidated Resistance Sls., Yonkers, N.Y.
Elctrn. Sys. Engrg., Cushing, Okla.
Essex Int'l., Inc., Decatur, Ill.
GBC Closed Circuit TV Corp., New York, N.Y.
General Elec., Lynchburg, Va.
Iso-Switch Corp., Costa Mesa, Cal.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Ling Elctrns., Anaheim, Calif.
Merchant, Robert C. Co., Carmel Valley, Calif.
Perry Amplifier, Brookline, Mass.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Precision Electronics, Inc., Franklin Park, Ill.
Private Tele-Comms., Inc., Chicago, Ill.
RFL Inds., Comms. Div., Boonton, N.J.
Robicon Corp., Pittsburgh, Pa
Singer - Tele-Signal, Woodbury, N.Y.
Spectra Sonics, Ogden, Utah
Stancil-Hoffman Corp., Hollywood, Calif.
Stromberg Carlson Corp., Rochester, N.Y.
Systems Resch. Labs., Dayton, Ohio
Trepac Corp. America, Englewood, N.J.
Ultra Audio Prods., Beverly Hills, Calif.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Webster Elec. Co., Inc., Racine, Wisc.

Amplifiers, Lock-In

Almond Instrs. Co., Covina, Cal.... p 329
Austron, Inc., Austin, Tex.
Clarke - Hess, New York, N.Y.
Control Technology Co., L.I.C., N.Y.
Dranetz Engrg. Labs., Plainfield, N.J.
Ithaco, Inc., Ithaca, N.Y. .... p 1286
Natel Engrg. Co., Canoga Pk., Cal.
Solid State Elctrns., Sepulveda, Cal.
Brower Laboratories, Inc., Waltham, Mass.
Defense Elctrns., Inc., Rockville, Md.
Electronics Missiles & Comms., White Haven, Pa.
International Light, Newburyport, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Pacific Photometric Instrs., Berkeley, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
SSR Instrs. Co., Santa Monica, Cal.
Thomson-CSF Inc., New York, N.Y.

Amplifiers, Logarithmic

American Astrionics, Hollywood, Cal p 335
American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y. .... p 1554
Control Technology Co., L.I.C., N.Y.
Daico Inds., Inc., Compton, Cal.
DDC, Hicksville, N.Y. .... p 1282
E & M Labs., Westlake Village, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
General Elec. Co., Schenectady, N.Y.
Gould, Inc., Cleveland, Ohio
Hewlett-Packard, Palo Alto, Cal.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y. .... p 1286
Kay Elemetrics, Pine Brook, N.J.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Meloy Laboratories, Springfield, Va.
Precision Monolithics, Santa Clara, Cal.
Quan-Tech, Whippany, N.J. .... p 548
RHG Elctrns. Lab., Farmingdale, N.Y. p 1562
Sierra Sys., Mountain View, Cal.
Solid State Elctrns., Sepulveda, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass. p 1294
Vega Precision Labs., Vienna, Va.
Aerospace Resch. Inc., Boston, Mass.
Aertech Inds., Sunnyvale, Calif.
Analog Devices, Inc., Norwood, Mass.
Audio Instr. Co., Union City, N.J.

Avantek, Inc., Santa Clara, Cal.
B & W Elctrn. Resch. Labs., Dallas, Tex.
BF Elctrns., Solana Beach, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Communication Elctrns., Rockville, Md.
Defense Elctrns., Inc., Rockville, Md.
Fairchild Semiconductor, Mountain View, Calif.
GPS Instr. Co., Framingham, Mass.
Intech, Santa Clara, Cal.
ISC/Telephonics Div, Huntington, N.Y.
K West, Westminster, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Lancer Elctrns. Corp., Norristown, Pa.
Locus, Inc, State College, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Milletron, Inc., Pittsburgh, Pa.
MITEQ, Inc., Hauppauge, N.Y.
Optical Elctrns., Tucson, Ariz.
Pacific Meas., Inc., Palo Alto, Calif.
Perry Amplifier, Brookline, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sedco Sys., Inc., Farmingdale, N.Y.
SSR Instrs. Co., Santa Monica, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Thermo Sys., Inc., St. Paul, Minn.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Wandel & Goltermann, E. Hanover, N.J.
Wiltron Co., Palo Alto, Calif.

Amplifiers, Magnetic

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla. p 1308
Arnold Magnetics, Culver City, Cal.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Coast Coil Co., Los Angeles, Calif.
Freed Transformer Co., Bklyn., N.Y.
General Elec. Co., Schenectady, N.Y.
General Magnetics, Bloomfield, N.J. p 1318
Harrel, Inc., E. Norwalk, Conn.
Ind'l. Control Co., Farmingdale, N.Y.
Kepco, Inc., Flushing, N.Y.
K.G.S. Elctrns., Pasadena, Cal.
Multitech Power Sys., Costa Mesa, Cal.
Torwico Elctrns., Inc., Lakewood, N.J.
Transmagnetics Inc., Farmingdale, N.Y.
Zaring Inds., Inc., Carmel, Ind.
Acme Elec. Corp., Cuba, N.Y.
Acromag, Inc., Wixom, Mich.
American Trans-Coil Corp., Richmond Hill, N.Y.
Automatic Signal Div., E. Norwalk, Conn.
Barwood Elctrns., Inc., Glendale, Cal.
Basler Elec. Co., Highland, Ill.
Bullock Magnetics Corp., Pomona, Calif.
Central Transformer Co., Chicago, Ill.
Coil Co. of Amer., Northvale, N.J.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Newport Beach, Calif.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
EDC (Electro Dev.), Lynnwood, Wash.
Electro-Pacific, Inc., Goleta, Calif.
Electro Windings & Comps., Kenilworth, N.J.
Electrocom Inds., So. Bend, Indiana
Elctrn. Transformer Corp., Paterson, N.J.
Esterline Angus Div., Indianapolis, Ind.
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Instr. Corp., Chicopee, Mass.
Granite State Machine Co., Inc., Manchester, N.H.
Gulton Inds., Hawthorne, Calif.
Hammond Mfg. Co., Ltd., Guelph, Ont., Can.
HGA Elctrns., Mt. Vernon, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Mag-Con Engrg. Co., St. Paul, Minn.
Magnetico, Inc., E. Northport, N.Y.
Magnetics, Sandy Lake, Pa.
Polyphase Instr. Co., Bridgeport, Pa.
Preferred Electronics, Inc., Westfield, Mass.
Queensboro Transformer & Mach., College Pt., N.Y.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Ramm Rectifier Co., Inc., Bronx, N.Y.
Robicon Corp., Pittsburgh, Pa
SBD Systems, Inc., Amityville, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Singer-General Precision, Inc., Little Falls, N.J.
SKG Assocs., Inc., Boston, Mass.
Telectro Sys. Corp., Corona, N.Y.
Torelco Inc., Irvington, N.J.
Transrex Div., Torrance, Cal.
Tresco an Aydin Co., Phila., Pa.
Varian Assocs., Palo Alto, Cal.
Ward Leonard, Mt. Vernon, N.Y.

Amplifiers, Maser—See Masers—Vol 1

Amplifiers, Master Antenna—See Amplifiers, Distribution

Amplifiers, Microphone—See Amplifiers A-F (Excluding Hi-Fi)

Amplifiers, Microwave—See Vol 1

Amplifiers, Mixing

Applied Research Inc., Port Washington, N.Y.
Data-Control Systems, Danbury, Conn.
Honeywell, Denver, Colo.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Nippon Electric/NEC America, N.Y., N.Y.
Solid State Elctrns., Sepulveda, Cal. p 954
Sonex, Inc., Bethayres, Pa.
Aertech Inds., Sunnyvale, Calif.
Altec, Anaheim, Calif.
Amplifier Corp. America, Westbury, N.Y.
Anzac Elctrns., Waltham, Mass.
Bell & Howell Co., Pasadena, Calif.
Bozak, R.T. Mfg. Co., Darien, Conn.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dorsett Elctrns., Tulsa, Okla.
Elctrn. Resources Div., Los Angeles, Cal.
Eon Instr., Inc., Van Nuys, Cal.
Fairchild Semiconductor, Mountain View, Calif.
General Devices, Inc., Princeton, N.J.
General Instr. Corp., Hicksville, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
HGA Elctrns., Mt. Vernon, N.Y.
Itek Corp., Lexington, Mass.
Microcom Corp., Horsham, Pa.
Microwave Assocs., Inc., Burlington, Mass.
Neptune Elctrns. Co., New York, N.Y.
Newcomb Audio Prods. Co., Sylmar, Calif.
NUS Corp., Paramus, N.J.
Optical Elctrns., Tucson, Ariz.
Philco-Ford Corp., Washington, D.C.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Precision Electronics, Inc., Franklin Park, Ill.
Pulse Techniques, Inc., W. Englewood, N.J.
Ramsay Engrg. Co., Anaheim, Calif.
Sage Labs. Inc., Natick, Mass.
Special Microwave Devices Oper., Waltham, Mass.
Spectra Sonics, Ogden, Utah
Systems Resch. Labs., Dayton, Ohio
Ultra Audio Prods., Beverly Hills, Calif.
Varian Assocs., Palo Alto, Cal.

Amplifiers, Narrow-Band

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. .... p 1867
C-COR Elctrns., State College, Pa. p 1280
CML-Macarr, Inc., Edison, N.J.
Dynamics Instr. Co., Monterey Pk., Cal.
E & M Labs., Westlake Village, Cal.
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Ind'l. Test Equip., Port Washington, N.Y.
Ithaco, Inc., Ithaca, N.Y.
Lorch Elctrns. Corp., Englewood, N.J.
Neff Instr. Corp., Duarte, Calif...... p 1291
Preston Scientific, Anaheim, Cal. p 1293
RF Communications, Rochester, N.Y. p 553
RHG Elctrns. Lab., Farmingdale, N.Y.
Rockland Sys. Corp., Blauvelt, N.Y.
Sierra Sys., Mountain View, Cal.
Teledyne Philbrick, Dedham, Mass.
Advanced Kinetics, Costa Mesa, Calif.
Aerospace Resch. Inc., Boston, Mass.
Aertech Inds., Sunnyvale, Calif.
AMBAC Inds., Garden City, N.Y.
Anzac Elctrns., Waltham, Mass.
B & K Instrs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Bose Corp., Natick, Mass.
Brower Laboratories, Inc., Waltham, Mass.
Burr-Brown Resch. Corp., Tucson, Ariz.
Dana Labs., Inc., Irvine, Calif.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Fairchild Semiconductor, Mountain View, Calif.
General Devices, Inc., Princeton, N.J.
General Instr. Corp., Hicksville, N.Y.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Culver City, Cal.
Incor Instr., Plainview, N.Y.
Int'l. Microwave, Cos Cob, Conn.
International Scanatron Sys., Wyandanch, N.Y.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Keithley Instrs., Inc., Cleveland, Ohio
Loral Elctrn. Sys., Bronx, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Optical Elctrns., Tucson, Ariz.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Princeton Applied Resch. Corp., Princeton, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Scientific Communications, Garland, Tex.
Singer - Tele-Signal, Woodbury, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Varian Assocs., Palo Alto, Cal.
Zeltex, Inc., Concord, Calif.
Zeta Labs., Inc., Mountain View, Calif.

Amplifiers, Null—See Vol 1

Amplifiers, Operational

Airpax Elctrns., Inc., Cambridge, Md.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. .... p 1865
California Elctrn. Mfg. Co., Alamo, Calif.
Cober Elctrns., Inc., Stamford, Conn.
Computer Labs, Greensboro, N.C. p 1279
DDC, Hicksville, N.Y....................... p 1282
Digital Equip. Corp., Maynard, Mass.
Dynamics Instr. Co., Monterey Pk., Cal.
Elctrn. Assocs., W. Long Branch, N.J. p 2381
General Elec. Co., Schenectady, N.Y.
Gould, Inc., Cleveland, Ohio
Hybrid Sys. Corp., Burlington, Mass. p 352
Intronics, Inc., Newton, Mass. .... p 1288
Ithaco, Inc., Ithaca, N.Y.
Julie Research Lab., New York, N.Y. p 502
Kepco, Inc., Flushing, N.Y................ p 748
Ledex, Inc., Dayton, Ohio
Melcor Elctrns. Corp., Farmingdale, N.Y. p 1290
Multitech Microelctrns., Monterey Pk., Cal.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Opamp Labs., Los Angeles, Cal. p 1292
Precision Monolithics, Santa Clara, Cal. p 1545
Quindar Elctrns., Inc., Springfield, N.J.
RO Assocs., Menlo Pk., Cal.
Solid State Elctrns., Sepulveda, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass. p 1294
Tempo/UTI Div., Chatsworth, Cal.
Achrodyne Corp., Yorktown, Va.
Advanced Kinetics, Costa Mesa, Calif.
Allegri-Tech, Inc., Nutley, N.J.
Amperex Elctrn., Cranston, R.I.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
Applied Dynamics Computer Sys., Ann Arbor, Mich.
B & W Elctrn. Resch. Labs., Dallas, Tex.
Bell & Howell Co., Pasadena, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Dynamics, Torrington, Conn.
Control Logic, Natick, Mass.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electronic Design Labs., Inc., Phila., Pa.
Fairchild Controls, Mountain View, Calif.
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
Ferranti Ltd., Hollinwood, Lancs., England
General Computers, Inc., Los Angeles, Calif.
General Instr. Corp., Hicksville, N.Y.
Glentek, Inc., Santa Monica, Calif.
Goerz Optical Co., Inc., Pittsburgh, Pa.
GPS Instr. Co., Framingham, Mass.
Harris Semiconductor, Melbourne, Fla.
Heath Co., Benton Harbor, Mich.
Honeywell, Apparatus Controls, Mpls., Minn.
Incor Instr., Plainview, N.Y.
Intech, Santa Clara, Cal.
Integrated Controls, San Diego, Cal.
International Light, Newburyport, Mass.
Isotech Inc., Westford, Mass.
ITT Semiconductors, W. Palm Beach, Fla.
Keithley Instrs., Inc., Cleveland, Ohio
Kinetic Tech., Inc., Santa Clara, Cal.
Lancer Elctrns. Corp., Norristown, Pa.
Leeds & Northrup Corp., No. Wales, Pa.
Ling Elctrns., Anaheim, Calif.
Link Div., Binghamton, N.Y.
Loral Elctrn. Sys., Bronx, N.Y.
McFadden Elctrns. Co., South Gate, Calif.
McKee-Pedersen Instrs., Danville, Calif.
Megadyne Inds., Inc., Rochester, N.Y.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Micro Networks, Worcester, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Calif.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Princeton Applied Resch. Corp., Princeton, N.J.
Qualidyne Corp., Santa Clara, Cal.
Raytheon Co., Mt. View, Calif.
REDCOR Corp., Woodland Hills, Cal.
Signetics Corp., Sunnyvale, Calif.
Silicon Gen'l., Inc., Westminster, Cal.
Singer-General Precision, Inc., Little Falls, N.J.
Sundstrand Data Control, Redmond, Wash.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Transducer Systems, Inc., Willow Grove, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Zeltex, Inc., Concord, Calif.

Amplifiers, Parametric—See Vol 1

Amplifiers, Peak-Limiting

Hybrid Sys. Corp., Burlington, Mass. p 352
Ithaco, Inc., Ithaca, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
Teledyne Philbrick, Dedham, Mass.
Universal Ad-Yu Elctrns., Inc., Passaic, N.J.
Amplifier Corp. America, Westbury, N.Y.
Burr-Brown Resch. Corp., Tucson, Ariz.
CBS Laboratories, Stamford, Conn.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Elctrn. Sys. Engrg., Cushing, Okla.
Fairchild Semiconductor, Mountain View, Calif.
Intech, Santa Clara, Cal.
Integrated Controls, San Diego, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Singer - Tele-Signal, Woodbury, N.Y.
Ultra Audio Prods., Beverly Hills, Calif.
Wilkinson Elctrns., Woodlyn, Pa.

Amplifiers, Phase-Lock—See Amplifiers, Lock-In

Amplifiers, Photocell

Arvee Engrg. Co., Torrance, Calif.
Centralab Semiconductor, El Monte, Cal.
DDC, Hicksville, N.Y.
Elctrn. Assocs., W. Long Branch, N.J.
Fork Standards, W. Chicago, Ill.
Hybrid Sys. Corp., Burlington, Mass.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Opamp Labs., Los Angeles, Cal.
Precision Monolithics, Santa Clara, Cal.
Sensor Tech., Van Nuys, Cal....... p 1638
Syracuse Elctrns. Corp., Syracuse, N.Y.
Teledyne Philbrick, Dedham, Mass.
United Detector Tech., Santa Monica, Cal.

Acromag, Inc., Wixom, Mich.
Advanced Kinetics, Costa Mesa, Calif.
Aerolite Electronics Corp., Union City, N.J.
Analog Devices, Inc., Norwood, Mass.
Belleville Elctrns. Co., Belleville, Mich.
Bio-Medical Elctrns., Inc., Rockville, Md.
Brower Laboratories, Inc., Waltham, Mass.
Burr-Brown Resch. Corp., Tucson, Ariz.
Controlcraft Corp., West Chicago, Ill.
De-Tec-Tronic Corp., Chicago, Ill.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Electronic Control Corp., Detroit, Mich.
Elctrns., Ltd., Marion, Iowa
Frost Electronics Corp., Bellingham, Mass.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
HEI, Inc., Chaska, Minn.
Hird Brown America, Livingston, N.J.
Intech, Santa Clara, Cal.
International Light, Newburyport, Mass.
Keithley Instrs., Inc., Cleveland, Ohio
Marathon Instrs. Div., Pico Rivera, Calif.
Massey Dickinson Co., Inc., Saxonville, Mass.
MEKontrol Inc., Northboro, Mass.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Optoelectronics, Inc., Petaluma, Cal.
Pacific Photometric Instrs., Berkeley, Cal.
Perry Amplifier, Brookline, Mass.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Power Instrs., Skokie, Ill.
Sensor Corp., Greenwich, Conn.
Tri-Tronics Co., Oak Brook, Ill.
Worner Elctrn. Devices, Rankin, Ill.

Amplifiers, Power (Excluding Hi-Fi)

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Microwave Lab., Andover, Mass.
Applied Research Inc., Port Washington, N.Y.......................... p 1554
Arvee Engrg. Co., Torrance, Calif.
Behlman Div., San Diego, Cal
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C-COR Elctrns., State College, Pa. p 1281
Clarke - Hess, New York, N.Y.
CML-Macarr, Inc., Edison, N.J. p 661-663,666
Cober Elctrns., Inc., Stamford, Conn. p 601
Connor-Winfield Corp., Winfield, Ill.
Control Technology Co., L.I.C., N.Y.
Crown Int'l., Elkhart, Ind.
DDC, Hicksville, N.Y.
Elctrn. Assocs., W. Long Branch, N.J.
Elgar Corp., San Diego, Cal.
Elin Div., San Diego, Cal.
Frequency Control, Inc., Austin, Tex.
Hewlett-Packard, Palo Alto, Cal.
Ind'l. Control Co., Farmingdale, N.Y.
Ind'l. Test Equip., Port Washington, N.Y.
Infodex, Inc., Waterbury, Conn.
Instrs. For Ind., Inc., Farmingdale, N.Y. p 1285
Ithaco, Inc., Ithaca, N.Y.
Kepco, Inc., Flushing, N.Y.........p 747-749
Krohn-Hite, Cambridge, Mass.
Lorch Elctrns. Corp., Englewood, N.J.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microdot Inc., City of Industry, Cal.
Microwave Cavity Labs., La Grange, Ill. p 611
Millen, James Mfg., Malden, Mass.
Multitech Communications, Monterey Pk., Cal. .... p 324
Multitech Power Sys., Costa Mesa, Cal.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Opamp Labs., Los Angeles, Cal. p 1292
Quindar Elctrns., Inc., Springfield, N.J.
RF Communications, Rochester, N.Y. p 553
RHG Elctrns. Lab., Farmingdale, N.Y.
SRC Div., Newport Bch., Cal.
Teledyne Philbrick, Dedham, Mass.
Vector Engrg., Springfield, N.J..... p 943
Achrodyne Corp., Yorktown, Va.
Acoustronics, Inc., Huntington, N.Y.
Action Systems Co., Meriden, Conn.
Aerospace Resch. Inc., Boston, Mass.
Alcor, Inc., Ithaca, N.Y.
Allis, Louis Co., Milwaukee, Wisc.
Allis Louis Co., Greendale, Wisc.
Altec, Anaheim, Calif.
American Geloso Elctrns., Inc., New York, N.Y.
Amplifier Corp. America, Westbury, N.Y.
Anzac Elctrns., Waltham, Mass.
Applied Control Co., Fairfield, N.J.
Applied Electro Mechanics, Alexandria, Va.
Audio Instr. Co., Union City, N.J.
Avantek, Inc., Santa Clara, Cal.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bell P/A Prods. Corp., Columbus, Ohio
Bertan Assocs., Inc., Plainview, N.Y.
Bogen Div., Paramus, N.J.
Bogue Elec. Mfg. Co., Paterson, N.J.
Bowmar/Ali, Inc., Acton, Mass.
Bose Corp., Natick, Mass.
Burr-Brown Resch. Corp., Tucson, Ariz.
California Instrs. Co., San Diego, Cal.
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Constant Voltage Co., Chicago, Ill.
Continental Elctrns. Mfg., Dallas, Tex.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Delta Elctrn. Control, Costa Mesa, Cal.
Dorsett Elctrns., Tulsa, Okla.
Du Kane Corp., St. Charles, Ill.
Dynamic Precision Controls, Hagerstown, Ind.
Edo Western Corp., Salt Lake City, Utah
Eico Electronic Instrument Co., Inc., Brooklyn, N.Y.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Elctrn. Resources Div., Los Angeles, Cal.
Energy Systems, Palo Alto, Cal.
Femco Div., Irwin, Pa.
General Radio Co., Concord, Mass.
Glentek, Inc., Santa Monica, Calif.
Goerz Optical Co., Inc., Pittsburgh, Pa.
Gotham Audio Corp., New York, N.Y.
Halmar Elctrns., Inc., Columbus, Ohio
Heath Co., Benton Harbor, Mich.
Hermes Elctrns., Dartmouth N.S., Can.
Holt Instr. Labs., Oconto, Wisc.
Honeywell, Apparatus Controls, Mpls., Minn.
Hope Elctrns., Clifton, N.J.
Hyletronics Corp., Littleton, Mass.
Indofex, Inc., Waterbury, Conn.
Inland Motor Corp. of Va., Radford, Va.
Instruments, Inc., San Diego, Calif.
Keltron Corp., Waltham, Mass.
Kistler Instr. Co., Redmond, Wash.
Lansing, James B. Sound, Los Angeles, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Ling Elctrns., Anaheim, Calif.
Litton Inds., San Carlos, Calif.
MB Elctrns/Textron Co., New Haven, Conn.
McFadden Elctrns. Co., South Gate, Calif.
McKee-Pedersen Instrs., Danville, Calif.
Merchant, Robert C. Co., Carmel Valley, Calif.
Micro-Tel Corp., Baltimore, Md.
Mini-Circuits Lab., Brooklyn, N.Y.
MPC Prods. Corp., Chicago, Ill.
Neptune Elctrns. Co., New York, N.Y.
Newcomb Audio Prods. Co., Sylmar, Calif.
NH Research, Inc., Santa Ana, Calif.
Olektron Corp., Dudley, Mass.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Paraplegics Mfg., Bensenville, Ill.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Power Control Corp., Pittsburgh, Pa.
Precision Electronics, Inc., Franklin Park, Ill.
Princeton Applied Resch. Corp., Princeton, N.J.
Private Tele-Comms., Inc., Chicago, Ill.
Randam Elctrns., Inc., Cincinnati, Ohio
Randtronics, Inc., Palo Alto, Cal.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Resalab Inc., Advanced Development Lab., Los Angeles, Cal.
RF Communications, Inc., Rochester, N.Y.
RFL Inds., Comms. Div., Boonton, N.J.
Robicon Corp., Pittsburgh, Pa
Rohde & Schwarz Sls., Passaic, N.J.
SBD Systems, Inc., Amityville, N.Y.
Scientific Communications, Garland, Tex.
Singer Co., Somerville, N.J.
Spectra Sonics, Ogden, Utah
Technical Mat'l., Mamaroneck, N.Y.
Tel-Instr. Elctrns. Corp., Carlstadt, N.J.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Transrex Div., Torrance, Cal.
Unholtz-Dickie Corp., Hamden, Conn.
University Sound, Anaheim, Cal.
Varian Assocs., Palo Alto, Cal.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Visual Elctrns. Corp., New York, N.Y.
Wand Elctrns., Inc., Old Bethpage, N.Y.
Ward Leonard, Mt. Vernon, N.Y.
Webster Elec. Co., Inc., Racine, Wisc.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Public Address

Crown Int'l., Elkhart, Ind.
Elctrn. Assocs., W. Long Branch, N.J.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Multitech Communications, Monterey Pk., Cal.
Action Systems Co., Meriden, Conn.
Alcor, Inc., Ithaca, N.Y.
Allied Elctrns. Corp., Chicago, Ill.
Altec, Anaheim, Calif.
American Geloso Elctrns., Inc., New York, N.Y.
Amplifier Corp. America, Westbury, N.Y.
Applied Electro Mechanics, Alexandria, Va.
Audio Equip. Co., Inc., Pt. Washington, N.Y.
Audio Instr. Co., Union City, N.J.
Bell P/A Prods. Corp., Columbus, Ohio
Bogen Div., Paramus, N.J.
Bozak, R.T. Mfg. Co., Darien, Conn.
Browning Labs., Laconia, N.H.
Chamberlain Mfg. Corp., Elmhurst, Ill.
Clinton Instr. Co., Clinton, Conn.
Components Specialties, Inc., Freeport, N.Y.
Du Kane Corp., St. Charles, Ill.
Eico Electronic Instrument Co., Inc., Brooklyn, N.Y.
Elctrn. Sys. Engrg., Cushing, Okla.
Encom Prods. Co., Inc., Oxford, Pa.
Executone, Inc., Long Island City, N.Y.
Fanon Elctrns., Hillside, N.J.
Femco Div., Irwin, Pa.
Gai-Tronics Corp., Reading, Pa
ISC/Telephonics Div, Huntington, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Matsushita Comm. Ind'l. Co., Ltd., Yokohama, Japan
Midwest Audio Corp., Chicago, Ill.
Multi Media Engrg., Inc., Rockville, Md.
Nelson-Hershfield Elctrns., Phoenix, Ariz.
Neptune Elctrns. Co., New York, N.Y.
Newcomb Audio Prods. Co., Sylmar, Calif.
Optimation, Inc., Sun Valley, Calif.
Paraplegics Mfg., Bensenville, Ill.
Philmore Mfg. Co., Richmond Hill, N.Y.
Precision Electronics, Inc., Franklin Park, Ill.
Private Tele-Comms., Inc., Chicago, Ill.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
SBD Systems, Inc., Amityville, N.Y.
Schindlers, Los Angeles, Cal.
Shure Bros., Inc., Evanston, Ill.
Spectra Sonics, Ogden, Utah
Trutone Elctrns., Inc., Van Nuys, Calif.
Ultra Audio Prods., Beverly Hills, Calif.
Universal Resch. Labs., Elk Grove Village, Ill
University Sound, Anaheim, Cal.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Webster Elec. Co., Inc., Racine, Wisc.

Amplifiers, Pulse

American Astrionics, Hollywood, Cal p 335
American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Microwave Lab., Andover, Mass.
Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif.
Arvin Magnetics, Eden Prairie, Minn.
Bowmar Instr. Corp., Ft. Wayne, Ind.
C-COR Elctrns., State College, Pa. p 1280
Chronetics, Inc., Mt. Vernon, N.Y.
CML-Macarr, Inc., Edison, N.J.
General Elec. Co., Schenectady, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Infodex, Inc., Waterbury, Conn.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Intronics, Inc., Newton, Mass.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Microwave Cavity Labs., La Grange, Ill. p 611
RHG Elctrns. Lab., Farmingdale, N.Y.
Solid State Elctrns., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
SRC Div., Newport Bch., Cal. ..p 560,561
Teledyne Philbrick, Dedham, Mass.
Vega Precision Labs., Vienna, Va.
Advanced Kinetics, Costa Mesa, Calif.
Aertech Inds., Sunnyvale, Calif.
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
AMF Electical Prods., Alexandria, Va.
Amplifier Research Corp., Fairview Village, Pa.
Analog Devices, Inc., Norwood, Mass.
Applied Electro Mechanics, Alexandria, Va.
Avantek, Inc., Santa Clara, Cal.
Avco Corp., Cincinnati, Ohio
Bell & Howell Co., Pasadena, Calif.
Bertan Assocs., Inc., Plainview, N.Y.
Biocom, Inc., Culver City, Cal.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cohu Elctrns., Inc., San Diego, Calif.
Computer Test Corp., Cherry Hill, N.J.
Consolidated Resistance Sls., Yonkers, N.Y.
Continental Elctrns. Mfg., Dallas, Tex.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Resources Div., Los Angeles, Cal.
Energy Systems, Palo Alto, Cal.
General Instr. Corp., Hicksville, N.Y.
General Radio Co., Concord, Mass.
Harshaw Chem. Co., Cleveland, Ohio
Heidelex Corp., Chelmsford, Mass.
Hope Elctrns., Clifton, N.J.
Hughes Aircraft Co, Culver City, Cal.
Indofex, Inc., Waterbury, Conn.
Integrated Controls, San Diego, Cal.
Int'l. Microwave, Cos Cob, Conn.
Isomet Corp., Oakland, N.J.
Johnston Labs., Inc., Cockeysville, Md.
Keithley Instrs., Inc., Cleveland, Ohio
Lasermetrics, Inc., Rochelle Park, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
Litton Inds., San Carlos, Calif.
Locus, Inc, State College, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Matrix Sys. Corp., Chatsworth, Cal.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Milletron, Inc., Pittsburgh, Pa.
Motorola Semiconductor Prods., Phoenix, Ariz.
Nanosecond Systems, Inc., Fairfield, Conn.
Neptune Elctrns. Co., New York, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Optical Elctrns., Tucson, Ariz.

Optimation, Inc., Sun Valley, Calif.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Randam Elctrns., Inc., Cincinnati, Ohio
Resalab Inc., Advanced Development Lab., Los Angeles, Cal.
RIL Elctrns., Inc., Southampton, Pa.
Rodale Elctrns., Inc., Garden City, N.Y.
Sensor Corp., Greenwich, Conn.
Signetics Corp., Sunnyvale, Calif.
SSR Instrs. Co., Santa Monica, Cal.
Systems Resch. Labs., Dayton, Ohio
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Velonex, Santa Clara, Calif.
Wand Elctrns., Inc., Old Bethpage, N.Y.

Amplifiers, Pulse-Limiting

American Astrionics, Hollywood, Cal
American Elctrn. Labs., Inc., Lansdale, Pa.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Cober Elctrns., Inc., Stamford, Conn.
RHG Elctrns. Lab., Farmingdale, N.Y.
Aertech Inds., Sunnyvale, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Clifton Div., Clifton Hgts., Pa.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Hughes Aircraft Co, Culver City, Cal.
Loral Elctrn. Sys., Bronx, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Neptune Elctrns. Co., New York, N.Y.
Optical Elctrns., Tucson, Ariz.
Philco-Ford Corp., Washington, D.C.
Randam Elctrns., Inc., Cincinnati, Ohio

Amplifiers, Radar—See Amplifiers, Microwave—Vol 1

Amplifiers, Recording—See Amplifiers, A-F (Excluding Hi-Fi)

Amplifiers Resolver—See Amplifiers, Servo

Amplifiers, R-F

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Microwave Lab., Andover, Mass.
Applied Research Inc., Port Washington, N.Y. .... p 1554
Arvee Engrg. Co., Torrance, Calif. p 1278
Astrosystems, Lake Success, N.Y.
Autronics Corp., Pasadena, Calif.
C-COR Elctrns., State College, Pa. p 1280
Daico Inds., Inc., Compton, Cal.
DDC, Hicksville, N.Y.
E & M Labs., Westlake Village, Cal. p 1557
Electro/Data, Inc., Garland, Tex. p 1558
Frequency Engrg. Labs., Farmingdale, N.J.
General Elec. Co., Schenectady, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Instrs. For Ind., Inc., Farmingdale, N.Y. p 1285
Johnson E. F. Co., Waseca, Minn.
Kay Elemetrics, Pine Brook, N.J... p 507
Krohn-Hite, Cambridge, Mass.
Lorch Elctrns. Corp., Englewood, N.J. p 609
Matrix Corp., Beech Grove, Ind.
Microdot Inc., City of Industry, Cal.
Microwave Cavity Labs., La Grange, Ill. p 611
Millen, James Mfg., Malden, Mass.
Multitech Power Sys., Costa Mesa, Cal.
RF Communications, Rochester, N.Y. p 553
RHG Elctrns. Lab., Farmingdale, N.Y. p 1562
Sierra Sys., Mountain View, Cal.
Solid State Elctrns., Sepulveda, Cal.
Teledyne Philbrick, Dedham, Mass. p 1294
Watkins Johnson Co., Palo Alto, Cal. p 1295
Adams-Russell Co., Waltham, Mass.
Advanced Kinetics, Costa Mesa, Calif.
Aerocom, Miami, Fla.
Aerolite Electronics Corp., Union City, N.J.
Aeronautical Comm. Equip. Inc., Miami, Fla.
Aerospace Resch. Inc., Boston, Mass.
Aertech Inds., Sunnyvale, Calif.
AMBAC Inds., Garden City, N.Y.
AMF Electical Prods., Alexandria, Va.
Amplifier Research Corp., Fairview Village, Pa.
Anzac Elctrns., Waltham, Mass.
Arenberg Ultrasonic Lab., Inc., Jamaica Plain, Mass.
Arvin Sys., Inc., Dayton, Ohio
AUL Instrs., Inc., Flushng, N.Y.
Ava Elctrns., Upper Darby, Pa.
Avantek, Inc., Santa Clara, Cal.
Avco Corp., Cincinnati, Ohio
Barker & Williamson, Bristol, Pa.
Benco Television Assoc., Rexdale, Ont., Can.
Bertan Assocs., Inc., Plainview, N.Y.
BF Elctrns., Solana Beach, Calif.
B.H. Inds., Los Angeles, Cal.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Comdel, Inc., Beverly, Mass.
Conductron Corp., St. Charles, Mo.
Continental Elctrns. Mfg., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dorsett Elctrns., Tulsa, Okla.
Eimac, San Carlos, Calif.
Elcom Sys., Deer Pk., N.Y.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Elctrn. Resources Div., Los Angeles, Cal.
Electronics Missiles & Comms., White Haven, Pa.
EMF Systems, Inc., State College, Pa.
Energy Systems, Palo Alto, Cal.
Entron, Inc., Silver Spring, Md.
Essex Int'l., Inc., Decatur, Ill.
Fairchild Semiconductor, Mountain View, Calif.
Farinon Electric, San Carlos, Calif.
Finney Co., Bedford, Ohio
Gavin Instrs., Somerville, N.J.
General Instr. of Can., Waterloo, Ont., Can.
General Instr. Corp., Hicksville, N.Y.
Hafstrom Tech. Prods., Inc., San Diego, Calif.
Hammarlund Mfg. Co., Red Bank, N.J.
Heath Co., Benton Harbor, Mich.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Int'l. Microwave, Cos Cob, Conn.
Itek Corp., Lexington, Mass.
ITT Mackay Marine, Clark, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Keithley Instrs., Inc., Cleveland, Ohio
Koch Inds., Anaheim, Cal.
La Pointe Inds., Inc., Rockville, Conn.
Lear Siegler, Inc., Santa Monica, Calif.
Linear Sys., Inc., Watsonville, Calif.
Litton Inds., San Carlos, Calif.
Locus, Inc, State College, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microdot Inc., S. Pasadena, Calif.
Micromega, Los Angeles, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
MITEQ, Inc., Hauppauge, N.Y.
Morey Corp, Downers Grove, Ill.
Narda Microwave Corp., Plainview, N.Y.
Neptune Elctrns. Co., New York, N.Y.
Oklahoma Aerotronics, Hartshorne, Okla.
Olektron Corp., Dudley, Mass.
Optimation, Inc., Sun Valley, Calif.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Pickard & Burns Inc., Lindenhurst, N.Y.
Radiation Devices Co., Baltimore, Md.
Radio Resch. Co., Rockaway, N.J.
Randam Elctrns., Inc., Cincinnati, Ohio
Rantec Div., Calabasas, Calif.
RF Communications, Inc., Rochester, N.Y.
RHA-Audio Communications, W. New York, N.J.
Robicon Corp., Pittsburgh, Pa
Rodelco, Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Rust Corp., Everett, Mass.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Scientific Communications, Garland, Tex.
Servo Corp. America, Hicksville, N.Y.
Signetics Corp., Sunnyvale, Calif.
Sinclair Radio Labs., Maple, Ont., Can.
Special Microwave Devices Oper., Waltham, Mass.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Sperry Marine Sys., Charlottesville, Va.
Standard Elctrns. Corp., Freehold, N.J.
Standard Winding Co., Newsburgh, N.Y.
Systems Resch. Labs., Dayton, Ohio
Technical Mat'l., Mamaroneck, N.Y.
Teledyne Micronetics, San Diego, Calif.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Wand Elctrns., Inc., Old Bethpage, N.Y.
Westinghouse Elec., Elmira, N.Y.
Wilkinson Elctrns., Woodlyn, Pa.
Wiltron Co., Palo Alto, Calif.
Winegard Co., Burlington, Iowa
Zeta Labs., Inc., Mountain View, Calif.

Amplifiers, Sample & Hold

A. D. Data Sys., Inc., Rochester, N.Y.
American Astrionics, Hollywood, Cal
Astrosystems, Lake Success, N.Y.
Austron, Inc., Austin, Tex.
California Elctrn. Mfg. Co., Alamo, Calif.
Chronetics, Inc., Mt. Vernon, N.Y.
Clarke - Hess, New York, N.Y.
Computer Prods., Ft. Lauderdale, Fla.
DDC, Hicksville, N.Y. .... p 1282
E-H Resch. Labs., Inc., Oakland, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Hybrid Sys. Corp., Burlington, Mass. p 352
Inter-Computer Elctrns., Lansdale, Pa. p 355
Intronics, Inc., Newton, Mass. .... p 1288
Melcor Elctrns. Corp., Farmingdale, N.Y.
Precision Monolithics, Santa Clara, Cal.
Preston Scientific, Anaheim, Cal. p 373
Raytheon Computer, Santa Ana, Cal. p 374,375
RO Assocs., Menlo Pk., Cal.
Teledyne Philbrick, Dedham, Mass. p 1294
Tempo/UTI Div., Chatsworth, Cal.
Adage, Inc., Boston, Mass.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
Bio-Medical Elctrns., Inc., Rockville, Md.
Burr-Brown Resch. Corp., Tucson, Ariz.
Computer Conversions Corp., East Northport, N.Y.
Data Technology Corp., Palo Alto, Cal.
Dynamic Sys. Elctrns. Corp., Tempe, Ariz.
Fairchild Semiconductor, Mountain View, Calif.
General Microwave Corp., Farmingdale, N.Y.
Geo Space, Houston, Tex.
GPS Instr. Co., Framingham, Mass.
Gralex Inds., Inc., Farmingdale, N.Y.
Gulton Inds., Albuquerque, N.M.
Integrated Controls, San Diego, Cal.
ISC/Telephonics Div, Huntington, N.Y.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Moore Inds., Van Nuys, Cal.
Newport Labs., Inc., Santa Ana, Cal.
Optical Elctrns., Tucson, Ariz.
REDCOR Corp., Woodland Hills, Cal.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Xerox Data Sys., El Segundo, Cal
Zeltex, Inc., Concord, Calif.

Amplifiers, Servo

Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla.
Behlman Div., San Diego, Cal
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. p 1865-1867
California Elctrn. Mfg. Co., Alamo, Calif.
Computer Instrs., Hempstead, N.Y.
Control Technology Co., L.I.C., N.Y. p 1868
Crown Int'l., Elkhart, Ind.
DDC, Hicksville, N.Y. .... p 1282
Elctrn. Assocs., W. Long Branch, N.J.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y. p 1872
International Rectifier, El Segundo, Cal.
Kepco, Inc., Flushing, N.Y.
Magnedyne Inc., Carlsbad, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
Opamp Labs., Los Angeles, Cal.
Teledyne Philbrick, Dedham, Mass.
Trio Labs, Inc., Plainview, N.Y.
Achrodyne Corp., Yorktown, Va.
Advance Instr. Corp., Belmar, N. J.
Allegri-Tech, Inc., Nutley, N.J.
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
Analog Devices, Inc., Norwood, Mass.
Applied Control Co., Fairfield, N.J.
Automatic Control Elctrns. Co., San Antonio, Tex.
Avco Corp., Cincinnati, Ohio
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Bendix, S. Montrose, Pa.
Bergen Labs., Inc., Paterson, N.J.
Betzelt GMBH, Trogerstr. 32, W. Germany
B.H. Inds., Los Angeles, Cal.
Bose Corp., Natick, Mass.
Burr-Brown Resch. Corp., Tucson, Ariz.
California Instrs. Co., San Diego, Cal.
Celtic Inds., Inc., Van Nuys, Cal.
CGS/Lawrence, Southampton, Pa.
Clifton Div., Clifton Hgts., Pa.
Coast Elctrns., Manhattan Beach, Cal.
Collins Radio Co., Dallas, Tex.
ComGeneral Corp., Dayton, Ohio
Computer Dynamics, Torrington, Conn.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Controlotron Corp., Farmingdale, N.Y.
Dynamic Precision Controls, Hagerstown, Ind.
EDC (Electro Dev.), Lynnwood, Wash.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electro-Craft Corp, Hopkins, Minn
Esterline Angus Div., Indianapolis, Ind.
Fairchild Semiconductor, Mountain View, Calif.
Farrand Controls, Inc., Valhalla, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Gap Instr. Corp., Hauppauge, N.Y.
General Oceanology, Inc., Cambridge, Mass.
Glar-Ban Corp., Buffalo, N.Y.
Glentek, Inc., Santa Monica, Calif.
Goerz Optical Co., Inc., Pittsburgh, Pa.
Guide Inds., Inc., Sun Valley, Calif.
Henschel Corp., Amesbury, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co, Culver City, Cal.
Innovatek Enterprise, Millerton, N.Y.
Instru-Lec Corp., Mt. Vernon, N.Y.
Intech, Santa Clara, Cal.
Integrated Controls, San Diego, Cal.
Jordan Controls, Milwaukee, Wisc.
Kelk, George Ltd., Don Mills, Ont., Canada
Keltron Corp., Waltham, Mass.
Kistler Instr. Co., Redmond, Wash.
Kollsman Instr. Corp., Syosset, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Magnetico, Inc., E. Northport, N.Y.
MB Elctrns/Textron Co., New Haven, Conn.
McFadden Elctrns. Co., South Gate, Calif.
McKee-Pedersen Instrs., Danville, Calif.
Medistor Instr. Co., Seattle, Wash.
Midland Standard Inc., Elgin, Ill.
MPC Prods. Corp., Chicago, Ill.
Muirhead, Inc., Mountainside, N.J.
Optical Elctrns., Tucson, Ariz.
Orbit Instr. Corp., Syosset, N.Y.
Power Control Corp., Pittsburgh, Pa.
Prototype Transformer Corp., E. Orange, N.J.
Ramsay Engrg. Co., Anaheim, Calif.
Randtronics, Inc., Palo Alto, Cal.
Rawco Instrs., Inc., Ft. Worth, Tex.
Robertson Instr., Azusa, Cal.
Robicon Corp., Pittsburgh, Pa

Sanders Assocs., Inc., Manchester, N.H.
Scientific-Atlanta, Inc., Atlanta, Ga.
Servo Dev. Corp., Hicksville, N.Y.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Sperry Marine Sys., Charlottesville, Va.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Unholtz-Dickie Corp., Hamden, Conn.
Westamp, Inc., Santa Monica, Cal.
Weston-Transicoil, Worcester, Pa.
Westronics, Inc., Ft. Worth, Tex.
Zonic Tech. Labs., Cincinnati, Ohio

Amplifiers, Single-Sideband—See Vol 1

Amplifiers, Standing Wave—See Vol 1

Amplifiers, Strain Gauge

Airpax Elctrns., Inc., Cambridge, Md.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
California Elctrn. Mfg. Co., Alamo, Calif.
Control Technology Co., L.I.C., N.Y. p 1868
Data-Control Systems, Danbury, Conn.
DDC, Hicksville, N.Y.
Dynamics Instr. Co., Monterey Pk., Cal.
Ectron Corp., San Diego, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Gould, Inc., Cleveland, Ohio
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Kepco, Inc., Flushing, N.Y.
Matrix Corp., Beech Grove, Ind.
Natel Engrg. Co., Canoga Pk., Cal.
Neff Instr. Corp., Duarte, Calif.
PPM, Inc., Bedford, Ohio
Precision Monolithics, Santa Clara, Cal.
Solid State Elctrns., Sepulveda, Cal.
SRC Div., Newport Bch., Cal. ..p 560,561
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Acromag, Inc., Wixom, Mich.
Analog Devices, Inc., Norwood, Mass.
Applied Control Co., Fairfield, N.J.
B & K Instrs., Inc., Cleveland, Ohio
Bay Labs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Belleville Elctrns. Co., Belleville, Mich.
Burr-Brown Resch. Corp., Tucson, Ariz.
Celtic Inds., Inc., Van Nuys, Cal.
CGS/Lawrence, Southampton, Pa.
Computer Dynamics, Torrington, Conn.
Datum, Inc., Anaheim, Calif.
Doric Sci. Corp., San Diego, Calif.
EDC (Electro Dev.), Lynnwood, Wash.
Elctrns., Ltd., Marion, Iowa
Endevco, Pasadena, Calif.
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
Genisco Tech. Corp., Instr. Div., Compton, Cal.
Glar-Ban Corp., Buffalo, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Houston Scientific Inds., Inc., Houston, Tex
Incor Instr., Plainview, N.Y.
Innovatek Enterprise, Millerton, N.Y.
Intech, Santa Clara, Cal.
Integrated Controls, San Diego, Cal.
K West, Westminster, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Kelk, George Ltd., Don Mills, Ont., Canada
Lebow Assocs., Inc., Troy, Mich.
Marathon Instrs. Div., Pico Rivera, Calif.
MB Elctrns/Textron Co., New Haven, Conn.
Megadyne Inds., Inc., Rochester, N.Y.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Minnetech Labs., Inc., Minneapolis, Minn.
Moore Inds., Van Nuys, Cal.
Newport Labs., Inc., Santa Ana, Cal.
Photron Instr. Co., Cleveland, Ohio
Polyphase Instr. Co., Bridgeport, Pa.
Rawco Instrs., Inc., Ft. Worth, Tex.
Rosemount Engrg. Co., Minneapolis, Minn.
San-ei Instrument Co., Ltd., Shinjuku-ku, Tokyo 160, Japan
Sensotec, Inc., Columbus, Ohio
Standard Controls, Seattle, Wash.
Statham Instrs., Inc., Oxnard, Cal.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Taylor Instr. Process Control Div., Rochester, N.Y.
Transducers, Inc., Santa Fe Springs, Calif.
Tylan Corp., Torrance, Calif.
Vishay Instrs., Malvern, Pa.
West Coast Resch. Corp., Los Angeles, Calif.

Amplifiers, Sweep

Beta Instr., Newton Upper Falls, Mass. p 337
C-COR Elctrns., State College, Pa.
Ind'l. Control Co., Farmingdale, N.Y.
Instrs. For Ind., Inc., Farmingdale, N.Y. p 1285
Kay Elemetrics, Pine Brook, N.J.
Millen, James Mfg., Malden, Mass.
RF Communications, Rochester, N.Y. p 553
Sierra Sys., Mountain View, Cal.
Syntronic Instrs., Inc., Addison, Ill.
Teledyne Philbrick, Dedham, Mass.
ATV Research, Dakota City, Neb.
Avco Corp., Cincinnati, Ohio
Hughes Aircraft Co., Torrance, Cal.
Indofex, Inc., Waterbury, Conn.
Neptune Elctrns. Co., New York, N.Y.
Randam Elctrns., Inc., Cincinnati, Ohio

Amplifiers, Synchro

Astrosystems, Lake Success, N.Y.
Behlman Div., San Diego, Cal
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. .... p 1865
Control Technology Co., L.I.C., N.Y. p 1868
DDC, Hicksville, N.Y. .... p 1282
Ind'l. Control Co., Farmingdale, N.Y. p 1872
Magnetic Technology, Canoga Pk., Cal. p 387
Melcor Elctrns. Corp., Farmingdale, N.Y.
Transmagnetics Inc., Farmingdale, N.Y. p 1875
Vernitron, Torrance, Cal. .... p 387
Vernitron Corp., Deer Pk., N.Y. .... p 387
Clifton Div., Clifton Hgts., Pa.
Dynalex, Inc., Burbank, Cal.
Farrand Controls, Inc., Valhalla, N.Y.
Glentek, Inc., Santa Monica, Calif.
Integrated Controls, San Diego, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Servo Dev. Corp., Hicksville, N.Y.
Singer-General Precision, Inc., Little Falls, N.J.
Sperry Marine Sys., Charlottesville, Va.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Weston-Transicoil, Worcester, Pa.

Amplifiers, Telemetering—See Vol 1

Amplifiers, Thermocouple

Airpax Elctrns., Inc., Cambridge, Md.
California Elctrn. Mfg. Co., Alamo, Calif.
DDC, Hicksville, N.Y.
Dynamics Instr. Co., Monterey Pk., Cal.
Ectron Corp., San Diego, Cal.
Gould, Inc., Cleveland, Ohio
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Intronics, Inc., Newton, Mass.
Matrix Corp., Beech Grove, Ind.
Neff Instr. Corp., Duarte, Calif.
PPM, Inc., Bedford, Ohio
Precision Monolithics, Santa Clara, Cal.
RO Assocs., Menlo Pk., Cal.
Solid State Elctrns., Sepulveda, Cal.
Teledyne Philbrick, Dedham, Mass.
Acromag, Inc., Wixom, Mich.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
B & W Elctrn. Resch. Labs., Dallas, Tex.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bio-Medical Elctrns., Inc., Rockville, Md.
Brower Laboratories, Inc., Waltham, Mass.
Burr-Brown Resch. Corp., Tucson, Ariz.
Coast Elctrns., Manhattan Beach, Cal.
Computer Dynamics, Torrington, Conn.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Dana Labs., Inc., Irvine, Calif.
Datum, Inc., Anaheim, Calif.
Doric Sci. Corp., San Diego, Calif.
EDC (Electro Dev.), Lynnwood, Wash.
Elctrns., Ltd., Marion, Iowa
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
Fischer & Porter Co., Warminster, Pa.
General Microwave Corp., Farmingdale, N.Y.
Glentek, Inc., Santa Monica, Calif.
Incor Instr., Plainview, N.Y.
Integrated Controls, San Diego, Cal.
K West, Westminster, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Moore Inds., Van Nuys, Cal.
Motorola Instr. & Control, Phoenix, Ariz.
Newport Labs., Inc., Santa Ana, Cal.
Omega Engrg., Inc., Stamford, Conn.
Rawco Instrs., Inc., Ft. Worth, Tex.
Rosemount Engrg. Co., Minneapolis, Minn.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tylan Corp., Torrance, Calif.
Zeltex, Inc., Concord, Calif.

Amplifiers, Thyratron

Cober Elctrns., Inc., Stamford, Conn. p 601
General Elec. Co., Schenectady, N.Y.
Bertan Assocs., Inc., Plainview, N.Y.
Coil Co. of Amer., Northvale, N.J.
De-Tec-Tronic Corp., Chicago, Ill.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Amplifiers, Transducer

Almond Instrs. Co., Covina, Cal.... p 329
Arvee Engrg. Co., Torrance, Calif. p 1278
Astrosystems, Lake Success, N.Y.
California Elctrn. Mfg. Co., Alamo, Calif. p 1315
CML-Macarr, Inc., Edison, N.J.
Control Technology Co., L.I.C., N.Y.
Crown Int'l., Elkhart, Ind.
Data-Control Systems, Danbury, Conn.
DDC, Hicksville, N.Y. .... p 1282
Dynamics Instr. Co., Monterey Pk., Cal. p 432
Dytronics Co., Columbus, Ohio
Ectron Corp., San Diego, Cal....... p 1283
Gould, Inc., Cleveland, Ohio
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Hybrid Sys. Corp., Burlington, Mass.
Intronics, Inc., Newton, Mass. .... p 1288
Ithaco, Inc., Ithaca, N.Y. ....p 1286,1287
Matrix Corp., Beech Grove, Ind.
Natel Engrg. Co., Canoga Pk., Cal. p 366,367
Neff Instr. Corp., Duarte, Calif..... p 1291
PPM, Inc., Bedford, Ohio .... p 535
Precision Monolithics, Santa Clara, Cal.
Schaevitz Engrg., Pennsauken, N.J. p 1991
Solid State Elctrns., Sepulveda, Cal.
SRC Div., Newport Bch., Cal. ...... p 1993
Tecnetics, Inc., Boulder, Colo.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass. p 1294
United Detector Tech., Santa Monica, Cal. .... p 1639
Active Control Instrumentation, E. Northport, NY
Advanced Kinetics, Costa Mesa, Calif.
AMF Electical Prods., Alexandria, Va.
Analog Devices, Inc., Norwood, Mass.
Automatic Control Elctrns. Co., San Antonio, Tex.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bell & Howell Co., Pasadena, Calif.
Belleville Elctrns. Co., Belleville, Mich.
Bio-Medical Elctrns., Inc., Rockville, Md.
Burr-Brown Resch. Corp., Tucson, Ariz.
Celtic Inds., Inc., Van Nuys, Cal.
CGS/Datametrics, Watertown, Mass.
CGS/Lawrence, Southampton, Pa.
Coil Co. of Amer., Northvale, N.J.
Columbia Resch. Labs., Woodlyn, Pa.
Datum, Inc., Anaheim, Calif.
Davidson Elctrn. Dev. Co., Erie, Pa.
Delta Elctrn. Control, Costa Mesa, Cal.
Dixson, Inc., Grand Junction, Colo.
Doric Sci. Corp., San Diego, Calif.
Dyna Magnetic Devices, Inc., Hicksville, N.Y.
Electronic Design Labs., Inc., Phila., Pa.
Electronic Modules, Inc., Pasadena, Cal.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Elctrns., Ltd., Marion, Iowa
Endevco, Pasadena, Calif.
Fairchild Semiconductor, Mountain View, Calif.
General Radio Co., Concord, Mass.
Genisco Tech. Corp., Instr. Div., Compton, Cal.
Geo Space, Houston, Tex.
GPS Instr. Co., Framingham, Mass.
Incor Instr., Plainview, N.Y.
Integrated Controls, San Diego, Cal.
K West, Westminster, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Kelk, George Ltd., Don Mills, Ont., Canada
Kenney Engrg. Corp., Monrovia, Cal.
Kistler Instr. Co., Redmond, Wash.
Lansdale Microelectronics Div., Metuchen, N.J.
Magnetics, Sandy Lake, Pa.
MB Elctrns/Textron Co., New Haven, Conn.
Micro-Strain, Inc., Spring City, Pa.
Midland Standard Inc., Elgin, Ill.
Minnetech Labs., Inc., Minneapolis, Minn.
Moore Inds., Van Nuys, Cal.
Newport Labs., Inc., Santa Ana, Cal.
NUS Corp., Paramus, N.J.
Omega Engrg., Inc., Stamford, Conn.
PCB Piezotronics, Inc., Depew, N.Y.
PECO, Milpitas, Cal.
Perry Amplifier, Brookline, Mass.
Power Instrs., Skokie, Ill.
Singer-General Precision, Inc., Little Falls, N.J.
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Systems Instrs. Resch., Inc., Atlanta, Ga.
Telmar, Inc., Columbus, Ohio
Transducer Systems, Inc., Willow Grove, Pa.
Transducers, Inc., Santa Fe Springs, Calif.
Tyco Instr. Div., Waltham, Mass.
Tylan Corp., Torrance, Calif.
Unholtz-Dickie Corp., Hamden, Conn.
Validyne Engrg. Corp., Northridge, Cal.
Wood, C.N. Mfg. Co., Newtown, Pa.
Zeltex, Inc., Concord, Calif.

Amplifiers, Traveling-Wave Tube—See Vol 1

Amplifiers, Tunnel Diode

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Aertech Inds., Sunnyvale, Calif.
Hughes Aircraft Co., Malibu, Cal.
Int'l. Microwave, Cos Cob, Conn.
Itek Corp., Lexington, Mass.
Loral Elctrn. Sys., Bronx, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
MITEQ, Inc., Hauppauge, N.Y.
Philco-Ford Corp., Washington, D.C.
Teledyne Micronetics, San Diego, Calif.
Varian Assocs., Palo Alto, Cal.

Amplifiers, Ultrasonic—See Vol 1

Amplifiers, Vibration Pickup

Beckman Instrs., Cedar Grove, N.J.
Data-Control Systems, Danbury, Conn.
Dytronics Co., Columbus, Ohio
Honeywell, Denver, Colo.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y.
Metrix Instr. Co., Houston, Tex..... p 518
Natel Engrg. Co., Canoga Pk., Cal.
Neff Instr. Corp., Duarte, Calif.
Teledyne Philbrick, Dedham, Mass.
AGAC-Derritron, Inc., Alexandria, Va.
AMF Electical Prods., Alexandria, Va.
B & K Instrs., Inc., Cleveland, Ohio

Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Columbia Resch. Labs., Woodlyn, Pa.
Dyna Magnetic Devices, Inc., Hicksville, N.Y.
EDC (Electro Dev.), Lynnwood, Wash.
Endevco, Pasadena, Calif.
Fairchild Semiconductor, Mountain View, Calif.
General Radio Co., Concord, Mass.
Geo Space, Houston, Tex.
Gulton Inds., Hawthorne, Calif.
Incor Instr., Plainview, N.Y.
Indikon Co., Watertown, Mass.
K West, Westminster, Calif.
MB Elctrns/Textron Co., New Haven, Conn.
PCB Piezotronics, Inc., Depew, N.Y.
Statham Instrs., Inc., Oxnard, Cal.
Sundstrand Data Control, Redmond, Wash.
Transducer Systems, Inc., Willow Grove, Pa.
Unholtz-Dickie Corp., Hamden, Conn.

Amplifiers, Video

American Astrionics, Hollywood, Cal p 335
American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
Arvee Engrg. Co., Torrance, Calif. p 1278
Beta Instr., Newton Upper Falls, Mass. p 337
C-COR Elctrns., State College, Pa. p 1280,1281
CELCO, Mahwah, N.J.
DDC, Hicksville, N.Y. .... p 1282
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Infodex, Inc., Waterbury, Conn.
Instrs. For Ind., Inc., Farmingdale, N.Y.
Intronics, Inc., Newton, Mass.
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Kay Elemetrics, Pine Brook, N.J... p 507
Krohn-Hite, Cambridge, Mass.
Lorch Elctrns. Corp., Englewood, N.J.
Matrix Corp., Beech Grove, Ind.
Melcor Elctrns. Corp., Farmingdale, N.Y.
North Hills Elctrns., Inc., Glen Cove, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
Sierra Sys., Mountain View, Cal.
United Detector Tech., Santa Monica, Cal.
Vega Precision Labs., Vienna, Va.
Advanced Kinetics, Costa Mesa, Calif.
Aerospace Resch. Inc., Boston, Mass.
Aertech Inds., Sunnyvale, Calif.
American Elctrn. Controls Co., Barrington, N.J.
AMF Electical Prods., Alexandria, Va.
Ampex Corp., Redwood City, Calif.
Analog Devices, Inc., Norwood, Mass.
Applied Electro Mechanics, Alexandria, Va.
ATV Research, Dakota City, Neb.
Avantek, Inc., Santa Clara, Cal.
Bell & Howell Co., Pasadena, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
CBS Laboratories, Stamford, Conn.
Cohu Elctrns., Inc., San Diego, Calif.
Collins Radio Co., Dallas, Tex.
Components Corp., Denville, N.J.
Composite Microcircuits, Waltham, Mass.
Concord Elctrns., Los Angeles, Cal.
Conductron Corp., St. Charles, Mo.
Consolidated Resistance Sls., Yonkers, N.Y.
Defense Elctrns., Inc., Rockville, Md.
Denson Elctrns. Corp., Rockville, Conn.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dynair Elctrns. Inc., San Diego, Calif.
Dynalex, Inc., Burbank, Cal.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Energy Systems, Palo Alto, Cal.
Fairchild Semiconductor, Mountain View, Calif.
GBC Closed Circuit TV Corp., New York, N.Y.
General Elec., Lynchburg, Va.
General Instr. Corp., Hicksville, N.Y.
GPS Instr. Co., Framingham, Mass.
Hiett Elctrns. Corp., Wheeling, Ill.
Hope Elctrns., Clifton, N.J.
Hughes Aircraft Co, Culver City, Cal.
Indofex, Inc., Waterbury, Conn.
Intech, Santa Clara, Cal.
International Scanatron Sys., Wyandanch, N.Y.
Isomet Corp., Oakland, N.J.
ITI Electronics, Inc., Clifton, N.J.
Lasermetrics, Inc., Rochelle Park, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Litton Inds., San Carlos, Calif.
Locus, Inc, State College, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Matrix Sys. Corp., Chatsworth, Cal.
Milletron, Inc., Pittsburgh, Pa.
Motorola Semiconductor Prods., Phoenix, Ariz.
Multi Media Engrg., Inc., Rockville, Md.
Nelson-Hershfield Elctrns., Phoenix, Ariz.
Neptune Elctrns. Co., New York, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Radio Resch. Co., Rockaway, N.J.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RIL Elctrns., Inc., Southampton, Pa.
Rohde & Schwarz Sls., Passaic, N.J.
Scientific Communications, Garland, Tex.
Signetics Corp., Sunnyvale, Calif.
Silicon Gen'l., Inc., Westminster, Cal.
Systems Resch. Labs., Dayton, Ohio
Teletronics, Inc., Orange, Calif.
Varian Assocs., Palo Alto, Cal.
Varian Assoc., Beverly, Mass
Visual Educom, Michigan City, Ind.
Visual Elctrns. Corp., New York, N.Y.
Wand Elctrns., Inc., Old Bethpage, N.Y.

Amplifiers, Voltage Reference

Bowmar Instr. Corp., Ft. Wayne, Ind.
Connor-Winfield Corp., Winfield, Ill.
Elctrn. Assocs., W. Long Branch, N.J.
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Intronics, Inc., Newton, Mass.
Kepco, Inc., Flushing, N.Y.
Multitech Power Sys., Costa Mesa, Cal.
Neff Instr. Corp., Duarte, Calif.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Precision Monolithics, Santa Clara, Cal.
Teledyne Philbrick, Dedham, Mass.
Trio Labs, Inc., Plainview, N.Y.
Analog Devices, Inc., Norwood, Mass.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bergen Labs., Inc., Paterson, N.J.
Burr-Brown Resch. Corp., Tucson, Ariz.
Dickson Elctrns. Corp., Scottsdale, Ariz
Doric Sci. Corp., San Diego, Calif.
Fairchild Semiconductor, Mountain View, Calif.
Fischer & Porter Co., Warminster, Pa.
Glentek, Inc., Santa Monica, Calif.
Holt Instr. Labs., Oconto, Wisc.
Incor Instr., Plainview, N.Y.
Integrated Controls, San Diego, Cal.
Keithley Instrs., Inc., Cleveland, Ohio
Lancer Elctrns. Corp., Norristown, Pa.
Lansdale Microelectronics Div., Metuchen, N.J.
Magnetics, Inc., Butler, Pa.
NH Research, Inc., Santa Ana, Calif.
Optimation, Inc., Sun Valley, Calif.
Ward Leonard, Mt. Vernon, N.Y.
Zeltex, Inc., Concord, Calif.

Amplifiers, Wideband

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif. p 1278
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
C-COR Elctrns., State College, Pa. p 1280,1281
CELCO, Mahwah, N.J.
Chronetics, Inc., Mt. Vernon, N.Y.
Clarke - Hess, New York, N.Y.
CML-Macarr, Inc., Edison, N.J. ...... p 666
Computer Labs, Greensboro, N.C. p 1279
Crown Int'l., Elkhart, Ind.
Data-Control Systems, Danbury, Conn.
DDC, Hicksville, N.Y. .... p 1282
Dynamics Instr. Co., Monterey Pk., Cal. p 432
Electro/Data, Inc., Garland, Tex. p 1558
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Hybrid Sys. Corp., Burlington, Mass. p 1284
Ind'l. Test Equip., Port Washington, N.Y.
Infodex, Inc., Waterbury, Conn.
Instrs. For Ind., Inc., Farmingdale, N.Y. p 1285
Intronics, Inc., Newton, Mass. .... p 1288
Ithaco, Inc., Ithaca, N.Y.
Kay Elemetrics, Pine Brook, N.J... p 507
Krohn-Hite, Cambridge, Mass.
Lorch Elctrns. Corp., Englewood, N.J. p 609
Matrix Corp., Beech Grove, Ind.
Melcor Elctrns. Corp., Farmingdale, N.Y. p 1290
Microwave Cavity Labs., La Grange, Ill. p 611
Neff Instr. Corp., Duarte, Calif..... p 1291
Opamp Labs., Los Angeles, Cal. p 1292
Preston Scientific, Anaheim, Cal. p 1293
Quan-Tech, Whippany, N.J. .... p 548
RF Communications, Rochester, N.Y. p 553
RHG Elctrns. Lab., Farmingdale, N.Y. p 1562
Rockland Sys. Corp., Blauvelt, N.Y.
Sierra Sys., Mountain View, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Philbrick, Dedham, Mass.
Universal Ad-Yu Elctrns., Inc., Passaic, N.J. .... p 2752
Vector Engrg., Springfield, N.J.
Watkins Johnson Co., Palo Alto, Cal. p 1295
Adams-Russell Co., Waltham, Mass.
Advanced Kinetics, Costa Mesa, Calif.
Aerospace Resch. Inc., Boston, Mass.
Aertech Inds., Sunnyvale, Calif.
AMF Electical Prods., Alexandria, Va.
Amplifier Research Corp., Fairview Village, Pa.
Analog Devices, Inc., Norwood, Mass.
Anzac Elctrns., Waltham, Mass.
Arenberg Ultrasonic Lab., Inc., Jamaica Plain, Mass.
Arvin Sys., Inc., Dayton, Ohio
Avantek, Inc., Santa Clara, Cal.
Avco Corp., Cincinnati, Ohio
Baganoff Assocs., Inc., St. Louis, Mo.
Bay Labs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Benco Television Assoc., Rexdale, Ont., Can.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cohu Elctrns., Inc., San Diego, Calif.
Collins Radio Co., Dallas, Tex.
Conductron Corp., St. Charles, Mo.
Continental Elctrns. Mfg., Dallas, Tex.
Dana Labs., Inc., Irvine, Calif.
Doric Sci. Corp., San Diego, Calif.
Dorsett Elctrns., Tulsa, Okla.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Energy Systems, Palo Alto, Cal.
Entron, Inc., Silver Spring, Md.
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
Farinon Electric, San Carlos, Calif.
FKS Comms., Inc., New Hyde Park, N.Y.
Gavin Instrs., Somerville, N.J.
General Devices, Inc., Princeton, N.J.
General Instr. Corp., Hicksville, N.Y.
General Radio Co., Concord, Mass.
GPS Instr. Co., Framingham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hermes Elctrns., Dartmouth N.S., Can.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Culver City, Cal.
Incor Instr., Plainview, N.Y.
Indofex, Inc., Waterbury, Conn.
Instruments, Inc., San Diego, Calif.
Intech, Santa Clara, Cal.
Integrated Controls, San Diego, Cal.
Interlind Elctrns., Doraville, Ga.
Int'l. Microwave, Cos Cob, Conn.
Itek Corp., Lexington, Mass.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Kaiser CATV, Phoenix, Ariz
Keithley Instrs., Inc., Cleveland, Ohio
Lasermetrics, Inc., Rochelle Park, N.J.
Link Div., Binghamton, N.Y.
Locus, Inc, State College, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Massa Div., Hingham, Mass.
Matrix Sys. Corp., Chatsworth, Cal.
Microwave Assocs., Inc., Burlington, Mass.
MITEQ, Inc., Hauppauge, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Neptune Elctrns. Co., New York, N.Y.
Newport Labs., Inc., Santa Ana, Cal.
Olektron Corp., Dudley, Mass.
Optical Elctrns., Tucson, Ariz.
Optimation, Inc., Sun Valley, Calif.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Philips Elctrn. Instrs., Mt. Vernon, N.Y.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Pickard & Burns Inc., Lindenhurst, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Qualidyne Corp., Santa Clara, Cal.
Radiation Devices Co., Baltimore, Md.
Radio Resch. Co., Rockaway, N.J.
Rantec Div., Calabasas, Calif.
Raytheon Co., Mt. View, Calif.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
REDCOR Corp., Woodland Hills, Cal.
Resalab Inc., Advanced Development Lab., Los Angeles, Cal.
RF Communications, Inc., Rochester, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Signetics Corp., Sunnyvale, Calif.
Spectra Sonics, Ogden, Utah
Spencer-Kennedy Labs., Inc., Winchester, Mass.
SSR Instrs. Co., Santa Monica, Cal.
VIKOA, Hoboken, N.J.
Wand Elctrns., Inc., Old Bethpage, N.Y.
Zeltex, Inc., Concord, Calif.

Analog Computers—See Computers, Analog—Vol 1

Analog-To-Digital Converters—See Converters, Analog-To-Digital—Vol 1

Analyzers, A-F—See Vol 1

Analyzers, Antenna Pattern—See Vol 1

Analyzers, Behavioral, Experimental—See Vol 1

Analyzers, Capacitor—See Testers, Capacitor—Vol 1

Analyzers, Circuit—See Testers, Signal Tracing—Vol 1

Analyzers, Coincidence—See Vol 1

Analyzers, Color—See Colorimeters

Analyzers, Crystal—See Vol 1

Analyzers, Differential—See Vol 1

Analyzers, Dispersion—See Analyzers, Spectrum—Vol 1

Analyzers, Distortion—See Analyzers, A-F—Vol 1

Analyzers, Frequency—See Analyzers, Spectrum—Vol 1

Analyzers, Frequency Stability—See Meters, Frequency Deviation—Vol 1

Analyzers, Gas—See Vol 1

Analyzers, Gear Train—See Vol 1

Analyzers, Harmonic—See Vol 1

Analyzers, Interference—See Vol 1

Analyzers, Intermodulation—See Vol 1

Analyzers, Magnetic—See Vol 1

Analyzers, Magnetic Tape Dropout—See Vol 1

Analyzers, Microwave—See Vol 1

Analyzers, Noise—See Vol 1

Analyzers, Particle-Size—See Vol 1

Analyzers, Phase & Voltage—See Vol 1

Analyzers, Polargraphic—See Vol 1

Analyzers, Probability Density—See Vol 1

Analyzers, Probability Distribution—See Analyzers, Probability Density—Vol 1

Analyzers, Pulse Height—See Vol 1

Analyzers, Radar—See Vol 1

Analyzers, Radiation, Nuclear—See Vol 1

Analyzers, Servo

Bafco, Inc., Warminster, Pa. .... p 412
Control Technology Co., L.I.C., N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
North Atlantic Inds., Plainview, N.Y. p 530
Auto Control Labs., Los Angeles, Calif.
Feedback, Inc., Berkeley Hghts., N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Ling Elctrns., Anaheim, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Orbit Instr. Corp., Syosset, N.Y.
Servo Corp. America, Hicksville, N.Y.
Singer-General Precision, Inc., Little Falls, N.J.
Theta Instr. Corp., Fairfield, N.J.
Weston Instrs. Div., Hatboro, Pa

Analyzers, SCR—See Vol 1

Analyzers, Single-Sideband—See Analyzers, Spectrum—Vol 1

Analyzers, Sonic & Subsonic—See Vol 1

Analyzers, Spectrum (Including Oscilloscopes With Plug-Ins)—See Vol 1

Analyzers, Surface—See Indicators, Surface Roughness—Vol 1

Analyzers, Telemetric Data—See Vol 1

Analyzers, Transfer Function—See Vol 1

Analyzers, Transistor—See Testers, Transistor—Vol 1

Analyzers, Ultrasonic—See Vol 1

Analyzers, Vibration—See Vol 1

Analyzers, Video—See Vol 1

Analyzers, Waveform—See Analyzers, Harmonic—Vol 1

Anechoic Chambers—See Vol 1

Angle-Of-Attack Indicators—See Indicators, Angle-Of-Attack—Vol 1

Annunciators

Allard Instr. Corp., Westbury, NY p 1435
American Zettler, Costa Mesa, Calif.
Dialight Corp., Brooklyn, N.Y.
Digitron Corp., Norristown, Pa.
Electrospace Corp., Westbury
Ind'l Elctrn. Engrs., Van Nuys, Cal.
LVC Ind's., Inc., Corona, N.Y.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Action Systems Co., Meriden, Conn.
Alcor, Inc., Ithaca, N.Y.
AMF Electical Prods., Alexandria, Va.
Artisan Elctrns. Corp., Parsippany, N.J.
Autocall Co., The, Shelby, Ohio
Autocon Inds., Inc., St. Paul, Minn.
Bourns Security Sys., Smithtown, N.Y.
Canrad Precision Inds., Inc., Pelham, N.Y.
Cognitronics Corp., Mt. Kisco, N.Y.
Devco Engrg., W. Caldwell, N.J.
Electro Devices, Inc., St. Louis, Mo.
Elctrn. Modules Corp., Timonium, Md.
Henschel Corp., Amesbury, Mass.
Info-Lite Corp., Ft. Lee, N.J.
Kirkland H. R. Co., Morristown, N.J.
Korry Mfg. Co., Seattle, Wash.
Marathon Instrs. Div., Pico Rivera, Calif.
Master Specialties, Costa Mesa, Cal.
Moore Inds., Van Nuys, Cal.
Mosler Electronic Systems Div., Danbury, Conn.
Narco Avionics, Ft. Washington, Pa.
National Time & Signal, Oak Pk., Mich.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
Nelson-Hershfield Elctrns., Phoenix, Ariz.
On-Guard Corp. America, Carlstadt, N.J.
Penn Keystone Corp., Ansonia, Conn.
Rochester Instr. Sys., Rochester, N.Y.
Scam Instr. Corp., Skokie, Ill.
Spectrum Dynamics, Inc., Ft. Lauderdale, Fla.
Stacoswitch, Inc., Costa Mesa, Cal.
Sundstrand Data Control, Redmond, Wash.
Switchcraft, Inc., Chicago, Ill.
Symbolic Displays, Inc., Orange, Calif.
TEC, Inc., Eden Prairie, Minn.
Truco, Inc., Simsbury, Conn.
Worner Elctrn. Devices, Rankin, Ill.

Anodes, Electroplating—See Vol 3

Antenna Coils—See Coils, Antenna Loading—Vol 3

Antenna Couplers—See Couplers Antenna—Vol 1

Antenna Dummy Loads—See Dummy Loads—Vol 3

Antenna Feed Systems

American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Applied Research Inc., Port Washington, N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Transco Prods., Inc., Venice, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., S. Braintree, Mass.
Amecom Div., College Park, Md.
Anaren Microwave, Inc., Syracuse, N.Y.
Andrew Corp., Orland Pk., Ill.
Chu Assocs., Inc., Littleton, Mass.
Coax Devices Inc., Chelsea, Mass.
Conductron Corp., St. Charles, Mo.
Delta Elctrns., Alexandria, Va.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Elctrn. Resources Div., Los Angeles, Cal.
Finney Co., Bedford, Ohio
Gabriel Elctrns. Corp., Saco, Me.
Goodyear Aerospace Corp., Akron, Ohio
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Kevlin Mfg. Co., Woburn, Mass.
Loral Elctrn. Sys., Bronx, N.Y.
LTV Electrosystems, Dallas, Tex.
Maury Microwave Corp., Cucamonga, Calif.
Maxson Elctrns. Div., Great River, N.Y.
MCS Corp., Monrovia, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Nurad, Inc., Baltimore, Md.
Omega Labs., Inc., Rowley, Mass.
Phelps Dodge Comm., North Haven, Conn.
Philco-Ford Corp., Washington, D.C.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RF Systems, Inc., Cohasset, Mass.
Scala Radio Corp., San Leandro, Cal.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sedco Sys., Inc., Farmingdale, N.Y.
Sierra Elec., Gardena, Calif.
Southern Avionics Co., Beaumont, Tex.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Surface Conduction, Inc., New York, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TACO Div., Sherburne, N.Y.
Teledyne Micronetics, San Diego, Calif.
TRG Prods., E. Boston, Mass.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Antenna Filters—See Filters, Antenna

Antenna Housings-Also See Radomes—See Vol 1

Antenna Lightning Arresters—See Arresters, Lightning

Antenna Pattern Analyzers—See Analyzers, Antenna Pattern—Vol 1

Antenna Pattern Recorders—See Recorders, Antenna Pattern—Vol 1

Antenna Position Indicators—See Indicators, Antenna Position—Vol 1

Antenna Reflectors—See Vol 1

Antenna Rotators (Industrial & Military)—See Vol 1

Antenna Switching Matrices—See Vol 1

Antenna Towers & Supports—See Vol 1

Antennas, Airborne—See Vol 1

Antennas, Broadcasting (Commercial)—See Vol 1

Antennas, Conical—See Vol 1

Antennas, Direction Finding—See Vol 1

Antennas, Ferrite—See Vol 1

Antennas, Ground Plane—See Vol 1

Antennas, Helical—See Vol 1

Antennas, Log-Periodic—See Vol 1

Antennas, Loop—See Vol 1

Antennas, Microwave—See Vol 1

Antennas, Mobile—See Vol 1

Antennas, Parabolic—See Vol 1

Antennas, Phased Array—See Vol 1

Antennas, Radar—See Vol 1

Antennas, Rhombic—See Vol 1

Antennas, Rotary Beam—See Vol 1

Antennas, Scatter Propagation—See Vol 1

Antennas, Spiral—See Vol 1

Antennas, Telemetry, Tracking—See Vol 1

Antennas, Telescopic—See Vol 1

Antennas, Troposcatter—See Vol 1

Antennas, Tunable Dipole—See Vol 1

Anti-Static Compounds & Coatings—See Coatings, Anti-Static—Vol 3

Arc Lamp Power Supplies—See Power Supplies, Arc Lamp—Vol 1

Armatures—See Motor & Generator Armatures, Rotors, Stators

Arms, Phono, Trascription—See Phonograph Arms, Transcription—Vol 1

Arresters, Electrical Surge-Also See Suppressors, Arc; Protectors, Surge

ATR Elctrns., Inc., St. Paul, Minn.
Betamite Electronic Devices, Culver City, Calif.
Dale Elctrns., Inc., Yankton, S.D. p 1906
Electrons Co., Fairfield, N.J. .... p 1451
Electrospace Corp., Westbury
Joslyn Elctrn. Sys., Goleta, Cal... p 1933
Ross Engrg. Corp., Campbell, Cal. p 1786
Signalite, Neptune, N.J. .... p 1952
Triac Elctrn. Sys., N.Y., N.Y.
Wanlass Div., Fort Washington, Pa.
Basic Ceramics Inc., Hawthorne, N.J.
Bellaire Elctrns. Inc., Farmingdale, N.J.
Cardion Communications, Woodbury, N.Y.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Green Rectifier Corp., Fair Lawn, N.J.
Rectifier Engrg. & Supply, St. Louis, Mo.
Rowe L. L. Co., Boston, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.
Staffall, Inc., Providence, R.I.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Arresters, Lightning

Consolidated Wire & Assoc. Corps., Chicago, Ill.
Dale Elctrns., Inc., Yankton, S.D. p 1906
Electrons Co., Fairfield, N.J. .... p 1451
General Elec. Co., Schenectady, N.Y.
JFD Elctrns./Sub. Riker-Maxson, Bklyn., N.Y.
Joslyn Elctrn. Sys., Goleta, Cal... p 1933
Signalite, Neptune, N.J.
Ava Elctrns., Upper Darby, Pa.
Basic Ceramics Inc., Hawthorne, N.J.
Bellaire Elctrns. Inc., Farmingdale, N.J.

Birnbach Co., Inc., Freeport, N.Y.
Cardion Communications, Woodbury, N.Y.
Finney Co., Bedford, Ohio
Gold Line Connector, Inc., Norwalk, Conn.
Hi-Lo Mfg. Corp., Chicago, Ill.
Lance Inds., Sylmar, Calif.
Maspro Co., Inc., Nagoya-Shigai, Japan
Rowe L. L. Co., Boston, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Staffall, Inc., Providence, R.I.
Topper Mfg. Co., Inc., Great Neck, N.Y.
Tricraft Prods., Chicago, Ill.
Westinghouse Elec. Int'l., New York, N.Y.

Asbestos—See Insulation Materials, Asbestos—Vol 3

Asphalt Insulation—See Insulating Compounds, Asphalt & Pitch—Vol 3

Attenuators, Audio—See Vol 1

Attenuators, Coaxial

American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol RF Div., Danburry, Conn.
Applied Research Inc., Port Washington, N.Y. .... p 1554
Arra Inc., Bayshore, N.Y. .... p 1553
Bird Elctrn., Cleveland, Ohio .... p 420
Daico Inds., Inc., Compton, Cal.
Dow-Key, Santa Barbara, Cal.
E-H Resch. Labs., Inc., Oakland, Cal.
Electro Impulse, Inc., Red Bank, N.J.
Hewlett-Packard, Palo Alto, Cal.
Kay Elemetrics, Pine Brook, N.J. p 508,509
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Sealectro Corp., Mamaroneck, N.Y.
Shallco, Inc., Smithfield, N.C.
Singer Instrumentation Los Angeles Oper., Los Angeles, Cal. .... p 562
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal. .... p 562
Texscan Corp., Indianapolis, Ind. p 578
Transco Prods., Inc., Venice, Cal.
Trompeter Elctrns., Chatsworth, Cal.
Waveline, Inc., W. Caldwell, N.J. p 1567
Weinschel Engrg. Co., Gaithersburg, Md. .... p 1571
Welwyn Int'l., Inc., Westlake, Ohio
Aerolite Electronics Corp., Union City, N.J.
Airtec, Inc., Roselle, N.J.
Altec, Anaheim, Calif.
Americon Corp., Waltham, Mass.
Astrolab Inc., Linden, N J
Ava Elctrns., Upper Darby, Pa.
Aviel Electronics Inc, Burbank, Calif.
Barth Elctrns., Inc., Cleveland, Ohio
Bell P/A Prods. Corp., Columbus, Ohio
Benco Television Assoc., Rexdale, Ont., Can.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Core-Tronics, Inc., Orange, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Elcom Sys., Deer Pk., N.Y.
EMC Technology Inc, Philadelphia, Pa.
Engelmann Microwave, Montville, N.J.
Entron, Inc., Silver Spring, Md.
Essex Int'l., Inc., Decatur, Ill.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Fairlane Electronics, Inc., Long Valley, N.J.
Fifth Dimension, Princeton, N.J.
Filmohm Div., Long Island City, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hope Elctrns., Clifton, N.J.
Hyletronics Corp., Littleton, Mass.
Industrial Microwave, Scotch Plains, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Kevlin Mfg. Co., Woburn, Mass.
Kings Elctrns., Tuckahoe, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Mini-Circuits Lab., Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Nurad, Inc., Baltimore, Md.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Pyrofilm Corp., Whippany, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Seven Assocs., Sunnyvale, Calif.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.
Special Microwave Devices Oper., Waltham, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Victor Microwave, Inc., Wakefield, Mass.
VIKOA, Hoboken, N.J.
Wald Sound, Sun Valley, Calif.
Wandel & Goltermann, E. Hanover, N.J.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Attenuators, Decade—See Vol 1

Attenuators, Fixed—See Vol 1

Attenuators, I-F—See Vol 1

Attenuators, Impedance Matching—See Vol 1

Attenuators, Logarithmic—See Vol 1

Attenuators, Microwave

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y. .... p 1554
Arra Inc., Bayshore, N.Y. .... p 1553
Daico Inds., Inc., Compton, Cal.
E & M Labs., Westlake Village, Cal.
Electro Impulse, Inc., Red Bank, N.J.
Hewlett-Packard, Palo Alto, Cal.
Kay Elemetrics, Pine Brook, N.J. p 508,509
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Sealectro Corp., Mamaroneck, N.Y.
Singer Instrumentation Los Angeles Oper., Los Angeles, Cal. .... p 562
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal. .... p 562
Texscan Corp., Indianapolis, Ind. p 578
Transco Prods., Inc., Venice, Cal.
Waveline, Inc., W. Caldwell, N.J. p 1567
Weinschel Engrg. Co., Gaithersburg, Md. .... p 1571
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Americon Corp., Waltham, Mass.
Anaren Microwave, Inc., Syracuse, N.Y.
Astrolab Inc., Linden, N J
AUL Instrs., Inc., Flushng, N.Y.
Aviel Electronics Inc, Burbank, Calif.
Barth Elctrns., Inc., Cleveland, Ohio
Bell P/A Prods. Corp., Columbus, Ohio
Cardwell Condenser, Lindenhurst, N.Y.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Core-Tronics, Inc., Orange, N.J.
Custom Comps., Fairfield, N.J.
Elcom Sys., Deer Pk., N.Y.
Electronautics, Littleton, Mass.
Elctrn. Specialty, Thomaston, Conn.
EMC Technology Inc, Philadelphia, Pa.
Engelmann Microwave, Montville, N.J.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Fifth Dimension, Princeton, N.J.
Filmohm Div., Long Island City, N.Y.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Industrial Microwave, Scotch Plains, N.J.
Kevlin Mfg. Co., Woburn, Mass.
Kings Elctrns., Tuckahoe, N.Y.
Lieco, Inc., Lindenhurst, N.Y.
Litton Inds., San Carlos, Calif.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Micrometals, City of Industry, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Pabst Engineering Equipment Co., Inc., Elizabeth, N.J.
Philco-Ford Corp., Washington, D.C.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Pyrofilm Corp., Whippany, N.J.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
Raytheon Co., Waltham, Mass.
Reeve Elctrns., Inc., Chicago, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sinclair Radio Labs., Maple, Ont., Can.
Somerset Radiation Lab., Arlington, Va.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Thomson-CSF Electron Tubes, N.Y., N.Y.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Vectronics Microwave Corp., Middlesex, N.J.
Victor Microwave, Inc., Wakefield, Mass.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.

Attenuators, Programmable—See Vol 1

Attenuators, R-F—See Vol 1

Attenuators, Turret—See Vol 1

Attenuators, Variable—See Vol 1

Attitude Indicators—See Indicators, Attitude—Vol 1

Audible Warning Devices—See Alarms & Alarm Systems-Also See Bells, Buzzers, Gongs, Sirens and Aural Warning Device

Audio Equipment—See Amplifiers; Microphones; Speakers; etc.—Vol 1

Audiometers—See Vol 1

Autocollimators—See Collimators

Autotransformers—See Transformers, Autotransformer—Vol 3

Averagers, Signal—See Vol 1

Azimuth Indicators—See Indicators, Azimuth—Vol 1

Backlighted Panel Displays—See display Panels

Badges, Radiation Indicating—See Services, Film Badge—Vol 3

Baffles, Acoustic Material—See Materials, Acoustic, Sound Absorbing—Vol 3

Baffles, Speaker—See Enclosures, Speaker—Vol 1

Bails, Stands & Supports (For Equipment, Instruments, etc.)—See Vol 3

Balancing Equipment, Dynamic—See Vol 1

Ball & Socket Joints—See Joints, Ball & Socket—Vol 3

Ballast Tubes—See Tubes, Ballast

Baluns—See Transformers, Matching—Vol 3

Banding Tools, C-Core—See Vol 3

Bars, Shorting—See Vol 3

Barretters—See Resistors, Barretter—Vol 3

Bases, Antenna—See Mounts, Antenna—Vol 1

Baths, Controlled Temperature (Air & Liquid)—See Vol 1

Baths, Ultrasonic—See Cleaners, Ultrasonic—Vol 1

Batteries, Bi-Polar—See Vol 1

Batteries, Carbon Zinc—See Vol 1

Batteries, Chemically Heated—See Vol 1

Batteries, Dry, Flashlight, Transistor, etc.—See Vol 1

Batteries, Lead-Acid—See Vol 1

Batteries, Lead-Dioxide—See Vol 1

Batteries, Lithium—See Vol 1

Batteries, Magnesium-Air—See Vol 1

Batteries, Manganese Alkaline—See Vol 1

Batteries, Mercury—See Vol 1

Batteries, Nickel-Alkaline—See Vol 1

Batteries, Nickel-Cadmium—See Vol 1

Batteries, Nickel-Zinc—See Vol 1

Batteries, Nuclear—See Vol 1

Batteries, Photoflash—See Vol 1

Batteries, Silver-Cadmium—See Vol 1

Batteries, Silver-Zinc—See Vol 1

Batteries, Solar—See Cells, Photovoltaic

Batteries, Standard Cell—See Vol 1

Batteries, Storage—See Vol 1

Batteries, Thermal—See Vol 1

Batteries, Transistor—See Batteries, Dry, Flashlight, Transistor, etc.—Vol 1

Batteries, Water Activated—See Vol 1

Batteries, Zinc-Air—See Vol 1

Battery Chargers—See Chargers, Battery—Vol 1

Battery Clips—See Clips, Battery—Vol 3

Battery Eliminators—See Eliminators, Battery—Vol 1

Battery Holders—See Retainers, Battery—Vol 3

Battery Plugs—See Connectors, Battery—Vol 3

Battery Retainers—See Retainers, Battery—Vol 3

Battery Testers—See Testers, Battery Bearings—Vol 1

Bearings—See Vol 3

Bearings & Assemblies, Jewel—See Vol 3

Bearings, Miniature—See Vol 3

Bearings, Self-Lubricating—See Vol 3

Bellows—See Vol 3

Bells, Buzzers, Gongs, Sirens & Aural Warning Devices

Electrospace Corp., Westbury
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Wheelock Signals, Long Branch, N.J.
Aristo-Craft Distinctive Miniatures, New York, N.Y.
Associated Mfg. Co., Chicago, Ill.
Atlas Sound Div., Parsippany, N.J.
Auth Elec. Co., Inc., Deer Park, NY
Autocall Co., The, Shelby, Ohio
Cable Elec. Prods., Inc., Providence, R.I.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Edwards Co. Inc., Norwalk, Conn.
Endicott Coil Co., Binghamton, N.Y.
General Elec., Providence, R.I.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Henschel Corp., Amesbury, Mass.
Industrial Inventions, Inc., Monmouth Jct., N.J.
Kidde, Walter & Co., Belleville, N.J.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Line Elec. Div., Parsippany, N.J.
Mallory Timers, Indpls., Ind.
Mobil Elctrns., Inc., Anderson, Ind.
National Time & Signal, Oak Pk., Mich.
On-Guard Corp. America, Carlstadt, N.J.
Pacific Electro Dynamics, Bellevue, Wash
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Ltd., New York, N.Y.
Stacoswitch, Inc., Costa Mesa, Cal.
Transformer Mfrs., Inc., Chicago, Ill.

Belts, Dial Drive—See Cords & Cable, Dial Drive

Belts, Drive (All Types)

GC Elctrns., Rockford, Ill.
Albany Int'l. Corp., Albany, NY
Altron Elctrns. Co., Woodlyn, Pa.
American Biltrite Rubber Co., Inc., Boston, Mass.
Corkpak Co., Inc., New Rochelle, N.Y.
Echo Science Corp., Pasadena, Cal.
Electronic Engrs., Inc., Chicago, Ill.
Goodrich, B.F. Ind'l. Prods. Co., Akron, Ohio
Minor Rubber Co., Inc., Bloomfield, N.J.
Narda Microwave Corp., Plainview, N.Y.
PIC Design Corp., Ridgefield,, Conn.
Raybestos-Manhattan, Inc., Bridgeport, Conn.
Uniroyal, Inc., New York, N.Y.

Benches, Optical

Barry Controls, Watertown, Mass.
BFC-Bernard Franklin Co., Phila., Pa.
Conductron Corp., St. Charles, Mo.
DoAll Co., Des Plaines, Ill.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
FJW Inds., Inc., Mt. Prospect, Ill.
Gaertner Scientific Corp., Chicago, Ill.
Gordon Alan Entprs., N. Hollywood, Cal.
Heitz, Karl, Inc., New York, N.Y.
Mann, David W. Co., Burlington, Mass.
Oriel Optics Corp., Stamford, Conn.
Schoeffel Instr. Corp., Westwood, N.J.
Zoomar, Inc., Glen Cove, N.Y.

Benches, Consoles, Stools, Tables (Lab & Shop)-Also See Cabinets & Accessories, Metal—See Vol 3

Bends & Twists, Microwave

Amphenol RF Div., Danburry, Conn.
Arra Inc., Bayshore, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Ainslie Corp., S. Braintree, Mass.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Astrolab Inc., Linden, N J
Co-Operative Inds., Inc., Chester, N.J.
Coax Devices Inc., Chelsea, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
Premier Microwave, Port Chester, N.Y.
Rank Precision Inds., W. Nyack, N.Y.
Reeve Elctrns., Inc., Chicago, Ill.
RF Systems, Inc., Cohasset, Mass.
Schutter Microwave, Lindenhurst, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TACO Div., Sherburne, N.Y.
TRG Prods., E. Boston, Mass.
Victor Microwave, Inc., Wakefield, Mass.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.

Beryllium Fabricating Facilities—See Vol 3

Bezels, Shielded & Unshielded

Dixson Inc., Grand Junction, Colo.
Electronic Hardware, Jamaica, N.Y.
Millen, James Mfg., Malden, Mass. p 1489
NOBEX Div., Burlingame, Cal. p 1470,1471
Pinlites, Fairfield, N.J.
Simpson Elec. Co., Chicago, Ill.
A & M Instrument, Inc., Great Neck, N.Y.
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Amatom Elctrn. Hardware, New Rochelle, N.Y.
Applied Design Co., Inc., Tonawanda, N.Y.
Dura Plastics N.Y., Inc., Westport, Conn.
Franklin Fibre-Lamitex, Wilmington, Del.
Granite State Machine Co., Inc., Manchester, N.H.
Hughes-Treitler Mfg. Corp., Garden City, N.Y.
Insulating Shapes, Inc., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Metex Corp., Edison, N.J.
National Elctrns., Geneva, Ill.
South Shore Metal Prods., Inc., Farmingdale, N.Y.
Staver Co., Inc., Bay Shore, N.Y.
Technical Wire Prods., Inc., Cranford, NJ
Technical Wire Prods., Inc., Santa Barbara, Cal.

Bi-Metals, Thermostatic—See Vol 3

Binary Scalers—See Scalers, Binary—Vol 1

Binding Posts—See Posts, Binding—Vol 3

Blocks, Terminal—See Vol 3

Blood-Pressure Recorders—See Recorders, Blood Pressure—Vol 1

Blower Cabinets—See Blowers & Fans, & Accessories—Vol 3

Blowers & Fans & Accessories—See Vol 3

Blueprint Machines—See Vol 3

Boards, Graphic, Visual Control—See Vol 1

Boards, Plotting—See Vol 1

Boards, Plug-In—See Vol 3

Boards, Printed Circuit—See Printed Circuit Boards

Boards, Printed Wiring, Universal

A. D. Data Sys., Inc., Rochester, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol Cadre Div., Endicott, N.Y.
Cinch-Graphik, City of Industry, Cal. p 1297
Digitron Corp., Norristown, Pa.
Douglas Electronics, Inc., San Leandro, Cal. .... p 1300
Elctrn. Molding Corp., Woonsocket, R.I. p 2626
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Tempo/UTI Div., Chatsworth, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Vega Precision Labs., Vienna, Va.
Vero Electronics, Inc., Hauppauge, N.Y. p 2329
Argent Inds., Inc., Dayton, Ohio
Beckman Instrs., Porterville, Cal.
Crystal Network Prods. Corp., Erie, Pa.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electrol Co., Inc., York, Pa.
Elctrn. Enterprises, Pasadena, Calif.
Elctrn. Modules Corp., Timonium, Md.
Gulton Inds., Albuquerque, N.M.
HMW Enterprises, Inc., Steelton, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Lehighton Elctrns., Inc., Lehighton, Pa.
Lockheed Aircraft Svce., Special Devices Div., Ontario, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Maxson Elctrns. Div., Great River, N.Y.
Methode Elctrns., Inc., Chicago, Ill.
Mid-West Metal Prods., Kansas City, Kans.
Morey Corp, Downers Grove, Ill.
Oklahoma Aerotronics, Hartshorne, Okla.
Radiation Sys., Inc., McLean, Va.
Robinson-Nugent, New Albany, Ind.
Rogers Corp., Rogers, Conn.
Solid Controls, Inc., Minneapolis, Minn.
Stanford Applied Engrg., Santa Clara, Cal.
3M Co., St. Paul, Minn.
Vitro Laboratories, Silver Spring, Md.
Wyle Labs., El Segundo, Calif.

Boards, Programming—See Vol 1

Boards, Terminal—See Vol 3

Boats & Crucibles—See Vol 3

Bobbins, Winding, Coil & Transformer-Also See Coil Forms—See Vol 3

Bolometers, Infrared—See Vol 1

Bolometers, Microwave—See Vol 1

Bolts—See Fasteners—Vol 3

Bonding Jumpers—See Jumpers, Bonding—Vol 3

Books—See Technical Books—Vol 3

Booms, Stands, Holders & Accessories, Microphone—See Vol 1

Boots, Switch Handle

Alco Elctrn. Prods., Lawrence, Mass. p 1878
APM Hexseal Corp., Englewood, N.J.
Multi-Flex Seals, Inc., Bronx, N.Y.
Technical Wire Prods., Inc., Cranford, NJ
Technical Wire Prods., Inc., Santa Barbara, Cal.

Boxes, Circuit Board—See Boxes, Component (Subassembly Handling)—Vol 3

Boxes, Component/Subassembly Handling (Production)—See Vol 3

Boxes, Decade—See Decade Boxes—Vol 1

Boxes, Dry—See Vol 1

Boxes, Echo—See Vol 1

Boxes, Glove—See Vol 1

Boxes, Junction & Wall Plate—See Vol 3

Boxes, Metal & Plastic—See Cabinets; Cans; Cases; Containers—Vol 3

Boxes, Plug-In—See Plug-In Module Enclosures—Vol 3

Boxes, Power Outlet—See Boxes, Junction & Wall Plate—Vol 3

Boxes, Shipping (Reusable)—See Transit Cases—Vol 3

Boxes, Tote—See Boxes, Components / Subassembly Handling—Vol 3

Brackets, Antenna—See Mounts, Antenna—Vol 1

Braid, Cable & Wire Shielding—See Vol 3

Brakes, Magnetic

American Precision Inds., Inc., E. Aurora, N.Y. .... p 1585
Bowmar Instr. Corp., Ft. Wayne, Ind.
Delevan Div., Coil Prods., E. Aurora, N.Y. .... p 1585
Dynamic Instr. Corp., Plainview, N.Y. p 1586
FAE Instr. Corp., Huntington Sta., N.Y. p 1587
General Elec. Co., Schenectady, N.Y.
General-Electro Mechanical, Buffalo, N.Y. .... p 1594
General Time Corp., Torrington, Conn.
Altair Resch. & Mfg. Co., Ontario, Calif.
American Elctrns., Inc., Fullerton, Cal.
American Rectifier Corp., College Point, N.Y.
Barger Corp., Sunnyvale, Cal.
Bendix, Elmira, N.Y.
Bowmar/TIC, Inc., Newbury Park, Calif.
Coil Co. of Amer., Northvale, N.J.
Conductron Corp., St. Charles, Mo.
Cutler-Hammer, Milwaukee, Wisc.
Dial Prods. Co., Bayonne, N.J.
Electroid Co., Union, N.J.
Fawick Airflex Div., Cleveland, Ohio
Formsprag Co., Warren, Mich.
Lear Siegler, Inc., Santa Monica, Calif.
Lem Instrument Corp., Farmingdale, N.Y.
Magnetec Corp., Van Nuys, Calif.
Magtrol, Inc., Buffalo, N.Y.

Meltronics Inc., Wantagh, N.Y.
Midwest Automatic, Inc., Des Moines, Iowa
MPC Prods. Corp., Chicago, Ill.
Northern Precision Labs., Inc., Fairfield, N.J.
Orbit Instr. Corp., Syosset, N.Y.
Perfect Gear & Instr. Corp., Northridge, Calif.
Permanent Magnet Co., Inc., Indianapolis, Ind.
PIC Design Corp., Ridgefield,, Conn.
Robot Inds., Inc., Dearborn, Mich.
SECS, Inc., Long Island City, N.Y.
Simplatrol Prods. Corp., Worcester, Mass.
Square D Co., Park Ridge, Ill.
Sterling Instr., New Hyde Pk., NY
Stop Components, Inc., Freeport, N.Y.
Valcor Engrg. Corp., Kenilworth, N.J.
Vibrac Corp., Chelmsford, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Int'l., New York, N.Y.

Brakes, Mechanical

American Precision Inds., Inc., E. Aurora, N.Y. .... p 1585
Bowmar Instr. Corp., Ft. Wayne, Ind.
Delevan Div., Coil Prods., E. Aurora, N.Y. .... p 1585
FAE Instr. Corp., Huntington Sta., N.Y. p 1587
Electroid Co., Union, N.J.
Lem Instrument Corp., Farmingdale, N.Y.
Meltronics Inc., Wantagh, N.Y.
Midwest Automatic, Inc., Des Moines, Iowa
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.

Brazing Flux—See Flux, Brazing & Soldering—Vol 3

Breadboard Kits—See Kits, Breadboarding

Breakdown Testers—See Testers, Insulation Breakdown—Vol 1

Breakers, Circuit—See Circuit Breakers

Bridges, Admittance—See Vol 1

Bridges, Antenna—See Bridges, R-F—Vol 1

Bridges, Audio—See Vol 1

Bridges, Bolometer—See Vol 1

Bridges, Calorimeter—See Vol 1

Bridges, Capacitance—See Vol 1

Bridges, Deviation—See Vol 1

Bridges, Impedance—See Vol 1

Bridges, Inductance—See Vol 1

Bridges, Kelvin—See Vol 1

Bridges, Limit—See Bridges (Specific Types)—Vol 1

Bridges, Magnetic Susceptibility—See Vol 1

Bridges, Megohm—See Bridges, Resistance—Vol 1

Bridges, Power, R-F—See Vol 1

Bridges, Programmable—See Bridges (Specific Types)—Vol 1

Bridges, Q—See Vol 1

Bridges, Ratio—See Testers, Ratio Voltage-Also See Meters, Ratio—Vol 1

Bridges, Resistance—See Vol 1

Bridges, R-F—See Vol 1

Bridges, Schering—See Vol 1

Bridges, Self-Balancing—See Vol 1

Bridges, Silicon Cell

Elctrn. Devices, Yonkers, N.Y. ..... p 1802
General Electc. Semiconductor, Syracuse,, N.Y.
International Rectifier, El Segundo, Cal.
Precision Monolithics, Santa Clara, Cal.
RCA Elctrns. Comps., Harrison, N.J.
Semtech Corp., Newbury Pk., Cal. p 1818,1820
Unitrode, Watertown, Mass. .... p 1854
Unitrode Corp., Watertown, Mass. p 1854
Westinghouse Elec., Youngwood, Pa. p 1859
Bradley Semiconductor Corp., New Haven, Conn.
Computer Diode, Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Mullard, Inc., Farmingdale, N.Y.
Varo, Inc., Semiconductor Div., Garland, Tex.

Bridges, Strain Gauge—See Vol 1

Bridges, Synchro & Resolver—See Vol 1

Bridges, Temperature—See Vol 1

Bridges, Thermistor—See Vol 1

Bridges, Wenner—See Vol 1

Bridges, Wheatstone—See Vol 1

Brushes & Brush Assemblies

Airflyte Elctrns. Co., Bayonne, N.J. p 1580
Chicago Switch, Chicago, Ill.
Engelhard Minerals & Chem., Murray Hill, N.J.
Fabricast, Inc., So. El Monte, Cal. p 1593
General Elec. Co., Schenectady, N.Y.
Graphite Metallizing Corp., Yonkers, N.Y. .... p 1596
Jonard Inds. Corp., Bronx, N.Y.
Keystone Carbon Co., St. Marys, Pa.
Airco Speer Carbon-Graphite, Carbon Prods. Dept., St. Marys, Pa.
Avionics, Inc., South Bend, Ind.
Carbone Corp., Boonton, N.J.
Collectron Corp., New York, N.Y.
Felton, S.A. & Son Co., Manchester, N.H.
General Devices, Inc., Princeton, N.J.
Helwig Carbon Prods., Inc., Milwaukee, Wisc.
Jenkins', M.W. Sons, Inc., Cedar Grove, N.J.
Meridian Laboratory, Inc., Madison, Wisc.
Micro Contacts Inc., Hicksville, N.Y.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Ney, J.M. Co., Bloomfield, Conn.
Northern Precision Labs., Inc., Fairfield, N.J.
Nuclear Prods. Co., El Monte, Calif.
Ohio Carbon Co., Cleveland, Ohio
Ostby & Barton Co., Providence, R.I.
Pure Carbon Co., Inc., St. Marys, Pa.
St. Marys Carbon Co., St. Marys, Pa.
Stackpole Carbon Co., Carbon Div., St. Marys, Pa.
Superior Carbon Prods., Inc., Cleveland, Ohio
Union Carbide, Carbon Prods. Div., New York, N.Y.
Wendon Co., Inc., Stamford, Conn.

Buffer Memories, Computer-Also See Memory Systems—See Vol 1

Bulbs—See Lamps

Bumpers—See Vol 3

Burnishers, Contact—See Vol 3

Bus Bars & Systems—See Vol 3

Bushings, Glass, Plastic, Metal, etc.—See Vol 3

Bushings, Hermetically Sealed—See Vol 3

Buzzers—See Bells, Buzzers, Gongs, Sirens & Aural Warning Devices

Cabinet Coolers, Blowers & Fans—See Blowers & Fans—Vol 3

Cabinet Pressurization Systems—See Pressurization Systems, Equipment Cabinet—Vol 3

Cabinets & Accessories, Metal—See Vol 3

Cabinets, Metal Shielded—See Vol 3

Cabinets, Plastic—See Vol 3

Cabinets, Sliding Drawer—See Vol 3

Cabinets, Speaker—See Enclosures, Speaker—Vol 1

Cabinets, Wood (Excluding Kits)—See Vol 3

Cable, Audio—See Vol 3

Cable, Battery Booster—See Vol 3

Cable, Coaxial—See Vol 3

Cable, Control—See Cable, Multiconductor—Vol 3

Cable, Dial—See Cords & Cable, Dial Drive

Cable, Fault Locators—See Locators, Cable & Line Fault—Vol 1

Cable, Flat, Collated (Flat or Round Conductors)—See Vol 3

Cable, Flat, Etched—See Vol 3

Cable, Flexible—See Cable, Flat—Vol 3

Cable, Heater—See Vol 3

Cable, High Voltage—See Vol 3

Cable, Irradiated—See Vol 3

Cable, Low-Capacitance—See Vol 3

Cable, Microphone—See Vol 3

Cable, Multiconductor—See Vol 3

Cable, Power—See Vol 3

Cable, Retractile—See Cords, Retractile—Vol 3

Cable, Ribbon—See Cable, Flat—Vol 3

Cable, Rotator, Antenna—See Vol 3

Cable, Shielded—See Vol 3

Cable, Solid Dielectric—See Vol 3

Cable, TFE Insulated—See Vol 3

Cable, TV Camera—See Vol 3

Cable, Telephone—See Vol 3

Cable, Transmission Line—See Vol 3

Cable, Triaxial—See Vol 3

Cable Assemblies & Harnesses—See Vol 3

Cable Clamps & Clips—See Clamps & Clips, Cable—Vol 3

Cable-End Sealing Kits—See Kits, Cable-End Sealing—Vol 3

Cable Pressurization Equipment—See Vol 1

Cable Retractors—See Vol 3

Cable Testers—See Testers, Cable—Vol 1

Cages, Circuit Board—See Racks, Circuit—Vol 3

Calculators, Electrical & Electronic-Also See Computers, Desk Top—See Vol 1

Calibration Services—See Services, Calibration & Instrument Repair—Vol 3

Calibrators, Accelerometer—See Vol 1

Calibrators, Attenuation—See Vol 1

Calibrators, Crystal—See Vol 1

Calibrators, Current—See Vol 1

Calibrators, Frequency—See Vol 1

Calibrators, LVDT—See Vol 1

Calibrators, Magnetic Field—See Vol 1

Calibrators, Meter—See Testers, Meter—Vol 1

Calibrators, Microphone—See Vol 1

Calibrators, Noise—See Vol 1

Calibrators, Oscilloscope—See Vol 1

Calibrators, Radar Range—See Vol 1

Calibrators, Sweep—See Generators, Sweep—Vol 1

Calibrators, Synchro—See Vol 1

Calibrators, Telemetering—See Telemetering Testers—Vol 1

Calibrators, Time-Base—See Vol 1

Calibrators, Voltage—See Vol 1

Calibrators, VSWR—See Vol 1

Calling Sytems—See Intercommunication Systems—Vol 1

Calorimeters, Heat Transfer—See Vol 1

Calorimeters, Laser—See Vol 1

Calorimeters, Microwave—See Vol 1

Calorimeters, Optical
EG & G, Inc., Salem, Mass.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Precision Sci. Co., Chicago, Ill.

Cameras, Data Recording
Abtronics, Inc., Livermore, Calif.
AGFA-Gevaert, Inc., Teterboro, N.J.
CAI Div. Bourns Inc., Barrington, Ill.
Chadwick-Helmuth Co., Inc., Monrovia, Calif.
Cole Instr., Costa Mesa, Cal.
Conductron Corp., St. Charles, Mo.
Electro Photo Systems, Anaheim, Cal.
Entron Inc., Morganville, N.J.
Ercona Corp., Bellmore, N.Y.
Fairchild Space & Defense Sys., Syosset, N.Y.
Gordon Alan Entprs., N. Hollywood, Cal.
Heitz, Karl, Inc., New York, N.Y.
Integrated Controls, San Diego, Cal.
KDI Adtrol, Inc., Broomall, Pa.
Lehigh Valley Elctrn., Inc., Fogelsville, Pa.
Maurer, J.A., Inc., Woodside, N.Y.
Meteorology Research, Inc., Altadena, Calif.
Photo-Sonics, Inc., Burbank, Calif.
Photomechanisms Div., Inc., Huntington Sta., N.Y.
Red Lake Labs, Inc., Santa Clara, Calif.
Teledyne Camera Sys., Arcadia, Cal.
3M Co., St. Paul, Minn.
Traid Corp., Glendale, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Cameras, Image Converter
Abtronics, Inc., Livermore, Calif.
Advanced Kinetics, Costa Mesa, Calif.
Goodyear Aerospace Corp., Akron, Ohio
Multi Media Engrg., Inc., Rockville, Md.
Photo-Sonics, Inc., Burbank, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
TRW Instrs., El Segundo, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Cameras, Image Dissection
Goodyear Aerospace Corp., Akron, Ohio

Cameras, Infrared
Dynarad, Inc., Norwood, Mass. .... p 439
Barnes Engrg. Co., Stamford, Conn.
GBC Closed Circuit TV Corp., New York, N.Y.
Heitz, Karl, Inc., New York, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Infrared Inds., Inc., Santa Barbara, Cal.
Traid Corp., Glendale, Cal.
TRW Instrs., El Segundo, Cal.

Cameras, Microcircuit Processing
Brown Mfg. Co., Evanston, Ill.
Burke & James, Inc., Chicago, Ill.
Film Microelectronics, Inc., Burlington, Mass
HLC Mfg. Co., Inc., Willow Grove, Pa.
Olympus Corp. America, New Hyde Park, N.Y.
Zeiss, Carl, Inc., New York, N.Y.

Cameras, Oscilloscope
Hewlett-Packard, Palo Alto, Cal.
Tektronix, Inc., Beaverton, Ore.
Abrams Instr., Lansing, Mich.
CAI Div. Bourns Inc., Barrington, Ill.
Dumont Oscilloscope Labs., Inc., W. Caldwell, N.J.
Ealing Corp., Cambridge, Mass.
Entron Inc., Morganville, N.J.
Gordon Alan Entprs., N. Hollywood, Cal.
Heitz, Karl, Inc., New York, N.Y.
Integrated Controls, San Diego, Cal.
Lehigh Valley Elctrn., Inc., Fogelsville, Pa.
Maurer, J.A., Inc., Woodside, N.Y.
Mico Instr. Co., Cambridge, Mass.
Photo-Sonics, Inc., Burbank, Calif.
Photo Tech. Prods., Garden City, N.Y.
Red Lake Labs, Inc., Santa Clara, Calif.
Shotec Inc., Clearlake Oaks, Cal.
Stoelting Co., Chicago, Ill.
Teledyne Camera Sys., Arcadia, Cal.
Traid Corp., Glendale, Cal.

Cameras, Rotating Mirror & Drum
Fairchild Space & Defense Sys., Syosset, N.Y.
Gordon Alan Entprs., N. Hollywood, Cal.
Photo-Sonics, Inc., Burbank, Calif.
Rank Precision Inds., W. Nyack, N.Y.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.

Cameras, TV (Black And White) & Accessories—See Vol 1

Cameras, TV (Color) & Accessories—See Vol 1

Cameras, TV, Infrared—See Vol 1

Cameras, X-Ray—See Vol 1

Cams—See Vol 3

Cans & Flat Packs, Integrated Circuit—See Packages, Integrated Circuit

Cans, Capacitor—See Vol 3

Cans, Crystal—See Vol 3

Cans, Relay—See Vol 3

Cans, Semiconductor—See Vol 3

Cans, Transformer—See Vol 3

Capacitance Comparators—See Bridges, Capacitance—Vol 1

Capacitor Leakage Indicators—See Testers, Capacitor—Vol 1

Capacitors, Air Cooled—See Vol 3

Capacitors, Chip (For Microcircuits)—See Vol 3

Capacitors, Fixed, Air—See Vol 3

Capacitors, Fixed, Bathtub—See Vol 3

Capacitors, Fixed, Ceramic—See Vol 3

Capacitors, Fixed, Ceramic Disc—See Vol 3

Capacitors, Fixed, Decade—See Vol 3

Capacitors, Fixed, Electrolytic (All Types)—See Vol 3

Capacitors, Fixed, Feedthru—See Vol 3

Capacitors, Fixed, Film—See Vol 3

Capacitors, Fixed, Gas Filled—See Vol 3

Capacitors, Fixed, Glass—See Vol 3

Capacitors, Fixed, High Capacitance-Low Voltage—See Vol 3

Capacitors, Fixed, High Temperature—See Vol 3

Capacitors, Fixed, High Voltage—See Vol 3

Capacitors, Fixed, Laboratory Standard—See Vol 3

Capacitors, Fixed, Mica—See Vol 3

Capacitors, Fixed, Motor Run—See Vol 3

Capacitors, Fixed, Motor-Starting—See Vol 3

Capacitors, Fixed, Mylar—See Vol 3

Capacitors, Fixed, Mylar, Metallized—See Vol 3

Capacitors, Fixed, Niobium—See Vol 3

Capacitors, Fixed, Oil—See Vol 3

Capacitors, Fixed, Paper—See Vol 3

Capacitors, Fixed, Paper, Metallized—See Vol 3

Capacitors, Fixed, Photoflash—See Vol 3

Capacitors, Fixed, Polycarbonate—See Vol 3

Capacitors, Fixed, Polycarbonate, Metallized—See Vol 3

Capacitors, Fixed, Polystyrene—See Vol 3

Capacitors, Fixed, Porcelain, Enamel—See Vol 3

Capacitors, Fixed, Power Factor Correction—See Vol 3

Capacitors, Fixed, Pulse-Forming Network—See Vol 3

Capacitors, Fixed, Silvered Mica—See Vol 3

Capacitors, Fixed, Tantalum—See Vol 3

Capacitors, Fixed, TFE—See Vol 3

Capacitors, Fixed, TFE, Metallized—See Vol 3

Capacitors, Fixed, Temperature Compensating—See Vol 3

Capacitors, Fixed, Vacuum—See Vol 3

Capacitors, Overvoltage Protected—See Vol 3

Capacitors, Variable, Air—See Vol 3

Capacitors, Variable, Ceramic—See Vol 3

Capacitors, Variable, Film—See Vol 3

Capacitors, Variable, Gas—See Vol 3

Capacitors, Variable, Glass—See Vol 3

Capacitors, Variable, High Temperature—See Vol 3

Capacitors, Variable, HV (Lab Type)-Also See Decade Boxes,Capacitance—See Vol 3

Capacitors, Variable, Motor Driven—See Vol 3

Capacitors, Variable, Mica—See Vol 3

Capacitors, Variable, Neutralizing—See Vol 3

Capacitors, Variable, Oil—See Vol 3

Capacitors, Variable, Padder—See Vol 3

Capacitors, Variable, Piston—See Capacitors, Variable, Trimmer (All Types)—Vol 3

Capacitors, Variable, Quartz—See Vol 3

Capacitors, Variable, Silicone—See Vol 3

Capacitors, Variable, TFE—See Vol 3

Capacitors, Variable, Temperature Compensating—See Vol 3

Capacitors, Variable, Trimmer (All Types)—See Vol 3

Capacitors, Variable, Vacuum—See Vol 3

Capacitors, Water Cooled—See Vol 3

Caps, Connector—See Vol 3

Caps, Forms & Tapes, Heat Shrinkable-Also See Tubing, Heat Shrinkable—See Vol 3

Caps, Grid & Plate—See Clips & Caps, Grid & Plate—Vol 3

Caps, Lens, Indicator Light
ADC Prods., Minneapolis, Minn.
Circon Corp., Goleta, Cal.
Dialight Corp., Brooklyn, N.Y.
Drake Mfg., Harwood Hgts., Ill.
Electro-Mech. Comps., S. El Monte, Cal.
General Elec. Co., Schenectady, N.Y. p 1462
General Illumination, Inc., St. Paul, Minn p 1457-1459
Genisco Technology Corp., Eldema Div., Compton, Cal. ....p 1454,1455
GTE Sylvania Inc., Hillsboro, N.H.p 1465
Ind'l. Devices, Edgewater, N.J.
Leecraft Mfg. Co., Inc., Long Island City, N.Y. .... p 1482
LVC Ind's., Inc., Corona, N.Y. ...... p 1441
Sloan Co., Sun Valley, Cal.
Trimm, Inc., Libertyville, Ill.
Aeronautical Elec. Co., Inc., Chicago, Ill.
APM Hexseal Corp., Englewood, N.J.
Arcolectric Switch Co., N. Hollywood, Calif.
Clare-Pendar Co., Post Falls, Idaho
Compu-Lite Corp., Irvine, Cal
Eby Sls. Co., Jamaica, N.Y.
Electro Assemblies, Inc., Chicago, Ill.
Glar-Ban Corp., Buffalo, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Kopp Glass, Inc., Pittsburgh, Pa.
Marco-Oak, Anaheim, Cal.
Nucleonic Prods., Canoga Pk, Cal.
Penn Keystone Corp., Ansonia, Conn.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Precision Paper Tube Co., Wheeling, Ill.
Resinite Corp. Div., Wheeling , Ill
Staver Co., Inc., Bay Shore, N.Y.
Tekform Prods. Co., Anaheim, Cal.
Warren Comps. Corp., Warren, Pa.

Caps, Wire-Splicing—See Splicers, Wire (Butt & Cap Types)—Vol 3

Carbides—See Vol 3

Carbon—See Vol 3

Card Holders, Circuit Board—See Racks, Circuit Board—Vol 3

Card Readers—See Punched Card Equipment—Vol 1

Cards, Linear Function (With Discrete Components)
Beta Instr., Newton Upper Falls, Mass. p 337
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
CELCO, Mahwah, N.J. .... p 339
Centralab, Elctrns., Milwaukee, Wisc.
DDC, Hicksville, N.Y.
Digital Equip. Corp., Maynard, Mass.
Digitron Corp., Norristown, Pa.
Elgenco, Inc., Santa Monica, Cal. p 460,461
Hybrid Sys. Corp., Burlington, Mass. p 352
Intronics, Inc., Newton, Mass. .... p 1288
Metric Sys., Ft. Walton Beach, Fla.p 359
North Hills Elctrns., Inc., Glen Cove, N.Y. .... p 1339
Precision Monolithics, Santa Clara, Cal.
Raytheon Computer, Santa Ana, Cal. p 375
RO Assocs., Menlo Pk., Cal.
Sealectro Corp., Mamaroneck, N.Y.
Teledyne Philbrick, Dedham, Mass.
Tempo/UTI Div., Chatsworth, Cal.
A C Electronics Co., Santa Monica, Cal.
AMBAC Inds., Garden City, N.Y.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
Atlantic Instrs. Corp., Watertown, Mass.
Automatic Control Elctrns. Co., San Antonio, Tex.
BECO Solid State Systems, Salem, Va.
Clifton Div., Clifton Hgts., Pa.
Data Technology Corp., Palo Alto, Cal.
De-Tec-Tronic Corp., Chicago, Ill.
Digital Prods., San Pedro, Calif.
Doran Mfg. Co., Cincinnati, Ohio
Flexible Circuits, Inc., Warrington, Pa.
General Comps., Inc., St. Petersburg, Fla.
Gulton Inds., Albuquerque, N.M.
Interlind Elctrns., Doraville, Ga.
ITT Semiconductors, W. Palm Beach, Fla.
Kentrox Inds., Inc., Portland, Ore.
Komak, Inc., Phila., Pa.
Lear Siegler, Inc., Santa Monica, Calif.
Monitor Sys., Inc., Ft. Washington, Pa.
Philway Prods., Ashland, Ohio
Ragen Precision Inds., Inc., N. Arlington, N.J.
Struthers-Dunn, Inc., Pitman, N.J.
Superior Elec., Bristol, Conn.
Transducer Controls Corp., Covina, Calif.
Universal Resch. Labs., Elk Grove Village, Ill
Xerox Data Sys., El Segundo, Cal
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Cards, Linear Function (With IC'S)
Beta Instr., Newton Upper Falls, Mass. p 337
Centralab, Elctrns., Milwaukee, Wisc.
Computer Prods., Ft. Lauderdale, Fla. p 341
DDC, Hicksville, N.Y.
Digital Equip. Corp., Maynard, Mass.
Digitron Corp., Norristown, Pa.
Hybrid Sys. Corp., Burlington, Mass.
Intronics, Inc., Newton, Mass.
Metric Sys., Ft. Walton Beach, Fla.p 359
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Precision Monolithics, Santa Clara, Cal. p 1546
Raytheon Computer, Santa Ana, Cal. p 375
Teledyne Philbrick, Dedham, Mass.
Tempo/UTI Div., Chatsworth, Cal.
A C Electronics Co., Santa Monica, Cal.
AMBAC Inds., Garden City, N.Y.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
Atlantic Instrs. Corp., Watertown, Mass.
Automatic Control Elctrns. Co., San Antonio, Tex.
BECO Solid State Systems, Salem, Va.
Clifton Div., Clifton Hgts., Pa.
Data Technology Corp., Palo Alto, Cal.
Digital Prods., San Pedro, Calif.
General Comps., Inc., St. Petersburg, Fla.
Goodyear Aerospace Corp., Akron, Ohio
Gulton Inds., Albuquerque, N.M.
Interlind Elctrns., Doraville, Ga.
ITT Semiconductors, W. Palm Beach, Fla.
Monitor Sys., Inc., Ft. Washington, Pa.
Morey Corp, Downers Grove, Ill.
Philway Prods., Ashland, Ohio
Ragen Precision Inds., Inc., N. Arlington, N.J.
Stanford Applied Engrg., Santa Clara, Cal.
Struthers-Dunn, Inc., Pitman, N.J.
Struthers-Dunn, Inc., Bettendorf, Iowa
Transducer Controls Corp., Covina, Calif.
Universal Resch. Labs., Elk Grove Village, Ill
Wyle Labs., El Segundo, Calif.
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Cards, Logic (With Discrete Components)—See Vol 1

Cards, Logic (With IC'S)—See Vol 1

Carriages, Probe
Hewlett-Packard, Palo Alto, Cal.
Omega Labs., Inc., Rowley, Mass.
PRD Elctrns., Inc., Westbury, N.Y.

Carrier Current Systems—See Comm. Systems, Carrier Current—Vol 1

Carriers—See Holders & Carriers

Cartridges, Microphone—See Vol 1

Cartridges, Phono, Ceramic—See Vol 1

Cartridges, Phono, Crystal—See Vol 1

Cartridges, Phono, Magnetic—See Vol 1

Carts, Instrument & Equipment—See Vol 3

Cases, Delay Line—See Vol 3

Cases, Equipment, Instrument, Meter (Portable)—See Vol 3

Cases, Equipment, Instrument, Meter (Stationary)—See Vol 3

Cases, Relay—See Cans, Relay—Vol 3

Cases, Semiconductor—See Cans, Semiconductor—Vol 3

Cases, Shielded—See Containers, Shielded—Vol 3

Cases, Transit—See Transit Cases—Vol 3

Castings—See Metal Parts, Cast—Vol 3

Cathode-Ray Readout Tubes—See Tubes, Readout

Catv Systems & Equipment—See Vol 1

Cavities, Microwave
Applied Microwave Lab., Andover, Mass.
Electro-Mechanics Co., Austin, Tex. p 452
Frequency Engrg. Labs., Farmingdale, N.J. .... p 605
General Elec. Co., Schenectady, N.Y.
Microwave Cavity Labs., La Grange, Ill. p 610
Polarad Elctrn. Instrs., Lake Success, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Union, N.H.
A.R.F. Products, Inc., Boulder, Colo.
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
AUL Instrs., Inc., Flushng, N.Y.
Coax Devices Inc., Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
GAF Corp., New York, N.Y.
Herley Inds., Inc., Syosset, N.Y.
Industrial Microwave, Scotch Plains, N.J.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microdot Inc., S. Pasadena, Calif.
Microlab/FXR, Livingston, N.J.
Micromega, Los Angeles, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Filter Co., Inc., East Syracuse, N.Y.
N-H Microwave, Inc., Red Bank, N.J.
Omega Labs., Inc., Rowley, Mass.
Pabst Engineering Equipment Co., Inc., Elizabeth, N.J.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Reeve Elctrns., Inc., Chicago, Ill.
RFD, Inc., Tampa, Fla.
Sage Labs. Inc., Natick, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Syncor Prods. Co., Inc., Malden, Mass.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Cells, Electrolytic (Timing)—See Timers, Electrolytic Cell

Cells, Fuel—See Fuel Cells—Vol 1

Cells, Kerr
Dell Optics Co., Inc., N. Bergen, N.J.
Thermal Amer. Fused Quartz, Montville, N.J.

Cells, Load
Schaevitz Engrg., Pennsauken, N.J. p 1989
BLH Elctrns., Inc., Waltham, Mass.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Gentran Inc., Sunnyvale, Cal
Houston Scientific Inds., Inc., Houston, Tex
Interface, Inc., Scottsdale, Ariz.
Kelk, George Ltd., Don Mills, Ont., Canada
Kenney Engrg. Corp., Monrovia, Cal.
Kistler Instr. Co., Redmond, Wash.
Lebow Assocs., Inc., Troy, Mich.
Micro-Strain, Inc., Spring City, Pa.
Revere Elctrn. Div., Wallingford, Conn.
Sensotec, Inc., Columbus, Ohio
Strainsert Co., Bryn Mawr, Pa.
Thwing-Albert Instr. Co., Philadelphia, Pa.
Transducer Controls Corp., Covina, Calif.
Transducers, Inc., Santa Fe Springs, Calif.
Tyco Instr. Div., Waltham, Mass.
West Coast Resch. Corp., Los Angeles, Calif.
Wood, C.N. Mfg. Co., Newtown, Pa.

Cells, Photoconductive
Allen-Bradley Co., Milwaukee, Wisc. p 1535
Clairex Elctrns., Mt. Vernon, N.Y. p 1637
General Elec. Co., Schenectady, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Nat'l. Semiconductors, Plattsburgh, N.Y. p 1814
Raytheon Co., Quincy, Mass. ...... p 2005
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
United Detector Tech., Santa Monica, Cal. .... p 1639
Vactec, Maryland Hgts., Mo. .... p 1640
Amperex Elctrn., Slatersville, R.I.
Baldwin Elctrns., Little Rock, Ark.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Ferranti Ltd., Hollinwood, Lancs., England
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Infrared Inds., Inc., Santa Barbara, Cal.
Infrared Inds., Waltham, Mass.
Int'l. Register, Chicago, Ill.
LGM Elctrns., Inc., Houston, Tex.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Moririca Elctrns., Ltd., Tozuka-ku, Yokohama, Japan
Mullard, Inc., Farmingdale, N.Y.
Optoelectronics, Inc., Petaluma, Cal.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
Quantrol Elctrns., Inc., El Paso, Tex.
Santa Barbara Resch. Ctr., Goleta, Calif.
Sigma Instrs., Inc., Braintree, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Cells, Photoemissive-Also See Tubes, Photomultiplier
Abtronics, Inc., Livermore, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
EMR Div., Princeton, N.J.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Hughes Aircraft Co, Culver City, Cal.
Mullard, Inc., Farmingdale, N.Y.
Photomation, Inc., Mountain View, Calif.
Rank Precision Inds., W. Nyack, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.

Cells, Photovoltaic
Allen-Bradley Co., Milwaukee, Wisc. p 1535
Centralab Semiconductor, El Monte, Cal. .... p 1798
Clairex Elctrns., Mt. Vernon, N.Y. p 1637
International Rectifier, El Segundo, Cal.
Julie Research Lab., New York, N.Y.
Nat'l. Semiconductors, Plattsburgh, N.Y. p 1814
Sensor Tech., Van Nuys, Cal. ...... p 1638
United Detector Tech., Santa Monica, Cal. .... p 1639
Vactec, Maryland Hgts., Mo. .... p 1640
Allis, Louis Co., Milwaukee, Wisc.
Baldwin Elctrns., Little Rock, Ark.
Ferranti Ltd., Hollinwood, Lancs., England
HEI, Inc., Chaska, Minn.
Heliotek, Sylmar, Calif.
Hughes Aircraft Co, Culver City, Cal.
Infrared Inds., Inc., Santa Barbara, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Moririca Elctrns., Ltd., Tozuka-ku, Yokohama, Japan
Optoelectronics, Inc., Petaluma, Cal.
Photovolt Corp., New York, N.Y.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Santa Barbara Resch. Ctr., Goleta, Calif.
Weston Instruments, Inc., Newark, N.J.

Cells, Solar—See Cells, Photovoltaic

Cements—See Adhesives—Vol 3

Centrifuges-Also See Simulators, Motion—See Vol 1

Ceramic Resonators
Amperex Elctrn. Corp., Hauppauge, N.Y.
Frequency Control, Inc., Austin, Tex.
Radio Materials Co., Chicago, Ill.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Basic Ceramics Inc., Hawthorne, N.J.
Crystal Optics Resch., Inc., Ann Arbor, Mich.
E.B.L. Co, East Hartford, Conn.

Ceramics—See Insulation Parts, Ceramic—Vol 3

Chambers, Acoustical Test, High-Intensity Noise—See Vol 1

Chambers, Altitude—See Vol 1

Chambers, Anechoic—See Anechoic Chambers—Vol 1

Chambers, Explosion—See Vol 1

Chambers, Humidity—See Vol 1

Chambers, Ionization—See Vol 1

Chambers, Magnetic Environment—See Vol 1

Chambers, Pressure—See Vol 1

Chambers, Radiation—See Vol 1

Chambers, Salt Spray—See Vol 1

Chambers, Sand & Dust—See Vol 1

Chambers, Space Simulation—See Solar Simulators—Vol 1

Chambers, Sunshine—See Vol 1

Chambers, Temperature—See Vol 1

Chambers, Vacuum—See Vol 1

Chambers, Vibration—See Vol 1

Chargers, Battery—See Vol 1

Chargers, Magnet—See Magnetizers—Vol 1

Chassis, Circuit Board Mounting—See Vol 3

Chassis Marking Kits—See Kits, Marking (Dial, Instrument, Equipment, etc.)

Chassis, Metal—See Vol 3

Chassis Slides—See Slides, Cabinet, Chassis & Drawer—Vol 3

Checkers—See Analyzers; Testers—Vol 1

Chemically Milled Parts—See Metal Parts, Chemically Milled—Vol 3

Chemicals, Anti-Static—See Coatings, Anti-Static—Vol 3

Chemicals, Degreasing—See Cleaners & Solvents—Vol 3

Chemicals, Dehumidifying—See Vol 3

Chemicals, Electroplating—See Vol 3

Chemicals, Epoxy Stripping—See Vol 3

Chemicals, Etching—See Vol 3

Chemicals, Fungicidal—See Coatings, Fungicidal—Vol 3

Chemicals, Luminescent—See Vol 3

Chemicals, Metal Stripping—See Vol 3

Chemicals, Photosensitive—See Vol 3

Chemicals, Semiconductor (Production)—See Vol 3

Chemicals, Wire Stripping—See Vol 3

Chestsets—See Handsets, Chestsets & Operator Sets—Vol 1

Chips, Capacitor—See Capacitors, Chip—Vol 3

Chips, IC—See Circuits, Integrated, Silicon Monolithic, Unpackaged Chips

Chips, Transistor—See Transistors, Chip Unpackaged

Chokes, A-F—See Coils, A-F—Vol 3

Chokes, Air Core, DC—See Vol 3

Chokes, Filter—See Vol 3

Chokes, R-F—See Vol 3

Chokes, Swinging—See Vol 3

Chokes, Waveguide

CEA, Monrovia, Cal.
United Transformer Co. Div. of TRW Inc., New York, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Airtec, Inc., Roselle, N.J.
American Radar Comps., Inc., Denville, N.J.
Cardwell Condenser, Lindenhurst, N.Y.
C.B.C. Inds., Inc., Ft. Washington, Pa.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Industrial Microwave, Scotch Plains, N.J.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Omega Labs., Inc., Rowley, Mass.
Pabst Engineering Equipment Co., Inc., Elizabeth, N.J.
Pem Mach. Tool Co., Inc., Cranford, N.J.
Piconics Inc., Tyngsboro, Mass.
Premier Microwave, Port Chester, N.Y.
Reeve Elctrns., Inc., Chicago, Ill.
RF Systems, Inc., Cohasset, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Victor Microwave, Inc., Wakefield, Mass.

Choppers

Airpax Elctrns., Inc., Cambridge, Md.
American Time Products, Woodside, N.Y. .... p 1642
Bulova Watch Elctrns. Div. Amer. Time Prods., Woodside, N.Y. .... p 1642
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Elctrn. Applications, S. El Monte, Cal.
General Elec. Co., Schenectady, N.Y.
General Magnetics, Bloomfield, N.J.
Graphite Metallizing Corp., Yonkers, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
International Rectifier, El Segundo, Cal.
Ithaco, Inc., Ithaca, N.Y. .... p 1286
James Elctrns., Inc., Chicago, Ill.
Oak Mfg., Crystal Lake, Ill.
Philamon, Inc., Westbury, N.Y.
Solid State Elctrns., Sepulveda, Cal. p 2006
Stevens-Arnold, Inc., So. Boston, Mass. p 2007
Transmagnetics Inc., Farmingdale, N.Y.
Advanced Kinetics, Costa Mesa, Calif.
Anritsu Electric Co., Ltd., Tokyo, Japan
Bristol Div, Waterbury, Conn
Brower Laboratories, Inc., Waltham, Mass.
Buckbee-Mears Co., St. Paul, Minn.
Climatronics Corp., Hauppauge, N.Y.
Collins Electronics, Inc., Stevensville, Md.
Crystalonics Div., Cambridge, Mass.
Data Dynamics Div., Englewood, N.J.
Guildline Instrs., Inc., Larchmont, N.Y.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Hobbs Mfg. Co., Worcester, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Power Control Corp., Pittsburgh, Pa.
Rawco Instrs., Inc., Ft. Worth, Tex.
Singer-General Precision, Inc., Little Falls, N.J.
Universal Relay Corp., New York, N.Y.

Choppers, Photo—See Choppers

Chromatographs—See Analyzers, Gas—Vol 1

Chronographs—See Recorders, Timing—Vol 1

Chronometers—See Vol 1

Circuit Analyzers—See Testers, Signal Tracing—Vol 1

Circuit Board Boxes—See Boxes, Component (Subassembly Handling)—Vol 3

Circuit Board Holders, Jig Type—See Holders, Circuit Board—Vol 3

Circuit Board Racks—See Racks, Circuit Board—Vol 3

Circuit Boards, Stamped (Without Components)

A. D. Data Sys., Inc., Rochester, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Augat Inc., Attleboro, Mass. .... p 1536
Cinch-Graphik, City of Industry, Cal. p 1297
Data-Control Systems, Danbury, Conn.
Digital Equip. Corp., Maynard, Mass.
Douglas Electronics, Inc., San Leandro, Cal. .... p 1301
Dynamics Instr. Co., Monterey Pk., Cal.
Elctrn. Molding Corp., Woonsocket, R.I.
ELFAB Crop., Dallas, Tex. .... p 2627
Pomona Elctrns. Co., Inc., Pomona, Cal.
Power/Mate, Hackensack, N.J.
Vector Elctrn. Co., Inc., Sylmar, Cal. p 2722
Vero Electronics, Inc., Hauppauge, N.Y. p 2329
Accurate Elctrns. Corp., Elyria, Ohio
Advanced Circuitry Div., Springfield, Mo.
Ansley Div. ACI Inc., Perkasie, Pa.
Argent Inds., Inc., Dayton, Ohio
Cambridge Thermionic, Cambridge, Mass
Central Plastics Dists., Chicago, Ill.
Consolidated Resistance Sls., Yonkers, N.Y.
Data Technology Corp., Palo Alto, Cal.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electrol Co., Inc., York, Pa.
Epoxy Cast Elctrn. Case Co., Yonkers, N.Y.
Flexible Circuits, Inc., Warrington, Pa.
General Circuits, Inc., Rochester, N.Y.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Kentrox Inds., Inc., Portland, Ore.
Keystone Elctrns. Corp., New York, N.Y.
Micro Contacts Inc., Hicksville, N.Y.
Mid-West Metal Prods., Kansas City, Kans.
Midland Standard Inc., Elgin, Ill.
NVF Co., Yorklyn, Del.
Power Control Corp., Pittsburgh, Pa.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Rogers Corp., Rogers, Conn.
Shigoto Inds., Ltd., New York, N.Y.
SKG Assocs., Inc., Boston, Mass.
Sparton Southwest, Inc., Albuquerque, N.M.
Spruce Pine Mica Co Inc., Spruce Pine, N.C.
Synthane Taylor Corp., Valley Forge, Pa.
Techinques, Inc., Englewood, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Westinghouse Elec. Int'l., New York, N.Y.

Circuit Breakers

Airpax Elctrns., Inc., Cambridge, Md. p 1877
Electrospace Corp., Westbury ...... p 323
Engelhard Minerals & Chem., Murray Hill, N.J.
Flight Sys., Inc., Mechanicsburg, Pa. p 1910
General Elec. Co., Schenectady, N.Y.
Heinemann Elec. Co., Trenton, N.J. p 1919
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Mauratron, Inc., Dallas, Tex.
Ross Engrg. Corp., Campbell, Cal. p 1786
Schrack Elec. Sls., New York, N.Y.
Triac Elctrn. Sys., N.Y., N.Y.
Wagner Elec. Corp., Livingston, N.J.
Allis-Chalmers, Milwaukee, Wisc.
Arrow-Hart, Inc., Hartford, Conn.
Birnbach Co., Inc., Freeport, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
E-T-A Prods. Co. America, Chicago, Ill.
Electrey, S.A., Monterrey, Mexico
Fasco Inds., Inc., Rochester, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Hughes Aircraft Co, Culver City, Cal.
Littelfuse, Inc., Des Plaines, Ill.
Mechanical Prods., Jackson, Mich.
Mel-Rain Corp., Indianapolis, Ind.
Pyle-National Co., Chgo., Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Square D Co., Park Ridge, Ill.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Underwriters Safety Device Co., Chicago, Ill.
Waber Elctrns., Inc., Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Inc., Covington, Ky.
Westinghouse Elec. Int'l., New York, N.Y.
Wood Elec. Corp., Danvers, Mass.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Circuit Linearity Comparators—See Comparators, Circuit Linearity—Vol 1

Circuit Testers—See Testers, Signal Tracing—Vol 1

Circuits, Flexible

Cinch-Graphik, City of Industry, Cal.
ITT Cannon Electric, Santa Ana, Cal.
American Elec. Cable Co., Holyoke, Mass.
Ansley Div. ACI Inc., Perkasie, Pa.
Ansley Elctrns. Corp., Doylestown, Pa.
Ansley Elctrns. Corp., Los Angeles, Cal.
Beman Mfg., Inc., New Cumberland, Pa.
Buckbee-Mears Co., St. Paul, Minn.
Bureau Engraving, Inc., Minneapolis, Minn.
Chemical Micro Milling Co, Camden, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Etchit, Inc., S. Hopkins, Minn.
Flexible Circuits, Inc., Warrington, Pa.
General Circuits, Inc., Rochester, N.Y.
Gore, W.L. & Assocs., Inc., Newark, Del.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Lockheed Elctrns. Co., Los Angeles, Calif.
Philway Prods., Ashland, Ohio
Rogers Corp., Rogers, Conn.
Sanders Assocs., Flexprint, Manchester, N.H.
Schjeldahl, G.T. Co., Northfield, Minn.
Sparton Southwest, Inc., Albuquerque, N.M.
Synthane Taylor Corp., Valley Forge, Pa.
Zippertubing Co., Los Angeles, Calif.

Circuits, Hybrid, Thick Film

American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
Astro-Space Labs., Huntsville, Ala
AVX Aerovox Corp., New Bedford, Mass. .... p 2330
Cal-R, Inc., Cal. Resistor Div., Santa Monica, Cal. .... p 1537
Cal-R, Inc., Capacitor Div., Santa Monica, Cal. .... p 1537
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal. .... p 1537
Centralab, Elctrns., Milwaukee, Wisc.
Centralab Semiconductor, El Monte, Cal. .... p 1798
Columbia Components, Hempstead, N.Y.
Computer Prods., Ft. Lauderdale, Fla. p 341
CTS Corp, Elkhart, Ind. .... p 1538
Dale Elctrns., Inc., Columbus, Neb. p 1539
DDC, Hicksville, N.Y. .... p 1282
Electro/Data, Inc., Garland, Tex. p 1558
Elctrn. Assocs., W. Long Branch, N.J. p 2381

Engelhard Minerals & Chem., Murray Hill, N.J.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hi-G, Windsor Locks, Conn. p 1322,1323,1728
Hughes Aircraft Co., Hybrid Microelectronic Circuits, Newport Bch., Cal.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Rectifier, El Segundo, Cal.
Lambda Elctrns., Melville, N.Y.
Ledex, Inc., Dayton, Ohio .... p 1542
Mepco, Inc., Morristown, N.J....... p 2864
Multitech Microelctrns., Monterey Pk., Cal. .... p 1543
Nippon Electric/NEC America, N.Y., N.Y.
Opamp Labs., Los Angeles, Cal.
Precision Monolithics, Santa Clara, Cal. p 1546
Raytheon Co., Quincy, Mass.
Sage Elctrns., Rochester, N.Y.
Sierra Sys., Mountain View, Cal.
Silicon Transistor Corp., Garden City, N.Y.
Southern Elctrns., Burbank, Cal. p 1548
Sprague Elec. Co., No. Adams, Mass.
Syracuse Elctrns. Corp., Syracuse, N.Y.
Tecnetics, Inc., Boulder, Colo. p 882,883
Teledyne Philbrick, Dedham, Mass.
AMBAC Inds., Garden City, N.Y.
American Comps., Inc., Conshohocken, Pa.
Analog Devices, Inc., Norwood, Mass.
Baldwin Elctrns., Little Rock, Ark.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Beltone Electronics Corp., Chicago, Ill.
Burr-Brown Resch. Corp., Tucson, Ariz.
Circuit Technology, Farmingdale, N.Y.
ComGeneral Corp., Dayton, Ohio
Components, Inc., Biddeford, Me.
Composite Microcircuits, Waltham, Mass.
Computer Components Int'l, Palm Beach Gardens, Fla.
Control Data, Minneapolis, Minn.
Device Seals, Inc., Sun Valley, Calif.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electra/Midland Corp., Mineral Wells, Tex.
Electra/Midland Corp., San Diego, Cal.
Electro-Science Labs., Philadelphia, Pa.
Fabri-Tek, Pompano Beach, Fla.
Fairchild Semiconductor, Mountain View, Calif.
Fansteel Inc., N Chicago, Ill.
General Instr. Corp., Hicksville, N.Y.
Goodyear Aerospace Corp., Akron, Ohio
HEI, Inc., Chaska, Minn.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Intersil, Inc., Cupertino, Calif.
Isotech Inc., Westford, Mass.
Kevlin Mfg. Co., Woburn, Mass.
Kidco, Inc., Medford, N.J.
Lockheed Elctrns. Co., Watchung, N.J.
Mark Micro-Elctrns. Mfg., Bayonne,, NJ
Micropac Inds., Inc., Garland, Tex.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Calif.
Nucleonic Prods., Canoga Pk, Cal.
Owens-Illinois, Consumer & Tech. Prods., Toledo, Ohio
Philco-Ford Corp., Washington, D.C.
Philway Prods., Ashland, Ohio
Rogers Corp., Rogers, Conn.
Solitron Devices, Tappan, N.Y.
Space Age Microcircuits, Long Valley, N.J.
Spectrum Control, Inc., Fairview, Pa.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Zeltex, Inc., Concord, Calif.

Circuits, Hybrid, Thin-Film

Allen-Bradley Co., Milwaukee, Wisc.p 1535
American Elctrn. Labs., Inc., Lansdale, Pa.
Arra Inc., Bayshore, N.Y.
AVX Aerovox Corp., New Bedford, Mass. .... p 2330
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Hybrid Microelectronic Circuits, Newport Bch., Cal.
IRC Burlington Div. of TRW INC., Burlington, Iowa .... p 2888
Mepco, Inc., Morristown, N.J.
Multitech Microelctrns., Monterey Pk., Cal. .... p 1543
Nippon Electric/NEC America, N.Y., N.Y.
Precision Monolithics, Santa Clara, Cal. p 1546
Raytheon Co., Quincy, Mass.
Seacor, Inc., Norwood, N.J.
Sensor Tech., Van Nuys, Cal....... p 1638
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Unisem, Philadelphia, Pa. ....p 1551,1847
American Comps., Inc., Conshohocken, Pa.
Amperex Elctrn., Slatersville, R.I.
Analog Devices, Inc., Norwood, Mass.
Avantek, Inc., Santa Clara, Cal.
Baldwin Elctrns., Little Rock, Ark.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Newport Beach, Calif.
Conductron Corp., St. Charles, Mo.
Control Data, Minneapolis, Minn.
Device Seals, Inc., Sun Valley, Calif.
Dickson Elctrns. Corp., Scottsdale, Ariz
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Film Microelectronics, Inc., Burlington, Mass
General Instr. Corp., Hicksville, N.Y.
Halex, Inc., Torrance, Cal.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
HyComp Inc., Maynard, Mass.
Intersil, Inc., Cupertino, Calif.
Kidco, Inc., Medford, N.J.
Megadyne Inds., Inc., Rochester, N.Y.
Micro Networks, Worcester, Mass.
Micropac Inds., Inc., Garland, Tex.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Philco-Ford Corp., Washington, D.C.
Philway Prods., Ashland, Ohio
Plessey Elctrns. Corp., Farmingdale, N.Y.
RCA Solid State Div., Somerville, N.J.
Rogers Corp., Rogers, Conn.
Sloan Technology Corp., Santa Barbara, Calif.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Circuits, Integrated, Metal Oxide Semiconductor (Mos)

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal. ....p 1540,1541
Nippon Electric/NEC America, N.Y., N.Y.
Sprague Elec. Co., No. Adams, Mass.
Unisem, Philadelphia, Pa. .... p 1550
Advanced Memory Systems, Inc., Sunnyvale, Cal
American Micro-Sys., Inc., Santa Clara, Cal.
Amperex Elctrn., Cranston, R.I.
Collins Radio Co., Newport Beach, Calif.
Electronic Arrays, Inc., Mountain View, Cal.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Garrett Micro-Circuits Corp., San Diego, Cal
General Instr. Corp., Hicksville, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Integrated Circuit Engrg., Phoenix, Ariz.
Intel Corp., Mountain View, Cal.
Intersil, Inc., Cupertino, Calif.
Litton Sys., Inc., Woodland Hills, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Mostek Corp., Carrollton,, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Calif.
NORTEC Elctrns. Corp., Santa Clara, Cal.
Nucleonic Prods., Canoga Pk, Cal.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Ragen Precision Inds., Inc., N. Arlington, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Signetics Corp., Sunnyvale, Calif.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Circuits, Integrated, Digital

American Elctrn. Labs., Inc., Lansdale, Pa.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Ledex, Inc., Dayton, Ohio
Nippon Electric/NEC America, N.Y., N.Y. .... p 1487
Sprague Elec. Co., No. Adams, Mass.
Unisem, Philadelphia, Pa. .... p 1550
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Cranston, R.I.
Amperex Elctrn., Slatersville, R.I.
Avco Corp., Cincinnati, Ohio
Burr-Brown Resch. Corp., Tucson, Ariz.
Computer Components Int'l, Palm Beach Gardens, Fla.
Control Data, Minneapolis, Minn.
Dionics, Inc., Westbury, N.Y.
Electronic Design Labs., Inc., Phila., Pa.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Elec., Inc., Plainview, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Garrett Micro-Circuits Corp., San Diego, Cal
General Instr. Corp., Hicksville, N.Y.
Harris Semiconductor, Melbourne, Fla.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Integrated Circuit Engrg., Phoenix, Ariz.
Intersil, Inc., Cupertino, Calif.
ITT Semiconductors, W. Palm Beach, Fla.
Lockheed Elctrns. Co., Watchung, N.J.
Loral Elctrn. Sys., Bronx, N.Y.
Maxson Elctrns. Div., Great River, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Calif.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Qualidyne Corp., Santa Clara, Cal.
Raytheon Co., Mt. View, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Signetics Corp., Sunnyvale, Calif.
Siliconix, Inc., Santa Clara, Cal.
Staffall, Inc., Providence, R.I.
State Labs, Inc., New York, N.Y.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Circuits, Integrated, Linear

American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
Centralab Semiconductor, El Monte, Cal.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal. .... p 1541
Ledex, Inc., Dayton, Ohio
Nippon Electric/NEC America, N.Y., N.Y.
Precision Monolithics, Santa Clara, Cal. p 1545
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass. p 1294
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Cranston, R.I.
Amperex Elctrn., Slatersville, R.I.
Burr-Brown Resch. Corp., Tucson, Ariz.
Computer Components Int'l, Palm Beach Gardens, Fla.
Control Data, Minneapolis, Minn.
Dionics, Inc., Westbury, N.Y.
Electronic Design Labs., Inc., Phila., Pa.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Elec., Inc., Plainview, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Harris Semiconductor, Melbourne, Fla.
Hughes Aircraft Co, Culver City, Cal.
Integrated Circuit Engrg., Phoenix, Ariz.
Intersil, Inc., Cupertino, Calif.
ITT Semiconductors, W. Palm Beach, Fla.
Maxson Elctrns. Div., Great River, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Calif.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Qualidyne Corp., Santa Clara, Cal.
Raytheon Co., Mt. View, Calif.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Signetics Corp., Sunnyvale, Calif.
Silicon Gen'l., Inc., Westminster, Cal.
Siliconix, Inc., Santa Clara, Cal.
Staffall, Inc., Providence, R.I.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Transitron Elctrn. Corp., Wakefield, Mass.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Circuits, Integrated, Silicon Monolithic, Unpackaged Chips

American Elctrn. Labs., Inc., Lansdale, Pa.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Sprague Elec. Co., No. Adams, Mass.
Amperex Elctrn., Slatersville, R.I.
Computer Components Int'l, Palm Beach Gardens, Fla.
Control Data, Minneapolis, Minn.
Dionics, Inc., Westbury, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Fansteel Inc., N Chicago, Ill.
Ferranti Ltd., Hollinwood, Lancs., England
Harris Semiconductor, Melbourne, Fla.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Integrated Circuit Engrg., Phoenix, Ariz.
Intersil, Inc., Cupertino, Calif.
Litton Sys., Inc., Woodland Hills, Calif.

Loral Elctrn. Sys., Bronx, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Calif.
NORTEC Elctrns. Corp., Santa Clara, Cal.
Nucleonic Prods., Canoga Pk, Cal.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Qualidyne Corp., Santa Clara, Cal.
Raytheon Co., Mt. View, Calif.
RCA Solid State Div., Somerville, N.J.
Signetics Corp., Sunnyvale, Calif.
Silicon Gen'l., Inc., Westminster, Cal.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, Tappan, N.Y.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Westinghouse Elec. Int'l., New York, N.Y.

Circuits, Large Scale Integration (LSI)

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Precision Monolithics, Santa Clara, Cal.
Unisem, Philadelphia, Pa. .... p 1551
Advanced Memory Systems, Inc., Sunnyvale, Cal
American Micro-Sys., Inc., Santa Clara, Cal.
Collins Radio Co., Newport Beach, Calif.
Control Data, Minneapolis, Minn.
Electronic Arrays, Inc., Mountain View, Cal.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Film Microelectronics, Inc., Burlington, Mass
Garrett Micro-Circuits Corp., San Diego, Cal
General Instr. Corp., Hicksville, N.Y.
Goodyear Aerospace Corp., Akron, Ohio
Grafo Colloids Corp., Sharon, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Integrated Circuit Engrg., Phoenix, Ariz.
Intel Corp., Mountain View, Cal.
Intersil, Inc., Cupertino, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Macrodata, Chatsworth, Cal.
Mostek Corp., Carrollton,, Tex.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Calif.
NORTEC Elctrns. Corp., Santa Clara, Cal.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Qualidyne Corp., Santa Clara, Cal.
Ragen Precision Inds., Inc., N. Arlington, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Solid State Div., Somerville, N.J.
Signetics Corp., Sunnyvale, Calif.
Siliconix, Inc., Santa Clara, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Circuits, Logic Computer—See Cards, Logic; Circuits, Hybrid; Circuits, Integrated; Modules, Logic—Vol 1

Circuits, Medium Scale Integration (MSI)

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Precision Monolithics, Santa Clara, Cal.
Sprague Elec. Co., No. Adams, Mass.
American Micro-Sys., Inc., Santa Clara, Cal.
Avantek, Inc., Santa Clara, Cal.
Control Data, Minneapolis, Minn.
Dionics, Inc., Westbury, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electronic Arrays, Inc., Mountain View, Cal.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Elec., Inc., Plainview, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Film Microelectronics, Inc., Burlington, Mass
General Instr. Corp., Hicksville, N.Y.
Goodyear Aerospace Corp., Akron, Ohio
Halex, Inc., Torrance, Cal.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Integrated Circuit Engrg., Phoenix, Ariz.
Intersil, Inc., Cupertino, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Megadyne Inds., Inc., Rochester, N.Y.
Micro Networks, Worcester, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Calif.
NORTEC Elctrns. Corp., Santa Clara, Cal.
Nucleonic Prods., Canoga Pk, Cal.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Qualidyne Corp., Santa Clara, Cal.
Raytheon Co., Mt. View, Calif.
RCA Solid State Div., Somerville, N.J.
Signetics Corp., Sunnyvale, Calif.
Solitron Devices, Tappan, N.Y.
Stewart-Warner Microcircuits, Div., Sunnyvale, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Circuits, Miniature (Cordwood etc.)

Artronic Instr. Co., Silver Spring, Md.
CTS Corp, Elkhart, Ind.
DDC, Hicksville, N.Y.
Dynamics Instr. Co., Monterey Pk., Cal.
Elctrn. Assocs., W. Long Branch, N.J.
Elctrn. Molding Corp., Woonsocket, R.I.
General Electc. Semiconductor, Syracuse,, N.Y.
General Magnetics, Bloomfield, N.J.
General Resistance, Mt. Vernon, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Intronics, Inc., Newton, Mass. .... p 1288
Ithaco, Inc., Ithaca, N.Y.
Precision Monolithics, Santa Clara, Cal.
Raytheon Co., Quincy, Mass.
Sensor Tech., Van Nuys, Cal.
Sierra Sys., Mountain View, Cal.
Solid State Elctrns., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
Tecnetics, Inc., Boulder, Colo.
Teledyne Philbrick, Dedham, Mass.
Transmagnetics Inc., Farmingdale, N.Y.
Advanced Circuitry Div., Springfield, Mo.
Allegri-Tech, Inc., Nutley, N.J.
American Comps., Inc., Conshohocken, Pa.
Analog Devices, Inc., Norwood, Mass.
Applied Control Co., Fairfield, N.J.
Atlantic Instrs. Corp., Watertown, Mass.
Avco Corp., Cincinnati, Ohio
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bureau Engraving, Inc., Minneapolis, Minn.
Burr-Brown Resch. Corp., Tucson, Ariz.
Chem Aero, Inc., Wilmington, Cal.
Chemical Micro Milling Co, Camden, N.J.
Collins Radio Co., Dallas, Tex.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Dynamics, Torrington, Conn.
Conductorlab, Inc., Groton, Mass.
Control Logic, Natick, Mass.
Crystalonics Div., Cambridge, Mass.
Delta-Tronics Corp., Tempe, Ariz.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electrol Co., Inc., York, Pa.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
EMC Technology Inc, Philadelphia, Pa.
Fabri-Tek, Pompano Beach, Fla.
General Circuits, Inc., Rochester, N.Y.
General Instr. Corp., Hicksville, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Iso-Switch Corp., Costa Mesa, Cal.
Isotech Inc., Westford, Mass.
ITT Semiconductors, W. Palm Beach, Fla.
Lansdale Microelectronics Div., Metuchen, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Luminetics Corp., Pompano Beach, Fla.
Megadyne Inds., Inc., Rochester, N.Y.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Micropac Inds., Inc., Garland, Tex.
National Semiconductor, Santa Clara, Calif.
Nucleonic Prods., Canoga Pk, Cal.
Owens-Illinois, C&TP Div., Elctrn. Mat'ls., Toledo, Ohio
Pulse Engrg., Inc., San Diego, Cal.
Ragen Precision Inds., Inc., N. Arlington, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
RCA Solid State Div., Somerville, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Sibley Co., Haddam, Conn
Space Age Microcircuits, Long Valley, N.J.
Techinques, Inc., Englewood, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Tri-Tronics Lab., Euless, Tex.
Vectronics Microwave Corp., Middlesex, N.J.
Viz Mfg. Co., Philadelphia, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Circuits, Multilayer—See Printed Circuits, Multilayer

Circuits, Printed (With Components)—See Cards, Linear Function

Circuits, Thick-Film—See Circuits, Hybrid, Thick-Film

Circuits, Thin-Film—See Circuits, Hybrid, Thin-Film

Circuits, Woven Wire—See Cloth, Woven Wire

Circulators, Ferrite

Bendix, Franklin, Ind. .... p 1555
E & M Labs., Westlake Village, Cal. p 1557
General Elec. Co., Schenectady, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Addington Labs., Inc., Santa Clara, Calif.
Electromagnetic Sci., Inc., Atlanta, Ga.
Ferranti Ltd., Hollinwood, Lancs., England
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Microlab/FXR, Livingston, N.J.
Micromega, Los Angeles, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Magnetics Inc., Danvers, Mass.
Microwave Prods., Inc., Chatsworth, Cal.
N-H Microwave, Inc., Red Bank, N.J.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
Raytheon Co., Waltham, Mass.
Sedco Sys., Inc., Farmingdale, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TDK Elctrns. Corp., Long Island City, N.Y.
Teledyne Microwave, Sunnyvale, Cal.
Trak Microwave, Tampa, Fla.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Wavecom, Inc., Northridge, Cal.
Western Microwave Labs., Los Gatos, Cal.

Clamps & Clips, Cable-Also See Wire & Cable Ties—See Vol 3

Clamps, Component—See Vol 3

Clamps, Servo

Vemaline Prods. Co., Wyckoff, N.J.
Beman Mfg., Inc., New Cumberland, Pa.
Betzelt GMBH, Trogerstr. 32, W. Germany
Perfect Gear & Instr. Corp., Northridge, Calif.
SECS, Inc., Long Island City, N.Y.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Theta Instr. Corp., Fairfield, N.J.
Timber-Top, Inc., Freeport, N.Y.

Clean Room Equipment & Supplies-Also See Work Stations, Clean, Dust-Free—See Vol 1

Clean Rooms—See Rooms, Clean, Dust-Free—Vol 1

Cleaners & Solvents—See Vol 3

Cleaners, Mechanical, Magnetic Tape—See Vol 1

Cleaners, Ultrasonic—See Vol 1

Cleaners & Filters, Air—See Air Cleaners & Filters—Vol 3

Cleaning & Filtering Equipment, Liquid—See Vol 1

Clip Insulators—See Insulators, Test & Battery Clip—Vol 3

Clips, Alligator—See Vol 3

Clips, Battery—See Vol 3

Clips, Board, Harness—See Vol 3

Clips, Component—See Vol 3

Clips, Fahnestock, Spring Wire—See Vol 3

Clips, Test—See Vol 3

Clips, Transistor & Diode—See Retainers, Transistor & Diode

Clips & Caps, Grid & Plate—See Vol 3

Clips & Holders, Fuse-Also See Panels, Fuse—See Vol 3

Clocks (All Types)—See Vol 1

Closed Circuit Tv Systems—See Television Systems, Closed Circuit—Vol 1

Cloth & Fabrics—See Insulation Materials, Fabric—Vol 3

Cloth, Speaker Grille—See Vol 1

Cloth, Woven Wire

Engelhard Minerals & Chem., Murray Hill, N.J.
Albany Int'l. Corp., Albany, NY
Bram Metallurgical-Chem., Phila., Pa.
Chase Metal Service Div., Cleveland, Ohio
Electrofilm, Inc., N. Hollywood, Calif.
Etchomatic, Inc., Waltham, Mass.
Flock Process Corp., S. Norwalk, Conn.
Matthey Bishop Inc., Malvern, Pa.
Pall Trinity Micro Corp., Cortland, N.Y.
W. S. Tyler Inc., Mentor, Ohio
Unique Wire Weaving Co., Hillside, N.J.
Wire Cloth Mfrs., Parsippany, N.J.
Wright, G.F. Steel & Wire Co., Worcester, Mass.

Clutches, Friction

American Precision Inds., Inc., E. Aurora, N.Y. .... p 1585
Bowmar Instr. Corp., Ft. Wayne, Ind.
Computer Instrs., Hempstead, N.Y.

Delevan Div., Coil Prods., E. Aurora, N.Y. .... p 1585
Dynamic Instr. Corp., Plainview, N.Y. p 1586
FAE Instr. Corp., Huntington Sta., N.Y. p 1587
General-Electro Mechanical, Buffalo, N.Y. .... p 1594
Northfield Precision Instr. Corp., Island Pk., N.Y. .... p 1625
Precision Mechanisms, Westbury, N.Y.
Vemaline Prods. Co., Wyckoff, N.J.
Auburn Mfg. Co., Middletown, Conn.
Bendix, Utica, N.Y.
Bowmar/Ali, Inc., Acton, Mass.
Cutler-Hammer, Milwaukee, Wisc.
Dial Prods. Co., Bayonne, N.J.
Dynamic Gear, Ft. Lauderdale, Fla.
Fawick Airflex Div., Cleveland, Ohio
Formsprag Co., Warren, Mich.
Insco Corp., Groton, Mass.
Lem Instrument Corp., Farmingdale, N.Y.
Magnetec Corp., Van Nuys, Calif.
Magtrol, Inc., Buffalo, N.Y.
Meltronics Inc., Wantagh, N.Y.
Midwest Automatic, Inc., Des Moines, Iowa
Perfect Gear & Instr. Corp., Northridge, Calif.
SECS, Inc., Long Island City, N.Y.
Simplatrol Prods. Corp., Worcester, Mass.
Sterling Instr., New Hyde Pk., NY
Stop Components, Inc., Freeport, N.Y.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Wer Ind'l. Corp., Grand Island, N.Y.
Zero-Max Co., Minneapolis, Minn.

Clutches, Magnetic

American Precision Inds., Inc., E. Aurora, N.Y. .... p 1585
Bowmar Instr. Corp., Ft. Wayne, Ind.
Delevan Div., Coil Prods., E. Aurora, N.Y. .... p 1585
Dynamic Instr. Corp., Plainview, N.Y. p 1586
FAE Instr. Corp., Huntington Sta., N.Y. p 1587
General-Electro Mechanical, Buffalo, N.Y. .... p 1594
General Time Corp., Torrington, Conn.
Allis, Louis Co., Milwaukee, Wisc.
Altair Resch. & Mfg. Co., Ontario, Calif.
Avionics, Inc., South Bend, Ind.
Barger Corp., Sunnyvale, Cal.
Bendix, Elmira, N.Y.
Bowmar/TIC, Inc., Newbury Park, Calif.
Coil Co. of Amer., Northvale, N.J.
Conductron Corp., St. Charles, Mo.
Cutler-Hammer, Milwaukee, Wisc.
Dial Prods. Co., Bayonne, N.J.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Electroid Co., Union, N.J.
Fawick Airflex Div., Cleveland, Ohio
Ferranti Ltd., Hollinwood, Lancs., England
Formsprag Co., Warren, Mich.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
Lear Siegler, Inc., Santa Monica, Calif.
Lem Instrument Corp., Farmingdale, N.Y.
Magnetec Corp., Van Nuys, Calif.
Magtrol, Inc., Buffalo, N.Y.
Meltronics Inc., Wantagh, N.Y.
Orbit Instr. Corp., Syosset, N.Y.
Perfect Gear & Instr. Corp., Northridge, Calif.
Permanent Magnet Co., Inc., Indianapolis, Ind.
PIC Design Corp., Ridgefield, Conn.
SECS, Inc., Long Island City, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Simplatrol Prods. Corp., Worcester, Mass.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Stop Components, Inc., Freeport, N.Y.
Valcor Engrg. Corp., Kenilworth, N.J.
Vibrac Corp., Chelmsford, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Wer Ind'l. Corp., Grand Island, N.Y.

Clutches, Positive

American Precision Inds., Inc., E. Aurora, N.Y. .... p 1585
Bowmar Instr. Corp., Ft. Wayne, Ind.
Computer Instrs., Hempstead, N.Y.
Delevan Div., Coil Prods., E. Aurora, N.Y. .... p 1585
FAE Instr. Corp., Huntington Sta., N.Y. p 1587
General-Electro Mechanical, Buffalo, N.Y. .... p 1594
Advance Gear & Mach., Los Angeles, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Dial Prods. Co., Bayonne, N.J.
Fawick Airflex Div., Cleveland, Ohio
Formsprag Co., Warren, Mich.
Geartronics Corp., N. Billerica, Mass.
Magnetec Corp., Van Nuys, Calif.
Perfect Gear & Instr. Corp., Northridge, Calif.
Stock Drive Prods., New Hyde Pk., N.Y.
Torrington Co., Torrington, Conn.
Zero-Max Co., Minneapolis, Minn.

Coatings, Anti-Laser Beam—See Vol 3

Coatings, Anti-Static—See Vol 3

Coatings, Conductive—See Vol 3

Coatings, See Materials—See Vol 3

Coatings, Films, Transfers, etc., Etchant-Resisting—See Vol 3

Coatings, Fluorescent—See Vol 3

Coatings, Fungicidal—See Vol 3

Coatings, Compounds, Lubricants, etc., Heat Conductive—See Vol 3

Coatings, High-Temperature, Ceramic, Plasma Spray—See Services, Coating—Vol 3

Coatings, Infrared—See Vol 3

Coatings, Insulating—See Vol 3

Coatings, Mold Releasing—See Vol 3

Coatings, Optical—See Vol 3

Coatings, Protective—See Vol 3

Coatings, Radioactive—See Vol 3

Coatings, Transducer Forming

Electrotec, Inc., Garland, Tex.
Isochem Resins Co., Lincoln, R.I.
Isomet Corp., Oakland, N.J.

Coatings, Weatherproofing—See Vol 3

Code & Tab Markers—See Wire Markers (All Types)—Vol 3

Coded Discs, Optical—See Vol 1

Coders, A-F—See Vol 1

Coders, Beacon—See Vol 1

Coders, R-F—See Vol 1

Coders, Transponder—See Vol 1

Coil Assemblies & Forms-Also See Bobbins—See Vol 3

Coil Standards—See Standards, Inductance—Vol 1

Coil Testers—See Testers, Coil—Vol 1

Coil-Winding Equipment—See Machines, Coil-Winding—Vol 1

Coils, A F—See Vol 3

Coils, Antenna Loading—See Vol 3

Coils, Broadcast—See Vol 3

Coils, Choke—See Chokes (As Modified)—Vol 3

Coils, Color Purity—See Vol 3

Coils, Crossover, Audio—See Vol 3

Coils, Degausing—See Vol 3

Coils, Field—See Vol 3

Coils, Focusing—See Vol 3

Coils, Foil-Wound—See Vol 3

Coils, High-Q, Low-Frequency—See Vol 3

Coils, Hybrid & Repeat—See Vol 3

Coils, I-F—See Vol 3

Coils, Metallized Glass—See Vol 3

Coils, Molded—See Vol 3

Coils, Oscillator, Phono Test—See Vol 3

Coils, Relay—See Vol 3

Coils, R-F—See Vol 3

Coils, Saturable Reactor—See Vol 3

Coils, Shielded—See Vol 3

Coils, Solenoid—See Vol 3

Coils, Telephone—See Vol 3

Coils, Telephone Pickup (For Recording)—See Pickups, Telephone—Vol 1

Coils, Toroidal—See Vol 3

Coils, Transducer—See Vol 3

Coils, Transformer—See Vol 3

Coils, TV (All Types)—See Vol 3

Coils, Variable—See Vol 3

Coils, Vidicon Alignment—See Vol 3

Coils, Voice—See Vol 3

Coils, Water—See Water Coils, Tube Cooling

Coincidence Analyzers—See Analyzers, Coincidence—Vol 1

Cold-Cathode Readout—See Tubes, Readout

Cold Traps—See Vol 1

Collars—See Vol 3

Collimators, Infrared

Barnes Engrg. Co., Stamford, Conn.
Infrared Inds., Inc., Santa Barbara, Cal.
Nat'l. Instr. Labs., Rockville, Md.

Collimators, Optical

Barnes Engrg. Co., Stamford, Conn.
Buckbee-Mears Co., St. Paul, Minn.
DoAll Co., Des Plaines, Ill.
Ealing Corp., Cambridge, Mass.
Ehrenreich Photo-Optical Industries Inc., Garden City, N.Y.
Electro-Optical Div., Northampton, Mass.
Fairchild Space & Defense Sys., Syosset, N.Y.
Gaertner Scientific Corp., Chicago, Ill.
Goerz Optical Co., Inc., Pittsburgh, Pa.
Heitz, Karl, Inc., New York, N.Y.
H H Controls Co., Arlington, Mass.
Infrared Inds., Inc., Santa Barbara, Cal.
Keuffel & Esser Co., Morristown, N.J.
Korad Mat'ls. Sys. Div., Santa Monica, Cal.
Maurer, J.A., Inc., Woodside, N.Y.
Nat'l. Instr. Labs., Rockville, Md.
Opto-Metric Tools, Rockleigh, N.J.
Photo Tech. Prods., Garden City, N.Y.
Rank Precision Inds., W. Nyack, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Spectra-Physics, Inc., Mountain View, Calif.
Teledyne Gurley, Troy, N.Y.
Thermal Amer. Fused Quartz, Montville, N.J.
Zeiss, Carl, Inc., New York, N.Y.
Zoomar, Inc., Glen Cove, N.Y.

Colorimeters

Chrono-log Corp., Broomall, Pa.
Penn Airborne Prods., Southampton, Pa.
Bausch & Lomb, Rochester, N.Y.
Beckman Instrs., (AISSD), Fullerton, Cal.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Canadian Research Institute, Don Mills, Ont., Canada
Coleman Instrs., Maywood, Ill.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Fisher Sci. Co., Pittsburgh, Pa.
Heitz, Karl, Inc., New York, N.Y.
Kollmorgen-Color Sys. Div., Attleboro, Mass.
Lektra Labs., Inc., College Point, N.Y.
Magnuson Engrs., Inc., San Jose, Calif.
McKee-Pedersen Instrs., Danville, Calif.
Photovolt Corp., New York, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Zeiss, Carl, Inc., New York, N.Y.

Color TV Equipment—See Cameras, TV (Color); Monitors, Video; Recorders, Video Tape—Vol 1

Combiners, Diversity, Post Detection—See Vol 1

Combustion Indicators—See Fire Detection & Fighting Equip.

Comm. Systems, Broadcast—See Vol 1

Comm. Systems, Carrier Current—See Vol 1

Comm. Systems, Data—See Vol 1

Comm. Systems, F-M—See Vol 1

Comm. Systems, Facsimile—See Vol 1

Comm. Systems, Frequency Shift—See Vol 1

Comm. Systems, Induction—See Vol 1

Comm. Systems, Infrared, Ultraviolet

Electro/Data, Inc., Garland, Tex.
Interelectronics Corp., Congers, N.Y.
Flame Resch., Inc., Pittsburgh, Pa.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hanovia Lamp Div., Newark, N.J.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Infrared Inds., Inc., Santa Barbara, Cal.
Loral Elctrn. Sys., Bronx, N.Y.
Raytheon Co., Lexington, Mass.
Sanders Assocs., Nashua, N.H.
Santa Barbara Resch. Ctr., Goleta, Calif.

Comm. Systems, Intercom—See Intercommunication Systems—Vol 1

Comm. Systems, Laser—See Vol 1

Comm. Systems, Microwave
American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y.
Data-Control Systems, Danbury, Conn.
Electro/Data, Inc., Garland, Tex.
Nippon Electric/NEC America, N.Y., N.Y.
Quindar Elctrns., Inc., Springfield, N.J.
RHG Elctrns. Lab., Farmingdale, N.Y. p 612
Vega Precision Labs., Vienna, Va. p 614
Watkins Johnson Co., Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Aircom, Inc., Union, N.H.
AMBAC Inds., Garden City, N.Y.
Andrew Corp., Orland Pk., Ill.
A.R.F. Products, Inc., Boulder, Colo.
A.R.F. Products, Inc., Raton, N.M.
Camusat Gueguen Telecom. Int'l., White Plains, N.Y.
Cardion Communications, Woodbury, N.Y.
Collins Radio Co., Dallas, Tex.
Conductron Corp., St. Charles, Mo.
Elctrn. Comm., Inc., St. Petersburg, Fla.
Energy Systems, Palo Alto, Cal.
Farinon Electric, San Carlos, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
General Dynamics, San Diego, Cal.
General Elec., Lynchburg, Va.
General Instr. Corp., Hicksville, N.Y.
GTE Lenkurt Inc., San Carlos, Calif.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Int'l. Microwave, Cos Cob, Conn.
Itek Corp., Lexington, Mass.
ITT Telecommunications, Raleigh, N.C.
Link Div., Binghamton, N.Y.
Lockheed Elctrns. Co., Watchung, N.J.
Loral Elctrn. Sys., Bronx, N.Y.
Maxson Elctrns. Div., Great River, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Div, Nashua, N.H.
Microwave/Sys., Inc., E. Syracuse, N.Y.
Motorola, Scottsdale, Ariz.
Narda Microwave Corp., Plainview, N.Y.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Olektron Corp., Dudley, Mass.
Philco-Ford Corp., Washington, D.C.
Pickard & Burns Inc., Lindenhurst, N.Y.
Prodelin, Inc., Hightstown, N.J.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
Raytheon Data Systems Co., Norwood, Mass.
RCA Corp., Camden, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Rodelco, Deer Park, N.Y.
Sage Labs. Inc., Natick, Mass.
Scientific Communications, Garland, Tex.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.
Special Microwave Devices Oper., Waltham, Mass.
Stromberg Carlson Corp., Rochester, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Surface Conduction, Inc., New York, N.Y.
TRG Prods., E. Boston, Mass.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Zeta Labs., Inc., Mountain View, Calif.

Comm. Systems, Multiplex—See Vol 1

Comm. Systems, Portable (Industrial)—See Vol 1

Comm. Systems, Radiotelephone—See Vol 1

Comm. Systems, Selective Paging—See Vol 1

Comm. Systems, Single-Sideband—See Vol 1

Comm. Systems, Telemetering—See Vol 1

Comm. Systems, Telephone—See Vol 1

Comm. Systems, Teletype—See Vol 1

Comm. Systems, Vehicle Mounted—See Vol 1

Commutators, Rotary
Airflyte Elctrns. Co., Bayonne, N.J. p 1580
Arra Inc., Bayshore, N.Y.
Carter Mfg. Corp., Hudson, Mass.
Computer Instrs., Hempstead, N.Y.
Fabricast, Inc., So. El Monte, Cal. p 1593
Ansley Div. ACI Inc., Perkasie, Pa.
Bogue Elec. Mfg. Co., Paterson, N.J.
Bowmar/Ali, Inc., Acton, Mass.
Bowmar/TIC, Inc., Newbury Park, Calif.
Collectron Corp., New York, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Duncan Elctrns., Inc., Costa Mesa, Cal.
Fifth Dimension, Princeton, N.J.
General Devices, Inc., Princeton, N.J.
Honeywell Information Systems, Goleta, Cal.
Lem Instrument Corp., Farmingdale, N.Y.
Marathon Instrs. Div., Pico Rivera, Calif.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Ney, J.M. Co., Bloomfield, Conn.
Nippert Co., Delaware, Ohio
Northern Precision Labs., Inc., Fairfield, N.J.
Sibley Co., Haddam, Conn
Subminiature Instrs. Corp., Riverside, Calif.
Teledyne Kinetics, Solana Beach, Cal.
Theta Instr. Corp., Fairfield, N.J.
Toledo Commutator Co., Owosso, Mich.
Viz Mfg. Co., Philadelphia, Pa.

Commutators, Switching
Airflyte Elctrns. Co., Bayonne, N.J. p 1580
Bendix Environmtl. Sci., Baltimore, Md.
Carter Mfg. Corp., Hudson, Mass. p 2913
Computer Instrs., Hempstead, N.Y.
Dynamic Instr. Corp., Plainview, N.Y.
Dytro Corp., Hicksville, N.Y.
Fabricast, Inc., So. El Monte, Cal. p 1593
Graphite Metallizing Corp., Yonkers, N.Y.
Sonex, Inc., Bethayres, Pa.
Adams-Russell Co., Waltham, Mass.
AMBAC Inds., Garden City, N.Y.
Ansley Div. ACI Inc., Perkasie, Pa.
Aydin Data Systems, Ft. Washington, Pa
Bowmar/TIC, Inc., Newbury Park, Calif.
CGS/Datametrics, Watertown, Mass.
Collectron Corp., New York, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dorsett Elctrns., Tulsa, Okla.
Duncan Elctrns., Inc., Costa Mesa, Cal.
Eon Instr., Inc., Van Nuys, Cal.
Fifth Dimension, Princeton, N.J.
General Devices, Inc., Princeton, N.J.
Gulton Inds., Albuquerque, N.M.
Honeywell Information Systems, Goleta, Cal.
Lem Instrument Corp., Farmingdale, N.Y.
Lockheed Aircraft Svc., Ont., Cal.
Marathon Instrs. Div., Pico Rivera, Calif.
Markite Corp., New York, N.Y.
Matrix Sys. Corp., Chatsworth, Cal.
Ney, J.M. Co., Bloomfield, Conn.
Northern Precision Labs., Inc., Fairfield, N.J.
Opto-Metric Tools, Rockleigh, N.J.
Poly-Scientific, Blacksburg, Va.
Sibley Co., Haddam, Conn
Somerset Radiation Lab., Arlington, Va.
Subminiature Instrs. Corp., Riverside, Calif.
Taft Electrosystems, Inc., Metuchen, N. J.
Tempo Instr., Plainview, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Toledo Commutator Co., Owosso, Mich.
Viz Mfg. Co., Philadelphia, Pa.

Comparators, Attenuation—See Vol 1

Comparators, Capacitance—See Bridges, Capacitance—Vol 1

Comparators, Circuit Linearity—See Vol 1

Comparators, Density—See Densitometers—Vol 1

Comparators, Digital—See Vol 1

Comparators, Frequency—See Vol 1

Comparators, Impedance—See Bridges, Impedance—Vol 1

Comparators, Inductance—See Bridges, Inductance—Vol 1

Comparators, Optical
Bendix, Dayton, Ohio
Conductron Corp., St. Charles, Mo.
DoAll Co., Des Plaines, Ill.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
Ehrenreich Photo-Optical Industries Inc., Garden City, N.Y.
Electrovert, Inc., Mt. Vernon, N.Y.
Ercona Corp., Bellmore, N.Y.
Gaertner Scientific Corp., Chicago, Ill.
Goodyear Aerospace Corp., Akron, Ohio
Hughes Aircraft Co, Culver City, Cal.
Mann, David W. Co., Burlington, Mass.
Minnetech Labs., Inc., Minneapolis, Minn.
Olympus Corp. America, New Hyde Park, N.Y.
Optical Gaging Prods., Rochester, N.Y.
Optical Inds., Santa Ana, Cal.
Opto-Metric Tools, Rockleigh, N.J.
Optomechanisms, Inc., Plainview, N.Y.
Photo Tech. Prods., Garden City, N.Y.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Rank Precision Inds., W. Nyack, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Techni-Tool, Inc., Philadelphia, Pa.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Traid Corp., Glendale, Cal.
Zeiss, Carl, Inc., New York, N.Y.

Comparators, Phase—See Vol 1

Comparators, Q—See Vol 1

Comparators, Reluctance—See Vol 1

Comparators, Resistance—See Bridges, Resistance—Vol 1

Comparators, Surface—See Indicators, Surface Roughness—Vol 1

Comparators, Voltage—See Vol 1

Compasses, Electronic Gyro
Ind'l. Control Co., Farmingdale, N.Y.
AMBAC Inds., Garden City, N.Y.
A.O.I.P., 75/Paris 12eme, France
Aviation Instrument Mfg. Corp., Houston, Tex
Bendix Aerospace-Elctrns., Teterboro, N.J.
Gyrosystems, Inc., Farmingdale, N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Sanders Assocs., Inc., Manchester, N.H.
Singer-General Precision, Inc., Little Falls, N.J.
Sperry Marine Sys., Charlottesville, Va.

Compensators, Angular Motion
American Aerospace Controls, Farmingdale, N.Y.
Planet Instr., Ft. Wayne, Ind.
Stock Drive Prods., New Hyde Pk., N.Y.

Compensators, Lead Resistance—See Vol 1

Component Substitutors-See Test Equipment, Component Substituting—See Vol 1

Compounds, Antistatic—See Coatings, Antistatic—Vol 3

Compounds, Encapsulating, Molding, Potting-Also See Plastic Raw Materials—See Vol 3

Compounds, Weatherproofing—See Coatings, Weatherproofing—Vol 3

Compressors, Data & Speech—See Vol 1

Computer Logic Circuits—See Cards, Logic; Circuits, Hybrid; Circuits, Integrated; Modules, Logic

Computer Memory Testers—See Testers, Computer Memory—Vol 1

Computer Tape Recorders—See Data Recorders—Vol 1

Computer Teaching Devices—See Teaching Machines—Vol 1

Computer Type Indicators—See Lights; Dials; Readouts

Computers, Analog—See Vol 1

Computers, Desk Top (Digital)—See Vol 1

Computers, Digital (General Purpose)—See Vol 1

Computers, Digital (Special Purpose)—See Vol 1

Computers, Hybrid, Analog-Digital—See Vol 1

Computers, Radiac—See Analyzers, Radiation—Vol 1

Computing Equipment, Peripheral—See Converters; Counters; Printers; etc.—Vol 1

Condensers—See Capacitors—Vol 3

Conductive Fabrics, Films & Tapes—See Fabrics, Conductive—Vol 3

Conductive Plastic—See Materials, Conductive Plastic—Vol 3

Conduit, Electrical—See Vol 3

Cones, Speaker—See Speaker Cones—Vol 1

Connector Adapters—See Vol 3

Connector Boxes & Strips, Power Outlet—See Vol 3

Connectors & Terminals, Push-On, Quick Disconnect—See Vol 3

Connectors, Anode—See Tube Parts

Connectors, Antenna—See Connectors, R-F, Coaxial—Vol 3

Connectors, Audio—See Vol 3

Connectors, Battery—See Vol 3

Connectors, Chassis, Rack & Panel—See Vol 3

Connectors, Filtered—See Vol 3

Connectors, Flat Cable—See Vol 3

Connectors, Heavy Duty, Power—See Vol 3

Connectors, Hermetic, Pressurized & Waterproof—See Vol 3

Connectors, High Voltage—See Vol 3

Connectors, Integrated Circuit—See Sockets, Integrated Circuit

Connectors, Miniature, Subminiature & Microminiature—See Vol 3

Connectors, Missile (Umbilicals, Interstage, Post Boost)—See Vol 3

Connectors, Plug-In, Program Board—See Vol 3

Connectors, Printed Circuit—See Vol 3

Connectors, RF, Coaxial & Triaxial—See Vol 3

Connectors, Stripline—See Vol 3

Connectors, Test—See Vol 3

Connectors, Thermocouple—See Vol 3

Consoles, Cabinet—See Cabinets & Accessories, Metal—Vol 3

Contact Cleaners—See Cleaners & Solvents-Also See Burnishers, Contact—Vol 3

Contact Strips, Finger—See Vol 3

Contactors—See Relays, Power

Contacts, Electrical—See Vol 3

Containers, Shielded (All Types)—See Vol 3

Containers, Shipping, Metal & Fiberglass (Reusable)-Also See Transit Cases—See Vol 3

Containers, Storage—See Vol 3

Containers, Transit—See Transit Cases—Vol 3

Control Equipment, Classification

A. D. Data Sys., Inc., Rochester, N.Y.
Allen-Bradley Co., Milwaukee, Wisc.
Control Technology Co., L.I.C., N.Y.
Digital Equip. Corp., Maynard, Mass.
Digitron Corp., Norristown, Pa.
K.C.C. Shokai, Ltd., Naka-ku, Kobe, Japan
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
RDI, Glen Ellyn, Ill.
Schaevitz Engrg., Pennsauken, N.J.
Alnor Instr. Co., Chicago, Ill.
AMF Electical Prods., Alexandria, Va.
Applied Control Co., Fairfield, N.J.
Applied Systems Corp., Detroit, Mich
Automatic Switch Co., Florham Park, N.J.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Basler Elec. Co., Highland, Ill.
Bendix, Detroit, Mich.
Caton Inds., Inc., Clark, N.J.
Century Strand, Inc., Clifton, N.J.
Conductron Corp., St. Charles, Mo.
Control Equip. Corp., New England, Lowell, Mass.
Control Logic, Natick, Mass.
Control Prods. Corp., Chicago, Ill.
Controlcraft Corp., West Chicago, Ill.
Data Technology Corp., Palo Alto, Cal.
Defense Elctrns., Inc., Rockville, Md.
Electrol Co., Inc., York, Pa.
Elctrn. Control Sys., Fairmont, W. Va.
Femco Div., Irwin, Pa.
Ferranti Ltd., Hollinwood, Lancs., England
Fincor Div., York, Pa.
Fostoria-Fannon, Inc., Fostoria, Ohio
Furnas Elec. Co., Batavia, Ill.
Hoagland Instr., Red Bank, N.J.
Hope Elctrns., Clifton, N.J.
Houston Magnetics Corp., Houston, Tex
Ind'l. Gauging & Control, Norwalk, Conn.
Instr. & Control Sys., Inc., Addison, Ill.
Integrated Controls, San Diego, Cal.
Intercontinental Elctrns., E. Rochester, N.Y.
Kato Engrg. Co., Mankato, Minn.
Kingmann-White, Inc., Placentia, Calif.
Kirk & Blum Mfg. Co., Cincinnati, Ohio
Leeds & Northrup Corp., No. Wales, Pa.
Luft Instrs., Inc., Lincoln, Mass.
Maytronics, Inc., Colorado Springs, Colo.
MEKontrol Inc., Northboro, Mass.
Midland Standard Inc., Elgin, Ill.
Moog, Inc., East Aurora, N.Y.
Morey Corp, Downers Grove, Ill.
Motorola Instr. & Control, Phoenix, Ariz.
PECO, Milpitas, Cal.
PMC Designing, Cincinnati,, Ohio
Polyphase Instr. Co., Bridgeport, Pa.
Precision Elctrns., Inc., Amityville, N.Y.
Prototype Transformer Corp., E. Orange, N.J.
Robicon Corp., Pittsburgh, Pa
Rowe L. L. Co., Boston, Mass.
Sensor Corp., Greenwich, Conn.
Solid Controls, Inc., Minneapolis, Minn.
Strandberg Engrg. Labs., Inc., Greensboro, N.C.
Superior Elec., Bristol, Conn.
Texas Instruments, Dallas, Tex.
Varied Ind'l. Prods., Inc., Paterson, N.J.
Vidar Corp., Mountain View, Cal.
Waber Elctrns., Inc., Philadelphia, Pa.

Control Panels & Systems, Computer—See Boards, Programming—Vol 1

Controls, Capacitance Operated

Ade Corp., Watertown, Mass.
Aladdin Controls, Nashville, Tenn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Controlotron Corp., Farmingdale, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dynamic Data Corp., Columbus, Ohio
Electro-Sonic Control, Manteca, Calif.
Foxboro Co., Foxboro, Mass.
Hird Brown America, Livingston, N.J.
Mechanical Technology, Inc., Latham, N.Y.
MEKontrol Inc., Northboro, Mass.
Photobell Co., Inc., New York, N.Y.
Robertshaw Controls Co., Anaheim, Cal.
Sensor Corp., Greenwich, Conn.
Westinghouse Elec. Int'l., New York, N.Y.

Controls, Carbon—See Potentiometers; Rheostats—Vol 3

Controls, Combustion

General Elec. Co., Schenectady, N.Y.
Precision Timer, Westbrook, Conn.
Triac Elctrn. Sys., N.Y., N.Y.
AMBAC Inds., Garden City, N.Y.
Automatic Switch Co., Florham Park, N.J.
Autotron, Inc., Danville, Ill.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
De-Tec-Tronic Corp., Chicago, Ill.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Fischer & Porter Co., Warminster, Pa.
Fuel Watchman Sls. & Svc., Inc., Bronx, N.Y.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Hird Brown America, Livingston, N.J.
Honeywell, Ft. Washington, Pa.
Honeywell, Residential Div., Mpls., Minn.
Leeds & Northrup Corp., No. Wales, Pa.
Milton Roy Co., St. Petersburg, Fla.
Photobell Co., Inc., New York, N.Y.
Precision Elctrns., Inc., Amityville, N.Y.
Selas Corp. America, Dresher, Pa.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Westinghouse Elec. Int'l., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Constant Impedance—See Attenuators—Vol 1

Controls, Counting & Sorting—See Vol 1

Controls, Density

General Elec. Co., Schenectady, N.Y.
Automation Products, Inc., Houston, Tex.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Electron-Machine Corp., Umatilla, Fla.
Elctrns., Ltd., Marion, Iowa
Foxboro Co., Foxboro, Mass.
Heitz, Karl, Inc., New York, N.Y.
Industrial Nucleonics, Columbus, Ohio
Kay-Ray, Inc., Palatine, Ill.
Luft Instrs., Inc., Lincoln, Mass.
Motorola Instr. & Control, Phoenix, Ariz.
National Sonics, Farmingdale, N.Y.
Nuclear-Chicago, Des Plaines, Ill.
Nuclear Resch. Corp., Southampton, Pa.
NUS Corp., Paramus, N.J.
Photomation, Inc., Mountain View, Calif.
Princo Instrs., Southampton, Pa.
RIL Elctrns., Inc., Southampton, Pa.
Robertshaw Controls Co., Anaheim, Cal.
Scientronics, Barrington, N.J.
Taylor Instr. Process Control Div., Rochester, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Dimension—See Vol 1

Controls, Door Opening & Closing (Industrial)

General Elec. Co., Schenectady, N.Y.
Meloy Laboratories, Springfield, Va.
Precision Timer, Westbrook, Conn.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Veeder-Root, Hartford, Conn.
A.R.F. Products, Inc., Raton, N.M.
Autotron, Inc., Danville, Ill.
Barry Controls, Watertown, Mass.
Basler Elec. Co., Highland, Ill.
Chamberlain Mfg. Corp., Elmhurst, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Electronic Control Corp., Detroit, Mich.
Femco Div., Irwin, Pa.
Furnas Elec. Co., Batavia, Ill.
General Equip. & Mfg., Louisville, Ky.
Hird Brown America, Livingston, N.J.
Linear Corp., Inglewood, Calif.
McClintock Matrixes, Inc., Woodbury, Conn.
Micro Switch, Freeport, Ill.
Paraplegics Mfg., Bensenville, Ill.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Robot Inds., Inc., Dearborn, Mich.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Skinner Polynoid Div., New Britain, Conn.
Square D Co., Park Ridge, Ill.
Tempo Instr., Plainview, N.Y.
Worner Elctrn. Devices, Rankin, Ill.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Controls, Environmental Test Equipment—See Vol 1

Controls, Film Thickness—See Controls, Material Thickness—Vol 1

Controls, Flame Failure—See Vol 1

Controls, Fluid Conductivity

Beckman Instrs., Cedar Grove, N.J.
General Elec. Co., Schenectady, N.Y.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Aladdin Controls, Nashville, Tenn.
AMBAC Inds., Garden City, N.Y.
Bailey Meter Co., Wickliffe, Ohio
Blake Electronics, Inc., Muskego, Wisc.
Controlotron Corp., Farmingdale, N.Y.
Eastern Chem. Corp., Reading, Pa.
Electronic Control Corp., Detroit, Mich.
Foxboro Co., Foxboro, Mass.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
Mag-Con Engrg. Co., St. Paul, Minn.
McNab, Inc., New York, N.Y.
MEKontrol Inc., Northboro, Mass.
National Sonics, Farmingdale, N.Y.
NUS Corp., Paramus, N.J.
Scientronics, Barrington, N.J.
Trans-Sonics, Inc., Lexington, Mass.

Controls, Fluid Flow

Automation Dev., Culver City, Cal.
Computer Instrs., Hempstead, N.Y.
Eagle-Signal Div., Davenport, Iowa
Fenwal Elctrns., Inc., Framingham, Mass.
Square D Co., Milwaukee, Wisc. p 1347
Triac Elctrn. Sys., N.Y., N.Y.
Veeder-Root, Hartford, Conn.
Adel Div., Burbank, Calif.
Aeronautical Div, Bryan, Ohio
AMBAC Inds., Garden City, N.Y.
Anderson, W.E., Inc., Kansas City, Mo.
Autocon Inds., Inc., St. Paul, Minn.
Automatic Switch Co., Florham Park, N.J.
Bailey Meter Co., Wickliffe, Ohio
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bendix Corp., Davenport, Iowa
Brooks Instr. Div., Hatfield, Pa.
Consolidated Controls Corp., El Segundo, Calif.
Controlotron Corp., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Decker Corp., Bala-Cynwyd, Pa.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Digiac Corp., Plainview, N.Y.
Durant Mfg. Co., Milwaukee, Wisc.
Dynalco Corp., Ft. Lauderdale, Fla.
Erdco Engrg. Corp., Addison, Ill.
Essex Cryogenics Inds., St. Louis, Mo.
Fischer & Porter Co., Warminster, Pa.
Flow Technology, Inc., Tempe, Ariz.
Fox Valve Dev. Co., Inc., Hanover, N.J.
Foxboro Co., Foxboro, Mass.
Gems Div., Farmington, Conn.
General Equip. & Mfg., Louisville, Ky.
Glar-Ban Corp., Buffalo, N.Y.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Harwil Co., Santa Monica, Calif.
Hastings-Raydist, Hampton, Va.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hydro-Aire Div., Burbank, Calif.
Johnson Corp., Three Rivers, Mich.
Joliet Control Corp., Joliet, Ill.
Kidde, Walter & Co., Belleville, N.J.
Kingmann-White, Inc., Placentia, Calif.
Lear Siegler, Inc., Elyria, Ohio
Luft Instrs., Inc., Lincoln, Mass.
Lunkenheimer Co., Cincinnati, Ohio
MEM Controls, Inc., Wickliffe, Ohio
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Milton Roy Co., St. Petersburg, Fla.
Motorola Instr. & Control, Phoenix, Ariz.
Neill Engrg. Co., Akron, Ohio
Pennwalt Corp., Phila., Pa.
Power Engrg. & Equip. Co., Inc., Torrance, Cal.
Robertshaw Controls Co., Anaheim, Cal.
Rosemount Engrg. Co., Minneapolis, Minn.
Sanders Assocs., Inc., Manchester, N.H.
Seco Elctrns. Corp., Hopkins, Minn.
Skinner Elec. Valve Div., New Britain, Conn.
Square D Co., Park Ridge, Ill.
Taylor Instr. Process Control Div., Rochester, N.Y.
Trans-Sonics, Inc., Lexington, Mass.
United Elec. Controls Co., Watertown, Mass.

U.O.P. Instrs. Div., Greenwich, Conn.
USM Corp., Wakefield, Mass.
West Coast Resch. Corp., Los Angeles, Calif.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston Hydraulics, Div., Van Nuys, Calif.
Winterburn Mfg. Co., Putnam, Conn.

Controls, Frequency

Accutronics, Inc., Geneva, Ill.
Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla. p 1308
Anadex Instrs., Inc., Van Nuys, Calif. p 397
Austron, Inc., Austin, Tex.
Autronics Corp., Pasadena, Calif. p 1311
Betamite Electronic Devices, Culver City, Calif.
Bramco Controls, Piqua, Ohio .... p 1406
Douglas Randall Div., Pawcatuck, Conn.
Durant Digital Instrs., Milwaukee, Wisc.
Fork Standards, W. Chicago, Ill. .. p 718
Frequency Control, Inc., Austin, Tex.
Frequency Elctrns., New Hyde Pk., N.Y.
Geo Space Sys., Tampa, Fla. .... p 350
Gibbs Mfg. & Resch., Janesville, Wisc.
Hewlett-Packard, Palo Alto, Cal.
Hi-G, Windsor Locks, Conn.
Logitek, Inc., Farmingdale, N.Y. .. p 1752
Meloy Laboratories, Springfield, Va.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J. .... p 529
Quindar Elctrns., Inc., Springfield, N.J.
Solid State Elctrns., Sepulveda, Cal.
A & M Instrument, Inc., Great Neck, N.Y.
Aerospace Resch. Inc., Boston, Mass.
Allis, Louis Co., Milwaukee, Wisc.
American Elctrns., Inc., Fullerton, Cal.
AMF Electical Prods., Alexandria, Va.
AMF Electrosystems Div., Vandalia, Ohio
Anritsu Electric Co., Ltd., Tokyo, Japan
Automatic Switch Co., Florham Park, N.J.
Avtron Mfg., Inc., Cleveland, Ohio
B.H. Inds., Los Angeles, Cal.
Davidson Elctrn. Dev. Co., Erie, Pa.
Dynalco Corp., Ft. Lauderdale, Fla.
Dynamic Precision Controls, Hagerstown, Ind.
Dynapar Corp., Gurnee, Ill.
Elctrn. Resources Div., Los Angeles, Cal.
Guardian California, Culver City, Cal.
HB Engrg. Corp., Silver Spring, Md.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Intercontinental Elctrns., E. Rochester, N.Y.
Leeds & Northrup Corp., No. Wales, Pa.
MEM Controls, Inc., Wickliffe, Ohio
Metron Instrs., Inc., Denver, Colo.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Neptune Elctrns. Co., New York, N.Y.
Parker Instr. Corp., Stamford, Conn.
PECO, Milpitas, Cal.
Power Control Corp., Pittsburgh, Pa.
Precision Elctrns., Inc., Amityville, N.Y.
Riverbank Labs., Geneva, Ill.
Robicon Corp., Pittsburgh, Pa
Systems Elctrns., Cleveland, Ohio
Teledyne Inet, Gardena, Cal.
Tempo Instr., Plainview, N.Y.
Workman Elctrn. Prods., Inc., Sarasota, Fla.
Zehntel, Inc., Berkeley, Calif.

Controls, Gas

Automation Dev., Culver City, Cal.
Engelhard Minerals & Chem., Murray Hill, N.J.
Fenwal Elctrns., Inc., Framingham, Mass.
General Elec. Co., Schenectady, N.Y.
Adel Div., Burbank, Calif.
Aeronautical Div, Bryan, Ohio
AMBAC Inds., Garden City, N.Y.
Automatic Switch Co., Florham Park, N.J.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bristol Div, Waterbury, Conn
Decker Corp., Bala-Cynwyd, Pa.
Devco Engrg., W. Caldwell, N.J.
Essex International, Mansfield, Ohio
Gas Analysis Sys., Inc., Basking Ridge, N.J.
HLS, Inc., Santa Clara, Cal.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Kingmann-White, Inc., Placentia, Calif.
Lektra Labs., Inc., College Point, N.Y.
Lunkenheimer Co., Cincinnati, Ohio
Mercoid Corp., Chicago, Ill.
Phoenix Materials Corp., Kittanning, Pa.
Puritan-Zep, El Segundo, Cal.
RBM Controls, Logansport, Ind.
Selas Corp. America, Dresher, Pa.
Texas Instruments, Dallas, Tex.
United Elec. Controls Co., Watertown, Mass.
Weston Hydraulics, Div., Van Nuys, Calif.

Controls, Hardware, Shafts & Accessories—See Shafts; Dials;etc.

Controls, Humidity

Blue M Engrg. Co., Blue Island, Ill.
Harrel, Inc., E. Norwalk, Conn. .... p 1973
A. J. Abrams Co., Westport, Conn.
AMBAC Inds., Garden City, N.Y.
American Instr. Co., Silver Spring, Md.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bristol Div, Waterbury, Conn
Cambridge Sys., EG&G Inc., Waltham, Mass.
Climatronics Corp., Hauppauge, N.Y.
Controls Co. of America, Schiller Park, Ill.
Davidson Elctrn. Dev. Co., Erie, Pa.
Foxboro Co., Foxboro, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Residential Div., Mpls., Minn.
Hotpack Corp., Phila., Pa.
Hughes Aircraft Co, Culver City, Cal.
Hygrodynamics, Inc., Silver Spring, Md.
J.K. Elctrn. Controls, Inc., Vancouver, Wash.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Lear Siegler, Inc., Elyria, Ohio
Logetronics, Inc., Springfield, Va.
Luft Instrs., Inc., Lincoln, Mass.
Reeve Elctrns., Inc., Chicago, Ill.
Taylor Instr. Process Control Div., Rochester, N.Y.
Texas Instruments, Inc., Attleboro, Mass.
Warren Comps. Corp., Warren, Pa.

Controls, Ignitron Firing

Precision Timer, Westbrook, Conn.
Triac Elctrn. Sys., N.Y., N.Y.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bergen Labs., Inc., Paterson, N.J.
Halmar Elctrns., Inc., Columbus, Ohio
Hughes Aircraft Co, Culver City, Cal.
Pass & Seymour, Inc., Syracuse, N.Y.
Power Control Corp., Pittsburgh, Pa.
RBM Controls, Logansport, Ind.
Research, Inc., Minneapolis, Minn.
Robotron Corp., Detroit, Mich.
Texas Instruments, Dallas, Tex.
Weltronic Co., Southfield, Mich.

Controls, Illumination

Control Technology Co., L.I.C., N.Y.
Drake Mfg., Harwood Hgts., Ill.
General Elec. Co., Schenectady, N.Y.
LVC Ind's., Inc., Corona, N.Y.
Ohmite Mfg. Co., Skokie, Ill.
Precision Timer, Westbrook, Conn.
Staco, Inc., Dayton, Ohio
Arizona Elctrns., Inc., Benson, Ariz.
Automatic Switch Co., Florham Park, N.J.
Bourns Security Sys., Smithtown, N.Y.
Century Strand, Inc., Clifton, N.J.
De Soto Elec. Prods., De Soto, Mo.
Decor Elctrns. Corp., Austin, Tex.
Firing Circuits Div., Norwalk, Conn
Furnas Elec. Co., Batavia, Ill.
General Elec., Providence, R.I.
Goodyear Aerospace Corp., Akron, Ohio
Halmar Elctrns., Inc., Columbus, Ohio
International Light, Newburyport, Mass.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Parker Instr. Corp., Stamford, Conn.
Photobell Co., Inc., New York, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
Superior Elec., Bristol, Conn.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Dallas, Tex.
Time-O-Matic, Inc., Danville, Ill.
Worner Elctrn. Devices, Rankin, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Controls, Level, Dry Material

Control Technology Co., L.I.C., N.Y.
General Elec. Co., Schenectady, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
Aladdin Controls, Nashville, Tenn.
Aladdin Elctrns., Nashville, Tenn.
AMBAC Inds., Garden City, N.Y.
Automatic Die Cutting Mach. Co., New York, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Devices, Inc., Fairview, Pa.
Automation Products, Inc., Houston, Tex.
Autotron, Inc., Danville, Ill.
Avionics, Inc., South Bend, Ind.
Controlotron Corp., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Delavan Mfg Co, West Des Moines, Iowa
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Elctrns., Ltd., Marion, Iowa
Euclid Elec. & Mfg. Div., Madison, Ohio
Frost Electronics Corp., Bellingham, Mass.
Hird Brown America, Livingston, N.J.
Industrial Nucleonics, Columbus, Ohio
Kay-Ray, Inc., Palatine, Ill.
Kingmann-White, Inc., Placentia, Calif.
Mag-Con Engrg. Co., St. Paul, Minn.
Mechanical Technology, Inc., Latham, N.Y.
MEKontrol Inc., Northboro, Mass.
Mullard, Inc., Farmingdale, N.Y.
National Sonics, Farmingdale, N.Y.
Nuclear-Chicago, Des Plaines, Ill.
Nuclear Resch. Corp., Southampton, Pa.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
RIL Elctrns., Inc., Southampton, Pa.
Robertshaw Controls Co., Anaheim, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
Wintriss Controls, New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Level, Liquid

Cook Elec. Co., Morton Grove, Ill.
General Elec. Co., Schenectady, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill.
Ind'l. Control Co., Farmingdale, N.Y.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Meloy Laboratories, Springfield, Va.
Aladdin Controls, Nashville, Tenn.
Aladdin Elctrns., Nashville, Tenn.
AMBAC Inds., Garden City, N.Y.
Ametek/Instrs. & Controls, Feasterville, Pa.
Andonian Assocs., Inc., Waltham, Mass.
Anritsu Electric Co., Ltd., Tokyo, Japan
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Autocon Inds., Inc., St. Paul, Minn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Products, Inc., Houston, Tex.
Autotron, Inc., Danville, Ill.
Avionics, Inc., South Bend, Ind.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barnes & Reinecke, Inc., Chicago, Ill.
Bendix Corp., Davenport, Iowa
Bristol Div, Waterbury, Conn
Brooks Instr. Div., Hatfield, Pa.
Coil Co. of Amer., Northvale, N.J.
Cole-Parmer Instr. Co., Chicago, Ill.
Conrac Corp., New York, N.Y.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Control Prods. Corp., Chicago, Ill.
Controlotron Corp., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cryotronics, Inc., High Bridge, N.J.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Cutler-Hammer, Milwaukee, Wisc.
Decker Corp., Bala-Cynwyd, Pa.
Delavan Mfg Co, West Des Moines, Iowa
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Dynasonics Corp., Pipestone, Minn.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Electronic Control Corp., Detroit, Mich.
Essex Cryogenics Inds., St. Louis, Mo.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Foxboro Co., Foxboro, Mass.
Frost Electronics Corp., Bellingham, Mass.
Furnas Elec. Co., Batavia, Ill.
Gagne Assocs., Inc., Binghamton, N.Y.
Gems Div., Farmington, Conn.
General Equip. & Mfg., Louisville, Ky.
Glo-Quartz Elec. Heater Co., Mentor, Ohio
Hird Brown America, Livingston, N.J.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Industrial Nucleonics, Columbus, Ohio
Integrated Dev. & Mfg. Co., Chagrin Falls, Ohio
Jo-Bell Prods., Inc., Oak Lawn, Ill.
Johnson Corp., Three Rivers, Mich.
Joliet Control Corp., Joliet, Ill.
Kay-Ray, Inc., Palatine, Ill.
Kingmann-White, Inc., Placentia, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Luft Instrs., Inc., Lincoln, Mass.
Mag-Con Engrg. Co., St. Paul, Minn.
Malaker Corp., High Bridge, N.J.
Mechanical Technology, Inc., Latham, N.Y.
MEKontrol Inc., Northboro, Mass.
Mercoid Corp., Chicago, Ill.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Motorola Instr. & Control, Phoenix, Ariz.
National Sonics, Farmingdale, N.Y.
Neill Engrg. Co., Akron, Ohio
Nuclear-Chicago, Des Plaines, Ill.
Nuclear Resch. Corp., Southampton, Pa.
Oxford Instr. Corp., Annapolis, Md.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Power Control Corp., Pittsburgh, Pa.
Power Engrg. & Equip. Co., Inc., Torrance, Cal.
Power Instrs., Skokie, Ill.
Puritan-Zep, El Segundo, Cal.
RIL Elctrns., Inc., Southampton, Pa.
Robertshaw Controls Co., Anaheim, Cal.
Robinson-Halpern Co., W. Conshohocken, Pa.
Roylyn, Glendale, Cal.
Square D Co., Park Ridge, Ill.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tempo Instr., Plainview, N.Y.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Thermometrics, Inc., Edison, N.J.
Torr Labs., Los Angeles, Cal.
Trans-Sonics, Inc., Lexington, Mass.
Transducer Controls Corp., Covina, Calif.
United Elec. Controls Co., Watertown, Mass.
U.O.P. Instrs. Div., Greenwich, Conn.
VirTis Co., Inc., Gardiner, N.Y.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Waters Equipment Div., Framingham, Mass.
Westinghouse Elec. Int'l., New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Machine Tool

Allen-Bradley Co., Milwaukee, Wisc.
Astrosystems, Lake Success, N.Y. p 409
Automation Dev., Culver City, Cal. p 1310
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Control Technology Co., L.I.C., N.Y.
Cook Elec. Co., Morton Grove, Ill.
Datascan, Inc., Clifton, N.J.
Delco Elctrns. Div., Kokomo, Ind.
Digital Equip. Corp., Maynard, Mass.
Dynage, Bloomfield, Conn.
Eagle-Signal Div., Davenport, Iowa
General Elec. Co., Schenectady, N.Y.

Haydon, A. W. Co., Waterbury, Conn.
Icon Corp., Cambridge, Mass. .... p 1333
International Rectifier, El Segundo, Cal.
LVC Ind's., Inc., Corona, N.Y.
Ohmite Mfg. Co., Skokie, Ill.
Precision Timer, Westbrook, Conn.
Square D Co., Milwaukee, Wisc. p 1347
Summit Engrg. Corp., Bozeman, Mont.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Tektronix, Inc., Beaverton, Ore.
Aldshir Mfg. Co., Inc., Tuckahoe, N.Y.
Allen-Bradley, Cleveland, Ohio
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
Anocut Engrg. Co., Elk Grove Village, Ill.
Anritsu Electric Co., Ltd., Tokyo, Japan
Applied Control Co., Fairfield, N.J.
Applied Systems Corp., Detroit, Mich
Arrow-Hart, Inc., Hartford, Conn.
Automatic Switch Co., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Devices, Inc., Fairview, Pa.
Baldwin Elctrns., Little Rock, Ark.
Bayside Timers, Inc., Flushing, N.Y.
Bendix, Detroit, Mich.
Boston Digital Corp., Ashland, Mass.
Caton Inds., Inc., Clark, N.J.
CGS/Lawrence, Southampton, Pa.
Clifton Div., Clifton Hgts., Pa.
Coil Co. of Amer., Northvale, N.J.
ComGeneral Corp., Dayton, Ohio
Computer Conversions Corp., East Northport, N.Y.
Concord Control, Boston, Mass.
Conrac Corp., New York, N.Y.
Control Logic, Natick, Mass.
Control Prods. Corp., Chicago, Ill.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Data Technology Inc., Watertown, Mass.
Davidson Elctrn. Dev. Co., Erie, Pa.
Decker Corp., Bala-Cynwyd, Pa.
Design Prods. Corp., Troy, Mich.
Devco Engrg., W. Caldwell, N.J.
Digital Prods., San Pedro, Calif.
Durant Mfg. Co., Milwaukee, Wisc.
Dynalco Corp., Ft. Lauderdale, Fla.
Dynamic Data Corp., Columbus, Ohio
Dynamic Precision Controls, Hagerstown, Ind.
Dynapar Corp., Gurnee, Ill.
Electro-Craft Corp, Hopkins, Minn
Electro Prods. Labs., Power Supply, Chicago, Ill.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Electronic Control Corp., Detroit, Mich.
Excellon Inds., Torrance, Calif.
Farrand Controls, Inc., Valhalla, N.Y.
Fincor Div., York, Pa.
Furnas Elec. Co., Batavia, Ill.
General Equip. & Mfg., Louisville, Ky.
General Oceanology, Inc., Cambridge, Mass.
Gerber Sci. Instr. Co., Hartford, Conn.
Gettys Mfg. Co., Racine, Wisc.
Guardian California, Culver City, Cal.
Hoagland Instr., Red Bank, N.J.
Honeywell, Apparatus Controls, Mpls., Minn.
Hughes Aircraft Co., Ind'l. Prods. Div., Oceanside, Cal.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Hyde Park Elctrns., Inc., Dayton, Ohio
IKL, Inc., Newport Beach, Calif.
Ind'l. Solid State Controls, York, Pa.
Inland Motor Corp. of Va., Radford, Va.
Keystone Micro Scan., Boston, Mass.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
McClintock Matrixes, Inc., Woodbury, Conn.
Measurement Sys., Inc., Norwalk, Conn.
MEKontrol Inc., Northboro, Mass.
MEM Controls, inc., Wickliffe, Ohio
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Minnetech Labs., Inc., Minneapolis, Minn.
Mullard, Inc., Farmingdale, N.Y.
National Acme, Cleveland, Ohio
National Time & Signal, Oak Pk., Mich.
Neill Engrg. Co., Akron, Ohio
Nucleonic Prods., Canoga Pk, Cal.
PECO, Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Randtronics, Inc., Palo Alto, Cal.
Raymond Controls Corp., Middletown, Conn.
Robicon Corp., Pittsburgh, Pa
Robotron Corp., Detroit, Mich.
Seco Elctrns. Corp., Hopkins, Minn.
Servo Prods. Co., Altadena, Cal.
Siemens Corp., Comps. Div., Iselin, N.J.
Solid Controls, Inc., Minneapolis, Minn.
Spiras Sys., Inc., Waltham, Mass.
Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Pitman, N.J.
Superior Elec., Bristol, Conn.
Taylor-Winfield Corp., Warren, Ohio
Teledyne Gurley, Troy, N.Y.
Teledyne Inet, Gardena, Cal.
Tempo Instr., Plainview, N.Y.
Tenor Co., Inc., New Berlin, Wisc.
Texas Instruments, Dallas, Tex.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
Trish Energetics, Harvard, Mass.
Weldotron Corp., Piscataway, N.J.
Weltronic Co., Southfield, Mich.
Westamp, Inc., Santa Monica, Cal.
Westinghouse Elec., Buffalo, N. Y.
Westinghouse Elec. Int'l., New York, N.Y.
Winterburn Mfg. Co., Putnam, Conn.
Wintriss Controls, New York, N.Y.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Zeiss, Carl, Inc., New York, N.Y.
Zero-Max Co., Minneapolis, Minn.
Zonic Tech. Labs., Cincinnati, Ohio

Controls, Materials Thickness—See Vol 1

Controls, Moisture—See Controls, Humidity

Controls, Motor Speed

Airpax Elctrns., Inc., Cambridge, Md.
Allen-Bradley Co., Milwaukee, Wisc.
API Instrs. Co., Waltham, Mass.
Automation Dev., Culver City, Cal. p 1310
Avtel Corp., Covina, Cal.
Bodine Elec. Co., Chicago, Ill. .... p 1581
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
CML-Macarr, Inc., Edison, N.J. ...... p 665
Control Technology Co., L.I.C., N.Y.
General Elec. Co., Schenectady, N.Y.
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1711
Harrel, Inc., E. Norwalk, Conn.
Howard Inds., Racine, Wisc.
Icon Corp., Cambridge, Mass. .... p 1333
Ind'l. Control Co., Farmingdale, N.Y. p 1873
International Rectifier, El Segundo, Cal.
Kratos Instrument Div., Pasadena, Cal p 510
LVC Ind's., Inc., Corona, N.Y.
Ohmite Mfg. Co., Skokie, Ill.
Sawyer Inds., Arcadia, Cal.
Schaevitz Engrg., Pennsauken, N.J.
Servo-Tek Prods. Co., Hawthorne, N.J. p 1632
Square D Co., Milwaukee, Wisc. p 1347
Tempo/UTI Div., Chatsworth, Cal. p 1349
Triac Elctrn. Sys., N.Y., N.Y.
Unitron, Garland, Tex...................... p 935
Adams Rite Mfg. Co., Glendale, Calif.
Advance Instr. Corp., Belmar, N. J.
Aerolite Electronics Corp., Union City, N.J.
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
Allis Louis Co., Greendale, Wisc.
American Elctrns., Inc., Fullerton, Cal.
AMF Electical Prods., Alexandria, Va.
AMF Electrosystems Div., Vandalia, Ohio
Anocut Engrg. Co., Elk Grove Village, Ill.
Applied Control Co., Fairfield, N.J.
Autocon Inds., Inc., St. Paul, Minn.
B & B Motor & Control, New York, NY
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Barnes & Reinecke, Inc., Chicago, Ill.
Basler Elec. Co., Highland, Ill.
Bayside Timers, Inc., Flushing, N.Y.
Beckman Instrs., Helipot Div., Fullerton, Cal.
BECO Solid State Systems, Salem, Va.
Belleville Elctrns. Co., Belleville, Mich.
Blake Electronics, Inc., Muskego, Wisc.
Bogue Elec. Mfg. Co., Paterson, N.J.
Borg-Warner Controls, Santa Ana, Cal.
Bose Corp., Natick, Mass.
Cal-Power Corp., El Segundo, Calif.
Carson Mfg. Co., Indianapolis, Ind.
Carter Motor Co., Chicago, Ill.
Cole-Parmer Instr. Co., Chicago, Ill.
Computer Central, Detroit, Mich.
Control Prods. Corp., Chicago, Ill.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Cooke Vacuum Prods., S. Norwalk, Conn.
Cutler-Hammer, Milwaukee, Wisc.
Davidson Elctrn. Dev. Co., Erie, Pa.
De Soto Elec. Prods., De Soto, Mo.
Decor Elctrns. Corp., Austin, Tex.
Delta Elctrn. Control, Costa Mesa, Cal.
Dynamic Controls Corp., S. Windsor, Conn.
Dynapar Corp., Gurnee, Ill.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Electro-Craft Corp, Hopkins, Minn
Electro-Devices, Inc., Paterson, N.J.
Electro-Pacific, Inc., Goleta, Calif.
Electro Prods. Labs., Power Supply, Chicago, Ill.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Electrol Co., Inc., York, Pa.
Elctrn. Control Co., Dresher, Pa.
Electronic Control Corp., Detroit, Mich.
Essex Engrg. Co., Inc., Essex, Conn.
Euclid Elec. & Mfg. Div., Madison, Ohio
Excellon Inds., Torrance, Calif.
Fincor Div., York, Pa.
Firing Circuits Div., Norwalk, Conn
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., Batavia, Ill.
Gems Div., Farmington, Conn.
General Devices, Inc., Princeton, N.J.
General Equip. & Mfg., Louisville, Ky.
General Instr. of Can., Waterloo, Ont., Can.
Glentek, Inc., Santa Monica, Calif.
Halmar Elctrns., Inc., Columbus, Ohio
Heath Co., Benton Harbor, Mich.
Heller, G K, Corp., Las Vegas, Nev.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Hope Elctrns., Clifton, N.J.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
Innovatek Enterprise, Millerton, N.Y.
Instr. & Control Sys., Inc., Addison, Ill.
Integrated Controls, San Diego, Cal.
Integrated Dev. & Mfg. Co., Chagrin Falls, Ohio
Intercontinental Elctrns., E. Rochester, N.Y.
Joliet Control Corp., Joliet, Ill.
Jones Motrola Corp., Stamford, Conn.
Lear Siegler, Inc., Santa Monica, Calif.
Linemaster Switch Corp., Woodstock, Conn.
Loyola Industries, Inc., El Segundo, Calif.
Luft Instrs., Inc., Lincoln, Mass.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Magnetics, Inc., Butler, Pa.
Magnetics, Sandy Lake, Pa.
MEKontrol Inc., Northboro, Mass.
Meltronics Inc., Wantagh, N.Y.
MEM Controls, Inc., Wickliffe, Ohio
Midland Standard Inc., Elgin, Ill.
Minarik Elec. Co., Los Angeles, Cal.
PECO, Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Power Control Corp., Pittsburgh, Pa.
Power Instrs., Skokie, Ill.
Preferred Electronics, Inc., Westfield, Mass.
Pyle-National Co., Chgo., Ill.
Ram Meter, Inc., Ferndale, Mich.
Randtronics, Inc., Palo Alto, Cal.
Reliance Elec. Co., Cleveland, Ohio
Research, Inc., Minneapolis, Minn.
Robicon Corp., Pittsburgh, Pa
Rodale Mfg. Co., Inc., Emmaus, Pa.
Scientific-Atlanta, Inc., Atlanta, Ga.
Seco Elctrns. Corp., Hopkins, Minn.
Sensor Corp., Greenwich, Conn.
Siemens Corp., Comps. Div., Iselin, N.J.
Singer Co., Somerville, N.J.
Sperry Marine Sys., Charlottesville, Va.
Square D Co., Park Ridge, Ill.
Strandberg Engrg. Labs., Inc., Greensboro, N.C.
Struthers-Dunn, Inc., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Superior Elec., Bristol, Conn.
T & T Controls Co., Media, Pa.
Task Corp., Anaheim, Calif.
Teledyne Inet, Gardena, Cal.
Teledyne Kinetics, Solana Beach, Cal.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
Triple-A Specialty Co., Chicago, Ill.
Vectrol, Inc., Rockville, Md.
Voltex Co., Inc., Farmingdale, N.Y.
Waber Elctrns., Inc., Philadelphia, Pa.
Weltronic Co., Southfield, Mich.
Westamp, Inc., Santa Monica, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Westinghouse Elec., Buffalo, N. Y.
Westinghouse Elec. Int'l., New York, N.Y.
Weston-Transicoil, Worcester, Pa.
Winterburn Mfg. Co., Putnam, Conn.
Zehntel, Inc., Berkeley, Calif.
Zero-Max Co., Minneapolis, Minn.

Controls, Oscillator

Accutronics, Inc., Geneva, Ill.
Austron, Inc., Austin, Tex.
Biddle, James G., Plymouth Meeting, Pa.
Bramco Controls, Piqua, Ohio .... p 1406
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1363
Fork Standards, W. Chicago, Ill. .. p 718
Frequency Control, Inc., Austin, Tex.
Frequency Elctrns., New Hyde Pk., N.Y.
Gibbs Mfg. & Resch., Janesville, Wisc.
Hewlett-Packard, Palo Alto, Cal.
J-B-T Instrs., Inc., New Haven, Conn. p 1929
Meloy Laboratories, Springfield, Va.
AMBAC Inds., Garden City, N.Y.
HB Engrg. Corp., Silver Spring, Md.
Meson Elctrns. Co., Inc., Rochester, N.Y.
National-Standard Co., Strongsville, Ohio
Neptune Elctrns. Co., New York, N.Y.
Sage Labs. Inc., Natick, Mass.
Sensor Corp., Greenwich, Conn.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Systems Elctrns., Cleveland, Ohio

Controls, P-H—See Vol 1

Controls, Photoelectric

Digitron Corp., Norristown, Pa.
Durant Digital Instrs., Milwaukee, Wisc.
General Elec. Co., Schenectady, N.Y.
James Elctrns., Inc., Chicago, Ill.
Meloy Laboratories, Springfield, Va.
Syracuse Elctrns. Corp., Syracuse, N.Y.
Vactec, Maryland Hgts., Mo......... p 1640
Veeder-Root, Hartford, Conn.
ACR Elctrns. Div., Carle Place, N.Y.
Allied Elctrns. Corp., Chicago, Ill.
Allis, Louis Co., Milwaukee, Wisc.
Applied Control Co., Fairfield, N.J.
Astronics, Inc., Dallas, Tex.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Devices, Inc., Fairview, Pa.
Autotron, Inc., Danville, Ill.
Belleville Elctrns. Co., Belleville, Mich.
Burlingame Sci., Burlingame, Cal.
Canadian Research Institute, Don Mills, Ont., Canada
Cole Instr., Costa Mesa, Cal.
Cole-Parmer Instr. Co., Chicago, Ill.
Control Logic, Natick, Mass.
Controlcraft Corp., West Chicago, Ill.
Copar Corp., Oak Lawn, Ill.
De-Tec-Tronic Corp., Chicago, Ill.
Decor Elctrns. Corp., Austin, Tex.
Design Prods. Corp., Troy, Mich.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Durant Mfg. Co., Milwaukee, Wisc.
Dynapar Corp., Gurnee, Ill.
Eagle Elec. Mfg. Co., L. I. C., N.Y.

Electro Fiberoptics Corp., W. Boylston, Mass.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Electro-Sonic Control, Manteca, Calif.
Electroid Co., Union, N.J.
Electrol Co., Inc., York, Pa.
Elctrn. Control Co., Dresher, Pa.
Electronic Control Corp., Detroit, Mich.
Electronic Mach. Parts, College Point, N.Y.
Elctrns., Ltd., Marion, Iowa
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Fiber Photics, Inc., Santa Cruz, Cal.
Frost Electronics Corp., Bellingham, Mass.
Fuel Watchman Sls. & Svc., Inc., Bronx, N.Y.
GTE Sylvania Inc., Danvers, Mass.
HEI, Inc., Chaska, Minn.
Hird Brown America, Livingston, N.J.
Hughey & Phillips, Inc., Burbank, Cal.
Hyde Park Elctrns., Inc., Dayton, Ohio
Intercontinental Elctrns., E. Rochester, N.Y.
Int'l. Register, Chicago, Ill.
JMR Elctrns. Corp., Bronx, N.Y.
Lehigh Valley Elctrn., Inc., Fogelsville, Pa.
Lektra Labs., Inc., College Point, N.Y.
Lem Instrument Corp., Farmingdale, N.Y.
LGM Elctrns., Inc., Houston, Tex.
MEKontrol Inc., Northboro, Mass.
Midland Standard Inc., Elgin, Ill.
Parker Instr. Corp., Stamford, Conn.
PECO, Milpitas, Cal.
Photo-Crystals, St. Charles, Ill.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
Post Elctrn. Prods., Beverly, Mass.
Power Instrs., Skokie, Ill.
Schoeffel Instr. Corp., Westwood, N.J.
Sensor Corp., Greenwich, Conn.
Sierra Elec., Gardena, Calif.
Sigma Instrs., Inc., Braintree, Mass.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Tabet Mfg. Co., Norfolk, Va.
Texas Instruments, Dallas, Tex.
Tri-Tronics Co., Oak Brook, Ill.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Weldotron Corp., Piscataway, N.J.
Wintriss Controls, New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Controls, Positioning—See Vol 1

Controls, Pressure

Allen-Bradley Co., Milwaukee, Wisc.
API Instrs. Co., Waltham,, Mass.
Automation Dev., Culver City, Cal.
Computer Instrs., Hempstead, N.Y.
Control Technology Co., L.I.C., N.Y.
Cook Elec. Co., Morton Grove, Ill.
General Elec. Co., Schenectady, N.Y.
Schaevitz Engrg., Pennsauken, N.J. p 1346
Square D Co., Milwaukee, Wisc. p 1347
Adel Div., Burbank, Calif.
Aeronautical Div, Bryan, Ohio
Alnor Instr. Co., Chicago, Ill.
Autocon Inds., Inc., St. Paul, Minn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bellofram Corp., Burlington, Mass.
Bendix, S. Montrose, Pa.
Bendix Corp., Davenport, Iowa
Bristol Div, Waterbury, Conn
CGS/Lawrence, Southampton, Pa.
Columbus Elec. Mfg. Co., Columbus, Ohio
Conrac Corp., New York, N.Y.
Consolidated Controls Corp., El Segundo, Calif.
Cutler-Hammer, Milwaukee, Wisc.
Decker Corp., Bala-Cynwyd, Pa.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Dynamic Controls Corp., S. Windsor, Conn.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Elctrn. Control Sys., Fairmont, W. Va.
Electronic Design Labs., Inc., Phila., Pa.
Ellison Draft Gage Co., Inc., New Buffalo, Mich.
Fasco Inds., Inc., Rochester, N.Y.
Fincor Div., York, Pa.
Fischer & Porter Co., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., Batavia, Ill.
Gagne Assocs., Inc., Binghamton, N.Y.
Gems Div., Farmington, Conn.
Glar-Ban Corp., Buffalo, N.Y.
Granville-Phillips Co., Boulder, Colo.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Honeywell, Residential Div., Mpls., Minn.
Hughes Aircraft Co, Culver City, Cal.
Hyde Park Elctrns., Inc., Dayton, Ohio
Hydro-Aire Div., Burbank, Calif.
Integrated Dev. & Mfg. Co., Chagrin Falls, Ohio
Joliet Control Corp., Joliet, Ill.
Kidde, Walter & Co., Belleville, N.J.
Kingmann-White, Inc., Placentia, Calif.
Lear Siegler, Inc., Elyria, Ohio
Luft Instrs., Inc., Lincoln, Mass.
Lunkenheimer Co., Cincinnati, Ohio
MB Elctrns/Textron Co., New Haven, Conn.
Mercoid Corp., Chicago, Ill.
MKS Instrs., Inc., Burlington, Mass.
Motorola Instr. & Control, Phoenix, Ariz.
Non-Linear Sys., Inc., Del Mar, Cal.
Puritan-Zep, El Segundo, Cal.
Robertshaw Controls Co., Anaheim, Cal.
Robinson-Halpern Co., W. Conshohocken, Pa.
Rosemount, Minneapolis, Minn.
Rosemount Engrg. Co., Minneapolis, Minn.
Seco Elctrns. Corp., Hopkins, Minn.
Sensotec, Inc., Columbus, Ohio
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Stow Labs., Inc., Hudson, Mass.
Taylor Instr. Process Control Div., Rochester, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Texas Instruments, Inc., Houston, Tex.
Trans-Sonics, Inc., Lexington, Mass.
Transducer Controls Corp., Covina, Calif.
Trish Energetics, Harvard, Mass.
Tyco Instr. Div., Waltham, Mass.
United Elec. Controls Co., Watertown, Mass.
U.O.P. Instrs. Div., Greenwich, Conn.
West Instr. Div., Schiller Pk., Ill.
Wintriss Controls, New York, N.Y.
Worner Elctrn. Devices, Rankin, Ill.

Controls, Proportioning

API Instrs. Co., Waltham,, Mass. .. p 403
Automation Dev., Culver City, Cal. p 1310
Blue M Engrg. Co., Blue Island, Ill.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1363
Control Technology Co., L.I.C., N.Y. p 1869
Durant Digital Instrs., Milwaukee, Wisc.
Eagle-Signal Div., Davenport, Iowa
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Harrel, Inc., E. Norwalk, Conn. .... p 1973
Hickok Elect. Instr., Cleveland, Ohio p 488
Ind'l. Control Co., Farmingdale, N.Y. p 1872
Oven Inds., Mechanicsburg, Pa. p 1394
RFL Inds., Thermocontrol Div., Boonton, N.J. .... p 1983
RO Assocs., Menlo Pk., Cal.
Schaevitz Engrg., Pennsauken, N.J. p 1346
Veeder-Root, Hartford, Conn.
Acromag, Inc., Wixom, Mich.
Allis, Louis Co., Milwaukee, Wisc.
Alnor Instr. Co., Chicago, Ill.
Alpha-Monarch Corp., Dallas, Tex.
AMBAC Inds., Garden City, N.Y.
Ametek/Instrs. & Controls, Feasterville, Pa.
Anocut Engrg. Co., Elk Grove Village, Ill.
Applied Control Co., Fairfield, N.J.
Automatic Control Elctrns. Co., San Antonio, Tex.
Automation Products, Inc., Houston, Tex.
Avtron Mfg., Inc., Cleveland, Ohio
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bowmar/TIC, Inc., Newbury Park, Calif.
Bristol Div, Waterbury, Conn
CGS/Lawrence, Southampton, Pa.
Cole-Parmer Instr. Co., Chicago, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Data Technology Inc., Watertown, Mass.
Decor Elctrns. Corp., Austin, Tex.
Dynapar Corp., Gurnee, Ill.
EDC Data Comps. Corp., Massapequa, N.Y.
Electro-Sonic Control, Manteca, Calif.
Electrol Co., Inc., York, Pa.
Electron-Machine Corp., Umatilla, Fla.
Elctrn. Control Co., Dresher, Pa.
Elctrn. Control Sys., Fairmont, W. Va.
Elctrn. Modules Corp., Timonium, Md.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., Cambridge, Mass.
Guardian California, Culver City, Cal.
Halmar Elctrns., Inc., Columbus, Ohio
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hydro-Aire Div., Burbank, Calif.
IMPACT-O-GRAPH Div., Bedford, Ohio
Instrulab, Inc., Dayton, Ohio
Integrated Controls, San Diego, Cal.
Intercontinental Elctrns., E. Rochester, N.Y.
Int'l. Instrs., Orange, Conn.
Jersey Tech. Conslts., Morristown, N.J.
Jordan Controls, Milwaukee, Wisc.
Leeds & Northrup Corp., No. Wales, Pa.
Loyola Industries, Inc., El Segundo, Calif.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Magnetics, Inc., Butler, Pa.
Magnetics, Sandy Lake, Pa.
Malaker Corp., High Bridge, N.J.
Measurement Sys., Inc., Norwalk, Conn.
Milton Roy Co., St. Petersburg, Fla.
Pennwalt Corp., Phila., Pa.
Photomation, Inc., Mountain View, Calif.
Post Elctrn. Prods., Beverly, Mass.
Power Control Corp., Pittsburgh, Pa.
Research, Inc., Minneapolis, Minn.
Robicon Corp., Pittsburgh, Pa
Rosemount, Minneapolis, Minn.
Seco Elctrns. Corp., Hopkins, Minn.
Sigma Instrs., Inc., Braintree, Mass.
T & T Controls Co., Media, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Technology/Versatronics, Yellow Springs, Ohio
Ten Bosch, M., Inc., Pleasantville, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Theta Instr. Corp., Fairfield, N.J.
3M Co., St. Paul, Minn.
Transducer Controls Corp., Covina, Calif.
West Instr. Div., Schiller Pk., Ill.

Controls, Proximity-Also See Controls, Capacitance Operated

American Aerospace Controls, Farmingdale, N.Y. .... p 1307
Licon Div., Chicago, Ill.
Schaevitz Engrg., Pennsauken, N.J.
Solid State Elctrns., Sepulveda, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
Ade Corp., Watertown, Mass.
Ametek/Instrs. & Controls, Feasterville, Pa.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Coil Co. of Amer., Northvale, N.J.
Cole Instr., Costa Mesa, Cal.
Controlcraft Corp., West Chicago, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Electro-Sonic Control, Manteca, Calif.
Electrol Co., Inc., York, Pa.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
General Equip. & Mfg., Louisville, Ky.
Gulton Inds., Costa Mesa, Cal.
HEI, Inc., Chaska, Minn.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Hughes Aircraft Co, Culver City, Cal.
Hyde Park Elctrns., Inc., Dayton, Ohio
JMR Elctrns. Corp., Bronx, N.Y.
McClintock Matrixes, Inc., Woodbury, Conn.
MEKontrol Inc., Northboro, Mass.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Mullard, Inc., Farmingdale, N.Y.
National Acme, Cleveland, Ohio
PECO, Milpitas, Cal.
Reed Switch Dev., Greenwich, Conn.
Robertshaw Controls Co., Anaheim, Cal.
Sensor Corp., Greenwich, Conn.
Sperry Marine Sys., Charlottesville, Va.
Square D Co., Park Ridge, Ill.
Texas Instruments, Dallas, Tex.
Tri-Tronics Co., Oak Brook, Ill.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.

Controls, Remote

A. D. Data Sys., Inc., Rochester, N.Y.
ADC Prods., Minneapolis, Minn.
Alco Elctrn. Prods., Lawrence, Mass. p 1646
Allen-Bradley Co., Milwaukee, Wisc.
Amphenol RF Div., Danbury, Conn.
Automation Dev., Culver City, Cal. p 1310
Bramco Controls, Piqua, Ohio
Control Technology Co., L.I.C., N.Y.
Dale Elctrns., Inc., Yankton, S.D.
General Elec. Co., Schenectady, N.Y.
Geo Space Sys., Tampa, Fla. .... p 608
Icon Corp., Cambridge, Mass. .... p 1333
K.C.C. Shokai, Ltd., Naka-ku, Kobe, Japan
Ledex, Inc., Dayton, Ohio
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Oak Mfg., Crystal Lake, Ill.
Ohmite Mfg. Co., Skokie, Ill.
Servo-Tek Prods. Co., Hawthorne, N.J.
Square D Co., Milwaukee, Wisc. p 1347
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Tech Labs., Inc., Palisades Pk., N.J. p 1957
Abtronics, Inc., Livermore, Calif.
Aemco Div., Mankato, Minn.
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
AMF Electical Prods., Alexandria, Va.
Anocut Engrg. Co., Elk Grove Village, Ill.
Anritsu Electric Co., Ltd., Tokyo, Japan
A.R.F. Products, Inc., Raton, N.M.
Arizona Elctrns., Inc., Benson, Ariz.
Arrow-Hart, Inc., Hartford, Conn.
Autocon Inds., Inc., St. Paul, Minn.
Automatic Switch Co., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barrett Elctrns. Corp., Northbrook, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bourns Security Sys., Smithtown, N.Y.
Carson Mfg. Co., Indianapolis, Ind.
Cole Instr., Costa Mesa, Cal.
Cole-Parmer Instr. Co., Chicago, Ill.
Dorsett Elctrns., Tulsa, Okla.
Du Kane Corp., St. Charles, Ill.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electrol Co., Inc., York, Pa.
Elctrn. Modules Corp., Timonium, Md.
Femco Div., Irwin, Pa.
Ferranti Ltd., Hollinwood, Lancs., England
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., Batavia, Ill.
General Elec., Providence, R.I.
Glar-Ban Corp., Buffalo, N.Y.

Heitz, Karl, Inc., New York, N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co., Ind'l. Prods. Div., Oceanside, Cal.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Innovatek Enterprise, Millerton, N.Y.
Intercontinental Elctrns., E. Rochester, N.Y.
Iso-Switch Corp., Costa Mesa, Cal.
Joliet Control Corp., Joliet, Ill.
Keltron Corp., Waltham, Mass.
Leeds & Northrup Corp., No. Wales, Pa.
Linear Corp., Inglewood, Calif.
Luft Instrs., Inc., Lincoln, Mass.
Measurement Sys., Inc., Norwalk, Conn.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Motorola Instr. & Control, Phoenix, Ariz.
Pennwalt Corp., Phila., Pa.
Philmore Mfg. Co., Richmond Hill, N.Y.
Polyphase Instr. Co., Bridgeport, Pa.
Precision Elctrns., Inc., Amityville, N.Y.
Randtronics, Inc., Palo Alto, Cal.
Rust Corp., Everett, Mass.
Seco Elctrns. Corp., Hopkins, Minn.
Secode Elctrns., Dallas, Texas
Servwell Prods. Co., Cleveland, Ohio
Southern Avionics Co., Beaumont, Tex.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Square D Co., Park Ridge, Ill.
Sunair Elctrn., Inc., Ft. Lauderdale, Fla.
Superior Elec., Bristol, Conn.
Tenor Co., Inc., New Berlin, Wisc.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Theta Instr. Corp., Fairfield, N.J.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Winterburn Mfg. Co., Putnam, Conn.

Controls, SCR

Airpax Elctrns., Inc., Cambridge, Md.
Allen-Bradley Co., Milwaukee, Wisc.
API Instrs. Co., Waltham,, Mass.
Autronics Corp., Pasadena, Calif.
Bodine Elec. Co., Chicago, Ill. .... p 1581
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Digitron Corp., Norristown, Pa.
General Elec. Co., Schenectady, N.Y.
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1711
International Rectifier, El Segundo, Cal. p 1807
NWL Transformers, Trenton, N.J.
RFL Inds., Thermocontrol Div., Boonton, N.J.
RO Assocs., Menlo Pk., Cal.
Schaevitz Engrg., Pennsauken, N.J.
Signalite, Neptune, N.J.
Sprague Elec. Co., No. Adams, Mass.
Square D Co., Milwaukee, Wisc. p 1347
Triac Elctrn. Sys., N.Y., N.Y.
Veeder-Root, Hartford, Conn.
Aerolite Electronics Corp., Union City, N.J.
Allen-Bradley, Cleveland, Ohio
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
Allis Louis Co., Greendale, Wisc.
Alnor Instr. Co., Chicago, Ill.
Alpha-Monarch Corp., Dallas, Tex.
AMF Electical Prods., Alexandria, Va.
Anocut Engrg. Co., Elk Grove Village, Ill.
Applied Control Co., Fairfield, N.J.
Autocon Inds., Inc., St. Paul, Minn.
B & B Motor & Control, New York, NY
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barnes & Reinecke, Inc., Chicago, Ill.
Basler Elec. Co., Highland, Ill.
Bergen Labs., Inc., Paterson, N.J.
Blake Electronics, Inc., Muskego, Wisc.
Bogue Elec. Mfg. Co., Paterson, N.J.
Borg-Warner Controls, Santa Ana, Cal.
Bristol Div, Waterbury, Conn
Caig Labs., Inc., Westbury, N.Y.
Cal-Power Corp., El Segundo, Calif.
Carson Mfg. Co., Indianapolis, Ind.
Celtic Inds., Inc., Van Nuys, Cal.
Coil Co. of Amer., Northvale, N.J.
Constant Voltage Co., Chicago, Ill.
Control Prods. Corp., Chicago, Ill.
Copar Corp., Oak Lawn, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Cyberex Inc., Willoughby, Ohio
De Soto Elec. Prods., De Soto, Mo.
De-Tec-Tronic Corp., Chicago, Ill.
Decor Elctrns. Corp., Austin, Tex.
Despatch Oven Co., Minneapolis, Minn.
Dynamic Controls Corp., S. Windsor, Conn.
EDC Data Comps. Corp., Massapequa, N.Y.
Electro-Devices, Inc., Paterson, N.J.
Electro-Pacific, Inc., Goleta, Calif.
Electro-Sonic Control, Manteca, Calif.
Electrol Co., Inc., York, Pa.
Elctrn. Control Co., Dresher, Pa.
Electronic Control Corp., Detroit, Mich.
Elctrn. Control Sys., Fairmont, W. Va.
Elctrn. Modules Corp., Timonium, Md.
Fairchild Semiconductor, Mountain View, Calif.
Fincor Div., York, Pa.
Firing Circuits Div., Norwalk, Conn
Furnas Elec. Co., Batavia, Ill.
General Equip. & Mfg., Louisville, Ky.
Glentek, Inc., Santa Monica, Calif.
Halmar Elctrns., Inc., Columbus, Ohio
Heller, G K, Corp., Las Vegas, Nev.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Hotpack Corp., Phila., Pa.
Hughes Aircraft Co., Ind'l. Prods. Div., Oceanside, Cal.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Instrulab, Inc., Dayton, Ohio
Integrated Controls, San Diego, Cal.
Isotech Inc., Westford, Mass.
Joliet Control Corp., Joliet, Ill.
Jones Motrola Corp., Stamford, Conn.
Jordan Controls, Milwaukee, Wisc.
Loyola Industries, Inc., El Segundo, Calif.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Magnetics, Inc., Butler, Pa.
Magnetics, Sandy Lake, Pa.
MEM Controls, Inc., Wickliffe, Ohio
Midland Standard Inc., Elgin, Ill.
Minarik Elec. Co., Los Angeles, Cal.
Model Rectifier, Edison, N.J.
Neill Engrg. Co., Akron, Ohio
Parker Instr. Corp., Stamford, Conn.
Philco-Ford Corp., Washington, D.C.
Port-O-Vox Enterprises, Corp., New York, N.Y.
Power Control Corp., Pittsburgh, Pa.
Prototype Transformer Corp., E. Orange, N.J.
Randtronics, Inc., Palo Alto, Cal.
Reliance Elec. Co., Cleveland, Ohio
Research, Inc., Minneapolis, Minn.
Robicon Corp., Pittsburgh, Pa
Robotron Corp., Detroit, Mich.
Rosemount, Minneapolis, Minn.
Rosemount Engrg. Co., Minneapolis, Minn.
Scientific-Atlanta, Inc., Atlanta, Ga.
Seco Elctrns. Corp., Hopkins, Minn.
Sensor Corp., Greenwich, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
T & T Controls Co., Media, Pa.
Teledyne Inet, Gardena, Cal.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Vectrol, Inc., Rockville, Md.
Voltex Co., Inc., Farmingdale, N.Y.
Ward Leonard, Mt. Vernon, N.Y.
Welco Inds. Inc., Cincinnati, Ohio
Wer Ind'l. Corp., Grand Island, N.Y.
West Instr. Div., Schiller Pk., Ill.
Westamp, Inc., Santa Monica, Cal.
Westinghouse Elec. Int'l., New York, N.Y.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Zenrad Controls Co., Santa Barbara, Cal.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Icon Corp., Cambridge, Mass.

Controls, Servo System

American Nucleonics Corp., Woodland Hills, Cal
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. .... p 1865
California Elctrn. Mfg. Co., Alamo, Calif.
Control Technology Co., L.I.C., N.Y. p 1869
Dranetz Engrg. Labs., Plainfield, N.J. p 436
International Rectifier, El Segundo, Cal.
Vernitron Corp., Deer Pk., N.Y.
Anocut Engrg. Co., Elk Grove Village, Ill.
Auto Control Labs., Los Angeles, Calif.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Betzelt GMBH, Trogerstr. 32, W. Germany
Blake Electronics, Inc., Muskego, Wisc.
Conductron Corp., St. Charles, Mo.
Electro-Craft Corp, Hopkins, Minn
Glar-Ban Corp., Buffalo, N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
Innovatek Enterprise, Millerton, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Theta Instr. Corp., Fairfield, N.J.
Unholtz-Dickie Corp., Hamden, Conn.
Westamp, Inc., Santa Monica, Cal.
Weston-Transicoil, Worcester, Pa.

Controls, Smoke & Combustion—See Controls, Combustion

Controls, Specific Gravity

Automation Products, Inc., Houston, Tex.
Bailey Meter Co., Wickliffe, Ohio
Bristol Div, Waterbury, Conn
Foxboro Co., Foxboro, Mass.
Kay-Ray, Inc., Palatine, Ill.
Luft Instrs., Inc., Lincoln, Mass.
NUS Corp., Paramus, N.J.
Taylor Instr. Process Control Div., Rochester, N.Y.

Controls, Stepping Motor

Automation Dev., Culver City, Cal. p 1310
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. .... p 1867
Computer Devices of Calif., Santa Fe Springs, Cal.
Computer Instrs., Hempstead, N.Y.
General Elec. Co., Schenectady, N.Y.
Haydon, A. W. Co., Waterbury, Conn. p 1597
Icon Corp., Cambridge, Mass. .... p 1333
Ledex, Inc., Dayton, Ohio
Precision Timer, Westbrook, Conn.
Sealectro Corp., Mamaroneck, N.Y.
Summit Engrg. Corp., Bozeman, Mont.
Vernitron Corp., Deer Pk., N.Y.
American Elctrns., Inc., Fullerton, Cal.
Anocut Engrg. Co., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
B & B Motor & Control, New York, NY
Bogue Elec. Mfg. Co., Paterson, N.J.
Boston Digital Corp., Ashland, Mass.
Bowmar/TIC, Inc., Newbury Park, Calif.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Controlotron Corp., Farmingdale, N.Y.
Digital Prods., San Pedro, Calif.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Furnas Elec. Co., Batavia, Ill.
Gap Instr. Corp., Hauppauge, N.Y.
General Equip. & Mfg., Louisville, Ky.
Gerber Sci. Instr. Co., Hartford, Conn.
Glentek, Inc., Santa Monica, Calif.
Harowe Servo Controls, W. Chester, Pa.
Honeywell, Apparatus Controls, Mpls., Minn.
IMC Magnetics Corp., Maywood, Cal.
Keltron Corp., Waltham, Mass.
Micro Switch, Freeport, Ill.
Motorola Instr. & Control, Phoenix, Ariz.
Power Control Corp., Pittsburgh, Pa.
Servo Dev. Corp., Hicksville, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Singer-General Precision, Inc., Little Falls, N.J.
Superior Elec., Bristol, Conn.
T & T Controls Co., Media, Pa.
Teledyne Gurley, Troy, N.Y.
Teledyne Kinetics, Solana Beach, Cal.
Texas Instruments, Inc., Attleboro, Mass.
Theta Instr. Corp., Fairfield, N.J.
USM Corp., Wakefield, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Weston-Transicoil, Worcester, Pa.

Controls, Temperature

ADC Prods., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
Allen-Bradley Co., Milwaukee, Wisc.
Andersen Labs. Inc., Bloomfield, Conn.
API Instrs. Co., Waltham,, Mass. p 402,403
Autronics Corp., Pasadena, Calif.
Beede Electrical Instr. Co., Inc., Penacook, N.H.
Blue M Engrg. Co., Blue Island, Ill.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1363
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Control Technology Co., L.I.C., N.Y. p 1868
Cox & Co., Inc., New York, N.Y... p 1968
Dohrmann Div., Mountain View, Cal. p 1969
Electronic Research Co., Shawnee Mission, Kans. .... p 458
Elmwood Sensors, Inc., Cranston, R.I. p 1970
Engelhard Minerals & Chem., Murray Hill, N.J.
General Elec. Co., Schenectady, N.Y.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Harrel, Inc., E. Norwalk, Conn. .... p 1973
Hexacon Elec. Co., Roselle Park, N.J.
Hickok Elect. Instr., Cleveland, Ohio
International Rectifier, El Segundo, Cal.
James Elctrns., Inc., Chicago, Ill.
Keystone Carbon Co., St. Marys, Pa.
Matrix Corp., Beech Grove, Ind.
McLean Engrg. Labs., Princeton Jctn., N.J. .... p 2788
North Hills Elctrns., Inc., Glen Cove, N.Y.
Oven Inds., Mechanicsburg, Pa. p 1394
Philadelphia Sci. Controls, Croydon, Pa.
Quindar Elctrns., Inc., Springfield, N.J.
RFL Inds., Thermocontrol Div., Boonton, N.J. .... p 1983
RO Assocs., Menlo Pk., Cal.
Rustrak Instr. Div., Manchester, N.H. p 595
Simpson Elec. Co., Chicago, Ill.
Square D Co., Milwaukee, Wisc. p 1347
Syracuse Elctrns. Corp., Syracuse, N.Y.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Weller, Easton, Pa.
A & M Instrument, Inc., Great Neck, N.Y.
A. J. Abrams Co., Westport, Conn.
Acromag, Inc., Wixom, Mich.
Addison Div., Mountainside, N.J.
Advanced Kinetics, Costa Mesa, Calif.
Aladdin Controls, Nashville, Tenn.
Alnor Instr. Co., Chicago, Ill.
Alpha-Monarch Corp., Dallas, Tex.
American Standard, Franklin Pk., Ill.
AMF Electical Prods., Alexandria, Va.
Amstro Corp., Fairfield, N.J.
Andonian Assocs., Inc., Waltham, Mass.
Artronix, Inc., St. Louis, Mo.
Astro Dynamics, Inc., Burlington, Mass.
Atkins Technical, Inc., Gainesville, Fla.
Automatic Control Elctrns. Co., San Antonio, Tex.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barnes Engrg. Co., Stamford, Conn.
Beckman Instrs., Process Instrs., Fullerton, Cal.
BECO Solid State Systems, Salem, Va.
Bell & Howell Co., Pasadena, Calif.
Bimet Corp., Morris, Ill.
Blake Electronics, Inc., Muskego, Wisc.
Bristol Div, Waterbury, Conn
Burling Instr. Co., Chatham, N.J.
Caig Labs., Inc., Westbury, N.Y.
Cambridge Thermionic, Cambridge, Mass
Chatham Controls Corp., Chatham, N.J.
Climatronics Corp., Hauppauge, N.Y.
Cole-Parmer Instr. Co., Chicago, Ill.
Columbus Elec. Mfg. Co., Columbus, Ohio
Consolidated Controls Corp., El Segundo, Calif.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Dales, Franklin Co., Akron, Ohio

Davidson Elctrn. Dev. Co., Erie, Pa.
Decor Elctrns. Corp., Austin, Tex.
Delta-Tronics Corp., Tempe, Ariz.
Devco Engrg., W. Caldwell, N.J.
Dynamic Controls Corp., S. Windsor, Conn.
Dynamic Precision Controls, Hagerstown, Ind.
EDC Data Comps. Corp., Massapequa, N.Y.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Elcom Sys., Deer Pk., N.Y.
Electro-Flex Heat, Inc., Bloomfield, Conn.
Electro-Pacific, Inc., Goleta, Calif.
Electrol Co., Inc., York, Pa.
Elctrn. Control Co., Dresher, Pa.
Electronic Control Corp., Detroit, Mich.
Elctrn. Control Sys., Fairmont, W. Va.
Electronic Design Labs., Inc., Phila., Pa.
Elctrn. Modules Corp., Timonium, Md.
Elgin Elctrns., Waterford, Pa.
Essex International, Mansfield, Ohio
Fasco Inds., Inc., Rochester, N.Y.
Fenwal, Inc., Ashland, Mass.
Firing Circuits Div., Norwalk, Conn
Fischer & Porter Co., Warminster, Pa.
Fisher Sci. Co., Pittsburgh, Pa.
Foxboro Co., Foxboro, Mass.
FRL, Marin Controls Co., Belmont, Cal.
Fuel Watchman Sls. & Svc., Inc., Bronx, N.Y.
General Oceanology, Inc., Cambridge, Mass.
Glentek, Inc., Santa Monica, Calif.
Glo-Quartz Elec. Heater Co., Mentor, Ohio
Guardian California, Culver City, Cal.
Guildline Instrs., Inc., Larchmont, N.Y.
H-B Instr. Co., Phila., Pa.
Hafstrom Tech. Prods., Inc., San Diego, Calif.
Halmar Elctrns., Inc., Columbus, Ohio
High Temperature Instr., W. Conshohocken, Pa.
Hoagland Instr., Red Bank, N.J.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Honeywell, Residential Div., Mpls., Minn.
Hope Elctrns., Clifton, N.J.
Hughes Aircraft Co, Culver City, Cal.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Hygrodynamics, Inc., Silver Spring, Md.
Infrared Inds., Inc., Santa Barbara, Cal.
Instrulab, Inc., Dayton, Ohio
Instr. & Control Sys., Inc., Addison, Ill.
Instruments, Inc., San Diego, Calif.
Integrated Controls, San Diego, Cal.
Integrated Dev. & Mfg. Co., Chagrin Falls, Ohio
Intercontinental Elctrns., E. Rochester, N.Y.
Int'l. Instrs., Orange, Conn.
Ircon Inc., Niles, Ill.
Jersey Tech. Conslts., Morristown, N.J.
Kidde, Walter & Co., Belleville, N.J.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Leeds & Northrup Corp., No. Wales, Pa.
Lewis Engrg. Co., Naugatuck, Conn.
Loyola Industries, Inc., El Segundo, Calif.
Luft Instrs., Inc., Lincoln, Mass.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Mag-Con Engrg. Co., St. Paul, Minn.
Malaker Corp., High Bridge, N.J.
Materials Development, Los Angeles, Cal.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Mercoid Corp., Chicago, Ill.
Micro-Technical Inds., Laguna Beach, Cal.
Midland Standard Inc., Elgin, Ill.
Motorola Instr. & Control, Phoenix, Ariz.
Norwalk Thermostat Co., Norwalk, Ohio
Nuclear Resch. Corp., Southampton, Pa.
Nuclear Sys., Garland, Tex.
OAL Assocs., Inc., Westbury, N.Y.
Omega Engrg., Inc., Stamford, Conn.
Oxford Instr. Corp., Annapolis, Md.
Pacific Electro Dynamics, Bellevue, Wash
Pennsylvania Elctrns. Technology, Pittsburgh, Pa.
Phoenix Materials Corp., Kittanning, Pa.
Power Control Corp., Pittsburgh, Pa.
Precision Elctrns., Inc., Amityville, N.Y.
Precision Sci. Co., Chicago, Ill.
Princeton Applied Resch. Corp., Princeton, N.J.
Princo Instrs., Southampton, Pa.
Projects Unlimited, Inc., Dayton, Ohio
Pyrometer Instr. Co., Inc., Northvale, N J
Relco Prods., Denver, Colo.
Research, Inc., Minneapolis, Minn.
Research Instr. Co., Westbury, N.Y.
RIL Elctrns., Inc., Southampton, Pa.
Robertshaw Controls Co., Anaheim, Cal.
Robicon Corp., Pittsburgh, Pa
Rosemount, Minneapolis, Minn.
Rosemount Engrg. Co., Minneapolis, Minn.
Rosemount Plug-In, Inc., Nashville, Tenn.
Scientronics, Barrington, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Simmonds Precision Prods., Inc., Bellows Falls, Vt.
Square D Co., Park Ridge, Ill.
Sundstrand Data Control, Redmond, Wash.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Superior Elec., Bristol, Conn.
Syscon Int'l., Inc., So. Bend, Ind.
T & T Controls Co., Media, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Technology/Versatronics, Yellow Springs, Ohio
Tem-Pres Research Div., State College, Pa.
Tempil Div., So. Plainfield, N.J.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Thermal Sys., Los Angeles, Cal.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
Thermometrics, Inc., Edison, N.J.
Trans-Met Engrg., La Habra, Cal.
Transducer Controls Corp., Covina, Calif.
Tylan Corp., Torrance, Calif.
United Elec. Controls Co., Watertown, Mass.
Varian Assocs., Vacuum Div., Palo Alto, Cal.
Victory Engrg. Corp., Springfield, N.J.
VirTis Co., Inc., Gardiner, N.Y.
Voltex Co., Inc., Farmingdale, N.Y.
Vulcan Elec. ITT, Danvers, Mass.
West Instr. Div., Schiller Pk., Ill.
Westinghouse Elec. Int'l., New York, N.Y.
Wiegand, Edwin L. Co., Pittsburgh, Pa.
Williamson Corp., Concord, Mass.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio
Zenrad Controls Co., Santa Barbara, Cal.

Controls, Thyratron Grid

Del Elctrns. Corp., Mt. Vernon, N.Y.
Firing Circuits Div., Norwalk, Conn
Hope Elctrns., Clifton, N.J.
Instru-Lec Corp., Mt. Vernon, N.Y.
Post Elctrn. Prods., Beverly, Mass.
Robotron Corp., Detroit, Mich.
Taylor-Winfield Corp., Warren, Ohio
Walters, W.A., Inc., Chicago, Ill.
Weltronic Co., Southfield, Mich.

Controls, Timing—See Timers

Controls, Torque-Electronic

Airpax Elctrns., Inc., Cambridge, Md.
Bodine Elec. Co., Chicago, Ill. .... p 1581
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y. .... p 1867
General Time Corp., Torrington, Conn.
Allis, Louis Co., Milwaukee, Wisc.
Ametek/Instrs. & Controls, Feasterville, Pa.
B & B Motor & Control, New York, NY
Bergen Labs., Inc., Paterson, N.J.
Bogue Elec. Mfg. Co., Paterson, N.J.
Bowmar/TIC, Inc., Newbury Park, Calif.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Dynamic Precision Controls, Hagerstown, Ind.
Electro-Devices, Inc., Paterson, N.J.
Electrol Co., Inc., York, Pa.
Electronic Control Corp., Detroit, Mich.
Falcon Div., Wilmington, Mass.
Fincor Div., York, Pa.
Himmelstein, S. & Co., Elk Grove Village, Ill.
Hobbs Mfg. Co., Worcester, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Integrated Dev. & Mfg. Co., Chagrin Falls, Ohio
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Magtrol, Inc., Buffalo, N.Y.
McFadden Elctrns. Co., South Gate, Calif.
McNab, Inc., New York, N.Y.
Minarik Elec. Co., Los Angeles, Cal.
Minnetech Labs., Inc., Minneapolis, Minn.
Parker Instr. Corp., Stamford, Conn.
Power Control Corp., Pittsburgh, Pa.
Power Instrs., Skokie, Ill.
Randtronics, Inc., Palo Alto, Cal.
Robicon Corp., Pittsburgh, Pa
Sigma Instrs., Inc., Braintree, Mass.
Tyco Instr. Div., Waltham, Mass.
Welco Inds. Inc., Cincinnati, Ohio
West Coast Resch. Corp., Los Angeles, Calif.

Controls, Vacuum—See Vol 1

Controls, Ventilating

Borg-Warner Controls, Santa Ana, Cal.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Foxboro Co., Foxboro, Mass.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Residential Div., Mpls., Minn.
Integrated Dev. & Mfg. Co., Chagrin Falls, Ohio
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Paragon Elec. Co., Two Rivers, Wisc.
Puritan-Zep, El Segundo, Cal.
Robicon Corp., Pittsburgh, Pa
Taylor Instr. Process Control Div., Rochester, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.

Controls, Voltage Regulating—See Regulators & Stabilizers, Voltage—Vol 1

Controls, Volume & Tone—See Potentiometers—Vol 3

Controls, Welding—See Vol 1

Controls, Wire Wound—See Potentiometers; Rheostats—Vol 3

Convection Cooling Packages, Semiconductor—See Transistor & Diode Heat Dissipators

Converters, A-C To D-C—See Vol 1

Converters, Analog To Digital—See Vol 1

Converters, Analog to Digital, Monolithic

Precision Monolithics, Santa Clara, Cal. p 1546,1547
Analog Devices, Inc., Norwood, Mass.
Fairchild Semiconductor, Mountain View, Calif.
Harris Semiconductor, Melbourne, Fla.

Converters, Analog To Pulse—See Vol 1

Converters, Binary To Decimal—See Vol 1

Converters, Card To Tape—See Vol 1

Converters, Counter, Vertical To Horizontal Readout—See Vol 1

Converters, CRT Display—See Vol 1

Converters, D-C To D-C—See Vol 1

Converters, D-C To Frequency—See Vol 1

Converters, Digital To Analog—See Vol 1

Converters, Digital To Paper Tape—See Vol 1

Converters, Digital To Resolver—See Vol 1

Converters, Digital To Synchro—See Vol 1

Converters, Facsimile—See Vol 1

Converters, Frequency, Logarithmic—See Vol 1

Converters, Frequency Shift Keying—See Vol 1

Converters, Frequency, Test—See Vol 1

Converters, Frequency To D-C—See Vol 1

Converters, Graphic To Digital—See Vol 1

Converters, High-Frequency—See Vol 1

Converters, Low-Frequency—See Vol 1

Converters, Microwave Frequency—See Vol 1

Converters, Paper Tape To Magnetic Tape—See Vol 1

Converters, Paper Tape To Paper Tape—See Vol 1

Converters, Phase—See Vol 1

Converters, Polar To Rectangular Coordinates—See Vol 1

Converters, Power Frequency, Electronic—See Vol 1

Converters, Power Frequency, Rotary—See Vol 1

Converters, Power Frequency, Vibrator—See Vol 1

Converters, Pressure To D-C—See Transducers, Pressure

Converters, Pressure To Frequency—See Transducers, Pressure

Converters, Pulse To Analog—See Vol 1

Converters, Pulse To Digital—See Vol 1

Converters, Resolver To Digital—See Vol 1

Converters, Scan—See Vol 1

Converters, Signal To Color—See Vol 1

Converters, Single Sideband Receiver—See Vol 1

Converters, Synchro To Digital—See Vol 1

Converters, Synchro To Linear DC—See Vol 1

Converters, Synchro To Sine-Cosine—See Vol 1

Converters, Tape To Card—See Vol 1

Converters, Telemetry—See Vol 1

Converters UHF To VHF—See Vol 1

Converters, Vibrator Type—See Converters, Power Frequency, Vibrator—Vol 1

Converters, Voltage To Frequency—See Vol 1

Coolants, Circuit & Component—See Vol 3

Coolers, Cryogenic—See Vol 1

Cooling Equipment—See Air Conditioners; Blowers & Fans—Vol 3

Cooling/Heating Modules, Thermoelectric

Associated Testing Labs., Inc., Wayne, N.J.
Bailey Instrs., Inc., Saddle Brook, N.J.
Borg-Warner Thermoelectrics, Des Plaines, Ill.
Cambridge Thermionic, Cambridge, Mass
Hughes Aircraft Co, Culver City, Cal.
Melcor-Materials Elctrn. Prods., Trenton, N.J.
Nuclear Sys., Garland, Tex.
Siemens Corp., Comps. Div., Iselin, N.J.
Thermalloy Co., Dallas, Tex.
3M Co., St. Paul, Minn.

Cooling Packages, Semiconductor—See Transistor & Diode Heat Dissipators

Cooling Sprays—See Coolants, Circuit & Component—Vol 3

Coordinate Measuring Machines—See Machines, Measuring—Vol 1

Copper Clad Laminates —See Laminates, Metal Clad—Vol 3

Cords & Cable, Dial Drive

Consolidated Wire & Assoc. Corps., Chicago, Ill.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
GC Elctrns., Rockford, Ill. .... p 2629
Saxton Prods., Congers, N.Y.
Bergen Wire Rope Co., Lodi, N.J.
Bevin-Wilcox Line Co., Moodus, Conn.
Birnbach Co., Inc., Freeport, N.Y.
EV/Game, Inc., Freeport, N.Y.
Gudebrod Bros. Silk Co., Inc., New York, N.Y.
Hackensack Cable Corp., Hackensack, N.J.
Philmore Mfg. Co., Richmond Hill, N.Y.
Plastic Wire & Cable Corp., Jewett City, Conn.
Shigoto Inds., Ltd., New York, N.Y.

Cords & Tapes, Lacing—See Vol 3

Cords, Line & Set, Extension—See Vol 3

Cords, Line (Lamp)—See Cable, Multiconductor—Vol 3

Cords, Line, Resistance—See Vol 3

Cords, Patch—See Vol 3

Cords, Power—See Cable, Power—Vol 3

Cords, Retractile—See Vol 3

Cords, Speaker Extension—See Cable, Audio—Vol 3

Cords, Twin Lead—See Cable, Multiconductor—Vol 3

Core Arrays, Memory—See Memory Arrays—Vol 1

Core Planes, Memory—See Memory Planes—Vol 1

Core Stacks, Memory—See Memory Stacks—Vol 1

Core Memory Systems—See Memory Systems, Core—Vol 1

Cores, Ceramic—See Vol 3

Cores, Magnetic, Ferrite, EL & E—See Vol 3

Cores, Magnetic, Ferrite, Pot/Cup—See Vol 3

Cores, Magnetic, Ferrite, Slug—See Vol 3

Cores, Magnetic, Ferrite, Toroid—See Vol 3

Cores, Magnetic, Ferrite, Yoke Section—See Vol 3

Cores, Magnetic, Metal Alloy (Other Than Silicon & Nickel-Iron)—See Vol 3

Cores, Magnetic, Nickel-Iron, EL, EE, F & Ring Laminations—See Vol 3

Cores, Magnetic, Nickel-Iron, Toroid—See Vol 3

Cores, Magnetic, Powdered Iron, Pot/Cup—See Vol 3

Cores, Magnetic, Powdered Iron, Slug—See Vol 3

Cores, Magnetic, Powdered Iron, Toroid—See Vol 3

Cores, Magnetic, Powdered Permalloy, Toroid—See Vol 3

Cores, Magnetic, Silicon, "C"—See Vol 3

Cores, Magnetic, Silicon EI, EE & F, Laminations—See Vol 3

Cores, Magnetic, Silicon, Toroid—See Vol 3

Corners, Waveguide—See Bends & Twists, Microwave—Vol 1

Corona Testers—See Testers, Corona—Vol 1

Coulometers—See Timers, Electrolytic Cell

Counters, Bi-Directional

A. D. Data Sys., Inc., Rochester, N.Y.
Anadex Instrs., Inc., Van Nuys, Calif. p 391
Atec, Inc., Houston, Tex. .... p 410
Automation Dev., Culver City, Cal.
Beckman Instruments, Shiller Pk., Ill. p 413
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1312
Chrono-log Corp., Broomall, Pa.
Data Graphics, San Antonio, Tex. p 346
Digital Equip. Corp., Maynard, Mass.
Digitron Corp., Norristown, Pa.
Durant Digital Instrs., Milwaukee, Wisc. p 1316
Eldorado Electrodata, Concord, Cal.
Electronic Research Co., Shawnee Mission, Kans. .... p 458
Fork Standards, W. Chicago, Ill.
Geo Space Sys., Tampa, Fla.
Gibbs Mfg. & Resch., Janesville, Wisc.
Haydon, A. W. Co., Waterbury, Conn.
Hecon Corp., New Shrewsbury, N.J. p 1332
Hewlett-Packard, Palo Alto, Cal.
Hi-G, Windsor Locks, Conn.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Icon Corp., Cambridge, Mass.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Kessler-Ellis Prods., Atlantic Highlands, N.J. .... p 1336
Landis & Gyr, Inc., Elmsford, N.Y.p 1337
Monitor Labs, Inc., San Diego, Cal.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J..... p 529
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Parabam, Inc., Compton, Cal.
Planet Instr., Ft. Wayne, Ind. ...... p 1340
Presin Co., Inc., Shelton, Conn... p 1345
Renco Corp., Goleta, Cal.
Summit Engrg. Corp., Bozeman, Mont.
Veeder-Root, Hartford, Conn....... p 1352
Abrams Instr., Lansing, Mich.
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
Anocut Engrg. Co., Elk Grove Village, Ill.
Baldwin Elctrns., Little Rock, Ark.
Burroughs Corp., Plainfield, N.J.
Canadian Research Institute, Don Mills, Ont., Canada
CGS Units, Inc., Rochester, N.Y.
Commander Labs., Inc., Escondido, Calif.
Computer Conversions Corp., East Northport, N.Y.
Controlcraft Corp., West Chicago, Ill.
Data Dynamics Div., Englewood, N.J.
Data Technology Corp., Palo Alto, Cal.
Data Technology Inc., Watertown, Mass.
Davidson Elctrn. Dev. Co., Erie, Pa.
Durant Mfg. Co., Milwaukee, Wisc.
Dynamics Resch. Corp., Wilmington, Mass.
Dynapar Corp., Gurnee, Ill.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
Elctrns., Ltd., Marion, Iowa
Encoder Division, Chatsworth, Cal.
ENM Co., Chicago, Ill.
Fairchild Semiconductor, Mountain View, Calif.
Fischer & Porter Co., Warminster, Pa.
Haydon Switch & Instr., Waterbury, Conn.
IKL, Inc., Newport Beach, Calif.
Instrumentation Tech. Corp., Northridge, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
JMR Elctrns. Corp., Bronx, N.Y.
Keltron Corp., Waltham, Mass.
Mast Dev. Co., Davenport, Iowa
MEKontrol Inc., Northboro, Mass.
Midland Standard Inc., Elgin, Ill.
Monitor Sys., Inc., Ft. Washington, Pa.
Moore Inds., Van Nuys, Cal.
Mullard, Inc., Farmingdale, N.Y.
Parametrics, Inc., Orange, Conn.
Post Elctrn. Prods., Beverly, Mass.
Redington Counters, Inc., Windsor, Conn.
Robertson Instr., Azusa, Cal.
Servo Dev. Corp., Hicksville, N.Y.
Struthers-Dunn, Inc., Bettendorf, Iowa
Techmetric Co., Redwood City, Calif.
Theta Instr. Corp., Fairfield, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Tyco Instr. Div., Waltham, Mass.
Wer Ind'l. Corp., Grand Island, N.Y.
Zehntel, Inc., Berkeley, Calif.

Counters, Coil Winding

Coast Coil Co., Los Angeles, Calif. p 2487
Durant Digital Instrs., Milwaukee, Wisc. p 1316
Fork Standards, W. Chicago, Ill.
Hecon Corp., New Shrewsbury, N.J.
Landis & Gyr, Inc., Elmsford, N.Y.
Presin Co., Inc., Shelton, Conn.
Veeder-Root, Hartford, Conn....... p 1352
Allis, Louis Co., Milwaukee, Wisc.
Avtron Mfg., Inc., Cleveland, Ohio
Controlcraft Corp., West Chicago, Ill.
Data Dynamics Div., Englewood, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Durant Mfg. Co., Milwaukee, Wisc.
Dynapar Corp., Gurnee, Ill.
Elden Mfg. Corp., Chicago, Ill.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
JMR Elctrns. Corp., Bronx, N.Y.
Post Elctrn. Prods., Beverly, Mass.
Robertson Instr., Azusa, Cal.
Struthers-Dunn, Inc., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Digitron Corp., Norristown, Pa.
Icon Corp., Cambridge, Mass.
Tempo/UTI Div., Chatsworth, Cal.
Neutronic Corp., Bridgeton, Mo.

Counters, Directional

A. D. Data Sys., Inc., Rochester, N.Y.
Anadex Instrs., Inc., Van Nuys, Calif.
Automation Dev., Culver City, Cal.
Beckman Instruments, Shiller Pk., Ill. p 413
Durant Digital Instrs., Milwaukee, Wisc. p 1316
Eldorado Electrodata, Concord, Cal. p 449
Gibbs Mfg. & Resch., Janesville, Wisc.
Hecon Corp., New Shrewsbury, N.J. p 1332
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Kessler-Ellis Prods., Atlantic Highlands, N.J. .... p 1336
Landis & Gyr, Inc., Elmsford, N.Y.p 1337
Parabam, Inc., Compton, Cal.
Planet Instr., Ft. Wayne, Ind. ...... p 1340
Tempo/UTI Div., Chatsworth, Cal.
Veeder-Root, Hartford, Conn....... p 1352
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
Anocut Engrg. Co., Elk Grove Village, Ill.
Burroughs Corp., Plainfield, N.J.
Controlcraft Corp., West Chicago, Ill.
Data Dynamics Div., Englewood, N.J.
Data Technology Corp., Palo Alto, Cal.
Data Technology Inc., Watertown, Mass.
Durant Mfg. Co., Milwaukee, Wisc.
Dynamics Resch. Corp., Wilmington, Mass.
Dynapar Corp., Gurnee, Ill.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
Elctrns., Ltd., Marion, Iowa
Fairchild Semiconductor, Mountain View, Calif.
IKL, Inc., Newport Beach, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
JMR Elctrns. Corp., Bronx, N.Y.
Keltron Corp., Waltham, Mass.
MEKontrol Inc., Northboro, Mass.
Monitor Sys., Inc., Ft. Washington, Pa.
Mullard, Inc., Farmingdale, N.Y.
Post Elctrn. Prods., Beverly, Mass.
Robertson Instr., Azusa, Cal.
Servo Dev. Corp., Hicksville, N.Y.
Struthers-Dunn, Inc., Bettendorf, Iowa
Techmetric Co., Redwood City, Calif.
Theta Instr. Corp., Fairfield, N.J.
3M Co., St. Paul, Minn.
Zehntel, Inc., Berkeley, Calif.

Counters, Electro-Magnetic

Chrono-log Corp., Broomall, Pa.
Durant Digital Instrs., Milwaukee, Wisc. p 1316
Dytro Corp., Hicksville, N.Y.
Eagle-Signal Div., Davenport, Iowa p 1317
Gibbs Mfg. & Resch., Janesville, Wisc.
Haydon, A. W. Co., Waterbury, Conn.
Hecon Corp., New Shrewsbury, N.J. p 1332
Kessler-Ellis Prods., Atlantic Highlands, N.J. .... p 1336
Landis & Gyr, Inc., Elmsford, N.Y.p 1337
Norden Div., Norwalk, Conn.
Parabam, Inc., Compton, Cal.
Precision Timer, Westbrook, Conn.
Presin Co., Inc., Shelton, Conn... p 1345
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Veeder-Root, Hartford, Conn....... p 1352
Abrams Instr., Lansing, Mich.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Canadian Research Institute, Don Mills, Ont., Canada
Cramer Div., Old Saybrook, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Elden Mfg. Corp., Chicago, Ill.
Electric Tachometer Corp., Philadelphia, Pa.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
Elctrns., Ltd., Marion, Iowa
ENM Co., Chicago, Ill.
General Equip. & Mfg., Louisville, Ky.

Hughes Aircraft Co, Fullerton, Cal.
Hyde Park Elctrns., Inc., Dayton, Ohio
MEKontrol Inc., Northboro, Mass.
Micro Switch, Freeport, Ill.
Orbit Instr. Corp., Syosset, N.Y.
PECO, Milpitas, Cal.
Photomation, Inc., Mountain View, Calif.
Power Instrs., Skokie, Ill.
Practical Automation, Inc., Shelton, Conn.
Redington Counters, Inc., Windsor, Conn.
Robertson Instr., Azusa, Cal.
Robot Inds., Inc., Dearborn, Mich.
Rowan Controller, Westminister, Md.
Sigma Instrs., Inc., Braintree, Mass.
Singer-General Precision, Inc., Little Falls, N.J.
Stock Drive Prods., New Hyde Pk., N.Y.
United Aircraft Corp., Norwalk, Conn.

Counters, Frequency— See Vol 1

Counters, Gating

A. D. Data Sys., Inc., Rochester, N.Y.
Anadex Instrs., Inc., Van Nuys, Calif. p 391
Atec, Inc., Houston, Tex. .... p 410
Automation Dev., Culver City, Cal.
Eldorado Electrodata, Concord, Cal. p 449
Fork Standards, W. Chicago, Ill.
Hewlett-Packard, Palo Alto, Cal.
Landis & Gyr, Inc., Elmsford, N.Y.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J. p 528,529
Systron-Donner Concord Instr. Div., Concord, Cal.
Veeder-Root, Hartford, Conn.
Allis, Louis Co., Milwaukee, Wisc.
Controlcraft Corp., West Chicago, Ill.
Data Dynamics Div., Englewood, N.J.
Datum, Inc., Anaheim, Calif.
Digital Displays, Mendham, N.J.
Dynapar Corp., Gurnee, Ill.
Instrumentation Tech. Corp., Northridge, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.
Loral Elctrn. Sys., Bronx, N.Y.
MEKontrol Inc., Northboro, Mass.
Monitor Sys., Inc., Ft. Washington, Pa.
Nanosecond Systems, Inc., Fairfield, Conn.
Neutronic Corp., Bridgeton, Mo.
Post Elctrn. Prods., Beverly, Mass.
Signetics Corp., Sunnyvale, Calif.
3M Co., St. Paul, Minn.
Tyco Instr. Div., Waltham, Mass.
Zehntel, Inc., Berkeley, Calif.

Counters, Geiger—See Vol 1

Counters, Mechanical

Amphenol Controls Div., Janesville, Wisc.
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1312
Chicago Dynamic Inds., Chicago, Ill.
Durant Digital Instrs., Milwaukee, Wisc.
Eagle-Signal Div., Davenport, Iowa
Gibbs Mfg. & Resch., Janesville, Wisc.
Haydon, A. W. Co., Waterbury, Conn.
Hecon Corp., New Shrewsbury, N.J.
Johnson E. F. Co., Waseca, Minn.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Landis & Gyr, Inc., Elmsford, N.Y.
Planet Instr., Ft. Wayne, Ind. ...... p 1340
Precision Timer, Westbrook, Conn.
Presin Co., Inc., Shelton, Conn... p 1345
Veeder-Root, Hartford, Conn....... p 1352
Allied Elctrns. Corp., Chicago, Ill.
Barker & Williamson, Bristol, Pa.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Durant Mfg. Co., Milwaukee, Wisc.
Dyonics, Inc., Woburn, Mass.
Elden Mfg. Corp., Chicago, Ill.
Electric Tachometer Corp., Philadelphia, Pa.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
Engler Instr. Corp., Jersey City, N.J.
ENM Co., Chicago, Ill.
Foxboro Co., Foxboro, Mass.
Mast Dev. Co., Davenport, Iowa
Melland Gear & Instr. Co., Inc., Westbury, N.Y.
Micro Switch, Freeport, Ill.
Olympic Instrs., Inc., Vashon, Wash.
Orbit Instr. Corp., Syosset, N.Y.
PIC Design Corp., Ridgefield, Conn.
Redington Counters, Inc., Windsor, Conn.
Robertson Instr., Azusa, Cal.
Servo Dev. Corp., Hicksville, N.Y.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
USM Corp., Wakefield, Mass.

Counters, Particle—See Vol 1

Counters, Photoelectric

Digitron Corp., Norristown, Pa.
Durant Digital Instrs., Milwaukee, Wisc.
General Elec. Co., Schenectady, N.Y.
Hecon Corp., New Shrewsbury, N.J.
Hewlett-Packard, Palo Alto, Cal.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Landis & Gyr, Inc., Elmsford, N.Y.
Meloy Laboratories, Springfield, Va.
Veeder-Root, Hartford, Conn.
Allis, Louis Co., Milwaukee, Wisc.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., Danville, Ill.
Baldwin Elctrns., Little Rock, Ark.
Controlcraft Corp., West Chicago, Ill.
Copar Corp., Oak Lawn, Ill.
Data Dynamics Div., Englewood, N.J.
De-Tec-Tronic Corp., Chicago, Ill.
Design Prods. Corp., Troy, Mich.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Durant Mfg. Co., Milwaukee, Wisc.
Dynapar Corp., Gurnee, Ill.
Dyonics, Inc., Woburn, Mass.
Ealing Corp., Cambridge, Mass.
Eastern Specialty Co., Philadelphia, Pa.
Electro-Sonic Control, Manteca, Calif.
Electroid Co., Union, N.J.
Electronic Control Corp., Detroit, Mich.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
ENM Co., Chicago, Ill.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Fiber Photics, Inc., Santa Cruz, Cal.
Frost Electronics Corp., Bellingham, Mass.
HEI, Inc., Chaska, Minn.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
JMR Elctrns. Corp., Bronx, N.Y.
Lehigh Valley Elctrn., Inc., Fogelsville, Pa.
MEKontrol Inc., Northboro, Mass.
Midland Standard Inc., Elgin, Ill.
Nuclear Resch. Corp., Southampton, Pa.
PECO, Milpitas, Cal.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Post Elctrn. Prods., Beverly, Mass.
Power Instrs., Skokie, Ill.
Robertson Instr., Azusa, Cal.
Sensor Corp., Greenwich, Conn.
Sigma Instrs., Inc., Braintree, Mass.
SSR Instrs. Co., Santa Monica, Cal.
Struthers-Dunn, Inc., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Tri-Tronics Co., Oak Brook, Ill.
Worner Elctrn. Devices, Rankin, Ill.

Counters, Preset

A. D. Data Sys., Inc., Rochester, N.Y.
Anadex Instrs., Inc., Van Nuys, Calif. p 394
Atec, Inc., Houston, Tex. .... p 410,411
Austron, Inc., Austin, Tex.
Automation Dev., Culver City, Cal.
Chrono-log Corp., Broomall, Pa.
Data Graphics, San Antonio, Tex. p 346
Durant Digital Instrs., Milwaukee, Wisc. p 1316
Eldorado Electrodata, Concord, Cal.
Electronic Research Co., Shawnee Mission, Kans. .... p 458
Fork Standards, W. Chicago, Ill.
Gibbs Mfg. & Resch., Janesville, Wisc.
Haydon, A. W. Co., Waterbury, Conn.
Hecon Corp., New Shrewsbury, N.J. p 1332
Hewlett-Packard, Palo Alto, Cal.
Hickok Elect. Instr., Cleveland, Ohio
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Icon Corp., Cambridge, Mass.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Kessler-Ellis Prods., Atlantic Highlands, N.J. .... p 1336
Landis & Gyr, Inc., Elmsford, N.Y. p 1337
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Parabam, Inc., Compton, Cal.
PPM, Inc., Bedford, Ohio
Precision Timer, Westbrook, Conn.
Presin Co., Inc., Shelton, Conn... p 1345
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Triac Elctrn. Sys., N.Y., N.Y.
Veeder-Root, Hartford, Conn....... p 1352
Abrams Instr., Lansing, Mich.
Allis, Louis Co., Milwaukee, Wisc.
Anocut Engrg. Co., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Burroughs Corp., Plainfield, N.J.
Conrac Corp., New York, N.Y.
Controlcraft Corp., West Chicago, Ill.
Copar Corp., Oak Lawn, Ill.
Cramer Div., Old Saybrook, Conn.
Data Dynamics Div., Englewood, N.J.
Data Technology Inc., Watertown, Mass.
Datum, Inc., Anaheim, Calif.
Di/An Controls, Inc., Boston, Mass.
Digital Displays, Mendham, N.J.
Durant Mfg. Co., Milwaukee, Wisc.
Dynamic Precision Controls, Hagerstown, Ind.
Dynamics Resch. Corp., Wilmington, Mass.
Dynapar Corp., Gurnee, Ill.
Dyonics, Inc., Woburn, Mass.
Elden Mfg. Corp., Chicago, Ill.
Electro-Sonic Control, Manteca, Calif.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
Elctrns., Ltd., Marion, Iowa
ENM Co., Chicago, Ill.
Fairchild Semiconductor, Mountain View, Calif.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Fischer & Porter Co., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
General Equip. & Mfg., Louisville, Ky.
Hird Brown America, Livingston, N.J.
HLS, Inc., Santa Clara, Cal.
IKL, Inc., Newport Beach, Calif.
Industrial Inventions, Inc., Monmouth Jct., N.J.
Instrumentation Tech. Corp., Northridge, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Intercontinental Elctrns., E. Rochester, N.Y.
JMR Elctrns. Corp., Bronx, N.Y.
Keltron Corp., Waltham, Mass.
MEKontrol Inc., Northboro, Mass.
Midland Standard Inc., Elgin, Ill.
Milletron, Inc., Pittsburgh, Pa.
Monitor Sys., Inc., Ft. Washington, Pa.
Moore Inds., Van Nuys, Cal.
Mullard, Inc., Farmingdale, N.Y.
Neutronic Corp., Bridgeton, Mo.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Nuclear Meas. Corp., Indianapolis, Ind.
PECO, Milpitas, Cal.
Photomation, Inc., Mountain View, Calif.
Post Elctrn. Prods., Beverly, Mass.
Robertson Instr., Azusa, Cal.
Rowan Controller, Westminister, Md.
Sensor Corp., Greenwich, Conn.
Soltec Corp., No. Hollywood, Cal.
SSR Instrs. Co., Santa Monica, Cal.
Stock Drive Prods., New Hyde Pk., N.Y.
Struthers-Dunn, Inc., Bettendorf, Iowa
Techmetric Co., Redwood City, Calif.
Theta Instr. Corp., Fairfield, N.J.
3M Co., St. Paul, Minn.
Tyco Instr. Div., Waltham, Mass.
Wer Ind'l. Corp., Grand Island, N.Y.
Zehntel, Inc., Berkeley, Calif.

Counters, Proportional—See Counters, Particle—Vol 1

Counters, Pulse

A. D. Data Sys., Inc., Rochester, N.Y.
Alco Elctrn. Prods., Lawrence, Mass.
Anadex Instrs., Inc., Van Nuys, Calif. p 391
Atec, Inc., Houston, Tex. ....p 410,411
Automation Dev., Culver City, Cal.
Beckman Instruments, Shiller Pk., Ill. p 413
Chicago Dynamic Inds., Chicago, Ill.
Chicago Switch, Chicago, Ill.
Chronetics, Inc., Mt. Vernon, N.Y.
Curtis Instrs., Inc., Mt. Kisco, N.Y.
Digital Equip. Corp., Maynard, Mass.
Durant Digital Instrs., Milwaukee, Wisc. p 1316
Eagle-Signal Div., Davenport, Iowa p 1317
Eldorado Electrodata, Concord, Cal.
Electro-Numerics, Santa Clara, Cal.
Gibbs Mfg. & Resch., Janesville, Wisc.
Haydon, A. W. Co., Waterbury, Conn.
Hecon Corp., New Shrewsbury, N.J. p 1332
Hewlett-Packard, Palo Alto, Cal.
Hickok Elect. Instr., Cleveland, Ohio p 488
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Icon Corp., Cambridge, Mass.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Landis & Gyr, Inc., Elmsford, N.Y.p 1337
Monsanto Company, Electronic Instruments, W. Caldwell, N.J..... p 528
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Parabam, Inc., Compton, Cal.
Pennwood Numechron, Pittsburgh, Pa. p 372
Precision Timer, Westbrook, Conn.
Presin Co., Inc., Shelton, Conn... p 1345
Quan-Tech, Whippany, N.J.
Systron-Donner Concord Instr. Div., Concord, Cal.
Tektronix, Inc., Beaverton, Ore.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Veeder-Root, Hartford, Conn....... p 1352
Victoreen Instr., Cleveland, Ohio
Abrams Instr., Lansing, Mich.
Acoustronics, Inc., Huntington, N.Y.
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bio-Medical Elctrns., Inc., Rockville, Md.
Central Scientific Co., Chicago, Ill.
Components Corp., Denville, N.J.
Conrac Corp., New York, N.Y.
Controlcraft Corp., West Chicago, Ill.
Copar Corp., Oak Lawn, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Data Dynamics Div., Englewood, N.J.
Data Technology Inc., Watertown, Mass.
Digiac Corp., Plainview, N.Y.
Digital Displays, Mendham, N.J.
Durant Mfg. Co., Milwaukee, Wisc.
Dynamic Precision Controls, Hagerstown, Ind.
Dynamics Resch. Corp., Wilmington, Mass.
Dynapar Corp., Gurnee, Ill.
Ealing Corp., Cambridge, Mass.
Eberline Instr. Corp., Santa Fe, N.M.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
ENM Co., Chicago, Ill.
Fischer & Porter Co., Warminster, Pa.
Foster & Allen, Inc., Chatham, N.J.
Foxboro Co., Foxboro, Mass.
General Equip. & Mfg., Louisville, Ky.
Harshaw Chem. Co., Cleveland, Ohio
Honeywell, Apparatus Controls, Mpls., Minn.
IKL, Inc., Newport Beach, Calif.
Instrumentation Tech. Corp., Northridge, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Intercontinental Elctrns., E. Rochester, N.Y.
JMR Elctrns. Corp., Bronx, N.Y.
Lecroy Resch. Sys. Corp., West Nyack, N.Y.

Magtrol, Inc., Buffalo, N.Y.
McKee-Pedersen Instrs., Danville, Calif.
MEKontrol Inc., Northboro, Mass.
Milletron, Inc., Pittsburgh, Pa.
Moore Inds., Van Nuys, Cal.
Neutronic Corp., Bridgeton, Mo.
Northeast Elctrns. Corp., Concord, N.H.
Nuclear-Chicago, Des Plaines, Ill.
Nuclear Data, Inc., Palatine, Ill.
Nuclear Diodes, Prairie View, Ill.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Nuclear Meas. Corp., Indianapolis, Ind.
Nuclear Resch. Corp., Southampton, Pa.
Packard Instrument Co., Inc., Downers Grove, Ill.
Philco-Ford Corp., Washington, D.C.
Philips Elctrn. Instrs., Mt. Vernon, N.Y.
Post Elctrn. Prods., Beverly, Mass.
Practical Automation, Inc., Shelton, Conn.
Redington Counters, Inc., Windsor, Conn.
Robertson Instr., Azusa, Cal.
Sensor Corp., Greenwich, Conn.
Servo Dev. Corp., Hicksville, N.Y.
Soltec Corp., No. Hollywood, Cal.
SSR Instrs. Co., Santa Monica, Cal.
Struthers-Dunn, Inc., Pitman, N.J.
Struthers-Dunn, Inc., Bettendorf, Iowa
Theta Instr. Corp., Fairfield, N.J.
Tyco Instr. Div., Waltham, Mass.
Wintriss Controls, New York, N.Y.
Zehntel, Inc., Berkeley, Calif.

Counters, Radiation—See Counters, Geiger-Also See Counters, Scintillation—Vol 1

Counters, Reversible—See Counters, Bi-Directional

Counters, Revolution

A. D. Data Sys., Inc., Rochester, N.Y.
Anadex Instrs., Inc., Van Nuys, Calif.
Data Graphics, San Antonio, Tex. p 346
Digitron Corp., Norristown, Pa.
Durant Digital Instrs., Milwaukee, Wisc. p 1316
Haydon, A. W. Co., Waterbury, Conn.
Hecon Corp., New Shrewsbury, N.J.
Hewlett-Packard, Palo Alto, Cal.
Hickok Elect. Instr., Cleveland, Ohio
Johnson E. F. Co., Waseca, Minn.
Kessler-Ellis Prods., Atlantic Highlands, N.J. .... p 1336
Landis & Gyr, Inc., Elmsford, N.Y.p 1337
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Planet Instr., Ft. Wayne, Ind. ...... p 1340
Precision Timer, Westbrook, Conn.
Presin Co., Inc., Shelton, Conn... p 1345
Schauer Mfg. Corp., Cincinnati, Ohio
Systron-Donner Concord Instr. Div., Concord, Cal.
Veeder-Root, Hartford, Conn....... p 1352
Abrams Instr., Lansing, Mich.
Allis, Louis Co., Milwaukee, Wisc.
Anocut Engrg. Co., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Controlcraft Corp., West Chicago, Ill.
Copar Corp., Oak Lawn, Ill.
Data Dynamics Div., Englewood, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Durant Mfg. Co., Milwaukee, Wisc.
Dynamic Precision Controls, Hagerstown, Ind.
Dynamics Resch. Corp., Wilmington, Mass.
Dynapar Corp., Gurnee, Ill.
Elctrns., Ltd., Marion, Iowa
ENM Co., Chicago, Ill.
General Equip. & Mfg., Louisville, Ky.
Honeywell, Apparatus Controls, Mpls., Minn.
IKL, Inc., Newport Beach, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
JMR Elctrns. Corp., Bronx, N.Y.
Moore Inds., Van Nuys, Cal.
Mullard, Inc., Farmingdale, N.Y.
Photobell Co., Inc., New York, N.Y.
Post Elctrn. Prods., Beverly, Mass.
Rank Precision Inds., W. Nyack, N.Y.
Redington Counters, Inc., Windsor, Conn.
Robertson Instr., Azusa, Cal.
Servo Dev. Corp., Hicksville, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Theta Instr. Corp., Fairfield, N.J.
Tyco Instr. Div., Waltham, Mass.
Wer Ind'l. Corp., Grand Island, N.Y.
Zehntel, Inc., Berkeley, Calif.

Counters, Scintillation—See Vol 1

Counters, Variable Time Base—See Vol 1

Couplers & Keyers—See Keyers & Couplers—Vol 1

Couplers, Antenna—See Vol 1

Couplers, Directional

Alford Mfg. Co., Winchester, Mass. p 598
American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol RF Div., Danburry, Conn.
Applied Research Inc., Port Washington, N.Y. .... p 1554
Arra Inc., Bayshore, N.Y. .... p 1553
Bendix, Franklin, Ind. .... p 1555
Bird Elctrn., Cleveland, Ohio
E & M Labs., Westlake Village, Cal.
Greenray Inds., Inc., Mechanicsburg, Pa.
Hewlett-Packard, Palo Alto, Cal.
Johnson E. F. Co., Waseca, Minn.
Lorch Elctrns. Corp., Englewood, N.J.
Microwave Cavity Labs., La Grange, Ill.
RF Communications, Rochester, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Transco Prods., Inc., Venice, Cal.
Waveline, Inc., W. Caldwell, N.J. p 1567
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Anaren Microwave, Inc., Syracuse, N.Y.
Anritsu Electric Co., Ltd., Tokyo, Japan
Anzac Elctrns., Waltham, Mass.
Aviel Electronics Inc, Burbank, Calif.
Benco Television Assoc., Rexdale, Ont., Can.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Cardwell Condenser, Lindenhurst, N.Y.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Delta Elctrns., Alexandria, Va.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Elctrn. Resources Div., Los Angeles, Cal.
Elctrn. Specialty, Thomaston, Conn.
Engelmann Microwave, Montville, N.J.
ESCA, Jupiter, Fla.
Essex Int'l., Inc., Decatur, Ill.
Finney Co., Bedford, Ohio
GAF Corp., New York, N.Y.
Gavin Instrs., Somerville, N.J.
General Microwave Corp., Farmingdale, N.Y.
Granite State Machine Co., Inc., Manchester, N.H.
GRFF, Port Salerno, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Kevlin Mfg. Co., Woburn, Mass.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
New-Tronics Corp., Brookpark, Ohio
Olektron Corp., Dudley, Mass.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Philco-Ford Corp., Washington, D.C.
PRD Elctrns., Inc., Westbury, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
RF Communications, Inc., Rochester, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Rowe Engravers, Clifton, N.J.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Scientific-Atlanta, Inc., Atlanta, Ga.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Vectronics Microwave Corp., Middlesex, N.J.
Victor Microwave, Inc., Wakefield, Mass.
Wavecom, Inc., Northridge, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Couplers, Microwave

Alford Mfg. Co., Winchester, Mass. p 598
American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol RF Div., Danburry, Conn.
Applied Research Inc., Port Washington, N.Y. .... p 1554
Arra Inc., Bayshore, N.Y. .... p 1553
Bendix, Franklin, Ind. .... p 1555
E & M Labs., Westlake Village, Cal.
Greenray Inds., Inc., Mechanicsburg, Pa.
Hewlett-Packard, Palo Alto, Cal.
Lorch Elctrns. Corp., Englewood, N.J.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Transco Prods., Inc., Venice, Cal. p 613
Waveline, Inc., W. Caldwell, N.J. p 1567
AAI Corp., Baltimore, Md.
Aertech Inds., Sunnyvale, Calif.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Anaren Microwave, Inc., Syracuse, N.Y.
Anzac Elctrns., Waltham, Mass.
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
Aviel Electronics Inc, Burbank, Calif.
Cardwell Condenser, Lindenhurst, N.Y.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Resources Div., Los Angeles, Cal.
Elctrn. Specialty, Thomaston, Conn.
Engelmann Microwave, Montville, N.J.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
GRFF, Port Salerno, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Industrial Microwave, Scotch Plains, N.J.
Kevlin Mfg. Co., Woburn, Mass.
Lieco, Inc., Lindenhurst, N.Y.
Litton Inds., San Carlos, Calif.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
Narda Microwave Corp., Plainview, N.Y.
Olektron Corp., Dudley, Mass.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Pabst Engineering Equipment Co., Inc., Elizabeth, N.J.
Philco-Ford Corp., Washington, D.C.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
Reeve Elctrns., Inc., Chicago, Ill.
RF Systems, Inc., Cohasset, Mass.
Rowe Engravers, Clifton, N.J.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TACO Div., Sherburne, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Vectronics Microwave Corp., Middlesex, N.J.
Victor Microwave, Inc., Wakefield, Mass.
Wavecom, Inc., Northridge, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Couplers, Multi-Set—See Couplers, Antenna—Vol 1

Couplers, Rotary

Bogue Elec. Mfg. Co., Paterson, N.J.
Cardwell Condenser, Lindenhurst, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Kevlin Mfg. Co., Woburn, Mass.
Lieco, Inc., Lindenhurst, N.Y.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Power Instrs., Skokie, Ill.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.

Couplings, Microwave—See Couplers, Microwave—Vol 1

Couplings, Quick-Disconnect, Liquid or Gas—See Vol 3

Couplings, Shaft, Rigid & Flexible

FAE Instr. Corp., Huntington Sta., N.Y. p 1587
Jackson Bros., (London) Ltd., New York, N.Y.
Johnson E. F. Co., Waseca, Minn.
Millen, James Mfg., Malden, Mass. p 1488,1999
Northfield Precision Instr. Corp., Island Pk., N.Y. .... p 1625
Precision Mechanisms, Westbury, N.Y.
Smith, Herman H., Inc., Bklyn., N.Y.
Vemaline Prods. Co., Wyckoff, N.J.
Abbott Prods., Inc., College Point, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Advance Gear & Mach., Los Angeles, Cal.
Amatom Elctrn. Hardware, New Rochelle, N.Y.
Avionics, Inc., South Bend, Ind.
Belfab, Daytona Beach, Fla.
Bendix, Utica, N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Bowmar/Ali, Inc., Acton, Mass.
Britec Ltd., London, W.C.2, England
Bud Radio, Inc., Willoughby, Ohio
Cardwell Condenser, Lindenhurst, N.Y.
Dial Prods. Co., Bayonne, N.J.
Dynamic Gear, Ft. Lauderdale, Fla.
Electroid Co., Union, N.J.
Falcon Div., Wilmington, Mass.
Farrand Controls, Inc., Valhalla, N.Y.
Federal Screw Prods., Inc., Chicago, Ill.
Gagne Assocs., Inc., Binghamton, N.Y.
General Thermodynamics Corp., Wilmington, Mass.
Granite State Machine Co., Inc., Manchester, N.H.
Hammarlund Mfg. Co., Red Bank, N.J.

Helical Prods. Co., Inc., Hermosa Beach, Calif.
Insco Corp., Groton, Mass.
Instru-Lec Corp., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Jones Motrola Corp., Stamford, Conn.
Kahlenberg Bros. Co., Two Rivers, Wisc.
Keystone Elctrns. Corp., New York, N.Y.
Lieco, Inc., Lindenhurst, N.Y.
Lord Mfg. Co., Erie, Pa.
Metal Bellows Corp., Sharon, Mass.
Naugler Engrg., Inc., Beverly, Mass.
Nilsen Mfg. Co., Haines City, Fla.
Panamech Inc., Inglewood, Cal.
Perfect Gear & Instr. Corp., Northridge, Calif.
Power Instrs., Skokie, Ill.
Renbrandt, Inc., Boston, Mass.
Russell Inds., Inc., Lynbrook, N.Y.
Santa Fe Mfg. Co., Bronx, N.Y.
Sealol, Inc., Providence, R.I.
SECS, Inc., Long Island City, N.Y.
Servometer Corp., Clifton, N.J.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Stop Components, Inc., Freeport, N.Y.
Stow Mfg. Co., Binghamton, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Theta Instr. Corp., Fairfield, N.J.
USM Corp., Wakefield, Mass.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Couplings, Vacuum—See Vol 1

Covers, Chassis—See Vol 3

Covers, Jack—See Jack Covers—Vol 3

Covers, Protective—See Vol 3

Crayons, Coatings, Pellets, etc., Temperature Indicating-Also See Crystals, Liquid, Temperature Indicating

Brady, W.H. Co., Milwaukee, Wisc.
Markal Co., Chicago, Ill.
Omega Engrg., Inc., Stamford, Conn.
VWR Scientific, San Francisco, Cal.

Crimping Machines & Tools—See Tools, Crimping—Vol 3

Crossbars—See Scanners, Crossbar; Switches, Crossbar—Vol 1

Crucibles—See Boats—Vol 3

Cryogenic Equipment—See Dewars; Pumps; etc.—Vol 1

Cryogenic Liquid Converters—See Vol 1

Crystal Analyzers—See Anlayzers, Crystal—Vol 1

Crystal Blanks—See Vol 1

Crystal Filters—See Filters, Crystal

Crystal Mounts—See Mounts, Crystal—Vol 1

Crystal Oscillators—See Oscillators, Crystal-Controlled—Vol 1

Crystal Ovens—See Ovens, Crystal—Vol 1

Crystals, Barium Titanate—See Vol 1

Crystals, Filter—See Vol 1

Crystals, Frequency Control—See Vol 1

Crystals, Laser-Maser—See Vol 1

Crystals, Liquid, Temperature Indicating-Also See Crayons, Coatings, Pellets, Temperature Indicating

Liquid Crystal Inds., Inc., Turtle Creek, Pa.
Omega Engrg., Inc., Stamford, Conn.
Vari-Light Corp., Cincinnati, Ohio

Crystals, Piezoelectric—See Vol 1

Crystals, Quartz—See Vol 1

Crystals, Rochelle Salts—See Vol 1

Crystals, Sapphire—See Vol 1

Crystals, Scintillation Counter—See Vol 1

Crystals, Semiconductor(Ingots & Wafers)—See Vol 1

Crystals, Yig—See Vol 1

Cups, Encapsulation—See Vol 3

Current Sensors-Also See Transducers, Volt, etc.

American Aerospace Controls, Farmingdale, N.Y. .... p 1304-1306
Bell, F.W., Inc., Columbus, Ohio
Diversified Elctrns., Evansville, Ind
Hi-G, Windsor Locks, Conn. .... p 1326
Ohio Semitronics, Columbus, Ohio p 1986
Torwico Elctrns., Inc., Lakewood, N.J.
Triac Elctrn. Sys., N.Y., N.Y.
Active Control Instrumentation, E. Northport, NY
Constant Voltage Co., Chicago, Ill.
Isotech Inc., Westford, Mass.
Mag-Con Engrg. Co., St. Paul, Minn.
Micro-Technical Inds., Laguna Beach, Cal.
Space Age Microcircuits, Long Valley, N.J.
Telmar, Inc., Columbus, Ohio

Current Sources—See Vol 1

Cutters, Hole, Hand Operated—See Vol 3

Cutters, Wire, Automatic—See Wire Measuring & Cutting Machines—Vol 1

Cutters, Wire, Hand—See Wire Cutters, Hand Operated—Vol 3

Dampers, Servo

Eastern Air Devices, Inc., Dover, N.H.
Ind'l. Control Co., Farmingdale, N.Y.
Magnetic Technology, Canoga Pk., Cal. p 1634
Rotating Comps., Bay Shore, N.Y.
Vernitron, Torrance, Cal. .... p 1634
Vernitron Corp., Deer Pk., N.Y. .. p 1634
Bendix, S. Montrose, Pa.
Honeywell, Apparatus Controls, Mpls., Minn.
Singer-General Precision, Inc., Little Falls, N.J.
Transducer Systems, Inc., Willow Grove, Pa.
Weston-Transicoil, Worcester, Pa.

Dampers, Structural, Chassis, Panel, etc.—See Mounts, Shock & Vibration—Vol 3

Dashpots—See Vol 3

Data Acquisition & Reduction Systems—See Vol 1

Data Blockers—See Vol 1

Data Compressors, Digital—See Vol 1

Data Display Indicators—See Lights; Dials; Readouts

Data Display Systems—See Displays

Data Processing Equipment—See Specific Types

Data Recorders, Computer—See Vol 1

Data Transmission Systems—See Transmission Systems, Data—Vol 1

Decade Boxes, Capacitance—See Vol 1

Decade Boxes, Delay Line—See Vol 1

Decade Boxes, Inductance—See Vol 1

Decade Boxes, Resistance—See Vol 1

Decade Boxes, Transformer—See Vol 1

Decalcomania-Also See Labels, Pressure Sensitive

Datak Corp., Passaic, N.J. .... p 1445
Brady, W.H. Co., Milwaukee, Wisc.
Canrad Precision Inds., Inc., Pelham, N.Y.
Decalcraft, Hatfield, Pa.
Dennison Mfg., Framingham, Mass.
GM Nameplate, Inc., Seattle, Wash.
Graphtex Inc., Lodi, NJ
Miller Dial, El Monte, Calif.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Seton Name Plate Corp., New Haven, Conn.
Stanpat Prods., Inc., Port Washington, N.Y.
Star Enterprises-Div., Lowell, Mass.
Tapecon, Inc., Rochester, N.Y.
Tekni-Labels Co., Van Nuys, Calif.
3M Co., St. Paul, Minn.
Topflight Corp., York, Pa.

Decimal Keyboards—See Keyboards, Decimal—Vol 1

Decoders, Audio Tone—See Vol 1

Decoders, Binary To Decimal—See Converters, Binary To Decimal—Vol 1

Decoders, Digital To Analog—See Converters, Digital To Analog—Vol 1

Decoders, Pulse—See Vol 1

Decoders, Readout—See Drivers & Decoders For Readouts

Decoders, Telemetry—See Decoders, Audio Tone—Vol 1

Decoders, Video—See Vol 1

Decommutators, Telemetering—See Vol 1

Decontaminants—See Cleaners & Solvents—Vol 3

Deflection Yokes, Coils & Assemblies—See Yokes, Deflection—Vol 3

Degaussers—See Demagnetizers-Also See Coils, Degausing—Vol 1

Degreasing Chemicals—See Cleaners & Solvents—Vol 3

Degreasing Machines—See Machines, Vapor-Degreasing; Cleaners,Ultrasonic—Vol 1

Dehumidifiers (For Equipment)—See Vol 1

Dehydrators—See Vol 1

Delay Line Cases—See Cases, Delay Line—Vol 3

Delay Line Synthesizers—See Vol 3

Delay Lines, Cable—See Vol 3

Delay Lines, Distributed, Constant (Fixed)—See Vol 3

Delay Lines, Distributed, Constant (Variable)—See Vol 3

Delay Lines, Glass & Quartz—See Vol 3

Delay Lines, Liquid—See Vol 3

Delay Lines, Lumped-Constant (Electrically Variable)—See Vol 3

Delay Lines, Lumped-Constant (Fixed)—See Vol 3

Delay Lines, Lumped-Constant (Mechanically Variable)—See Vol 3

Delay Lines, Magnetostrictive—See Vol 3

Delay Lines, Miniature & Subminiature-Also See Specific Types Of Delay Lines—See Vol 3

Delay Lines, Solid Blank—See Vol 3

Delay Lines, Strip—See Vol 3

Delay Lines, Trimmer—See Vol 3

Delay Lines, Ultrasonic—See Vol 3

Delay Lines, Waveguide—See Vol 3

Delay Lines, Wire—See Vol 3

Delays, Time (Excluding Delay Lines)

Allen Avionics, Mineola, N.Y.
Artronic Instr. Co., Silver Spring, Md.
Autronics Corp., Pasadena, Calif. p 1311
Betamite Electronic Devices, Culver City, Calif.
Control Elctrns. Co., Inc., Farmingdale, N.Y.
Diversified Elctrns., Evansville, Ind
Eagle-Signal Div., Davenport, Iowa p 1317
General Time Corp., Torrington, Conn. p 1321
Gibbs Mfg. & Resch., Janesville, Wisc.
Haydon, A. W. Co., Waterbury, Conn.
Hewlett-Packard, Palo Alto, Cal.
Hi-G, Windsor Locks, Conn. p 1322-1325
Precision Timer, Westbrook, Conn. p 1344
Sealectro Corp., Mamaroneck, N.Y.
Solid State Elctrns., Sepulveda, Cal.
Tempo/UTI Div., Chatsworth, Cal.
Agastat Div., Elizabeth, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Audio Instr. Co., Union City, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bulova Watch Co., Timer Lab., Flushing, N.Y.
Controlotron Corp., Farmingdale, N.Y.
De-Tec-Tronic Corp., Chicago, Ill.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
G-V Controls, Livingston, N.J.
Gems Div., Farmington, Conn.
General Instr. Corp., Chicopee, Mass.
Guardian California, Culver City, Cal.
Heidelex Corp., Chelmsford, Mass.
Hoagland Instr., Red Bank, N.J.
Ind'l. Solid State Controls, York, Pa.
Int'l. Register, Chicago, Ill.
Jay-El Prods., Gardena, Calif.
Leach Corp., Los Angeles, Cal.

McElroy Elctrns. Corp., Shirley, Mass.
MCG Elctrns., Inc., Deer Park, N.Y.
Meson Elctrns. Co., Inc., Rochester, N.Y.
National Time & Signal, Oak Pk., Mich.
Sensor Corp., Greenwich, Conn.
Texas Instruments, Dallas, Tex.
Trepac Corp. America, Englewood, N.J.
TRW Instrs., El Segundo, Cal.
Vanguard Elctrns., Inglewood, Cal.
Worner Elctrn. Devices, Rankin, Ill.
Zenith Controls Inc., Chicago, Ill.

Demagnetizers—See Vol 1

Demodulators—See Vol 1

Demodulators, Magnetic

American Aerospace Controls, Farmingdale, N.Y.
General Magnetics, Bloomfield, N.J. p 1320
Multitech Power Sys., Costa Mesa, Cal.
Computer Conversions Corp., East Northport, N.Y.
Hughes Aircraft Co, Fullerton, Cal.
Polyphase Instr. Co., Bridgeport, Pa.

Densitometers, Electronic—See Vol 1

Deposition Equipment, Vacuum & Accessories-Also See Evaporation Equipment, Electron Beam—See Vol 1

Desiccators—See Dehumidifiers—Vol 1

Desoldering Tools & Equipment—See Soldering Accessories; Soldering Equip.; Soldering Guns; etc.—Vol 3

Detectors, A-F—See Detectors, Frequency—Vol 1

Detectors, Cable & Pipe—See Locators, Metal—Vol 3

Detectors, Chroma—See Vol 1

Detectors, Coaxial—See Vol 1

Detectors, Corona—See Testers, Corona—Vol 1

Detectors, Crystal—See Vol 1

Detectors, Electrostatic—See Meters, Volt, Electrostatic—Vol 1

Detectors, F-M—See Detectors, Frequency—Vol 1

Detectors, Fire & Smoke (Electronic)—See Fire Detection & Fighting Equip.

Detectors, Flaw & Defect-Also See Locators, Cable & Line Fault; Locators, Open-Short—See Vol 1

Detectors, Frequency—See Vol 1

Detectors, Gas Leak—See Vol 1

Detectors, Ice, Sleet & Snow—See Vol 1

Detectors, Impedance—See Meters, Impedance—Vol 1

Detectors, Infrared

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
United Detector Tech., Santa Monica, Cal.
Abtronics, Inc., Livermore, Calif.
ACR Elctrns. Div., Carle Place, N.Y.
Advanced Kinetics, Costa Mesa, Calif.
Arco Systems Inc., Palo Alto, Cal
A.R.P. Inds., Inc., Huntington, N.Y.
Automation Devices, Inc., Fairview, Pa.
Avco Corp., Cincinnati, Ohio
Barnes Engrg. Co., Stamford, Conn.
Bausch & Lomb, Rochester, N.Y.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Borg-Warner Thermoelectrics, Des Plaines, Ill.
Brower Laboratories, Inc., Waltham, Mass.
Cetron Elctrn. Corp., Geneva, Ill.
Conductron Corp., St. Charles, Mo.
Dolan-Jenner Inds., Inc., Melrose, Mass.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Electron-Machine Corp., Umatilla, Fla.
Electrophysics Corp., Nutley, N.J.
EMR Div., Princeton, N.J.
Eppley Lab., Inc., Newport, R.I.
Euclid Elec. & Mfg. Div., Madison, Ohio
FJW Inds., Inc., Mt. Prospect, Ill.
Flame Resch., Inc., Pittsburgh, Pa.
General Dynamics, San Diego, Cal.
General Electrodynamics Corp., Garland, Tex.
General Microwave Corp., Farmingdale, N.Y.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Harshaw Chem. Co., Cleveland, Ohio
HEI, Inc., Chaska, Minn.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Residential Div., Mpls., Minn.
HRB-Singer, Inc., State College, Pa.
Infrared Inds., Inc., Santa Barbara, Cal.
Infrared Inds., Waltham, Mass.
Judson Resch. & Mfg. Co., Conshohocken, Pa.
Laser Sys. Corp., Ann Arbor, Mich.
Mikron Instr. Co., Ridgewood, N.J.
Molectron Corp., Sunnyvale, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Mullard, Inc., Farmingdale, N.Y.
Nuclear Diodes, Prairie View, Ill.
Omega Engrg., Inc., Stamford, Conn.
Optoelectronics, Inc., Petaluma, Cal.
Philco-Ford Corp., Washington, D.C.
Philips Broadcast Equipment Corp., Montvale, N.J.
Rank Precision Inds., W. Nyack, N.Y.
Raytheon Co., Waltham, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Reeder Charles M. & Co., Detroit, Mich.
Santa Barbara Resch. Ctr., Goleta, Calif.
Sensor Corp., Greenwich, Conn.
Servo Corp. America, Hicksville, N.Y.
Tem-Pres Research Div., State College, Pa.
Thermometrics, Inc., Edison, N.J.
Victory Engrg. Corp., Springfield, N.J.

Detectors, Ion—See Vol 1

Detectors, Light Intensity—See Meters, Light, Nonphotographic—Vol 1

Detectors, Magnetic—See Vol 1

Detectors, Metal—See Locators, Metal—Vol 3

Detectors, Microwave—See Vol 1

Detectors, Null—See Indicators, Null—Vol 1

Detectors, Phase-Sensitive—See Vol 1

Detectors, Photovoltaic —See Cells, Photovoltaic

Detectors, Radiation—See Counters, Geiger Counters, Scintillation—Vol 1

Detectors,R-F—See Detectors, Frequency—Vol 1

Detectors, Standing Wave—See Vol 1

Detectors, Torque—See Indicators, Torque—Vol 1

Detectors, Ultraviolet—See Vol 1

Detectors, Vacuum—See Vol 1

Detectors,Vibration—See Transducers, Vibration

Detectors, Video—See Vol 1

Detectors, Voltage—See Vol 1

Detectors, Waveguide Arc—See Vol 1

Dewars—See Vol 1

Diagonal Cutters —See Wire Cutters, Hand Operated—Vol 3

Dial Locks—See Locks, Dial & Shaft

Dials, Instrument, Metal, Plastic, etc.

Alco Elctrn. Prods., Lawrence, Mass.
Amphenol Controls Div., Janesville, Wisc...p 1436,1437
Amphenol Sales Div., Broadview, Ill. p 1436,1437
Bowmar Instr. Corp., Ft. Wayne, Ind.
Datak Corp., Passaic, N.J.
Electronic Hardware, Jamaica, N.Y. p 1456
Hickok Elect. Instr., Cleveland, Ohio
Jackson Bros., (London) Ltd., New York, N.Y... p 2419
Millen, James Mfg., Malden, Mass. p 1489
NOBEX Div., Burlingame, Cal....... p 1469
Precision Timer, Westbrook, Conn.
Raytheon Co., Quincy, Mass.
Rogan Bros., Skokie, Ill.
Simpson Elec. Co., Chicago, Ill.
Smith, Herman H., Inc., Bklyn., N.Y.
Vemaline Prods. Co., Wyckoff, N.J.
A & M Instrument, Inc., Great Neck, N.Y.
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Ackerman Engravers, Inc., Long Island City, N.Y.
Acromark Co., Berkeley Hts, N.J.
Albany Int'l. Corp., Albany, NY
Apahouser Corp. of N.E., Boston, Mass.
Avionics, Ltd., Niagara-on-the-Lake, Ont., Can.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Birnbach Co., Inc., Freeport, N.Y.
Bodnar Prods. Corp., New Rochelle, N.Y.
Brady, W.H. Co., Milwaukee, Wisc.
Canrad Precision Inds., Inc., Pelham, N.Y.
Central Plastics Dists., Chicago, Ill.
Cryptographics, Inc., New York, N.Y.
Davies, Harry Molding Co., Chicago, Ill.
Dura Plastics N.Y., Inc., Westport, Conn.
Electro Assemblies, Inc., Chicago, Ill.
Electro Chemical Engraving Co., Bronx, N.Y.
Eljay Corp., Columbia, Md.
Franklin Fibre-Lamitex, Wilmington, Del.
Gentape Corp., Bloomfield, N.J.
Glar-Ban Corp., Buffalo, N.Y.
GM Nameplate, Inc., Seattle, Wash.
Graphtex Inc., Lodi, NJ
Hermes Plastics, Inc., New York, N.Y.
Insulating Fabricators, E. Rutherford, N.J.
Insulating Shapes, Inc., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Jodee Plastics, Inc., Brooklyn, N.Y.
Kurz-Kasch, Inc., Dayton, Ohio
Master Engraving, East Paterson, N.J.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Metalphoto Corp., Cleveland, Ohio
Metrological Data Corp., Garfield, N.J.
Miller Dial, El Monte, Calif.
Muirhead, Inc., Mountainside, N.J.
N/P Co., Temple City, Calif.
Norelcom Inds., Inc., Farmingdale, N.Y.
Norgus Silk Screen Co., Inc., Clifton, N.J.
NY-Glass Plastics, Paramount, Calif.
Perfect Gear & Instr. Corp., Northridge, Calif.
Philmore Mfg. Co., Richmond Hill, N.Y.
Photo Chemical Prods. Cal., Santa Monica, Cal.
PIC Design Corp., Ridgefield,, Conn.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Radial Controls Div. Nicely Corp., Indianapolis, Ind.
Rex Rheostat & Co., Roosevelt, N.Y.
Romar Plastics, Inc., St. Charles, Ill.
SECS, Inc., Long Island City, N.Y.
Seton Name Plate Corp., New Haven, Conn.
Sillcocks-Miller Co., Maplewood, N.J.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Stop Components, Inc., Freeport, N.Y.
Tech-Etch, Inc., Hingham, Mass.
Teledyne Gurley, Troy, N.Y.
Theta Instr. Corp., Fairfield, N.J.
3M Co., St. Paul, Minn.
Waldom Elctrns., Inc., Chicago, Ill.
Weston Instruments, Inc., Newark, N.J.

Dials, Telephone-Type

Electro-Mech. Comps., S. El Monte, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Schrack Elec. Sls., New York, N.Y.
GTE Automatic Elec., Northlake, Ill.
Stromberg Carlson Corp., Rochester, N.Y.

Dials, Turns-Counting

Amphenol Controls Div., Janesville, Wisc...p 1436,1437
Amphenol Sales Div., Broadview, Ill. p 1436,1437
Harrel, Inc., E. Norwalk, Conn..... p 1973
IRC St. Peterburg Div. of TRW Inc., St. Petersburg, Fla........................... p 2931
Johnson E. F. Co., Waseca, Minn.
Millen, James Mfg., Malden, Mass.
Spectrol Elctrns., City of Industry, Cal. p 2924,2925
Vemaline Prods. Co., Wyckoff, N.J.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bourns, Inc., Riverside, Cal.
Canrad Precision Inds., Inc., Pelham, N.Y.
Duncan Elctrns., Inc., Costa Mesa, Cal.
Eljay Corp., Columbia, Md.
Master Engraving, East Paterson, N.J.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Robertson Instr., Azusa, Cal.
Stop Components, Inc., Freeport, N.Y.
Waters Mfg., Inc., Wayland, Mass.

Diaphragms—See Vol 3

Dielectric Constant Indicators—See Indicators, Dielectric Constant—Vol 1

Dielectric Coolants—See Coolants, Circuit & Component—Vol 3

Dielectric Heating Equipment

Cober Elctrns., Inc., Stamford, Conn. p 601
Barth Elctrns., Inc., Cleveland, Ohio
Cycle-Dyne, Inc., Jamaica, N.Y.
Electrofilm, Inc., N. Hollywood, Calif.
Feco, Cleveland, Ohio
La Rose, W.T. & Assocs., Troy, N.Y.
Mann-Russell Elctrns., Inc., Tacoma, Wash.
Radio Frequency Co., Inc., Medfield, Mass.
Reeve Elctrns., Inc., Chicago, Ill.
Scientific Elec., Inc., Garfield, N.J.
Taylor-Winfield Corp., Warren, Ohio
3M Co., St. Paul, Minn.

Dielectrics—See Films; Insulation Materials—Vol 3

Dies & Taps—See Vol 3

Differential Analyzers—See Analyzers, Differential—Vol 1

Differentials Mechanical—See Gears & Gear Mechanisms—Vol 3

Digital Analyzers—See Analyzers, Differential—Vol 1

Digital Comparators—See Comparators, Digital—Vol 1

Digital Tape Recorders—See Data Recorders, Computer—Vol 1

Digital Voltmeters—See Meters, Volt, Digital—Vol 1

Digitizers, Pencil Follower (Inc. Coordinate & Graphic)—See Vol 1

Dimmers—See Controls Photoelectric

Diode Arrays

Bowmar Instr. Corp., Ft. Wayne, Ind.
Carter Semiconductor, Amityville, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal.
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal.
Sprague Elec. Co., No. Adams, Mass.
United Detector Tech., Santa Monica, Cal. .... p 1639
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Argent Inds., Inc., Dayton, Ohio
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Dionics, Inc., Westbury, N.Y.
Eastern Delta Corp., Fair Lawn, N.J.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
General Instr. Corp., Hicksville, N.Y.
HEI, Inc., Chaska, Minn.
Hughes Aircraft Co, Malibu, Cal.
Info-Lite Corp., Ft. Lee, N.J.
Isofilm Int'l., Chatsworth, Cal.
Megadyne Inds., Inc., Rochester, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Optoelectronics, Inc., Petaluma, Cal.
Parametric Inds., Inc., Winchester, Mass.
Raytheon Co., Mt. View, Calif.
Silicon Gen'l., Inc., Westminster, Cal.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Transitron Elctrn. Corp., Wakefield, Mass.
Westinghouse Elec. Int'l., New York, N.Y.

Diode Testers—See Testers, Diode—Vol 1

Diodes, Avalanche

Carter Semiconductor, Amityville, N.Y.
Centralab Semiconductor, El Monte, Cal.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
Semtech Corp., Newbury Pk., Cal.
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Unitrode, Watertown, Mass.
Wagner Elec. Corp., Livingston, N.J. p 1841
Calvert Elctrns., Inc., New York, N.Y.
Computer Diode, Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Semiconductor Corp., Tempe, Ariz.
GHZ Devices, Inc., No. Chelmsford, Mass.
Hughes Aircraft Co., Torrance, Cal.
KSC Semiconductor Corp., Chelmsford, Mass.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Diode Corp., Newburyport, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Parametric Inds., Inc., Winchester, Mass.
RCA Solid State Div., Somerville, N.J.
Rectifier Engrg. & Supply, St. Louis, Mo.
Semicon Inc., Burlington, Mass.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Syntron Div., Homer City, Pa.
Teledyne Semiconductor, Hawthorne, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Varo, Inc., Semiconductor Div., Garland, Tex.

Diodes, Backward

Carter Semiconductor, Amityville, N.Y.
Centralab Semiconductor, El Monte, Cal.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Computer Diode, Fair Lawn, N.J.
Franel Corp., So. River, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Special Microwave Devices Oper., Waltham, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

Diodes, Dual

Carter Semiconductor, Amityville, N.Y.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Dionics, Inc., Westbury, N.Y.
Eastern Delta Corp., Fair Lawn, N.J.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
Green Rectifier Corp., Fair Lawn, N.J.
ITT Semiconductors, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Optoelectronics, Inc., Petaluma, Cal.
Parametric Inds., Inc., Winchester, Mass.
Teledyne Semiconductor, Hawthorne, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Varian Assocs., Palo Alto, Cal.

Diodes, Electroluminescent (Radiating)

General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Ferranti Ltd., Hollinwood, Lancs., England
Infrared Inds., Inc., Santa Barbara, Cal.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Santa Barbara Resch. Ctr., Goleta, Calif.
Siemens Corp., Comps. Div., Iselin, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Elmira, N.Y.

Diodes, Germanium

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y. .... p 1799
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Aertech Inds., Sunnyvale, Calif.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Cordover, Carl & Co., Mineola, N.Y.
Corvair Diode, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
ITT Semiconductors, W. Palm Beach, Fla.
JSH Elctrns, Inc., Culver City, Calif.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Diode Corp., Newburyport, Mass.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Optoelectronics, Inc., Petaluma, Cal.
Parametric Inds., Inc., Winchester, Mass.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

Diodes, Gunn

Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Calvert Elctrns., Inc., New York, N.Y.
GHZ Devices, Inc., No. Chelmsford, Mass.
Microwave Assocs., Inc., Burlington, Mass.
Plessey Elctrns. Corp., Farmingdale, N.Y.
State Labs, Inc., New York, N.Y.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, High Voltage

Carter Semiconductor, Amityville, N.Y.
Elctrn. Enterprises, Newark, N.J.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal.
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal. p 1813
Nippon Electric/NEC America, N.Y., N.Y.
Rectifier Comps. Corp., Freeport, N.Y. p 1815
Semtech Corp., Newbury Pk., Cal. p 1819
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Unitrode, Watertown, Mass. .... p 1854
Unitrode Corp., Watertown, Mass. p 1854
Victoreen Instr., Cleveland, Ohio
Westinghouse Elec., Youngwood, Pa. p 1859

Calvert Elctrns., Inc., New York, N.Y.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Dickson Elctrns. Corp., Scottsdale, Ariz
Eimac, San Carlos, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Diode Corp., Newburyport, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Power Physics Corp., Eatontown, N.J.
RCA Solid State Div., Somerville, N.J.
Sarkes Tarzian, Inc., Bloomington, Ind.
Semicon Inc., Burlington, Mass.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Syntron Div., Homer City, Pa.
Teledyne Semiconductor, Hawthorne, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Varo, Inc., Semiconductor Div., Garland, Tex.

Diodes, Hot Carrier

Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
United-Page, Patterson, N.J.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
International Diode Corp., Jersey City, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
Solitron Devices, Tappan, N.Y.

Diodes, Light-Emitting (Led)

Bowmar Instr. Corp., Ft. Wayne, Ind.
Centralab Semiconductor, El Monte, Cal. .... p 1798
General Illumination, Inc., St. Paul, Minn p 1460
Nippon Electric/NEC America, N.Y., N.Y.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
HEI, Inc., Chaska, Minn.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Plessey Elctrns. Corp., Farmingdale, N.Y.
RCA Solid State Div., Somerville, N.J.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
TEC, Inc., Eden Prairie, Minn.

Diodes, Limiting

American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Schauer Mfg. Corp., Cincinnati, Ohio p 1821
Solid State Devices, Santa Fe Springs, Cal.
Unitrode, Watertown, Mass. .... p 1566
Unitrode Corp., Watertown, Mass. p 1566
Abadak Inds., Inc., Farmingdale, N.Y.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
GHZ Devices, Inc., No. Chelmsford, Mass.
Green Rectifier Corp., Fair Lawn, N.J.
Int'l. Elctrns., Melville, N.Y.
Isofilm Int'l., Chatsworth, Cal.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Parametric Inds., Inc., Winchester, Mass.
RCA Solid State Div., Somerville, N.J.

Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.

Diodes, Matched Pairs

American Elctrn. Labs., Inc., Lansdale, Pa.
Carter Semiconductor, Amityville, N.Y.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Solid State Devices, Santa Fe Springs, Cal.
Summit Engrg. Corp., Bozeman, Mont. p 1565
United-Page, Patterson, N.J.
Abadak Inds., Inc., Farmingdale, N.Y.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Crystalonics Div., Cambridge, Mass.
Dickson Elctrns. Corp., Scottsdale, Ariz
Dionics, Inc., Westbury, N.Y.
Eastron Corp., Haverhill, Mass.
Edal Inds., Inc., E. Haven, Conn.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
General Semiconductor Corp., Tempe, Ariz.
International Diode Corp., Jersey City, N.J.
Isofilm Int'l., Chatsworth, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
Semicoa, City of Industry, Calif.
Semicon Inc., Burlington, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRG Prods., E. Boston, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.

Diodes, Matched Quads

American Elctrn. Labs., Inc., Lansdale, Pa.
Carter Semiconductor, Amityville, N.Y.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal.
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal.
RCA Elctrns. Comps., Harrison, N.J.
Solid State Devices, Santa Fe Springs, Cal.
Summit Engrg. Corp., Bozeman, Mont. p 1565
United Detector Tech., Santa Monica, Cal.
United-Page, Patterson, N.J.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Crystalonics Div., Cambridge, Mass.
Dionics, Inc., Westbury, N.Y.
Eastron Corp., Haverhill, Mass.
Edal Inds., Inc., E. Haven, Conn.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
International Diode Corp., Jersey City, N.J.
Isofilm Int'l., Chatsworth, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
Semicoa, City of Industry, Calif.
Semicon Inc., Burlington, Mass.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.

Diodes, Microwave Detector

American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
Electro/Data, Inc., Garland, Tex. p 1558
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Abadak Inds., Inc., Farmingdale, N.Y.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Franel Corp., So. River, N.J.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Parametric Inds., Inc., Winchester, Mass.
Solitron Devices, Tappan, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.

Diodes, Microwave Mixer

General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Metropolitan Supply Corp., New York, N.Y.
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Diode, New York, N.Y.
Franel Corp., So. River, N.J.
JSH Elctrns, Inc., Culver City, Calif.
Kemtron Electron Prods., Inc., Newburyport, Mass.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Parametric Inds., Inc., Winchester, Mass.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Sarkes Tarzian, Inc., Bloomington, Ind.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
TRG Prods., E. Boston, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Varian Assocs., Palo Alto, Cal.

Diodes, Noise

Centralab Semiconductor, El Monte, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Computer Diode, Fair Lawn, N.J.
Franel Corp., So. River, N.J.
General Semiconductor Corp., Tempe, Ariz.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.

Diodes, Photoelectric

Centralab Semiconductor, El Monte, Cal. .... p 1798
Clairex Elctrns., Mt. Vernon, N.Y. p 1636
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Nat'l. Semiconductors, Plattsburgh, N.Y. p 1814
RCA Elctrns. Comps., Harrison, N.J.
Sensor Tech., Van Nuys, Cal. ...... p 1638
United Detector Tech., Santa Monica, Cal. .... p 1639
United-Page, Patterson, N.J.
Abtronics, Inc., Livermore, Calif.
Calvert Elctrns., Inc., New York, N.Y.
EG & G, Inc., Salem, Mass.
EMR Div., Princeton, N.J.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
HEI, Inc., Chaska, Minn.
Isofilm Int'l., Chatsworth, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Optoelectronics, Inc., Petaluma, Cal.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Quantum Sensing, Inc., Bohemia, N.Y.
Sensor Corp., Greenwich, Conn.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Pin

Arra Inc., Bayshore, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal. p 1812
Sensor Tech., Van Nuys, Cal.
United Detector Tech., Santa Monica, Cal.
United-Page, Patterson, N.J.
Unitrode, Watertown, Mass. .... p 1566
Unitrode Corp., Watertown, Mass. p 1566
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Eastron Corp., Haverhill, Mass.
Ferranti Ltd., Hollinwood, Lancs., England
GHZ Devices, Inc., No. Chelmsford, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Schottky

Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
United Detector Tech., Santa Monica, Cal. .... p 1639
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Microwave Assocs., Inc., Burlington, Mass.
Parametric Inds., Inc., Winchester, Mass.
Solitron Devices, Tappan, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.

Diodes, Selenium—See Rectifiers, Selenium

Diodes, Silicon

American Elctrn. Labs., Inc., Lansdale, Pa.
Carter Semiconductor, Amityville, N.Y.
Centralab Semiconductor, El Monte, Cal. .... p 1796
Delco Elctrns. Div., Kokomo, Ind. p 1801
Elctrn. Devices, Yonkers, N.Y.
Erie Technological Prods. (EEM), Erie, Pa.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal. p 1812
Nippon Electric/NEC America, N.Y., N.Y.
Schauer Mfg. Corp., Cincinnati, Ohio p 1821
Semtech Corp., Newbury Pk., Cal.
Solid State Devices, Santa Fe Springs, Cal.
United Detector Tech., Santa Monica, Cal.
United-Page, Patterson, N.J.
Unitrode, Watertown, Mass. .... p 1853
Unitrode Corp., Watertown, Mass. p 1853
Wagner Elec. Corp., Livingston, N.J.
Westinghouse Elec., Youngwood, Pa. p 1859
Abadak Inds., Inc., Farmingdale, N.Y.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Alpha Comps. Corp., Venice, Calif.
American Semiconductor Corp., Arlington Hgts., Ill.
Amperex Elctrn., Slatersville, R.I.
Bradley Semiconductor Corp., New Haven, Conn.
Burroughs Corp., Plainfield, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Components, Inc., Biddeford, Me.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Cordover, Carl & Co., Mineola, N.Y.
Dionics, Inc., Westbury, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Eastron Corp., Haverhill, Mass.
Edal Inds., Inc., E. Haven, Conn.
EG & G, Inc., Salem, Mass.
Electronic Transistors, Flushing, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Instr. of Can., Waterloo, Ont., Can.
General Instr. Corp., Hicksville, N.Y.
General Semiconductor Corp., Tempe, Ariz.
GHZ Devices, Inc., No. Chelmsford, Mass.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
Isofilm Int'l., Chatsworth, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
JSH Elctrns, Inc., Culver City, Calif.

Kemtron Electron Prods., Inc., Newburyport, Mass.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Diode Corp., Newburyport, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
MSI Elctrns. Inc., Woodside, N.Y.
Mullard, Inc., Farmingdale, N.Y.
Nuclear Diodes, Prairie View, Ill.
Nucleonic Prods., Canoga Pk, Cal.
Optoelectronics, Inc., Petaluma, Cal.
Parametric Inds., Inc., Winchester, Mass.
Rapid Elec. Co., Bronx, N.Y.
Raytheon Co., Mt. View, Calif.
RCA Solid State Div., Somerville, N.J.
Rectifier Engrg. & Supply, St. Louis, Mo.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Sarkes Tarzian, Inc., Bloomington, Ind.
Semicoa, City of Industry, Calif.
Semicon Inc., Burlington, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Syntron Div., Homer City, Pa.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Varo, Inc., Semiconductor Div., Garland, Tex.

Diodes, Step Recovery

Carter Semiconductor, Amityville, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Nippon Electric/NEC America, N.Y., N.Y.
United-Page, Patterson, N.J.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
GHZ Devices, Inc., No. Chelmsford, Mass.
Isofilm Int'l., Chatsworth, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Siemens Corp., Comps. Div., Iselin, N.J.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Surface Barrier

General Electc. Semiconductor, Syracuse,, N.Y.
Metropolitan Supply Corp., New York, N.Y.
United Detector Tech., Santa Monica, Cal.
United-Page, Patterson, N.J.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Gencom Div., Plainview, N.Y.
Parametric Inds., Inc., Winchester, Mass.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Switching

American Elctrn. Labs., Inc., Lansdale, Pa.
Arra Inc., Bayshore, N.Y.
Carter Semiconductor, Amityville, N.Y.
Centralab Semiconductor, El Monte, Cal.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y. .... p 1799
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal. p 1812
Nippon Electric/NEC America, N.Y., N.Y.
Semtech Corp., Newbury Pk., Cal.
Solid State Devices, Santa Fe Springs, Cal. ....p 1836,1837
United-Page, Patterson, N.J. .... p 1856
Unitrode, Watertown, Mass.
Abadak Inds., Inc., Farmingdale, N.Y.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Corvair Diode, New York, N.Y.
Dionics, Inc., Westbury, N.Y.
Electronic Transistors, Flushing, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
GHZ Devices, Inc., No. Chelmsford, Mass.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
Intersil, Inc., Cupertino, Calif.
Isofilm Int'l., Chatsworth, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
JSH Elctrns, Inc., Culver City, Calif.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Diode Corp., Newburyport, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Parametric Inds., Inc., Winchester, Mass.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Syntron Div., Homer City, Pa.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRG Prods., E. Boston, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Tunnel

Centralab Semiconductor, El Monte, Cal.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Aertech Inds., Sunnyvale, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Diode, New York, N.Y.
Franel Corp., So. River, N.J.
Microphase Corp., Cos Cob, Conn.
Parametric Inds., Inc., Winchester, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Special Microwave Devices Oper., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.

Diodes, Varactor

American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Metropolitan Supply Corp., New York, N.Y.
Nippon Electric/NEC America, N.Y., N.Y.
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Aertech Inds., Sunnyvale, Calif.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Corvair Diode, New York, N.Y.
Crystalonics Div., Cambridge, Mass.
Eastron Corp., Haverhill, Mass.
Fairchild Semiconductor, Mountain View, Calif.
Fansteel Inc., N Chicago, Ill.
Ferranti Ltd., Hollinwood, Lancs., England
GHZ Devices, Inc., No. Chelmsford, Mass.
Hughes Aircraft Co, Malibu, Cal.
Isofilm Int'l., Chatsworth, Cal.
ITT Electron Tube, Easton, Pa.
KSC Semiconductor Corp., Chelmsford, Mass.
Microwave Assocs., Inc., Burlington, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
MSI Elctrns. Inc., Woodside, N.Y.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Parametric Inds., Inc., Winchester, Mass.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRG Prods., E. Boston, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Varian, Beverly, Mass.

Diodes, Video Detector—See Diodes, Microwave Detector

Diodes, Zener

Beckman Instrs., Cedar Grove, N.J.
Centralab Semiconductor, El Monte, Cal. ....p 1796,1797
Delco Elctrns. Div., Kokomo, Ind. p 1801
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal. p 1807
Julie Research Lab., New York, N.Y.
Mauratron, Inc., Dallas, Tex. .... p 815
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal. p 1810
Nippon Electric/NEC America, N.Y., N.Y.
Precision Monolithics, Santa Clara, Cal.
Schauer Mfg. Corp., Cincinnati, Ohio p 1821
Solid State Devices, Santa Fe Springs, Cal.
Trio Labs, Inc., Plainview, N.Y.
United-Page, Patterson, N.J.
Unitrode, Watertown, Mass. .... p 1848
Unitrode Corp., Watertown, Mass. p 1848
Abadak Inds., Inc., Farmingdale, N.Y.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
American Semiconductor Corp., Arlington Hgts., Ill.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Components, Inc., Biddeford, Me.
Computer Components Int'l, Palm Beach Gardens, Fla.
Computer Diode, Fair Lawn, N.J.
Cordover, Carl & Co., Mineola, N.Y.
Corvair Diode, New York, N.Y.
Dickson Elctrns. Corp., Scottsdale, Ariz
Dionics, Inc., Westbury, N.Y.
Eastron Corp., Haverhill, Mass.
Electronic Transistors, Flushing, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Semiconductor Corp., Tempe, Ariz.
International Diode Corp., Jersey City, N.J.
ITT Semiconductors, W. Palm Beach, Fla.
JSH Elctrns, Inc., Culver City, Calif.
KSC Semiconductor Corp., Chelmsford, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Sarkes Tarzian, Inc., Bloomington, Ind.
Semicoa, City of Industry, Calif.
Semicon Inc., Burlington, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Diplexers—See Vol 1

Directional Couplers—See Couplers, Directional—Vol 1

Discharge Systems, Energy—See Vol 1

Discriminators—See Vol 1

Disc Packs, Magnetic—See Vol 1

Discs, Computer Memory Also See Memory Systems, Disc —See Vol 1

Discs, Optical Encoder—See Coded Discs, Optical—Vol 1

Dispensers For Epoxy, Encapsulating Compounds, etc.—See Vol 1

Display Boards—See Boards, Plotting—Vol 1

Display Panels (Back-Lighted & Edge-Lighted)

Bowmar Instr. Corp., Ft. Wayne, Ind.
Dialight Corp., Brooklyn, N.Y.
Display Devices, Inc., Encinitas, Cal. p 1450
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Inter-Market, Inc., Glenview, Ill.
K.C.C. Shokai, Ltd., Naka-ku, Kobe, Japan .... p 1479
LVC Ind's., Inc., Corona, N.Y.
Vemaline Prods. Co., Wyckoff, N.J. p 1505
Ackerman Engravers, Inc., Long Island City, N.Y.
Arvin Sys., Inc., Dayton, Ohio
Bomac Elctrns., Inc., Northridge, Cal.
Burtek, Inc., Tulsa, Okla.
Canrad Precision Inds., Inc., Pelham, N.Y.
Devco Engrg., W. Caldwell, N.J.
Fiber Photics, Inc., Santa Cruz, Cal.
Gagne Assocs., Inc., Binghamton, N.Y.
Glar-Ban Corp., Buffalo, N.Y.
GM Nameplate, Inc., Seattle, Wash.
Hughes Aircraft Co, Culver City, Cal.
Info-Lite Corp., Ft. Lee, N.J.
Miller Dial, El Monte, Calif.
Moore Inds., Van Nuys, Cal.
N/P Co., Temple City, Calif.
Norgus Silk Screen Co., Inc., Clifton, N.J.
Panob Corp., Port Chester, N.Y.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Robertson Instr., Azusa, Cal.
Sanders Data Sys., Nashua, N.H.
Singer-General Precision, Inc., Little Falls, N.J.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
Symbolic Displays, Inc., Orange, Calif.
TEC, Inc., Eden Prairie, Minn.
Telmar, Inc., Columbus, Ohio
T.J. Elctrns., Ft. Worth, Tex.
Virginia Elctrns. Co., Inc., Falls Church, Va.

Wilmer Mfg. Co., Beltsville, Md.

Displays, Projection Type (CRT, Electromechanical, Film Light Valve)

Allard Instr. Corp., Westbury, NY
Beta Instr., Newton Upper Falls, Mass. p 337
Bowmar Instr. Corp., Ft. Wayne, Ind.
CELCO, Mahwah, N.J. .... p 339
Corning Glass Works, Elctrn. Prods. Div., Corning, N.Y.
Data Technology, Palo Alto, Cal... p 429
Dialight Corp., Brooklyn, N.Y.
Gould, Inc., Cleveland, Ohio
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Intronics, Inc., Newton, Mass.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Raytheon Co., Quincy, Mass. ...... p 2005
Systron-Donner Kruse Elctrns. Sub., Mountain View, Cal.
Tektronix, Inc., Beaverton, Ore.
Adage, Inc., Boston, Mass.
Applied Digital Data Systems, Inc., Hauppauge, N.Y.
Arco Systems Inc., Palo Alto, Cal
Astronautics Corp. of Amer., Milwaukee, Wisc.
Aydin Data Systems, Ft. Washington, Pa
Bendix Aerospace-Elctrns., Teterboro, N.J.
California Computer Prods., Anaheim, Cal
California Instrs. Co., San Diego, Cal.
Communitype Corp., New York, N.Y.
Conductron Corp., St. Charles, Mo.
Conrac Div., Covina, Calif.
Devco Engrg., W. Caldwell, N.J.
Elecpac Inc., Cary, Ill.
Entron Inc., Morganville, N.J.
Excellon Inds., Torrance, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
General Dynamics, San Diego, Cal.
Goodyear Aerospace Corp., Akron, Ohio
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Indofex, Inc., Waterbury, Conn.
Information Displays, Inc., Mt. Kisco, N.Y.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
ISC/Telephonics Div, Huntington, N.Y.
Kaiser Aerospace & Elctrns., Palo Alto, Calif.
Kollsman Instr. Corp., Syosset, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Lockheed Aircraft Svce., Special Devices Div., Ontario, Calif.
LTV Electrosystems, Dallas, Tex.
Mast Dev. Co., Davenport, Iowa
Motorola, Scottsdale, Ariz.
Optimation, Inc., Sun Valley, Calif.
Philco-Ford Corp., Washington, D.C.
Raytheon Data Systems Co., Norwood, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Robertson Instr., Azusa, Cal.
Sanders Assocs., Nashua, N.H.
Sanders Data Sys., Nashua, N.H.
Sanders Assocs., Inc., Data Sys. Div., Nashua, N.H.
Sanders Assocs., Ocean Sys., So. Nashua, N.H.
Spiras Sys., Inc., Waltham, Mass.
Stromberg DatagraphiX, San Diego, Cal.
TEC, Inc., Eden Prairie, Minn.
Telmar, Inc., Columbus, Ohio
Westinghouse Elec., Elmira, N.Y.

Dissipators, Heat—See Heat Sinks—Vol 3

Distortion Analyzers—See Analyzers, A-F—Vol 1

Distortion Indicators—See Analyzers, A-F—Vol 1

Distribution Systems, Frequency—See Vol 1

Dividers, Analog—See Vol 1

Dividers, Angular—See Vol 1

Dividers, Frequency—See Vol 1

Dividers, Magnetic

American Aerospace Controls, Farmingdale, N.Y.
Arra Inc., Bayshore, N.Y.
General Magnetics, Bloomfield, N.J. p 1318
ISC Magnetics Div., Huntington, N.Y.
Transmagnetics Inc., Farmingdale, N.Y.

Dividers, Power (LF, HF, VHF, UHF)—See Vol 1

Dividers, Power, Microwave

Alford Mfg. Co., Winchester, Mass. p 598
American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol RF Div., Danbury, Conn.
Arra Inc., Bayshore, N.Y.
Bendix, Franklin, Ind.
E & M Labs., Westlake Village, Cal.
Lorch Elctrns. Corp., Englewood, N.J. p 609
Microwave Cavity Labs., La Grange, Ill.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Sealectro Corp., Mamaroneck, N.Y.
Transco Prods., Inc., Venice, Cal. p 613
Vari-L Co., Inc., Denver, Colo. .... p 1570
Vega Precision Labs., Vienna, Va. p 615
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md. .... p 1571
Aertech Inds., Sunnyvale, Calif.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Americon Corp., Waltham, Mass.
Anaren Microwave, Inc., Syracuse, N.Y.
Anzac Elctrns., Waltham, Mass.
Astrolab Inc., Linden, N J
Aviel Electronics Inc, Burbank, Calif.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Elctrn. Resources Div., Los Angeles, Cal.
Elctrn. Specialty, Thomaston, Conn.
ESCA, Jupiter, Fla.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Indit Corp., Albertson, N.Y.
Industrial Microwave, Scotch Plains, N.J.
ITT Gremar, Inc., Woburn, Mass.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Olektron Corp., Dudley, Mass.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
Reeve Elctrns., Inc., Chicago, Ill.
RF Systems, Inc., Cohasset, Mass.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Scientific-Atlanta, Inc., Atlanta, Ga.
Scientific Communications, Garland, Tex.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Vectronics Microwave Corp., Middlesex, N.J.
Wavecom, Inc., Northridge, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Dividers, Voltage Also See Transformers, Voltage Dividing—See Vol 1

Dollies & Instrument Carts—See Carts, Instrument & Equipment—Vol 3

Domes, Optical

Amersil, Inc., Hillside, N.J.
Parabam, Inc., Compton, Cal.
Bausch & Lomb, Rochester, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Dell Optics Co., Inc., N. Bergen, N.J.
Electro-Optical Div., Northampton, Mass.
Exotic Materials, Inc., Costa Mesa, Cal.
Franklin Fibre-Lamitex, Wilmington, Del.
General Electrodynamics Corp., Garland, Tex.
Harshaw Chem. Co., Cleveland, Ohio
Hughes Aircraft Co, Culver City, Cal.
Jones, A.D. Optical Works, Burlington, Mass.
Kollsman Instr. Corp., Syosset, N.Y.
Liberty Mirror Div., Brackenridge, Pa.
Optical Inds., Santa Ana, Cal.
Santa Barbara Resch. Ctr., Goleta, Calif.
Servo Corp. America, Hicksville, N.Y.
Syncor Prods. Co., Inc., Malden, Mass.
Texas Instruments, Inc., Dallas, Tex.
Thermal Amer. Fused Quartz, Montville, N.J.
Topper Mfg. Co., Inc., Great Neck, N.Y.
Zeiss, Carl, Inc., New York, N.Y.

Doors, Cabinet, Metal—See Cabinets & Accessories, Metal—Vol 3

Dope, Coil—See Insulating Compounds, Coil Dope—Vol 3

Dosimeters—See Vol 1

Doublers, Frequency—See Multipliers, Frequency—Vol 1

Drafting Machines—See Vol 3

Drafting Symbols, Dry Transfer, Pressure Sensitive, etc.—See Vol 3

Drafting Templates & Equip.—See Vol 3

Drawers, Sliding—See Vol 3

Drills & Accessories, Hand & Power—See Vol 3

Drivers, Chopper

Solid State Elctrns., Sepulveda, Cal. p 2006
Microwave Development Labs., Inc., Needham Hgts., Mass.

Drivers, Lamp

Data Technology Corp., Palo Alto, Cal.
Luminetics Corp., Pompano Beach, Fla.
Micro Networks, Worcester, Mass.

Drivers, Nut—See Vol 3

Drivers, Solenoid—See Solenoid Drivers

Drivers, Speaker—See Vol 1

Drivers, Switch

American Elctrn. Labs., Inc., Lansdale, Pa.
Arra Inc., Bayshore, N.Y.
Daico Inds., Inc., Compton, Cal.
E & M Labs., Westlake Village, Cal.
Ledex, Inc., Dayton, Ohio .... p 1940
Cole Instr., Costa Mesa, Cal.
Hyletronics Corp., Littleton, Mass.
Matrix Sys. Corp., Chatsworth, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Div, Nashua, N.H.
Rantec Div., Calabasas, Calif.
Sanders Assocs., Nashua, N.H.
Sloan Technology Corp., Santa Barbara, Calif.
Whistler Elctrns., Inc., Northridge, Cal.

Drivers, Tube

Ind'l Elctrn. Engrs., Van Nuys, Cal.
Tempo/UTI Div., Chatsworth, Cal.
Watkins Johnson Co., Palo Alto, Cal.
Burroughs Corp., Plainfield, N.J.
Instr. Resch. Co., Lincoln, Mass.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
LAD Electro-Sys., Inc., Hicksville, N.Y.

Drivers & Decoders For Readouts

Alco Elctrn. Prods., Lawrence, Mass. p 1438
Digital Equip. Corp., Maynard, Mass.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal. .... p 1540
Ind'l Elctrn. Engrs., Van Nuys, Cal. p 1477
Inter-Market, Inc., Glenview, Ill.
Nippon Electric/NEC America, N.Y., N.Y. .... p 1487
Pinlites, Fairfield, N.J. .... p 1490
Burroughs Corp., Plainfield, N.J.
Fabri-Tek, Pompano Beach, Fla.
Hughes Aircraft Co, Culver City, Cal.
Info-Lite Corp., Ft. Lee, N.J.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Iso-Switch Corp., Costa Mesa, Cal.
Luminetics Corp., Pompano Beach, Fla.
Mostek Corp., Carrollton,, Tex.
Robins Inds. Corp., Flushing, N Y
TEC, Inc., Eden Prairie, Minn.
Theta Instr. Corp., Fairfield, N.J.

Drives, Dial

Bowmar Instr. Corp., Ft. Wayne, Ind.
Dale Elctrns., Inc., Yankton, S.D.
GC Elctrns., Rockford, Ill.
General Elec. Co., Schenectady, N.Y.
Jackson Bros., (London) Ltd., New York, N.Y. .... p 2419
Millen, James Mfg., Malden, Mass. p 1488,1489
Smith, Herman H., Inc., Bklyn., N.Y.
Vemaline Prods. Co., Wyckoff, N.J. p 2775
All Star Prods., Inc., Defiance, Ohio
Bowmar/Ali, Inc., Acton, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Geartronics Corp., N. Billerica, Mass.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Perfect Gear & Instr. Corp., Northridge, Calif.
Robertson Instr., Azusa, Cal.
Theta Instr. Corp., Fairfield, N.J.
USM Corp., Wakefield, Mass.
Waldom Elctrns., Inc., Chicago, Ill.

Drivers & Drive Mechanisms

Automation Dev., Culver City, Cal. p 1310
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
Dale Elctrns., Inc., Yankton, S.D.
Dynamic Instr. Corp., Plainview, N.Y. p 1586
General Elec. Co., Schenectady, N.Y.
Haydon, A. W. Co., Waterbury, Conn.
Jackson Bros., (London) Ltd., New York, N.Y. .... p 2419
Ledex, Inc., Dayton, Ohio
Millen, James Mfg., Malden, Mass. p 1489
Precision Mechanisms, Westbury, N.Y. p 1876
Servo-Tek Prods. Co., Hawthorne, N.J. p 1632
Vemaline Prods. Co., Wyckoff, N.J. p 2775
Advance Gear & Mach., Los Angeles, Cal.
All Star Prods., Inc., Defiance, Ohio
Allis, Louis Co., Milwaukee, Wisc.
Analog General Corp., Oceanside, N.Y.
Barry Controls, Watertown, Mass.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dynamic Gear, Ft. Lauderdale, Fla.

Essex Engrg. Co., Inc., Essex, Conn.
Furnas Elec. Co., Batavia, Ill.
Geartronics Corp., N. Billerica, Mass.
Helitronics Corp., Newark, N.J.
Heller, G K, Corp., Las Vegas, Nev.
Insco Corp., Groton, Mass.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Jones Motrola Corp., Stamford, Conn.
Kingmann-White, Inc., Placentia, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lem Instrument Corp., Farmingdale, N.Y.
Lisk, G.W. Co., Clifton Springs, N.Y.
McNally Bros. Mach. & Gear, Mipls., Minn.
Metron Instrs., Inc., Denver, Colo.
MPC Prods. Corp., Chicago, Ill.
Perfect Gear & Instr. Corp., Northridge, Calif.
Permanent Magnet Co., Inc., Indianapolis, Ind.
PIC Design Corp., Ridgefield,, Conn.
Reliance Elec. Co., Cleveland, Ohio
Robertson Instr., Azusa, Cal.
Robot Inds., Inc., Dearborn, Mich.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Stop Components, Inc., Freeport, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Theta Instr. Corp., Fairfield, N.J.
USM Corp., Wakefield, Mass.
Waldom Elctrns., Inc., Chicago, Ill.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westinghouse Elec. Int'l., New York, N.Y.
Weston-Transicoil, Worcester, Pa.

Drums, Computer Memory Also See Memory Systems, Drum—See Vol 1

Dry Transfer Letters & Numbers—See Kits, Marking-Also See Drafting Symbols

Dryers, Air, Heatless—See Vol 1

Ducts, Flexible—See Vol 3

Ducts, Wiring—See Vol 3

Dummy Loads—See Vol 3

Duplexer Equipment—See Recievers; Transmitters; etc. —Vol 1

Duplexers, Microwave—See Vol 1

Duplicators, Magnetic Tape—See Vol 1

Duplicators, Paper Tape—See Vol 1

Dust-Free Chambers—See Rooms, Clean, Dust-Free—Vol 1

Dvm's—See Meters, Volt, Digital—Vol 1

Dynamometers—See Vol 1

Dynamotors
General Elec. Co., Schenectady, N.Y.
Carter Motor Co., Chicago, Ill.
Continental Elec., Newark, N.J.
Dyna Technology Inc., Sioux City, Iowa
Elctrn. Specialty, Thomaston, Conn.

Earphones—See Headphones & Headsets—Vol 1

Echo Boxes—See Boxes, Echo—Vol 1

Echo Ranging Equipment, Ultrasonic—See Vol 1

Economizers, Carbon Dioxide—See Vol 1

Editing Equipment—See Vol 3

Elastoners, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable—Vol 3

Electrical Surge Arresters—See Arresters, Electrical Surge

Electrocardiographs (Ecg)—See Vol 1

Electrodes—See Tube Parts

Electrodes, Electroplating—See Electroplating Equipment & Supplies—Vol 1

Electrodes, Spherical—See Vol 3

Electroencephalographs (Eeg)—See Vol 1

Electromechanical Readouts—See Readouts, Electromagnetic

Electromagnets—See Magnets, Electromagnetic—Vol 3

Electrometers—See Meters, Electrometer—Vol 1

Electromyographs—See Vol 1

Electron Guns—See Tube Parts

Electroplating Equipment & Supplies—See Vol 1

Electroplating Power Supplies—See Power Supplies, Electroplating Equipment—Vol 1

Electroplating Services—See Services, Plating—Vol 1

Electrostatic Spray Paint Systems—See Spray Systems, Electrostatic Paint—Vol 1

Elements, Heating—See Heating Elements

Elements, Sensing—See Transducers

Eliminators, Battery-Also See Power Supplies—See Vol 1

Emissometers-Also See Meters, Reflectometer—See Vol 1

Enamel Insulation—See Insulating Compounds, Enamel—Vol 3

Encapsulating Cups—See Cups, Encapsulation—Vol 3

Encapsulating Materials—See Compounds, Encapsulating—Vol 3

Encapsulation Services—See Services, Encapsulation—Vol 3

Enclosures, Component, Plug-In—See Cans—Vol 3

Enclosures, Speaker (Excluding Kits)—See Vol 1

Encoders, Binary—See Vol 1

Encoders, Brush & Magnetic, Disc—See Vol 1

Encoders, Digital—See Vol 1

Encoders, Displacement, Linear—See Vol 1

Encoders, Keyboard—See Vol 1

Encoders, Optical—See Coded Discs, Optical—Vol 1

Encoders, Shaft Position—See Vol 1

Energy Discharge Systems—See Discharge Systems, Energy—Vol 1

Engineering Reference Books—See Technical Books—Vol 3

Engraving & Profiling Equipment—See Vol 1

Engraving & Profiling Services—See Services, Engraving—Vol 3

Environmental Chambers—See Chambers—Vol 1

Environmental Rooms—See Rooms, Environmental—Vol 1

Environmental Seals & Feedthrus—See Feedthrus & Seals, Environmental—Vol 3

Environmental Testing Services—See Services, Environmental Testing—Vol 3

Epoxy Resins—See Adhesives; Compounds—Vol 3

Equalizers, Audio—See Vol 1

Equalizers, Delay—See Vol 1

Equalizers, Phase—See Vol 1

Erasers, Magnetic Tape (Bulk)—See Vol 1

Error Correction Equipment, Teleprinter—See Vol 1

Escutcheons
Best Mfg. Co., Kansas City, Mo.
Brady, W.H. Co., Milwaukee, Wisc.
Century Fastener Corp., Brooklyn, N.Y.
GM Nameplate, Inc., Seattle, Wash.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Seton Name Plate Corp., New Haven, Conn.
South Shore Metal Prods., Inc., Farmingdale, N.Y.
Topflight Corp., York, Pa.

Etchants, Printed Circuit—See Printed Circuit Etchants—Vol 3

Evaporation Equipment, Electron Beam—See Vol 1

Exciters—See Oscillators—Vol 1

Exciters, Vibration—See Vibration Test Systems—Vol 1

Expanders, Data & Speech—See Vol 1

Expanders, Meter—See Multipliers, Meter—Vol 1

Explosive Gas Indicators—See Detectors, Gas Leak—Vol 1

Extensometers, Electro-Optical
Gaertner Scientific Corp., Chicago, Ill.
Hughes Aircraft Co, Culver City, Cal.
Instron Corp., Canton, Mass.
Optron Corp., Woodbridge, Conn.
Physitech, Inc., Willow Grove, Pa.
Strandberg Engrg. Labs., Inc., Greensboro, N.C.
Transducer Controls Corp., Covina, Calif.

Extractors, Circuit Board, Fuse, Lamp, Tube—See Pullers—Vol 3

Eyelets—See Vol 3

Fabric, Insulation—See Insulating Materials, Fabric—Vol 3

Fabrics, Acoustic, Sound-Transparent—See Vol 3

Fabrics, Conductive—See Vol 3

Faceplates
Apahouser Corp. of N.E., Boston, Mass.
Best Mfg. Co., Kansas City, Mo.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Eljay Corp., Columbia, Md.
GM Nameplate, Inc., Seattle, Wash.
Metalphoto Corp., Cleveland, Ohio
Rank Precision Inds., W. Nyack, N.Y.
S & S Optical Co., Inc., Ft. Wayne, Ind.
Seton Name Plate Corp., New Haven, Conn.

Facsimile Equipment—See Recievers; Transmitters; etc. —Vol 1

Fans—See Blowers & Fans—Vol 3

Fasteners, Metal—See Vol 3

Fasteners, Non-Metallic—See Vol 3

Fault Locators—See Detectors, Flaw & Defect—Vol 1

Feedthrus & Seals, Environmental—See Vol 3

Feedthrus, Terminal—See Terminals, Feedthru—Vol 3

Felt & Felt Parts—See Vol 3

Ferrite Parts-Also See Materials Ferrite;Cores, Ferrite—See Vol 3

Fiber Optic Bundles
Sensor Tech., Van Nuys, Cal.
ACMI Ind'l. Div., Bronx, N.Y.
Allied Elctrns. Corp., Chicago, Ill.
Allyn, W., Inc., Skaneateles Falls, N.Y.
Bausch & Lomb, Rochester, N.Y.
Bendix, Sturbridge, Mass.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dyonics, Inc., Woburn, Mass.
Ealing Corp., Cambridge, Mass.
E.I. DuPont DeNemours & Co., Wilmington, Del.
Electro Fiberoptics Corp., W. Boylston, Mass.
Fiber Photics, Inc., Santa Cruz, Cal.
International Light, Newburyport, Mass.
Lenox Instr. Co., Philadelphia, Pa.
Mechanical Technology, Inc., Latham, N.Y.
Optical Inds., Santa Ana, Cal.
Optics Technology, Palo Alto, Calif.
Opto-Metric Tools, Rockleigh, N.J.
Owens-Corning Fiberglas, Toledo, Ohio
Rank Precision Inds., W. Nyack, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Syncor Prods. Co., Inc., Malden, Mass.
Techni-Tool, Inc., Philadelphia, Pa.

Fiber Optic Inspection Equipment—See Vol 1

Fibers—See Insulating Materials, Fiber—Vol 3

Field Plotters, Electric & Magnetic—See Vol 1

Film Badges—See Services, Film Badge—Vol 3

Film Thickness Indicators—See Indicators, Film Thickness—Vol 1

Films, Capacitor—See Vol 3

Films, Masking (Incl. Photographic)—See Vol 1

Films, Resistance—See Vol 3

Filter Synthesizers

Allen Avionics, Mineola, N.Y. ...... p 1510
Rockland Sys. Corp., Blauvelt, N.Y. p 1527
Kinetic Tech., Inc., Santa Clara, Cal.
Teledyne Adcom, Cambridge, Mass.

Filters, A-F

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
A. P. Circuit Corp., New York, N.Y.
AVX Aerovox Corp., New Bedford, Mass.
Bramco Controls, Piqua, Ohio .... p 1523
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364
Coast Coil Co., Los Angeles, Calif. p 2487
Data Delay Devices, Clifton, N.J.
Dytronics Co., Columbus, Ohio .... p 441
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
General Resistance, Mt. Vernon, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Garden City Pk., N.Y. p 1516
Hisonic, Inc., Olathe, Kans. .... p 1517
Kappa Networks, Inc., Carteret, N.J. p 1521
Krohn-Hite, Cambridge, Mass. .... p 1522
Microtran Co., Valley Stream, N.Y.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Neshaminy Transformer, Furlong, Pa.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Raytheon Co., Quincy, Mass.
Reeves-Hoffman Div., Carlisle, Pa.
Rockland Sys. Corp., Blauvelt, N.Y. p 1527
San Fernando Elec. Mfg., San Fernando, Cal.
Seg Elctrns., Richmond Hill, N.Y. p 1525
Solid State Elctrns., Sepulveda, Cal.
Southern Elctrns., Burbank, Cal.
Sprague Elec. Co., No. Adams, Mass.
Torotel, Inc., Grandview, Mo.
TT Elctrns., Inc., Culver City, Cal. p 1530,1531
United Transformer Co. Div. of TRW Inc., New York, N.Y. .... p 1533
Universal Ad-Yu Elctrns., Inc., Passaic, N.J. .... p 2752
A C Electronics Co., Santa Monica, Cal.
Aladdin Elctrns., Nashville, Tenn.
AMBAC Inds., Garden City, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
A.R.F. Products, Inc., Raton, N.M.
Armec Corp., Huntington Sta., N.Y.
Barwood Elctrns., Inc., Glendale, Cal.
Beukers Labs., Inc., Hauppauge, N.Y.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Control Sci. Corp., Alexandria, Va.
Coral Magnetics Co., Farmingdale, N.Y.
Crystal Network Prods. Corp., Erie, Pa.
De Coursey Engrg. Lab., Culver City, Cal.
Electro Windings & Comps., Kenilworth, N.J.
Electrocom Inds., So. Bend, Indiana
Filtron Co., Flushing, N.Y.
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Instr. Corp., Chicopee, Mass.
General Radio Co., Concord, Mass.
HB Engrg. Corp., Silver Spring, Md.
Kinetic Tech., Inc., Santa Clara, Cal.
Linear Networks Co., San Pedro, Cal.
Nat'l. Coil Co., Douglas, Ariz.
Peerless Elec. Prods., Anaheim, Cal.
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Techniques, Inc., W. Englewood, N.J.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Riverbank Labs., Geneva, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
SKG Assocs., Inc., Boston, Mass.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Stromberg Carlson Corp., Rochester, N.Y.
Systems Resch. Labs., Dayton, Ohio
Torotron, Mt. Vernon, N.Y.
Trion, Inc., McKees Rocks, Pa.
United Resch. Lab., Corp., New York, N.Y.
Vanguard Elctrns., Inglewood, Cal.
Weston-Magnetics, Archbald, Pa.
White Instrs., Inc., Austin, Tex.

Filters, Active (All Types)

A. P. Circuit Corp., New York, N.Y. p 1509
Clarke - Hess, New York, N.Y.
CTS Corp, Elkhart, Ind.
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Research Co., Shawnee Mission, Kans. .... p 1384
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Ithaco, Inc., Ithaca, N.Y.
Krohn-Hite, Cambridge, Mass.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Rockland Sys. Corp., Blauvelt, N.Y.
Seg Elctrns., Richmond Hill, N.Y. p 1525
Solid State Elctrns., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Torotel, Inc., Grandview, Mo. ...... p 1529
United Transformer Co. Div. of TRW Inc., New York, N.Y.
Analog Devices, Inc., Norwood, Mass.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cambridge Thermionic, Cambridge, Mass
General Radio Co., Concord, Mass.
Gulton Inds., Albuquerque, N.M.
Kinetic Tech., Inc., Santa Clara, Cal.
Linear Networks Co., San Pedro, Cal.
Listening, Inc., Arlington, Mass.
Moore Inds., Van Nuys, Cal.
Polyphase Instr. Co., Bridgeport, Pa.
Radiation Devices Co., Baltimore, Md.
Sanders Assocs., Nashua, N.H.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Torotron, Mt. Vernon, N.Y.
Transrex Div., Torrance, Cal.
Wavecom, Inc., Northridge, Cal.
White Instrs., Inc., Austin, Tex.

Filters, Air—See Air Cleaners & Filters—Vol 3

Filters, Analog—See Filters, Continuously Variable

Filters, Antenna

Allen-Bradley Co., Milwaukee, Wisc.
Applied Research Inc., Port Washington, N.Y.
Bird Elctrn., Cleveland, Ohio.......... p 421
Electro-Mechanics Co., Austin, Tex.
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
GC Elctrns., Rockford, Ill.
Hertz Filter, Garden City Pk., N.Y.
Johnson E. F. Co., Waseca, Minn.
Lorch Elctrns. Corp., Englewood, N.J.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Miller, J.W. Co., Compton, Cal.
Piezo Technology, Orlando, Fla.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
San Fernando Elec. Mfg., San Fernando, Cal.
Seg Elctrns., Richmond Hill, N.Y.
TMC Systems (Ariz.), Tempe, Ariz.
Transco Prods., Inc., Venice, Cal.
TT Elctrns., Inc., Culver City, Cal.
American Trans-Coil Corp., Richmond Hill, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
Benco Television Assoc., Rexdale, Ont., Can.
Beukers Labs., Inc., Hauppauge, N.Y.
Decibel Prods., Inc., Dallas, Tex.
Delta Elctrns., Alexandria, Va.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Resources Div., Los Angeles, Cal.
Engelmann Microwave, Montville, N.J.
Farinon Electric, San Carlos, Calif.
Fedtro, Inc., Rockville Centre, N.Y.
Finney Co., Bedford, Ohio
General Instr. Corp., Chicopee, Mass.
General Microwave Corp., Farmingdale, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Hi-Lo Mfg. Corp., Chicago, Ill.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Culver City, Cal.
Industrial Microwave, Scotch Plains, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
K & L Microwave Inc., Salisbury, Md.
Kaman Nuclear, Colorado Springs, Colo.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microphase Corp., Cos Cob, Conn.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Nurad, Inc., Baltimore, Md.
Nytronics, Inc., Alpha, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Philco-Ford Corp., Washington, D.C.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
Sanders Assocs., Nashua, N.H.
Sinclair Radio Labs., Maple, Ont., Can.
Superex Elctrns. Corp., Yonkers, N.Y.
TACO Div., Sherburne, N.Y.
TDK Elctrns. Corp., Long Island City, N.Y.
Technical Mat'l., Mamaroneck, N.Y.
Teledyne Micronetics, San Diego, Calif.
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Torotron, Mt. Vernon, N.Y.
Tricraft Prods., Chicago, Ill.
Vanguard Elctrns., Inglewood, Cal.
Wavecom, Inc., Northridge, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Filters, Band Elimination

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
Allen Avionics, Mineola, N.Y. ...... p 1510
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
A. P. Circuit Corp., New York, N.Y. p 1509
Applied Research Inc., Port Washington, N.Y. .... p 1554
Automatic Coil, New Hyde Pk., N.Y.
AVX Aerovox Corp., New Bedford, Mass.
Bramco Controls, Piqua, Ohio .... p 1523
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364,1512
Coast Coil Co., Los Angeles, Calif. p 2487
CTS Corp, Elkhart, Ind.
Dale Elctrns., Inc., Yankton, S.D.
Damon Corp., Needham Hgts., Mass. p 1379
Data Delay Devices, Clifton, N.J.
Dytronics Co., Columbus, Ohio .... p 441
Electro Cube, San Gabriel, Cal
Electro/Data, Inc., Garland, Tex.
Electro-Mechanics Co., Austin, Tex.
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Research Co., Shawnee Mission, Kans. .... p 1384
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J. .... p 605
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Garden City Pk., N.Y. p 1516
Hewlett-Packard, Palo Alto, Cal.
Hisonic, Inc., Olathe, Kans. .... p 1517
Hopkins Engrg., San Fernando, Cal. p 1519
Hughes Aircraft Co., Frequency Control Devices, Newport Bch., Cal.
Ithaco, Inc., Ithaca, N.Y. .... p 1286
JFD Elctrns./Sub. Riker-Maxson, Bklyn., N.Y.
Kappa Networks, Inc., Carteret, N.J. p 1520,1521
Krohn-Hite, Cambridge, Mass. .... p 1522
Lorch Elctrns. Corp., Englewood, N.J.
Marconi Instrs., Englewood, N.J.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microtran Co., Valley Stream, N.Y.
Microwave Cavity Labs., La Grange, Ill.
Motorola Communications & Electrns., Chicago, Ill. .... p 1417
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Quindar Elctrns., Inc., Springfield, N.J.
Raytheon Co., Quincy, Mass.
Reeves-Hoffman Div., Carlisle, Pa.
RF Interonics, Bay Shore, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Rockland Sys. Corp., Blauvelt, N.Y. p 1526,1527
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
San Fernando Elec. Mfg., San Fernando, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Seg Elctrns., Richmond Hill, N.Y. p 1525
Solid State Elctrns., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Texscan Corp., Indianapolis, Ind. p 578
TMC Systems (Ariz.), Tempe, Ariz. p 1430,1431
Torotel, Inc., Grandview, Mo. ...... p 1529
TT Elctrns., Inc., Culver City, Cal. p 1530
United Transformer Co. Div. of TRW Inc., New York, N.Y.
Abphot, New York, N.Y.
Aerolite Electronics Corp., Union City, N.J.
Aladdin Elctrns., Nashville, Tenn.
American Trans-Coil Corp., Richmond Hill, N.Y.
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
B & K Instrs., Inc., Cleveland, Ohio
Beukers Labs., Inc., Hauppauge, N.Y.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Captor Corp., Tipp City, Ohio
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Control Sci. Corp., Alexandria, Va.
Coral Magnetics Co., Farmingdale, N.Y.
Cornell-Dubilier Elctrns., Newark, N.J.
Crystal Network Prods. Corp., Erie, Pa.
De Coursey Engrg. Lab., Culver City, Cal.
Decibel Prods., Inc., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Delta Elctrns., Alexandria, Va.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electrac, Inc., Anaheim, Calif.
Electro Windings & Comps., Kenilworth, N.J.
Electrocom Inds., So. Bend, Indiana
Elctrn. Transformer Corp., Paterson, N.J.
Entron, Inc., Silver Spring, Md.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Filtech Corp., Franklin Park, Ill.
Filtron Co., Flushing, N.Y.
Finney Co., Bedford, Ohio
Forbes & Wagner, Inc., Silver Creek, N.Y.
Frequency Devices, Inc., Haverhill, Mass.
General Instr. Corp., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Radio Co., Concord, Mass.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Hope Elctrns., Clifton, N.J.
Hughes Aircraft Co, Fullerton, Cal.
Industrial Microwave, Scotch Plains, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
K & L Microwave Inc., Salisbury, Md.
Kaman Nuclear, Colorado Springs, Colo.
Kinetic Tech., Inc., Santa Clara, Cal.
Lynch Communication Systems, San Francisco, Calif.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microphase Corp., Cos Cob, Conn.
Microsonics, Inc., Weymouth, Mass.
Microwave Assocs., Inc., Burlington, Mass.

Microwave Development Labs., Inc., Needham Hgts., Mass.
Nat'l. Coil Co., Douglas, Ariz.
Nurad, Inc., Baltimore, Md.
Nytronics, Inc., Alpha, N.J.
Peerless Elec. Prods., Anaheim, Cal.
Peninsula Microwave Labs., Mountain View, Cal.
Physical Elctrn. Labs., Menlo Park, Calif.
Polyphase Instr. Co., Bridgeport, Pa.
Power Elctrns. Co., Houston, Tex.
Premier Microwave, Port Chester, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Rantec Div., Calabasas, Calif.
Renco Elctrns., Inc., Hicksville, N.Y.
RF Systems, Inc., Cohasset, Mass.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Sartron, Inc., Newberg, Ore.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.
Signal Analysis Inds. Corp., Hauppauge, N.Y.
Sinclair Radio Labs., Maple, Ont., Can.
Spectra Sonics, Ogden, Utah
Spectrum Control, Inc., Fairview, Pa.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Stanford Applied Engrg., Santa Clara, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
Stromberg Carlson Corp., Rochester, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systems Resch. Labs., Dayton, Ohio
Technical Mat'l., Mamaroneck, N.Y.
Tedford Crystal Labs., Cincinnati, Ohio
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Torotron, Mt. Vernon, N.Y.
Triad Distributor Div., Huntington, Ind.
Vanguard Elctrns., Inglewood, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Wavecom, Inc., Northridge, Cal.
Weston-Magnetics, Archbald, Pa.
White Instrs., Inc., Austin, Tex.
Winegard Co., Burlington, Iowa
Y.T. & T. Corp., Roslyn Hgts., N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Filters, Band Pass

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
Allen Avionics, Mineola, N.Y. ...... p 1510
Allen-Bradley Co., Milwaukee, Wisc.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
A. P. Circuit Corp., New York, N.Y. p 1509
Applied Research Inc., Port Washington, N.Y. ...... p 1554
Automatic Coil, New Hyde Pk., N.Y.
AVX Aerovox Corp., New Bedford, Mass.
Bendix, Franklin, Ind. ...... p 1555
Biddle, James G., Plymouth Meeting, Pa.
Bird Elctrn., Cleveland, Ohio...... p 421
Bliley Electric, Erie, Pa. ...... p 1370
Bramco Controls, Piqua, Ohio .... p 1523
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364,1512
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y. ...... p 2484
Coast Coil Co., Los Angeles, Calif. p 2487
CTS Corp, Elkhart, Ind.
Damon Corp., Needham Hgts., Mass. p 1379
Data-Control Systems, Danbury, Conn.
Data Delay Devices, Clifton, N.J. p 2745
Dynamics Instr. Co., Monterey Pk., Cal.
Dytronics Co., Columbus, Ohio .... p 441
Electro Cube, San Gabriel, Cal
Electro/Data, Inc., Garland, Tex.
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Research Co., Shawnee Mission, Kans. ...... p 1384
ESC Elctrns. Corp., Palisades Pk., N.J. p 1513
Freed Transformer Co., Bklyn., N.Y.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J. ...... p 605
General Resistance, Mt. Vernon, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Greenray Inds., Inc., Mechanicsburg, Pa. ...... p 606
Gulton Inds., Inc., Metuchen, N.J.
Hertz Filter, Garden City Pk., N.Y. p 1516
Hewlett-Packard, Palo Alto, Cal.
Hisonic, Inc., Olathe, Kans. ...... p 1517
Hopkins Engrg., San Fernando, Cal. p 1519
Hughes Aircraft Co., Frequency Control Devices, Newport Bch., Cal. .... p 1403
Hughes Aircraft Co., Hybrid Microelectronic Circuits, Newport Bch., Cal. ...... p 1403
Ithaco, Inc., Ithaca, N.Y. ...... p 1286
Kappa Networks, Inc., Carteret, N.J. p 1520
Krohn-Hite, Cambridge, Mass. .... p 1522
Lorch Elctrns. Corp., Englewood, N.J. p 609
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microtran Co., Valley Stream, N.Y.
Microwave Cavity Labs., La Grange, Ill.
Motorola Communications & Electrns., Chicago, Ill. ...... p 1417
Multimetric Ind., Inc., Richmond Hill, N.Y. ...... p 1524
Murata Corp. of America, Elmsford, N.Y. ...... p 1418
Murata Mfg. Co. Ltd., Kyoto, Japan p 1418
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Philamon, Inc., Westbury, N.Y.... p 1424
Piezo Technology, Orlando, Fla.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Quindar Elctrns., Inc., Springfield, N.J.
Raytheon Co., Quincy, Mass.
Reeves-Hoffman Div., Carlisle, Pa. p 1427
RF Interonics, Bay Shore, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rockland Sys. Corp., Blauvelt, N.Y. p 1526,1527
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
San Fernando Elec. Mfg., San Fernando, Cal.
Sangamo Elec. Co., Pickens, S.C.
Sealectro Corp., Mamaroneck, N.Y.
Seg Elctrns., Richmond Hill, N.Y.
Sierra Sys., Mountain View, Cal.
Solid State Elctrns., Sepulveda, Cal.
Southern Elctrns., Burbank, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Texscan Corp., Indianapolis, Ind. p 578
TMC Systems (Ariz.), Tempe, Ariz. p 1430,1431
Tohoku Metal Inds., Ltd., Tokyo, Japan
Torotel, Inc., Grandview, Mo. ...... p 1529
TT Elctrns., Inc., Culver City, Cal. p 1530,1531
United Transformer Co. Div. of TRW Inc., New York, N.Y. ...... p 1533
Universal Ad-Yu Elctrns., Inc., Passaic, N.J. ...... p 2752
Vari-L Co., Inc., Denver, Colo. .... p 1534
Watkins Johnson Co., Palo Alto, Cal.
AAI Corp., Baltimore, Md.
Aerolite Electronics Corp., Union City, N.J.
Aladdin Elctrns., Nashville, Tenn.
Altec, Anaheim, Calif.
AMBAC Inds., Garden City, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
Analog Devices, Inc., Norwood, Mass.
A.R.F. Products, Inc., Boulder, Colo.
A.R.F. Products, Inc., Raton, N.M.
Armec Corp., Huntington Sta., N.Y.
Astro Comm. Lab., Gaithersburg, Md.
Astrolab Inc., Linden, N J
AUL Instrs., Inc., Flushng, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Barker & Williamson, Bristol, Pa.
Barnes Engrg. Co., Stamford, Conn.
Benco Television Assoc., Rexdale, Ont., Can.
Beukers Labs., Inc., Hauppauge, N.Y.
B.H. Inds., Los Angeles, Cal.
Blackhawk Networks Corp., Janesville, Wisc.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bullock Magnetics Corp., Pomona, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cambridge Thermionic, Cambridge, Mass
Captor Corp., Tipp City, Ohio
Collins Radio Co., Newport Beach, Calif.
Communication Elctrns., Rockville, Md.
Components Corp., Chicago, Ill.
Control Sci. Corp., Alexandria, Va.
Coral Magnetics Co., Farmingdale, N.Y.
Cornell-Dubilier Elctrns., Newark, N.J.
Crystal Network Prods. Corp., Erie, Pa.
De Coursey Engrg. Lab., Culver City, Cal.
Decibel Prods., Inc., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Dell Optics Co., Inc., N. Bergen, N.J.
Delta Elctrns., Alexandria, Va.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Elcom Sys., Deer Pk., N.Y.
Electro Assemblies, Inc., Chicago, Ill.
Electro Windings & Comps., Kenilworth, N.J.
Electrocom Inds., So. Bend, Indiana
Elctrn. Resources Div., Los Angeles, Cal.
Elctrn. Specialty, Thomaston, Conn.
Elctrn. Transformer Corp., Paterson, N.J.
Engelmann Microwave, Montville, N.J.
ESCA, Jupiter, Fla.
Exotic Materials, Inc., Costa Mesa, Cal.
Farinon Electric, San Carlos, Calif.
Filtech Corp., Franklin Park, Ill.
Filtron Co., Flushing, N.Y.
Finney Co., Bedford, Ohio
Forbes & Wagner, Inc., Silver Creek, N.Y.
Frequency Devices, Inc., Haverhill, Mass.
General Instr. Corp., Automatic Mfg. Div., Newark, N.J.
General Instr. Corp., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Geo Space, Houston, Tex.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Harder, Donald C. Co., Inc., San Diego, Calif.
Hope Elctrns., Clifton, N.J.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Incor Instr., Plainview, N.Y.
Industrial Microwave, Scotch Plains, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
K & L Microwave Inc., Salisbury, Md.
Kevlin Mfg. Co., Woburn, Mass.
Kinetic Tech., Inc., Santa Clara, Cal.
Lab Electro-Acoustique, 92-Rueil, Malmaison, France
Liberty Mirror Div., Brackenridge, Pa.
Lieco, Inc., Lindenhurst, N.Y.
Linear Networks Co., San Pedro, Cal.
Listening, Inc., Arlington, Mass.
Lynch Communication Systems, San Francisco, Calif.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microsonics, Inc., Weymouth, Mass.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
Moore Inds., Van Nuys, Cal.
Mullard, Inc., Farmingdale, N.Y.
Nat'l. Coil Co., Douglas, Ariz.
Novatronics, Inc., Pompano Beach, Fla.
Nytronics, Inc., Alpha, N.J.
Peerless Elec. Prods., Anaheim, Cal.
Peninsula Microwave Labs., Mountain View, Cal.
Physical Elctrn. Labs., Menlo Park, Calif.
Polyphase Instr. Co., Bridgeport, Pa.
Power Elctrns. Co., Houston, Tex.
Premier Microwave, Port Chester, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Radiation Sys., Inc., McLean, Va.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Rantec Div., Calabasas, Calif.
Renco Elctrns., Inc., Hicksville, N.Y.
RF Systems, Inc., Cohasset, Mass.
RFL Inds., Comps. Div., Boonton, N.J.
Rho Engrg. Co., Los Angeles, Calif
Riverbank Labs., Geneva, Ill.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Sanders Assocs., Nashua, N.H.
Sartron, Inc., Newberg, Ore.
Schoeffel Instr. Corp., Westwood, N.J.
Sherold Crystal Prods., Kansas City, Mo.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.
Sinclair Radio Labs., Maple, Ont., Can.
Singer - Tele-Signal, Woodbury, N.Y.
Spectra Sonics, Ogden, Utah
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Spectran Elctrns., Pompano Beach, Fla.
Spectrum Control, Inc., Fairview, Pa.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Stanford Applied Engrg., Santa Clara, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
Stromberg Carlson Corp., Rochester, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systems Resch. Labs., Dayton, Ohio
Systron-Donner Microwave Div., Van Nuys, Cal.
TDK Elctrns. Corp., Long Island City, N.Y.
Technical Mat'l., Mamaroneck, N.Y.
Tedford Crystal Labs., Cincinnati, Ohio
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Torotron, Mt. Vernon, N.Y.
Triad Distributor Div., Huntington, Ind.
Vanguard Elctrns., Inglewood, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Vernitron Piezoelectric Div., Bedford, Ohio
Wavecom, Inc., Northridge, Cal.
Weston-Magnetics, Archbald, Pa.
White Instrs., Inc., Austin, Tex.
Y.T. & T. Corp., Roslyn Hgts., N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Filters, Ceramic

Allen-Bradley Co., Milwaukee, Wisc. p 1511
AVX Aerovox Corp., New Bedford, Mass.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Murata Corp. of America, Elmsford, N.Y. ...... p 1418
Murata Mfg. Co. Ltd., Kyoto, Japan p 1418
RF Interonics, Bay Shore, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Southern Elctrns., Burbank, Cal.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
USCC/Centralab, Elctrns. Div., Burbank, Cal.
Alloys Unlimited, Inc., Encino, Calif.
Bendix, Sturbridge, Mass.
Captor Corp., Tipp City, Ohio
Commander Labs., Inc., Escondido, Calif.
Engelmann Microwave, Montville, N.J.
Filtron Co., Flushing, N.Y.
Jones, A.D. Optical Works, Burlington, Mass.
Spectrum Control, Inc., Fairview, Pa.
Star Porcelain Co., Trenton, N.J.

TDK Elctrns. Corp., Long Island City, N.Y.
Vernitron Piezoelectric Div., Bedford, Ohio

Filters, Coaxial

Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Applied Research Inc., Port Washington, N.Y. .... p 1554
Bendix, Franklin, Ind. .... p 1555
Bird Elctrn., Cleveland, Ohio.......... p 421
E & M Labs., Westlake Village, Cal. p 1557
Electro/Data, Inc., Garland, Tex.
Erie Technological Prods. (EEM), Erie, Pa.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Greenray Inds., Inc., Mechanicsburg, Pa. .... p 606
Hewlett-Packard, Palo Alto, Cal.
Lorch Elctrns. Corp., Englewood, N.J. p 609
Microwave Cavity Labs., La Grange, Ill.
Polarad Elctrn. Instrs., Lake Success, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Sealectro Corp., Mamaroneck, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Texscan Corp., Indianapolis, Ind. p 578
Transco Prods., Inc., Venice, Cal.
USCC/Centralab, Elctrns. Div., Burbank, Cal.
Waveline, Inc., W. Caldwell, N.J.
Aerolite Electronics Corp., Union City, N.J.
Astrolab Inc., Linden, N J
Audio-Vidio Engrg. Co., Merrick, N.Y.
Cambridge Thermionic, Cambridge, Mass
Captor Corp., Tipp City, Ohio
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Cornell-Dubilier Elctrns., Newark, N.J.
Decibel Prods., Inc., Dallas, Tex.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Elctrn. Resources Div., Los Angeles, Cal.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Finney Co., Bedford, Ohio
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Hyletronics Corp., Littleton, Mass.
Industrial Microwave, Scotch Plains, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
K & L Microwave Inc., Salisbury, Md.
Kevlin Mfg. Co., Woburn, Mass.
Kings Elctrns., Tuckahoe, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Peninsula Microwave Labs., Mountain View, Cal.
Physical Elctrn. Labs., Menlo Park, Calif.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Sinclair Radio Labs., Maple, Ont., Can.
Spectrum Control, Inc., Fairview, Pa.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Varian Assocs., Palo Alto, Cal.
Victor Microwave, Inc., Wakefield, Mass.
Wavecom, Inc., Northridge, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Filters, Comb

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Bliley Electric, Erie, Pa. ....p 1370,1371
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1512
CTS Corp, Elkhart, Ind.
Damon Corp., Needham Hgts., Mass.
Electronic Research Co., Shawnee Mission, Kans. .... p 1384
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Garden City Pk., N.Y.
Hisonic, Inc., Olathe, Kans.
Hughes Aircraft Co., Frequency Control Devices, Newport Bch., Cal.
Kappa Networks, Inc., Carteret, N.J.
Lorch Elctrns. Corp., Englewood, N.J.
McCoy Elctrns. Co., Mt. Holly Springs, Pa. .... p 1409
Microwave Cavity Labs., La Grange, Ill.
Motorola Communications & Electrns., Chicago, Ill. .... p 1417
Multimetric Ind., Inc., Richmond Hill, N.Y.
Piezo Technology, Orlando, Fla. p 1425
Reeves-Hoffman Div., Carlisle, Pa.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rockland Sys. Corp., Blauvelt, N.Y.
Seg Elctrns., Richmond Hill, N.Y.
Sprague Elec. Co., No. Adams, Mass.
TMC Systems (Ariz.), Tempe, Ariz. p 1430
TT Elctrns., Inc., Culver City, Cal.
American Trans-Coil Corp., Richmond Hill, N.Y.
Applied Tech., Palo Alto, Cal.
Astrolab Inc., Linden, N J
Beukers Labs., Inc., Hauppauge, N.Y.
Blackhawk Networks Corp., Janesville, Wisc.
Bowmar/Ali, Inc., Acton, Mass.
Collins Radio Co., Newport Beach, Calif.
Control Sci. Corp., Alexandria, Va.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Crystal Network Prods. Corp., Erie, Pa.
Electrac, Inc., Anaheim, Calif.
Electrocom Inds., So. Bend, Indiana
Elctrn. Resources Div., Los Angeles, Cal.
Elctrn. Transformer Corp., Paterson, N.J.
Elmag Corp., Newark, N.J.
Filtech Corp., Franklin Park, Ill.
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Instr. Corp., Chicopee, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Industrial Microwave, Scotch Plains, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
Maury Microwave Corp., Cucamonga, Calif.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microsonics, Inc., Weymouth, Mass.
Microwave Prods., Inc., Chatsworth, Cal.
Nytronics, Inc., Alpha, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Polyphase Instr. Co., Bridgeport, Pa.
Rantec Div., Calabasas, Calif.
Sinclair Radio Labs., Maple, Ont., Can.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Stanford Applied Engrg., Santa Clara, Cal.
Technical Mat'l., Mamaroneck, N.Y.
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Torotron, Mt. Vernon, N.Y.
Vanguard Elctrns., Inglewood, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Vernitron Piezoelectric Div., Bedford, Ohio
Wavecom, Inc., Northridge, Cal.
White Instrs., Inc., Austin, Tex.

Filters, Continuously Variable

A. P. Circuit Corp., New York, N.Y. p 1509
Bafco, Inc., Warminster, Pa.
Dytronics Co., Columbus, Ohio .... p 441
Electro/Data, Inc., Garland, Tex.
Electro-Mechanics Co., Austin, Tex.
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
JFD Elctrns./Sub. Riker-Maxson, Bklyn., N.Y.
Krohn-Hite, Cambridge, Mass. .... p 1522
Lorch Elctrns. Corp., Englewood, N.J.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Reeves-Hoffman Div., Carlisle, Pa.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rockland Sys. Corp., Blauvelt, N.Y. p 1527
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
Solid State Elctrns., Sepulveda, Cal.
Texscan Corp., Indianapolis, Ind. p 578
Universal Ad-Yu Elctrns., Inc., Passaic, N.J.
Vari-L Co., Inc., Denver, Colo. .... p 1534
Watkins Johnson Co., Palo Alto, Cal.
Altec, Anaheim, Calif.
Astrolab Inc., Linden, N J
Burr-Brown Resch. Corp., Tucson, Ariz.
Delta Elctrns., Alexandria, Va.
Elctrn. Transformer Corp., Paterson, N.J.
Fairchild Electro-Metrics, Amsterdam, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Industrial Microwave, Scotch Plains, N.J.
K & L Microwave Inc., Salisbury, Md.
Kinetic Tech., Inc., Santa Clara, Cal.
Liberty Mirror Div., Brackenridge, Pa.
Lionmount & Co., Ltd., New Southgate, London, England
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Premier Microwave, Port Chester, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Radiation Devices Co., Baltimore, Md.
Rohde & Schwarz Sls., Passaic, N.J.
Signal Analysis Inds. Corp., Hauppauge, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Systems Resch. Labs., Dayton, Ohio
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Wavecom, Inc., Northridge, Cal.

Filters, Crystals (Incl. Monolithic Devices)—See Vol 1

Filters, Digital—See Vol 1

Filters, Electric Wave Section

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
American Elctrn. Labs., Inc., Lansdale, Pa.
AVX Aerovox Corp., New Bedford, Mass.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Coast Coil Co., Los Angeles, Calif.
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
Hopkins Engrg., San Fernando, Cal. p 1519
Kappa Networks, Inc., Carteret, N.J. p 1521
Lorch Elctrns. Corp., Englewood, N.J.
Microtran Co., Valley Stream, N.Y.
Multimetric Ind., Inc., Richmond Hill, N.Y.
Reeves-Hoffman Div., Carlisle, Pa.
RF Interonics, Bay Shore, N.Y.
Rockland Sys. Corp., Blauvelt, N.Y.
Seg Elctrns., Richmond Hill, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Torotel, Inc., Grandview, Mo.
TT Elctrns., Inc., Culver City, Cal.
United Transformer Co. Div. of TRW Inc., New York, N.Y. .... p 1533
A.R.F. Products, Inc., Raton, N.M.
Beukers Labs., Inc., Hauppauge, N.Y.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Crystal Network Prods. Corp., Erie, Pa.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Electro Windings & Comps., Kenilworth, N.J.
Elctrn. Transformer Corp., Paterson, N.J.
Forbes & Wagner, Inc., Silver Creek, N.Y.
K & L Microwave Inc., Salisbury, Md.
Kinetic Tech., Inc., Santa Clara, Cal.
Lynch Communication Systems, San Francisco, Calif.
Peerless Elec. Prods., Anaheim, Cal.
Polyphase Instr. Co., Bridgeport, Pa.
Solar Elctrns. Co., Hollywood, Calif.
Stromberg Carlson Corp., Rochester, N.Y.
Texscan Microwave Prods., Indianapolis, Ind.
Vernitron Piezoelectric Div., Bedford, Ohio
Weston-Magnetics, Archbald, Pa.
White Instrs., Inc., Austin, Tex.

Filters, Equalizer

ADC Prods., Minneapolis, Minn.
American Elctrn. Labs., Inc., Lansdale, Pa.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364,1512
Elctrn. Assocs., W. Long Branch, N.J.
ESC Elctrns. Corp., Palisades Pk., N.J. p 1513
Freed Transformer Co., Bklyn., N.Y.
Frequency Elctrns., New Hyde Pk., N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Garden City Pk., N.Y.
Hisonic, Inc., Olathe, Kans.
Kappa Networks, Inc., Carteret, N.J.
Microtran Co., Valley Stream, N.Y.
Multimetric Ind., Inc., Richmond Hill, N.Y.
Reeves-Hoffman Div., Carlisle, Pa.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Seg Elctrns., Richmond Hill, N.Y. p 1525
TMC Systems (Ariz.), Tempe, Ariz. p 1430
Torotel, Inc., Grandview, Mo. ...... p 1529
TT Elctrns., Inc., Culver City, Cal.
Altec, Anaheim, Calif.
Bowmar/Ali, Inc., Acton, Mass.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
El-Rad Mfg. Co., Chicago, Ill.
Elctrn. Transformer Corp., Paterson, N.J.
Filtech Corp., Franklin Park, Ill.
Guide Inds., Inc., Sun Valley, Calif.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Kinetic Tech., Inc., Santa Clara, Cal.
Peerless Elec. Prods., Anaheim, Cal.
Polyphase Instr. Co., Bridgeport, Pa.
Pulse Techniques, Inc., W. Englewood, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Spectra Sonics, Ogden, Utah
Technical Mat'l., Mamaroneck, N.Y.
United Resch. Lab., Corp., New York, N.Y.
Vanguard Elctrns., Inglewood, Cal.
Wavecom, Inc., Northridge, Cal.
Weston-Magnetics, Archbald, Pa.
White Instrs., Inc., Austin, Tex.
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Filters, Fluid, Nonmetallic—See Vol 1

Filters, Harmonic

ADC Prods., Minneapolis, Minn.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1512
Coast Coil Co., Los Angeles, Calif.
Data Delay Devices, Clifton, N.J.
Electro Cube, San Gabriel, Cal
Electro/Data, Inc., Garland, Tex.
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
Kappa Networks, Inc., Carteret, N.J.
Lorch Elctrns. Corp., Englewood, N.J.
Microtran Co., Valley Stream, N.Y.
Microwave Cavity Labs., La Grange, Ill.
Multimetric Ind., Inc., Richmond Hill, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
RF Interonics, Bay Shore, N.Y.
Rockland Sys. Corp., Blauvelt, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Sprague Elec. Co., No. Adams, Mass.
Torotel, Inc., Grandview, Mo.
TT Elctrns., Inc., Culver City, Cal.
AMBAC Inds., Garden City, N.Y.
Beukers Labs., Inc., Hauppauge, N.Y.
CCA Elctrns. Corp., Gloucester, N.J.
Coax Devices Inc., Chelsea, Mass.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Elctrn. Transformer Corp., Paterson, N.J.
Filtron Co., Flushing, N.Y.
Finney Co., Bedford, Ohio
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Instr. Corp., Chicopee, Mass.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Industrial Microwave, Scotch Plains, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Peninsula Microwave Labs., Mountain View, Cal.
Polyphase Instr. Co., Bridgeport, Pa.
Rantec Div., Calabasas, Calif.
Sinclair Radio Labs., Maple, Ont., Can.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Technical Mat'l., Mamaroneck, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Torotron, Mt. Vernon, N.Y.
Vanguard Elctrns., Inglewood, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Wavecom, Inc., Northridge, Cal.
White Instrs., Inc., Austin, Tex.
Y.T. & T. Corp., Roslyn Hgts., N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Filters, High-Pass

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
Allen Avionics, Mineola, N.Y. ...... p 1510
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
A. P. Circuit Corp., New York, N.Y. p 1509
Automatic Coil, New Hyde Pk., N.Y.
AVX Aerovox Corp., New Bedford, Mass.
Bendix, Franklin, Ind. .... p 1555
Bird Elctrn., Cleveland, Ohio.......... p 421
Bramco Controls, Piqua, Ohio .... p 1523
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364,1512
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y. .... p 2484
Coast Coil Co., Los Angeles, Calif. p 2487
CTS Corp, Elkhart, Ind.
Data-Control Systems, Danbury, Conn.
Data Delay Devices, Clifton, N.J. p 2745
Dynamics Instr. Co., Monterey Pk., Cal.
Dytronics Co., Columbus, Ohio .... p 441
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Research Co., Shawnee Mission, Kans. .... p 1384
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Garden City Pk., N.Y. p 1516
Hewlett-Packard, Palo Alto, Cal.
Hisonic, Inc., Olathe, Kans. .... p 1517
Hopkins Engrg., San Fernando, Cal. p 1519
Ithaco, Inc., Ithaca, N.Y. .... p 1286
Kappa Networks, Inc., Carteret, N.J. p 1520,1521
Krohn-Hite, Cambridge, Mass. .... p 1522
Lorch Elctrns. Corp., Englewood, N.J.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microtran Co., Valley Stream, N.Y.
Microwave Cavity Labs., La Grange, Ill.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Neshaminy Transformer, Furlong, Pa.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Quindar Elctrns., Inc., Springfield, N.J.
Raytheon Co., Quincy, Mass.
Reeves-Hoffman Div., Carlisle, Pa.
RF Interonics, Bay Shore, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Rockland Sys. Corp., Blauvelt, N.Y. p 1526,1527
San Fernando Elec. Mfg., San Fernando, Cal.
Seg Elctrns., Richmond Hill, N.Y.
Solid State Elctrns., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Texscan Corp., Indianapolis, Ind. p 578
Torotel, Inc., Grandview, Mo. ...... p 1529
TT Elctrns., Inc., Culver City, Cal. p 1530,1531
United Transformer Co. Div. of TRW Inc., New York, N.Y. .... p 1533
A C Electronics Co., Santa Monica, Cal.
Aladdin Elctrns., Nashville, Tenn.
Altec, Anaheim, Calif.
AMBAC Inds., Garden City, N.Y.
American Comps., Inc., Conshohocken, Pa.
American Trans-Coil Corp., Richmond Hill, N.Y.
Analog Devices, Inc., Norwood, Mass.
Anritsu Electric Co., Ltd., Tokyo, Japan
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
Barnes Engrg. Co., Stamford, Conn.
Beukers Labs., Inc., Hauppauge, N.Y.
B.H. Inds., Los Angeles, Cal.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bud Radio, Inc., Willoughby, Ohio
Bullock Magnetics Corp., Pomona, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Captor Corp., Tipp City, Ohio
Collins Radio Co., Newport Beach, Calif.
Communication Elctrns., Rockville, Md.
Components Corp., Chicago, Ill.
Control Sci. Corp., Alexandria, Va.
Cornell-Dubilier Elctrns., Newark, N.J.
Crystal Network Prods. Corp., Erie, Pa.
De Coursey Engrg. Lab., Culver City, Cal.
Delta Elctrns., Alexandria, Va.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Drake, R.L., Co., Miamisburg, Ohio
Dynographic Elctrns. Corp., Hicksville, N.Y.
El-Rad Mfg. Co., Chicago, Ill.
Elcom Sys., Deer Pk., N.Y.
Electro Windings & Comps., Kenilworth, N.J.
Electrocom Inds., So. Bend, Indiana
Elctrn. Resources Div., Los Angeles, Cal.
Elctrn. Transformer Corp., Paterson, N.J.
Engelmann Microwave, Montville, N.J.
Farinon Electric, San Carlos, Calif.
Filtech Corp., Franklin Park, Ill.
Filtron Co., Flushing, N.Y.
Finney Co., Bedford, Ohio
Forbes & Wagner, Inc., Silver Creek, N.Y.
Frequency Devices, Inc., Haverhill, Mass.
General Instr. Corp., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Harder, Donald C. Co., Inc., San Diego, Calif.
Hi-Lo Mfg. Corp., Chicago, Ill.
Incor Instr., Plainview, N.Y.
Industrial Condenser Corp., Chicago, Ill.
Industrial Microwave, Scotch Plains, N.J.
K & L Microwave Inc., Salisbury, Md.
Kinetic Tech., Inc., Santa Clara, Cal.
Linear Networks Co., San Pedro, Cal.
Lynch Communication Systems, San Francisco, Calif.
Maury Microwave Corp., Cucamonga, Calif.
Meca Elctrns., Inc., Denville, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microsonics, Inc., Weymouth, Mass.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
Moore Inds., Van Nuys, Cal.
Nat'l. Coil Co., Douglas, Ariz.
Nytronics, Inc., Alpha, N.J.
Peerless Elec. Prods., Anaheim, Cal.
Peninsula Microwave Labs., Mountain View, Cal.
Polyphase Instr. Co., Bridgeport, Pa.
Power Elctrns. Co., Houston, Tex.
Premier Microwave, Port Chester, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
RFL Inds., Comps. Div., Boonton, N.J.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Sartron, Inc., Newberg, Ore.
Sinclair Radio Labs., Maple, Ont., Can.
Solar Elctrns. Co., Hollywood, Calif.
Spectrum Control, Inc., Fairview, Pa.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Stanford Applied Engrg., Santa Clara, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
Stromberg Carlson Corp., Rochester, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Superex Elctrns. Corp., Yonkers, N.Y.
Systems Resch. Labs., Dayton, Ohio
TDK Elctrns. Corp., Long Island City, N.Y.
Technical Mat'l., Mamaroneck, N.Y.
Tedford Crystal Labs., Cincinnati, Ohio
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Torotron, Mt. Vernon, N.Y.
Trepac Corp. America, Englewood, N.J.
Vanguard Elctrns., Inglewood, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Wavecom, Inc., Northridge, Cal.
Weston-Magnetics, Archbald, Pa.
White Instrs., Inc., Austin, Tex.
Winegard Co., Burlington, Iowa
Y.T. & T. Corp., Roslyn Hgts., N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Filters, I-F

ADC Prods., Minneapolis, Minn.
American Elctrn. Labs., Inc., Lansdale, Pa.
A. P. Circuit Corp., New York, N.Y.
AVX Aerovox Corp., New Bedford, Mass.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364
CTS Corp, Elkhart, Ind.
Electronic Research Co., Shawnee Mission, Kans. .... p 1384
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Elctrns., New Hyde Pk., N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Garden City Pk., N.Y. p 1516
Hisonic, Inc., Olathe, Kans.
Hughes Aircraft Co., Frequency Control Devices, Newport Bch., Cal.
Kappa Networks, Inc., Carteret, N.J. p 1521
Krohn-Hite, Cambridge, Mass.
Lorch Elctrns. Corp., Englewood, N.J.
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Miller, J.W. Co., Compton, Cal.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Murata Corp. of America, Elmsford, N.Y. .... p 1418
Murata Mfg. Co. Ltd., Kyoto, Japan p 1418
North Hills Elctrns., Inc., Glen Cove, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Piezo Technology, Orlando, Fla.
Reeves-Hoffman Div., Carlisle, Pa.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Seg Elctrns., Richmond Hill, N.Y.
Sierra Sys., Mountain View, Cal.
Sprague Elec. Co., No. Adams, Mass.
Texscan Corp., Indianapolis, Ind. p 578
TMC Systems (Ariz.), Tempe, Ariz.
Torotel, Inc., Grandview, Mo.
TT Elctrns., Inc., Culver City, Cal.
Vari-L Co., Inc., Denver, Colo.
A C Electronics Co., Santa Monica, Cal.
Aladdin Elctrns., Nashville, Tenn.
AMBAC Inds., Garden City, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
Beukers Labs., Inc., Hauppauge, N.Y.
Blackhawk Networks Corp., Janesville, Wisc.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Cornell-Dubilier Elctrns., Newark, N.J.
Crystal Network Prods. Corp., Erie, Pa.
Defense Elctrns., Inc., Rockville, Md.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
El-Rad Mfg. Co., Chicago, Ill.
Elcom Sys., Deer Pk., N.Y.
Electro Assemblies, Inc., Chicago, Ill.
Filtech Corp., Franklin Park, Ill.
Filtron Co., Flushing, N.Y.
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Instr. Corp., Automatic Mfg. Div., Newark, N.J.
General Instr. Corp., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
Hope Elctrns., Clifton, N.J.
Hughes Aircraft Co, Fullerton, Cal.
Industrial Condenser Corp., Chicago, Ill.
K & L Microwave Inc., Salisbury, Md.
Loral Elctrn. Sys., Bronx, N.Y.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microphase Corp., Cos Cob, Conn.
Microsonics, Inc., Weymouth, Mass.
Microwave Assocs., Inc., Burlington, Mass.
Nat'l. Coil Co., Douglas, Ariz.
Nytronics, Inc., Alpha, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Rantec Div., Calabasas, Calif.
Renco Elctrns., Inc., Hicksville, N.Y.
RFL Inds., Comps. Div., Boonton, N.J.
Smallwood, S.G., Ltd., Kitchener, Ont., Canada
Technical Mat'l., Mamaroneck, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Torotron, Mt. Vernon, N.Y.
Vanguard Elctrns., Inglewood, Cal.
Vernitron Piezoelectric Div., Bedford, Ohio
Wavecom, Inc., Northridge, Cal.
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Filters, Industrial, Heavy Duty (Electronic)

AVX Aerovox Corp., New Bedford, Mass.
Electro Cube, San Gabriel, Cal
ESC Elctrns. Corp., Palisades Pk., N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal. .... p 1514,1515
Hopkins Engrg., San Fernando, Cal. p 1519
Microtran Co., Valley Stream, N.Y.
NWL Transformers, Trenton, N.J.
RF Interonics, Bay Shore, N.Y..... p 1528
San Fernando Elec. Mfg., San Fernando, Cal.
Seg Elctrns., Richmond Hill, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Topaz Elctrns., San Diego, Cal.
USCC/Centralab, Elctrns. Div., Burbank, Cal. .... p 1532
American Air Filter, Louisville, Ky.
Cambridge Filter Corp., Syracuse, N.Y.
Components Corp., Chicago, Ill.
Cornell-Dubilier Elctrns., Newark, N.J.
Elctrn. Transformer Corp., Paterson, N.J.
Elmag Corp., Newark, N.J.
Filtron Co., Flushing, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
North American Rockwell Corp., Cleveland, Ohio
Peninsula Microwave Labs., Mountain View, Cal.
"The Potter Co.", Inglewood, Calif
RtroN Corp., Skokie, Ill.
Spectrum Control, Inc., Fairview, Pa.
TDK Elctrns. Corp., Long Island City, N.Y.
Trion, Inc., McKees Rocks, Pa.

Filters, Interference

ADC Prods., Minneapolis, Minn.
All-Tronics Inc., Westbury, N.Y. p 1506-1508
Allen-Bradley Co., Milwaukee, Wisc. p 1511
American Elctrn. Labs., Inc., Lansdale, Pa.
A. P. Circuit Corp., New York, N.Y.
Arnold Magnetics, Culver City, Cal. p 651
AVX Aerovox Corp., New Bedford, Mass. .... p 2330
CTS Corp, Elkhart, Ind.
Electro Cube, San Gabriel, Cal
Electro-Mechanics Co., Austin, Tex.
Erie Technological Prods. (EEM), Erie, Pa.
ESC Elctrns. Corp., Palisades Pk., N.J. p 1513
GC Elctrns., Rockford, Ill.
Genisco Tech. Corp., Genistron Div., Compton, Cal. .... p 1514,1515
Hopkins Engrg., San Fernando, Cal. p 1519
Kappa Networks, Inc., Carteret, N.J.
Microtran Co., Valley Stream, N.Y.
Miller, J.W. Co., Compton, Cal.
RF Interonics, Bay Shore, N.Y..... p 1528
San Fernando Elec. Mfg., San Fernando, Cal. .... p 2437
Seg Elctrns., Richmond Hill, N.Y.
Southern Elctrns., Burbank, Cal.
Sprague Elec. Co., No. Adams, Mass. p 2474
Standard Condenser Corp., Chicago, Ill.
TMC Systems (Ariz.), Tempe, Ariz.
Tobe Deutschmann Labs., Inc., Canton, Mass.
Torotel, Inc., Grandview, Mo.
TT Elctrns., Inc., Culver City, Cal.
USCC/Centralab, Elctrns. Div., Burbank, Cal. .... p 1532
Wanlass Div., Fort Washington, Pa.
AMBAC Inds., Garden City, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
Audio-Vidio Engrg. Co., Merrick, N.Y.
Barnes Engrg. Co., Stamford, Conn.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Bowmar/Ali, Inc., Acton, Mass.
Capcon, Inc., New York, N.Y.
Captor Corp., Tipp City, Ohio
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Cornell-Dubilier Elctrns., Newark, N.J.
De Coursey Engrg. Lab., Culver City, Cal.
Dell Optics Co., Inc., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill, N.J.
Elctrn. Transformer Corp., Paterson, N.J.
Elmag Corp., Newark, N.J.
Estes Engrg. Co., Gardena, Calif.
Exotic Materials, Inc., Costa Mesa, Cal.
Fedtro, Inc., Rockville Centre, N.Y.
Filtech Corp., Franklin Park, Ill.
Filtron Co., Flushing, N.Y.
Finney Co., Bedford, Ohio
General Lab. Assocs., Norwich, N.Y.
Gold Line Connector, Inc., Norwalk, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Harshaw Chem. Co., Cleveland, Ohio
Heliotek, Sylmar, Calif.
Industrial Condenser Corp., Chicago, Ill.
Infrared Inds., Inc., Santa Barbara, Cal.
International Light, Newburyport, Mass.
Jerrold Elctrns. Corp., Philadelphia, Pa.
LectroMagnetics, Los Angeles, Cal.
Liberty Mirror Div., Brackenridge, Pa.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Nytronics, Inc., Alpha, N.J.
Optical Inds., Santa Ana, Cal.
Optics Technology, Palo Alto, Calif.
Photovolt Corp., New York, N.Y.
"The Potter Co.", Inglewood, Calif
Renco Elctrns., Inc., Hicksville, N.Y.
RtroN Corp., Skokie, Ill.
Sanders Assocs., Nashua, N.H.
Sanders Assocs., Nashua, N.H.
Schoeffel Instr. Corp., Westwood, N.J.
Solar Elctrns. Co., Hollywood, Calif.
Soltec Corp., No. Hollywood, Cal.
Spectrum Control, Inc., Fairview, Pa.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
TDK Elctrns. Corp., Long Island City, N.Y.
Technical Mat'l., Mamaroneck, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Zeiss, Carl, Inc., New York, N.Y.

Filters, Interstage & Line—See Filters, Telemetering—Vol 1

Filters, Line

ADC Prods., Minneapolis, Minn.
Allen-Bradley Co., Milwaukee, Wisc. p 1511
A. P. Circuit Corp., New York, N.Y.
Arnold Magnetics, Culver City, Cal. p 651
AVX Aerovox Corp., New Bedford, Mass.
Dale Elctrns., Inc., Columbus, Neb.
Electro Cube, San Gabriel, Cal
Erie Technological Prods. (EEM), Erie, Pa.
ESC Elctrns. Corp., Palisades Pk., N.J. p 1513
Freed Transformer Co., Bklyn., N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
Hopkins Engrg., San Fernando, Cal. p 1519
Microtran Co., Valley Stream, N.Y.
Miller, J.W. Co., Compton, Cal.
Quindar Elctrns., Inc., Springfield, N.J.
RF Interonics, Bay Shore, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Seg Elctrns., Richmond Hill, N.Y.
Southern Elctrns., Burbank, Cal.
Sprague Elec. Co., No. Adams, Mass.
Topaz Elctrns., San Diego, Cal.
Torotel, Inc., Grandview, Mo.
USCC/Centralab, Elctrns. Div., Burbank, Cal. .... p 1532
Wanlass Div., Fort Washington, Pa.
AMBAC Inds., Garden City, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
Astrolab Inc., Linden, N J
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Capcon, Inc., New York, N.Y.
Components Corp., Chicago, Ill.
Coral Magnetics Co., Farmingdale, N.Y.
Core-Tronics, Inc., Orange, N.J.
Cornell-Dubilier Elctrns., Newark, N.J.
Electro-Voice, Inc., Buchanan, Mich.
Elmag Corp., Newark, N.J.
Fedtro, Inc., Rockville Centre, N.Y.
Filtron Co., Flushing, N.Y.
General Lab. Assocs., Norwich, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Industrial Condenser Corp., Chicago, Ill.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Marshall Inds., Monrovia, Cal.
Mullard, Inc., Farmingdale, N.Y.
Nytronics, Inc., Alpha, N.J.
Pall Trinity Micro Corp., Cortland, N.Y.
Polyphase Instr. Co., Bridgeport, Pa.
"The Potter Co.", Inglewood, Calif
Ragen Precision Inds., Inc., N. Arlington, N.J.
RtroN Corp., Skokie, Ill.
Sanders Assocs., Nashua, N.H.
Sanders Assocs., Nashua, N.H.
Solar Elctrns. Co., Hollywood, Calif.
Spectrum Control, Inc., Fairview, Pa.
Stromberg Carlson Corp., Rochester, N.Y.
Superex Elctrns. Corp., Yonkers, N.Y.
TDK Elctrns. Corp., Long Island City, N.Y.
Vidaire Electronics Mfg. Corp., Freeport, N.Y.
Wire Cloth Mfrs., Parsippany, N.J.

Filters, Linear Phase

ADC Prods., Minneapolis, Minn.
A. P. Circuit Corp., New York, N.Y. p 1509
Applied Research Inc., Port Washington, N.Y.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364,1512
Coast Coil Co., Los Angeles, Calif.
CTS Corp, Elkhart, Ind.
Damon Corp., Needham Hgts., Mass. p 1379
Data-Control Systems, Danbury, Conn.
Data Delay Devices, Clifton, N.J.
Dynamics Instr. Co., Monterey Pk., Cal.
Dytronics Co., Columbus, Ohio
Elctrn. Assocs., W. Long Branch, N.J.
Electronic Research Co., Shawnee Mission, Kans.
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Garden City Pk., N.Y.
Hisonic, Inc., Olathe, Kans.
Hughes Aircraft Co., Frequency Control Devices, Newport Bch., Cal.
Kappa Networks, Inc., Carteret, N.J. p 1521
Krohn-Hite, Cambridge, Mass. .... p 1522
McCoy Elctrns. Co., Mt. Holly Springs, Pa. .... p 1409
Microtran Co., Valley Stream, N.Y.
Multimetric Ind., Inc., Richmond Hill, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Piezo Technology, Orlando, Fla. p 1425
Reeves-Hoffman Div., Carlisle, Pa.
Rockland Sys. Corp., Blauvelt, N.Y.
San Fernando Elec. Mfg., San Fernando, Cal.
Seg Elctrns., Richmond Hill, N.Y.
Solid State Elctrns., Sepulveda, Cal.
Sprague Elec. Co., No. Adams, Mass.
TMC Systems (Ariz.), Tempe, Ariz.
Torotel, Inc., Grandview, Mo. ...... p 1529
TT Elctrns., Inc., Culver City, Cal.
Aladdin Elctrns., Nashville, Tenn.
AMBAC Inds., Garden City, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
A.R.F. Products, Inc., Raton, N.M.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Crystal Network Prods. Corp., Erie, Pa.
Electrac, Inc., Anaheim, Calif.
Electrocom Inds., So. Bend, Indiana
Elctrn. Transformer Corp., Paterson, N.J.
Filtech Corp., Franklin Park, Ill.
Filtron Co., Flushing, N.Y.
Forbes & Wagner, Inc., Silver Creek, N.Y.
Frequency Devices, Inc., Haverhill, Mass.
General Lab. Assocs., Norwich, N.Y.
K & L Microwave Inc., Salisbury, Md.
Kinetic Tech., Inc., Santa Clara, Cal.
Linear Networks Co., San Pedro, Cal.
Microsonics, Inc., Weymouth, Mass.
Nytronics, Inc., Alpha, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Polyphase Instr. Co., Bridgeport, Pa.
Princeton Applied Resch. Corp., Princeton, N.J.
Rantec Div., Calabasas, Calif.
Sanders Assocs., Nashua, N.H.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Stanford Applied Engrg., Santa Clara, Cal.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systems Resch. Labs., Dayton, Ohio
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Torotron, Mt. Vernon, N.Y.
Vanguard Elctrns., Inglewood, Cal.
Wavecom, Inc., Northridge, Cal.
White Instrs., Inc., Austin, Tex.

Filters, Low-Pass

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
Alford Mfg. Co., Winchester, Mass.
Allen Avionics, Mineola, N.Y. ...... p 1510
Allen-Bradley Co., Milwaukee, Wisc. p 1511
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Amp Inc., Elizabethtown, Pa.
A. P. Circuit Corp., New York, N.Y. p 1509
Automatic Coil, New Hyde Pk., N.Y.
AVX Aerovox Corp., New Bedford, Mass.
Bendix, Franklin, Ind. .... p 1555
Bird Elctrn., Cleveland, Ohio.......... p 421
Bramco Controls, Piqua, Ohio .... p 1523
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364,1512
Clarke - Hess, New York, N.Y.
Coast Coil Co., Los Angeles, Calif. p 2487
Control Elctrns. Co., Inc., Farmingdale, N.Y.
CTS Corp, Elkhart, Ind.
Data-Control Systems, Danbury, Conn.
Data Delay Devices, Clifton, N.J. p 2745
Dynamics Instr. Co., Monterey Pk., Cal.
Dytronics Co., Columbus, Ohio .... p 441
Elctrn. Assocs., W. Long Branch, N.J.
Erie Technological Prods. (EEM), Erie, Pa.
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Gulton Inds., Inc., Metuchen, N.J.
Hertz Filter, Garden City Pk., N.Y. p 1516
Hewlett-Packard, Palo Alto, Cal.
Hisonic, Inc., Olathe, Kans.......... p 1517
Hopkins Engrg., San Fernando, Cal. p 1519
Ithaco, Inc., Ithaca, N.Y................ p 1286
Johnson E. F. Co., Waseca, Minn.
Kappa Networks, Inc., Carteret, N.J. p 1520,1521
Krohn-Hite, Cambridge, Mass. .... p 1522
Lorch Elctrns. Corp., Englewood, N.J. p 609
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Metrix Instr. Co., Houston, Tex.
Microtran Co., Valley Stream, N.Y.
Microwave Cavity Labs., La Grange, Ill.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Neff Instr. Corp., Duarte, Calif.
Neshaminy Transformer, Furlong, Pa.
North Hills Elctrns., Inc., Glen Cove, N.Y.
NWL Transformers, Trenton, N.J.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Quindar Elctrns., Inc., Springfield, N.J.
Raytheon Co., Quincy, Mass.

Reeves-Hoffman Div., Carlisle, Pa. p 1427
RF Interonics, Bay Shore, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Rockland Sys. Corp., Blauvelt, N.Y. p 1526,1527
San Fernando Elec. Mfg., San Fernando, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Seg Elctrns., Richmond Hill, N.Y. p 1525
Solid State Elctrns., Sepulveda, Cal.
Southern Elctrns., Burbank, Cal.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Texscan Corp., Indianapolis, Ind. p 578
Tohoku Metal Inds., Ltd., Tokyo, Japan
Torotel, Inc., Grandview, Mo....... p 1529
TT Elctrns., Inc., Culver City, Cal. p 1530,1531
United Transformer Co. Div. of TRW Inc., New York, N.Y. .... p 1533
USCC/Centralab, Elctrns. Div., Burbank, Cal.
Aladdin Elctrns., Nashville, Tenn.
Altec, Anaheim, Calif.
AMBAC Inds., Garden City, N.Y.
American Comps., Inc., Conshohocken, Pa.
American Trans-Coil Corp., Richmond Hill, N.Y.
Americon Corp., Waltham, Mass.
Analog Devices, Inc., Norwood, Mass.
Anritsu Electric Co., Ltd., Tokyo, Japan
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
Barnes Engrg. Co., Stamford, Conn.
Barwood Elctrns., Inc., Glendale, Cal.
B.H. Inds., Los Angeles, Cal.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bud Radio, Inc., Willoughby, Ohio
Bullock Magnetics Corp., Pomona, Calif.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cambridge Thermionic, Cambridge, Mass
Capcon, Inc., New York, N.Y.
Captor Corp., Tipp City, Ohio
Collins Radio Co., Newport Beach, Calif.
Communication Elctrns., Rockville, Md.
Components Corp., Chicago, Ill.
Control Sci. Corp., Alexandria, Va.
Crystal Network Prods. Corp., Erie, Pa.
De Coursey Engrg. Lab., Culver City, Cal.
Delta Elctrns., Alexandria, Va.
Diamond Repeater Co., Madison, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Drake, R.L., Co., Miamisburg, Ohio
Dynographic Elctrns. Corp., Hicksville, N.Y.
El-Rad Mfg. Co., Chicago, Ill.
Elcom Sys., Deer Pk., N.Y.
Electro Windings & Comps., Kenilworth, N.J.
Electrocom Inds., So. Bend, Indiana
Elctrn. Transformer Corp., Paterson, N.J.
Elmag Corp., Newark, N.J.
ESCA, Jupiter, Fla.
Farinon Electric, San Carlos, Calif.
Filtech Corp., Franklin Park, Ill.
Filtron Co., Flushing, N.Y.
Forbes & Wagner, Inc., Silver Creek, N.Y.
Frequency Devices, Inc., Haverhill, Mass.
General Instr. Corp., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Gulton Inds., Albuquerque, N.M.
Harder, Donald C. Co., Inc., San Diego, Calif.
Hope Elctrns., Clifton, N.J.
Industrial Condenser Corp., Chicago, Ill.
Industrial Microwave, Scotch Plains, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
K & L Microwave Inc., Salisbury, Md.
Kevlin Mfg. Co., Woburn, Mass.
Kinetic Tech., Inc., Santa Clara, Cal.
Lieco, Inc., Lindenhurst, N.Y.
Linear Networks Co., San Pedro, Cal.
Lionmount & Co., Ltd., New Southgate, London, England
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Lynch Communication Systems, San Francisco, Calif.
Maury Microwave Corp., Cucamonga, Calif.
Meca Elctrns., Inc., Denville, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
Nat'l. Coil Co., Douglas, Ariz.
Nytronics, Inc., Alpha, N.J.
PCA Elctrns., Inc., Sepulveda, Calif.
Peerless Elec. Prods., Anaheim, Cal.
Peninsula Microwave Labs., Mountain View, Cal.
Philco-Ford Corp., Washington, D.C.
Polyphase Instr. Co., Bridgeport, Pa.
"The Potter Co.", Inglewood, Calif
Power Elctrns. Co., Houston, Tex.
Princeton Applied Resch. Corp., Princeton, N.J.
Radiation Sys., Inc., McLean, Va.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
RtroN Corp., Skokie, Ill.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Sartron, Inc., Newberg, Ore.
Solar Elctrns. Co., Hollywood, Calif.
Spectrum Control, Inc., Fairview, Pa.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Stanford Applied Engrg., Santa Clara, Cal.
Sterling Transformer Corp., Brooklyn, N.Y.
Stromberg Carlson Corp., Rochester, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systems Resch. Labs., Dayton, Ohio
TDK Elctrns. Corp., Long Island City, N.Y.
Technical Mat'l., Mamaroneck, N.Y.
Tedford Crystal Labs., Cincinnati, Ohio
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Trepac Corp. America, Englewood, N.J.
Triad Distributor Div., Huntington, Ind.
Vanguard Elctrns., Inglewood, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Wavecom, Inc., Northridge, Cal.
Weston-Magnetics, Archbald, Pa.
White Instrs., Inc., Austin, Tex.
Zeta Labs., Inc., Mountain View, Calif.

Filters, Mechanical

Bramco Controls, Piqua, Ohio .... p 1523
Frequency Engrg. Labs., Farmingdale, N.J.
Nippon Electric/NEC America, N.Y., N.Y.
Tohoku Metal Inds., Ltd., Tokyo, Japan
American Air Filter, Louisville, Ky.
Bowmar/Ali, Inc., Acton, Mass.
Circle Seal Corp., Anaheim, Cal.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
General Microwave Corp., Farmingdale, N.Y.
HB Engrg. Corp., Silver Spring, Md.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Novatronics, Inc., Pompano Beach, Fla.
Pall Trinity Micro Corp., Cortland, N.Y.
Riverbank Labs., Geneva, Ill.
Singer-General Precision, Inc., Little Falls, N.J.
Spectran Elctrns., Pompano Beach, Fla.

Filters, Microwave

Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
American Nucleonics Corp., Woodland Hills, Cal
Applied Research Inc., Port Washington, N.Y. .... p 1554
Bendix, Franklin, Ind. .... p 1555
E & M Labs., Westlake Village, Cal. p 1557
EIP, Inc., Santa Clara, Cal.
Electro/Data, Inc., Garland, Tex. p 1559
Electro-Mechanics Co., Austin, Tex.
Erie Technological Prods. (EEM), Erie, Pa.
Frequency Engrg. Labs., Farmingdale, N.J.
Greenray Inds., Inc., Mechanicsburg, Pa. .... p 606
Hewlett-Packard, Palo Alto, Cal.
Hopkins Engrg., San Fernando, Cal. p 1519
Lorch Elctrns. Corp., Englewood, N.J. p 609
Microwave Cavity Labs., La Grange, Ill.
Polarad Elctrn. Instrs., Lake Success, N.Y.
RF Interonics, Bay Shore, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
San Fernando Elec. Mfg., San Fernando, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Texscan Corp., Indianapolis, Ind. p 578
Transco Prods., Inc., Venice, Cal.
TT Elctrns., Inc., Culver City, Cal.
Vari-L Co., Inc., Denver, Colo. ..... p 1534
Vega Precision Labs., Vienna, Va.
Watkins Johnson Co., Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
AAI Corp., Baltimore, Md.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
AMBAC Inds., Garden City, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
Anaren Microwave, Inc., Syracuse, N.Y.
Applied Tech., Palo Alto, Cal.
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
AUL Instrs., Inc., Flushng, N.Y.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Core-Tronics, Inc., Orange, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Elctrn. Specialty, Thomaston, Conn.
Engelmann Microwave, Montville, N.J.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
GAF Corp., New York, N.Y.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Hyletronics Corp., Littleton, Mass.
Industrial Microwave, Scotch Plains, N.J.
K & L Microwave Inc., Salisbury, Md.
Kevlin Mfg. Co., Woburn, Mass.
Lieco, Inc., Lindenhurst, N.Y.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
N-H Microwave, Inc., Red Bank, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Philco-Ford Corp., Washington, D.C.
Physical Elctrn. Labs., Menlo Park, Calif.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
Raytheon Co., Waltham, Mass.
RF Systems, Inc., Cohasset, Mass.
Rowe Engravers, Clifton, N.J.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Spectrum Control, Inc., Fairview, Pa.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Teledyne Micronetics, San Diego, Calif.
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Vectronics Microwave Corp., Middlesex, N.J.
Victor Microwave, Inc., Wakefield, Mass.
Wavecom, Inc., Northridge, Cal.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Filters, Miniature—See Filters (Specific Types)

Filters, Optical

American Ultraviolet Co., Chatham, N.J.
Barnes Engrg. Co., Stamford, Conn.
Bausch & Lomb, Rochester, N.Y.
Black Light Eastern, Westbury, N.Y.
Buhl Optical Co., Pittsburgh, Pa.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Crimpco Engrg., Cangoga Park, Calif.
Dell Optics Co., Inc., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill, N.J.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
EdnaLite Corp., Peekskill, N.Y.
Electro Optics Assocs., Palo Alto, Calif.
Eppley Lab., Inc., Newport, R.I.
Esco Products, Oak Ridge, NJ
Exotic Materials, Inc., Costa Mesa, Cal.
Fairchild Space & Defense Sys., Syosset, N.Y.
Gaertner Scientific Corp., Chicago, Ill.
Gordon Alan Entprs., N. Hollywood, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Heitz, Karl, Inc., New York, N.Y.
Heliotek, Sylmar, Calif.
Infrared Inds., Inc., Santa Barbara, Cal.
International Light, Newburyport, Mass.
Isomet Corp., Oakland, N.J.
Itek Corp., Lexington, Mass.
Jones, A.D. Optical Works, Burlington, Mass.
Kaiser Aerospace & Elctrns., Palo Alto, Calif.
Kopp Glass, Inc., Pittsburgh, Pa.
Liberty Mirror Div., Brackenridge, Pa.
McKee-Pedersen Instrs., Danville, Calif.
Micro-Line, Jamestown, N.Y.
Optical Inds., Santa Ana, Cal.
Opticon Chem., Palos Verdes Peninsula, Cal.
Optics Technology, Palo Alto, Calif.
Oriel Optics Corp., Stamford, Conn.
Photovolt Corp., New York, N.Y.
Polacoat, Inc., Cincinnati,, Ohio
Republic Lens Co., Inc., Bronx, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Spectra-Physics, Inc., Mountain View, Calif.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Torr Labs., Los Angeles, Cal.
Y.T. & T. Corp., Roslyn Hgts., N.Y.
Zeiss, Carl, Inc., New York, N.Y.
Zenith Optical Lab., Dobbs Ferry, N.Y.

Filters, Programmable—See Filters, Variable

Filters, R-F

ADC Prods., Minneapolis, Minn.
Alford Mfg. Co., Winchester, Mass.
Allen Avionics, Mineola, N.Y. ...... p 1510
American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
Amp Inc., Elizabethtown, Pa.
Applied Research Inc., Port Washington, N.Y. .... p 1554
AVX Aerovox Corp., New Bedford, Mass.
Bendix, Franklin, Ind. .... p 1555
Bird Elctrn., Cleveland, Ohio.......... p 421

Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y. .... p 2484
Dale Elctrns., Inc., Yankton, S.D.
Electro Cube, San Gabriel, Cal
Electro/Data, Inc., Garland, Tex. p 1559
Electro-Mechanics Co., Austin, Tex.
Erie Technological Prods. (EEM), Erie, Pa.
ESC Elctrns. Corp., Palisades Pk., N.J. p 1513
Frequency Elctrns., New Hyde Pk., N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Gulton Inds., Inc., Metuchen, N.J.
Hertz Filter, Garden City Pk., N.Y. p 1516
Hisonic, Inc., Olathe, Kans. .... p 1517
Hopkins Engrg., San Fernando, Cal. p 1519
Hughes Aircraft Co., Frequency Control Devices, Newport Bch., Cal. .... p 1403
Hughes Aircraft Co., Hybrid Microelectronic Circuits, Newport Bch., Cal. .... p 1403
JFD Elctrns./Sub. Riker-Maxson, Bklyn., N.Y.
Johnson E. F. Co., Waseca, Minn.
Kappa Networks, Inc., Carteret, N.J. p 1520
Krohn-Hite, Cambridge, Mass. .... p 1522
Lorch Elctrns. Corp., Englewood, N.J. p 609
McCoy Elctrns. Co., Mt. Holly Springs, Pa. ....p 1409,1410
Microwave Cavity Labs., La Grange, Ill.
Miller, J.W. Co., Compton, Cal.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Multitech Power Sys., Costa Mesa, Cal.
North Hills Elctrns., Inc., Glen Cove, N.Y.
Reeves-Hoffman Div., Carlisle, Pa. p 1427
RF Interonics, Bay Shore, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rockland Sys. Corp., Blauvelt, N.Y. p 1526,1527
San Fernando Elec. Mfg., San Fernando, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Seg Elctrns., Richmond Hill, N.Y.
Sierra Sys., Mountain View, Cal.
Southern Elctrns., Burbank, Cal.
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Texscan Corp., Indianapolis, Ind. p 578
Topaz Elctrns., San Diego, Cal.
Torotel, Inc., Grandview, Mo. p 1432,1529
TT Elctrns., Inc., Culver City, Cal. p 1530,1531
United Transformer Co, Div. of TRW Inc., New York, N.Y.
USCC/Centralab, Elctrns. Div., Burbank, Cal.
Vari-L Co., Inc., Denver, Colo. .... p 1534
AMBAC Inds., Garden City, N.Y.
American Trans-Coil Corp., Richmond Hill, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
Barker & Williamson, Bristol, Pa.
B.H. Inds., Los Angeles, Cal.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Capcon, Inc., New York, N.Y.
Captor Corp., Tipp City, Ohio
CCA Elctrns. Corp., Gloucester, N.J.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Consolidated Resistance Sls., Yonkers, N.Y.
Constant Voltage Co., Chicago, Ill.
Core-Tronics, Inc., Orange, N.J.
Cornell-Dubilier Elctrns., Newark, N.J.
Crystal Network Prods. Corp., Erie, Pa.
Decibel Prods., Inc., Dallas, Tex.
Defense Elctrns., Inc., Rockville, Md.
Delta Elctrns., Alexandria, Va.
Dorsett Elctrns., Tulsa, Okla.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Elcom Sys., Deer Pk., N.Y.
Electro Assemblies, Inc., Chicago, Ill.
Elctrn. Specialty, Thomaston, Conn.
Elmag Corp., Newark, N.J.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Filtron Co., Flushing, N.Y.
Finney Co., Bedford, Ohio
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Instr. Corp., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hope Elctrns., Clifton, N.J.
Hughes Aircraft Co, Culver City, Cal.
Industrial Condenser Corp., Chicago, Ill.
Industrial Microwave, Scotch Plains, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
K & L Microwave Inc., Salisbury, Md.
Kahn Resch. Labs., Inc., Freeport, N.Y.
Kings Elctrns., Tuckahoe, N.Y.
Kwikset Powdered Metal Prods., Anaheim, Cal.
LectroMagnetics, Los Angeles, Cal.
Liberty Mirror Div., Brackenridge, Pa.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Marshall Inds., Monrovia, Cal.
Maury Microwave Corp., Cucamonga, Calif.
Meca Elctrns., Inc., Denville, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Nat'l. Coil Co., Douglas, Ariz.
North American Rockwell Corp., Cleveland, Ohio
Nytronics, Inc., Alpha, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Philco-Ford Corp., Washington, D.C.
Physical Elctrn. Labs., Menlo Park, Calif.
"The Potter Co.", Inglewood, Calif
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rafec Elctrns., Temple City, Calif.
Rantec Div., Calabasas, Calif.
Renco Elctrns., Inc., Hicksville, N.Y.
RF Systems, Inc., Cohasset, Mass.
RFL Inds., Comps. Div., Boonton, N.J.
RtroN Corp., Skokie, Ill.
Sage Labs. Inc., Natick, Mass.
Spectrum Control, Inc., Fairview, Pa.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Stanford Applied Engrg., Santa Clara, Cal.
Stark Elctrn. Instrs., Ltd., Ajax, Ont., Canada
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Technical Mat'l., Mamaroneck, N.Y.
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Vanguard Elctrns., Inglewood, Cal.
Wavecom, Inc., Northridge, Cal.
Weston-Magnetics, Archbald, Pa.
Zeta Labs., Inc., Mountain View, Calif.

Filters, Reactor

ACDC Elctrns., Oceanside, Cal.
ADC Prods., Minneapolis, Minn.
Arnold Magnetics, Culver City, Cal.
Coast Coil Co., Los Angeles, Calif.
Del Elctrns. Corp., Mt. Vernon, N.Y.
Douglas Randall Div., Pawcatuck, Conn.
Ferrodyne Corp., Venice, Calif.
Freed Transformer Co., Bklyn., N.Y.
General Elec. Co., Schenectady, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Lambda Elctrns., Melville, N.Y.
Microtran Co., Valley Stream, N.Y.
NWL Transformers, Trenton, N.J.
Seg Elctrns., Richmond Hill, N.Y.
Torotel, Inc., Grandview, Mo.
Zaring Inds., Inc., Carmel, Ind.
A C Electronics Co., Santa Monica, Cal.
American Trans-Coil Corp., Richmond Hill, N.Y.
Basler Elec. Co., Highland, Ill.
B.H. Inds., Los Angeles, Cal.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Bullock Magnetics Corp., Pomona, Calif.
Central Transformer Co., Chicago, Ill.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Coral Magnetics Co., Farmingdale, N.Y.
Eastern Delta Corp., Fair Lawn, N.J.
Electro Windings & Comps., Kenilworth, N.J.
Elctrn. Transformer Corp., Paterson, N.J.
Filtron Co., Flushing, N.Y.
General Instr. Corp., Chicopee, Mass.
Green Rectifier Corp., Fair Lawn, N.J.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Peschel Instrs., Cape Coral, Fla.
Ramm Rectifier Co., Inc., Bronx, N.Y.
Sartron, Inc., Newberg, Ore.
SKG Assocs., Inc., Boston, Mass.
Sterling Transformer Corp., Brooklyn, N.Y.
TDC Div., Littleton, Mass.
Torotron, Mt. Vernon, N.Y.
Transformer Mfrs., Inc., Chicago, Ill.
Transrex Div., Torrance, Cal.

Filters, Screenroom

All-Tronics Inc., Westbury, N.Y. p 1506-1508
AVX Aerovox Corp., New Bedford, Mass.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hopkins Engrg., San Fernando, Cal. p 1519
RF Interonics, Bay Shore, N.Y..... p 1528
San Fernando Elec. Mfg., San Fernando, Cal.
Sprague Elec. Co., No. Adams, Mass.
Topaz Elctrns., San Diego, Cal.
USCC/Centralab, Elctrns. Div., Burbank, Cal.
American Trans-Coil Corp., Richmond Hill, N.Y.
Captor Corp., Tipp City, Ohio
Cornell-Dubilier Elctrns., Newark, N.J.
Filtron Co., Flushing, N.Y.
LectroMagnetics, Los Angeles, Cal.
Lindgren, Erik A. & Assoc., Chicago, Ill.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
RtroN Corp., Skokie, Ill.
Solar Elctrns. Co., Hollywood, Calif.
Spectrum Control, Inc., Fairview, Pa.
VIKOA, Hoboken, N.J.

Filters, Single Sideband

ADC Prods., Minneapolis, Minn.
American Elctrn. Labs., Inc., Lansdale, Pa.
A. P. Circuit Corp., New York, N.Y.
Automatic Coil, New Hyde Pk., N.Y.
Bliley Electric, Erie, Pa. .... p 1371
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364
CTS Corp, Elkhart, Ind.
Damon Corp., Needham Hgts., Mass. p 1379
Electronic Research Co., Shawnee Mission, Kans.
ESC Elctrns. Corp., Palisades Pk., N.J.
Freed Transformer Co., Bklyn., N.Y.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hertz Filter, Garden City Pk., N.Y.
Hisonic, Inc., Olathe, Kans.
Hughes Aircraft Co., Frequency Control Devices, Newport Bch., Cal. .... p 1403
Hughes Aircraft Co., Hybrid Microelectronic Circuits, Newport Bch., Cal. .... p 1403
Kappa Networks, Inc., Carteret, N.J.
McCoy Elctrns. Co., Mt. Holly Springs, Pa. .... p 1409
Multimetric Ind., Inc., Richmond Hill, N.Y.
Piezo Technology, Orlando, Fla.
Reeves-Hoffman Div., Carlisle, Pa. p 1427
RF Interonics, Bay Shore, N.Y.
Seg Elctrns., Richmond Hill, N.Y.
Sprague Elec. Co., No. Adams, Mass.
TMC Systems (Ariz.), Tempe, Ariz.
Torotel, Inc., Grandview, Mo. .... p 1529
TT Elctrns., Inc., Culver City, Cal.
Aladdin Elctrns., Nashville, Tenn.
American Trans-Coil Corp., Richmond Hill, N.Y.
Astrolab Inc., Linden, N J
Beukers Labs., Inc., Hauppauge, N.Y.
Blackhawk Networks Corp., Janesville, Wisc.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Crystal Network Prods. Corp., Erie, Pa.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Filtech Corp., Franklin Park, Ill.
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Lab. Assocs., Norwich, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Industrial Microwave, Scotch Plains, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
Nat'l. Coil Co., Douglas, Ariz.
Nytronics, Inc., Alpha, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RFL Inds., Comps. Div., Boonton, N.J.
Technical Mat'l., Mamaroneck, N.Y.
Tedford Crystal Labs., Cincinnati, Ohio
Torotron, Mt. Vernon, N.Y.
Vanguard Elctrns., Inglewood, Cal.
Weston-Magnetics, Archbald, Pa.

Filters, Synchronous Tracking

ADC Prods., Minneapolis, Minn.
Austron, Inc., Austin, Tex.
Bafco, Inc., Warminster, Pa.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Clarke - Hess, New York, N.Y.
CTS Corp, Elkhart, Ind.
Dytronics Co., Columbus, Ohio .... p 441
Elctrn. Assocs., W. Long Branch, N.J.
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Interstate Elctrns. Corp., Anaheim, Cal.
Ithaco, Inc., Ithaca, N.Y.
Multimetric Ind., Inc., Richmond Hill, N.Y.
Quan-Tech, Whippany, N.J. .... p 545
Universal Ad-Yu Elctrns., Inc., Passaic, N.J. .... p 2752
Brower Laboratories, Inc., Waltham, Mass.
Electrac, Inc., Anaheim, Calif.
Hughes Aircraft Co, Culver City, Cal.
Industrial Microwave, Scotch Plains, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
Peninsula Microwave Labs., Mountain View, Cal.
Signal Analysis Inds. Corp., Hauppauge, N.Y.
Spectral Dynamics Corp. San Diego, San Diego, Cal.

Filters,Telemetering— See Vol 1

Filters, Tone, Telegraph

ADC Prods., Minneapolis, Minn.
A. P. Circuit Corp., New York, N.Y.
Bramco Controls, Piqua, Ohio .... p 1523
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1512
Coast Coil Co., Los Angeles, Calif.
Data-Control Systems, Danbury, Conn.
Douglas Randall Div., Pawcatuck, Conn. p 1381
Elctrn. Assocs., W. Long Branch, N.J.
ESC Elctrns. Corp., Palisades Pk., N.J. p 1513
Freed Transformer Co., Bklyn., N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans. .... p 1517
Hopkins Engrg., San Fernando, Cal. p 1519
Kappa Networks, Inc., Carteret, N.J. p 1521
Microtran Co., Valley Stream, N.Y.
Multimetric Ind., Inc., Richmond Hill, N.Y.
Multitech Communications, Monterey Pk., Cal.

Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Quindar Elctrns., Inc., Springfield, N.J.
Reeves-Hoffman Div., Carlisle, Pa.
RF Interonics, Bay Shore, N.Y. ..... p 1528
San Fernando Elec. Mfg., San Fernando, Cal.
Seg Elctrns., Richmond Hill, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Torotel, Inc., Grandview, Mo. ...... p 1529
TT Elctrns., Inc., Culver City, Cal.
Aladdin Elctrns., Nashville, Tenn.
Beukers Labs., Inc., Hauppauge, N.Y.
Collins Radio Co., Dallas, Tex.
Collins Radio Co., Newport Beach, Calif.
Components Corp., Chicago, Ill.
Electrocom Inds., So. Bend, Indiana
Elctrn. Transformer Corp., Paterson, N.J.
Filtech Corp., Franklin Park, Ill.
Filtron Co., Flushing, N.Y.
Forbes & Wagner, Inc., Silver Creek, N.Y.
Gosh Instrs., Inc., Wethersfield, Conn.
HB Engrg. Corp., Silver Spring, Md.
Kinetic Tech., Inc., Santa Clara, Cal.
Lynch Communication Systems, San Francisco, Calif.
Nytronics, Inc., Alpha, N.J.
Polyphase Instr. Co., Bridgeport, Pa.
Radiation Devices Co., Baltimore, Md.
RFL Inds., Comps. Div., Boonton, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Stanford Applied Engrg., Santa Clara, Cal.
Stromberg Carlson Corp., Rochester, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Torotron, Mt. Vernon, N.Y.
Trepac Corp. America, Englewood, N.J.
Vanguard Elctrns., Inglewood, Cal.

Filters, Tunable—See Filters, Continuously Variable

Filters, Tuning Fork—See Vol 1

Filters, UHF & VHF

ADC Prods., Minneapolis, Minn.
Alford Mfg. Co., Winchester, Mass.
Allen-Bradley Co., Milwaukee, Wisc. p 1511
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Applied Research Inc., Port Washington, N.Y.
Bird Elctrn., Cleveland, Ohio .... p 421
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1364
E & M Labs., Westlake Village, Cal.
Electro/Data, Inc., Garland, Tex. p 1559
Electro-Mechanics Co., Austin, Tex.
Erie Technological Prods. (EEM), Erie, Pa.
Frequency Elctrns., New Hyde Pk., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
GC Elctrns., Rockford, Ill.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Greenray Inds., Inc., Mechanicsburg, Pa. .... p 606
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Frequency Control Devices, Newport Bch., Cal. .... p 1403
Hughes Aircraft Co., Hybrid Microelectronic Circuits, Newport Bch., Cal. .... p 1403
Lorch Elctrns. Corp., Englewood, N.J. p 609
McCoy Elctrns. Co., Mt. Holly Springs, Pa.
Microwave Cavity Labs., La Grange, Ill.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Piezo Technology, Orlando, Fla. p 1425
Reeves-Hoffman Div., Carlisle, Pa. p 1427
RF Interonics, Bay Shore, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
San Fernando Elec. Mfg., San Fernando, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Seg Elctrns., Richmond Hill, N.Y.
Sprague Elec. Co., No. Adams, Mass.
Texscan Corp., Indianapolis, Ind. p 578
Torotel, Inc., Grandview, Mo.
TT Elctrns., Inc., Culver City, Cal. p 1530,1531
United Transformer Co. Div. of TRW Inc., New York, N.Y.
USCC/Centralab, Elctrns. Div., Burbank, Cal.
Vari-L Co., Inc., Denver, Colo. .... p 1534
Aladdin Elctrns., Nashville, Tenn.
Ampex Corp., Redwood City, Calif.
Anaren Microwave, Inc., Syracuse, N.Y.
A.R.F. Products, Inc., Raton, N.M.
Astrolab Inc., Linden, N J
Avco Corp., Cincinnati, Ohio
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
CCA Elctrns. Corp., Gloucester, N.J.
Decibel Prods., Inc., Dallas, Tex.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Elcom Sys., Deer Pk., N.Y.
Electronics Missiles & Comms., White Haven, Pa.
Engelmann Microwave, Montville, N.J.
Entron, Inc., Silver Spring, Md.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Filtron Co., Flushing, N.Y.
Finney Co., Bedford, Ohio
General Instr. Corp., Chicopee, Mass.
General Lab. Assocs., Norwich, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Hi-Lo Mfg. Corp., Chicago, Ill.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Fullerton, Cal.
Industrial Microwave, Scotch Plains, N.J.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
K & L Microwave Inc., Salisbury, Md.
Kevlin Mfg. Co., Woburn, Mass.
Lundy Elctrns. & Sys., Inc., Glen Head, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Nat'l. Coil Co., Douglas, Ariz.
Nytronics, Inc., Alpha, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Philco-Ford Corp., Washington, D.C.
Physical Elctrn. Labs., Menlo Park, Calif.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
RCA Corp., Camden, N.J.
RF Systems, Inc., Cohasset, Mass.
RFL Inds., Comps. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Spectrum Control, Inc., Fairview, Pa.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Teledyne Microwave, Sunnyvale, Cal.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Tricraft Prods., Chicago, Ill.
Vanguard Elctrns., Inglewood, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Vernitron Piezoelectric Div., Bedford, Ohio
Wavecom, Inc., Northridge, Cal.
Winegard Co., Burlington, Iowa
Zeta Labs., Inc., Mountain View, Calif.

Filters, Variable

A. P. Circuit Corp., New York, N.Y. p 1509
Applied Research Inc., Port Washington, N.Y.
Data-Control Systems, Danbury, Conn.
Dynamics Instr. Co., Monterey Pk., Cal. p 432
Dytronics Co., Columbus, Ohio .... p 441
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Engrg. Labs., Farmingdale, N.J. .... p 605
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Ithaco, Inc., Ithaca, N.Y. .... p 1286
Kappa Networks, Inc., Carteret, N.J. p 1521
Krohn-Hite, Cambridge, Mass. .... p 1522
Lorch Elctrns. Corp., Englewood, N.J.
Multimetric Ind., Inc., Richmond Hill, N.Y. .... p 1524
Reeves-Hoffman Div., Carlisle, Pa.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Rockland Sys. Corp., Blauvelt, N.Y. p 1526,1527
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
Seg Elctrns., Richmond Hill, N.Y.
Texscan Corp., Indianapolis, Ind. p 578
TMC Systems (Ariz.), Tempe, Ariz. p 1430
Universal Ad-Yu Elctrns., Inc., Passaic, N.J. .... p 2752
Vari-L Co., Inc., Denver, Colo. .... p 1534
Vega Precision Labs., Vienna, Va.
Watkins Johnson Co., Palo Alto, Cal.
Altec, Anaheim, Calif.
American Trans-Coil Corp., Richmond Hill, N.Y.
Astrolab Inc., Linden, N J
Crimpco Engrg., Cangoga Park, Calif.
Delta Elctrns., Alexandria, Va.
Electrac, Inc., Anaheim, Calif.
Entron, Inc., Silver Spring, Md.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Frequency Devices, Inc., Haverhill, Mass.
General Instr. Corp., Chicopee, Mass.
General Microwave Corp., Farmingdale, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Heliotek, Sylmar, Calif.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Industrial Microwave, Scotch Plains, N.J.
Kinetic Tech., Inc., Santa Clara, Cal.
Liberty Mirror Div., Brackenridge, Pa.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Optics Technology, Palo Alto, Calif.
Peninsula Microwave Labs., Mountain View, Cal.
Physical Elctrn. Labs., Menlo Park, Calif.
Power Elctrns. Co., Houston, Tex.
Premier Microwave, Port Chester, N.Y.
Princeton Applied Resch. Corp., Princeton, N.J.
RFL Inds., Comps. Div., Boonton, N.J.
Rohde & Schwarz Sls., Passaic, N.J.
Rowe Engravers, Clifton, N.J.
Sanders Assocs., Nashua, N.H.
Schoeffel Instr. Corp., Westwood, N.J.
Signal Analysis Inds. Corp., Hauppauge, N.Y.
Spectrum Instrs., Inc., New Rochelle, N.Y.
Spencer-Kennedy Labs., Inc., Winchester, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systems Resch. Labs., Dayton, Ohio
Technical Mat'l., Mamaroneck, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Texscan Microwave Prods., Indianapolis, Ind.
Vanguard Elctrns., Inglewood, Cal.
Victor Microwave, Inc., Wakefield, Mass.
Voltex Co., Inc., Farmingdale, N.Y.
Wavecom, Inc., Northridge, Cal.

Filters, Vestigial Sideband

ADC Prods., Minneapolis, Minn.
Alford Mfg. Co., Winchester, Mass.
ESC Elctrns. Corp., Palisades Pk., N.J.
Frequency Engrg. Labs., Farmingdale, N.J.
Multimetric Ind., Inc., Richmond Hill, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Reeves-Hoffman Div., Carlisle, Pa.
Seg Elctrns., Richmond Hill, N.Y.
Sprague Elec. Co., No. Adams, Mass.
TT Elctrns., Inc., Culver City, Cal.
Forbes & Wagner, Inc., Silver Creek, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Industrial Microwave, Scotch Plains, N.J.
Polyphase Instr. Co., Bridgeport, Pa.
Vanguard Elctrns., Inglewood, Cal.

Filters, Waveguide

American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal
Bendix, Franklin, Ind. .... p 1555
E & M Labs., Westlake Village, Cal.
Electro/Data, Inc., Garland, Tex.
Electro-Mechanics Co., Austin, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
Greenray Inds., Inc., Mechanicsburg, Pa. .... p 606
Hewlett-Packard, Palo Alto, Cal.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
AMBAC Inds., Garden City, N.Y.
Astrolab Inc., Linden, N J
Cornell-Dubilier Elctrns., Newark, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Ferranti Ltd., Hollinwood, Lancs., England
Filtron Co., Flushing, N.Y.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Industrial Microwave, Scotch Plains, N.J.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
N-H Microwave, Inc., Red Bank, N.J.
Nurad, Inc., Baltimore, Md.
Pabst Engineering Equipment Co., Inc., Elizabeth, N.J.
Peninsula Microwave Labs., Mountain View, Cal.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
Rowe Engravers, Clifton, N.J.
Sage Labs. Inc., Natick, Mass.
Stark Elctrn. Instrs., Ltd., Ajax, Ont., Canada
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Teledyne Microwave, Sunnyvale, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Wavecom, Inc., Northridge, Cal.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Finders, Range—See Range Finder Systems—Vol 1

Finger Contact Strips—See Contact Strips, Finger—Vol 3

Finishes—See Coatings; Paints; Plating Solutions—Vol 3

Fire Control Systems, Aircraft, Missile, Rocket

Control Technology Co., L.I.C., N.Y.
Frequency Engrg. Labs., Farmingdale, N.J.
Ledex, Inc., Dayton, Ohio
Norden Div., Norwalk, Conn.
Abrams Instr., Lansing, Mich.
AMBAC Inds., Garden City, N.Y.
Anchor Specialty Mfg., Teterboro, N.J.
ASC Sys. Corp., Chicago, Ill.

Astronautics Corp. of Amer., Milwaukee, Wisc.
Delco Elctrns. Div., Milwaukee, Wisc.
Dynalex, Inc., Burbank, Cal.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Ferranti Ltd., Hollinwood, Lancs., England
General Dynamics, San Diego, Cal.
Goodyear Aerospace Corp., Akron, Ohio
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Hughes Aircraft Co, Culver City, Cal.
Lingenfelter Applied Tech., Gaithersburg, Md.
Lockheed Elctrns. Co., Watchung, N.J.
Loral Elctrn. Sys., Bronx, N.Y.
Maxson Elctrns. Div., Great River, N.Y.
Measurement Sys., Inc., Norwalk, Conn.
Pem Mach. Tool Co., Inc., Cranford, N.J.
Philips Broadcast Equipment Corp., Montvale, N.J.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Radiation Sys., Inc., McLean, Va.
Raytheon Co., Lexington, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Technical Consultants Corp., Ellington, Conn.
United Aircraft Corp., Norwalk, Conn.
USM Corp., Wakefield, Mass.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Fire Detection & Fighting Equip.

Dynarad, Inc., Norwood, Mass.
Aerolite Electronics Corp., Union City, N.J.
AMBAC Inds., Garden City, N.Y.
American Elec. Cable Co., Holyoke, Mass.
A.R.P. Inds., Inc., Huntington, N.Y.
Autocall Co., The, Shelby, Ohio
Beckman Instrs., Process Instrs., Fullerton, Cal.
BRK Elctrns., Aurora, Ill.
Components Specialties, Inc., Freeport, N.Y.
Cramer Div., Old Saybrook, Conn.
De-Tec-Tronic Corp., Chicago, Ill.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Edwards Co. Inc., Norwalk, Conn.
Electronic Control Corp., Detroit, Mich.
Fedtro, Inc., Rockville Centre, N.Y.
Fenwal, Inc., Ashland, Mass.
Fuel Watchman Sls. & Svc., Inc., Bronx, N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
Kidde, Walter & Co., Belleville, N.J.
Loral Elctrn. Sys., Bronx, N.Y.
National Time & Signal, Oak Pk., Mich.
N.Y. Testing Labs., Inc., Westbury, N.Y.
On-Guard Corp. America, Carlstadt, N.J.
Pem Mach. Tool Co., Inc., Cranford, N.J.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Standard Elec. Time Corp., Springfield, Mass.
Worner Elctrn. Devices, Rankin, Ill.

Flame Spraying Equipment—See Vol 1

Flanges, Waveguide

Amphenol RF Div., Danburry, Conn.
Waveline, Inc., W. Caldwell, N.J.
Airtec, Inc., Roselle, N.J.
American Radar Comps., Inc., Denville, N.J.
Cardwell Condenser, Lindenhurst, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Gabriel Elctrns. Corp., Saco, Me.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Lieco, Inc., Lindenhurst, N.Y.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
Pem Mach. Tool Co., Inc., Cranford, N.J.
Premier Microwave, Port Chester, N.Y.
Reeve Elctrns., Inc., Chicago, Ill.
RF Systems, Inc., Cohasset, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Varian Assocs., Palo Alto, Cal.

Flash Photolysis Systems & Components

Amglo Inds., Inc., Rosemont, Ill. p 1641
Instr. Resch. Co., Lincoln, Mass.
Xenon Corp., Medford, Mass.

Flashers

Autronics Corp., Pasadena, Calif.
Betamite Electronic Devices, Culver City, Calif. .... p 1660
Drake Mfg., Harwood Hgts., Ill.
Eagle-Signal Div., Davenport, Iowa
Elco, Willow Grove, Pa.
Haydon, A. W. Co., Waterbury, Conn.
Logitek, Inc., Farmingdale, N.Y. p 1338,1756
Metric Sys., Ft. Walton Beach, Fla.
Precision Timer, Westbrook, Conn.
Sealectro Corp., Mamaroneck, N.Y.
Wagner Elec. Corp., Livingston, N.J.
Aerolite Electronics Corp., Union City, N.J.
Arizona Elctrns., Inc., Benson, Ariz.
Artisan Elctrns. Corp., Parsippany, N.J.
Assembly Elctrns. Ltd., Niagara Falls, Can.
Bergen Labs., Inc., Paterson, N.J.
Bullock Magnetics Corp., Pomona, Calif.
Cable Elec. Prods., Inc., Providence, R.I.
Carbone Corp., Boonton, N.J.
Controlotron Corp., Farmingdale, N.Y.
Dynamic Controls Corp., S. Windsor, Conn.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
E.C.P. Corp., Cleveland, Ohio
E.D.I. Inc., Cairo, Ill.
GTE Sylvania Inc., Danvers, Mass.
Guardian California, Culver City, Cal.
Hi-Tek Corp., Santa Ana, Calif.
Hoagland Instr., Red Bank, N.J.
Hughey & Phillips, Inc., Burbank, Cal.
Innovatek Enterprise, Millerton, N.Y.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kidde, Walter & Co., Belleville, N.J.
Mel-Rain Corp., Indianapolis, Ind.
Nelson-Hershfield Elctrns., Phoenix, Ariz.
Pek, Inc., Sunnyvale, Calif.
Pennwalt Corp., Phila., Pa.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Servo Dev. Corp., Hicksville, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
Tempo Instr., Plainview, N.Y.
Time-O-Matic, Inc., Danville, Ill.
U.S. Scientific Instrs., Watertown, Mass.
Wallace & Tiernan Div., Belleville, N.J.
Xenon Corp., Medford, Mass.

Flashlights & Lanterns—See Vol 1

Flat Packages, Integrated Circuit—See Packages, Integrated Circuit

Flaw Detection Equipment—See Detectors, Flaw & Defect —Vol 1

Fluid Conductivity Indicators —See Indicators, Fluid Conductivity—Vol 1

Fluid Flow Indicators—See Meters, Fluid Flow

Fluidic Control Systems & Equip.

Ametek/Lamb Elec., Kent, Ohio
Agastat Div., Elizabeth, N.J.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bendix, Dayton, Ohio
CGS/Datametrics, Watertown, Mass.
Controlotron Corp., Farmingdale, N.Y.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Decor Elctrns. Corp., Austin, Tex.
deHart Mfg. Co., Norristown, Pa.
Digiac Corp., Plainview, N.Y.
Dynalco Corp., Ft. Lauderdale, Fla.
Fox Valve Dev. Co., Inc., Hanover, N.J.
Gagne Assocs., Inc., Binghamton, N.Y.
Glar-Ban Corp., Buffalo, N.Y.
Goodyear Aerospace Corp., Akron, Ohio
Honeywell, Aerospace & Def., Minneapolis, Minn.
Hughes Aircraft Co, Culver City, Cal.
IPT Corp., Mountain View, Cal.
Mechanical Technology, Inc., Latham, N.Y.
Natvar Corp., Rahway, N.J.
Simmonds Precision Prods., Inc., Bellows Falls, Vt.
Singer-General Precision, Inc., Little Falls, N.J.
Trish Energetics, Harvard, Mass.

Fluorescent Compounds & Phosphors—See Vol 3

Fluorometers—See Vol 1

Flux, Brazing & Soldering—See Vol 3

Fluxmeters—See Meters, Flux —Vol 1

Foil, Capacitor Electrode—See Vol 3

Foil, Magnetic—See Vol 3

Foil, Magnetic Shielding—See Shields, Magnetic—Vol 3

Force Links-Also See Cells, Load

Interface, Inc., Scottsdale, Ariz.
Kenney Engrg. Corp., Monrovia, Cal.
Wood, C.N. Mfg. Co., Newtown, Pa.

Forks, Tuning—See Tuning Forks—Vol 1

Forms, Coil—See Coil Forms—Vol 3

Forms, Wire—See Vol 3

Frames, Cabinet & Rack—See Vol 3

Frequency Analyzers—See Analyzers, Spectrum—Vol 1

Frequency Calibration Services—See Services, Calibration & Instrument Repair—Vol 3

Frequency Distribution Systems—See Distribution Systems, Frequency—Vol 1

Frequency Extenders—See Dividers, Frequency—Vol 1

Frequency Sources—See Oscillators—Vol 1

Frequency Standards—See Standards, Frequency—Vol 1

Frequency Synthesizers—See Synthesizers, Frequency—Vol 1

Fuel Cells—See Vol 1

Furnaces, Brazing—See Vol 1

Furnaces, Diffusion—See Vol 1

Furnaces, Electric (Laboratory)—See Vol 1

Furnaces, Electric (Production)—See Vol 1

Furnaces, Gas (Production)—See Vol 1

Furnaces, High-Frequency—See Vol 1

Furnaces, Vacuum—See Vol 1

Furniture, Electronic Lab.—See Benches, Consoles, Stools, Tables (Lab & Shop) —Vol 3

Fuse Clips—See Clips & Holders, Fuse—Vol 3

Fuse Panels—See Panels, Fuse

Fused Plugs—See Plugs, Fused—Vol 3

Fused Quartz—See Quartz, Fused—Vol 3

Fuses

Bel Fuse, Inc., Jersey City, N.J.
Bussmann Mfg., St. Louis, Mo. p 1890,1891
Engelhard Minerals & Chem., Murray Hill, N.J.
General Elec. Co., Schenectady, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Auto Prods. Co., St. Louis, Mo.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bedford Div., Bedford, Mass.
Bellaire Elctrns. Inc., Farmingdale, N.J.
Cable Elec. Prods., Inc., Providence, R.I.
Carbone Corp., Boonton, N.J.
Chase-Shawmut Co., Newburyport, Mass.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Economy Fuse Div., Des Plaines, Ill.
Electra/Midland Corp., San Diego, Cal.
Electrey, S.A., Monterrey, Mexico
Ercona Corp., Bellmore, N.Y.
General Elec., Providence, R.I.
Hughes Aircraft Co, Culver City, Cal.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Littelfuse, Inc., Des Plaines, Ill.
Megadyne Inds., Inc., Rochester, N.Y.
Micro Devices Corp., Dayton, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Trico Fuse Mfg. Co., Milwaukee, Wisc.
Westinghouse Elec. Int'l., New York, N.Y.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Fuses, Failure Indicating

Bussmann Mfg., St. Louis, Mo. p 1890,1891
Carbone Corp., Boonton, N.J.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Economy Fuse Div., Des Plaines, Ill.
Electrey, S.A., Monterrey, Mexico
Elctrn. Ideas, Wyncote, Pa.
Littelfuse, Inc., Des Plaines, Ill.
Master Specialties, Costa Mesa, Cal.
Micro Devices Corp., Dayton, Ohio
Westinghouse Elec. Corp., Pittsburgh, Pa.

Fuses, Thermal

Eagle Elec. Mfg. Co., L. I. C., N.Y.
Economy Fuse Div., Des Plaines, Ill.
Electrey, S.A., Monterrey, Mexico
Ercona Corp., Bellmore, N.Y.
Littelfuse, Inc., Des Plaines, Ill.
Micro Devices Corp., Dayton, Ohio
Networks Elctrn. Corp., Chatsworth, Calif.

Fuses, Time Delay

Bussmann Mfg., St. Louis, Mo. p 1890,1891
Precision Timer, Westbrook, Conn.
Chase-Shawmut Co., Newburyport, Mass.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Economy Fuse Div., Des Plaines, Ill.
Electrey, S.A., Monterrey, Mexico
General Elec., Providence, R.I.
Littelfuse, Inc., Des Plaines, Ill.
Micro Devices Corp., Dayton, Ohio
Raymond Engrg., Inc., Middletown, Conn.

Galvanometers—See Meters, Galvanometer—Vol 1

Gamma Ray Tubes—See Tubes, Radiation Detection

Garnet Parts-Also See Materials, Garnet—See Vol 3

Gas Analyzers—See Analyzers, Gas—Vol 1

Gases, Inert—See Vol 3

Gaskets—See Seals—Vol 3

Gaskets, Shielding, R-F-Also See Shields, R-F—See Vol 3

Gates, Computer Circuit (AND, OR, NOR, ETC.)—See Cards, Logic; Circuits, Integrated; Modules, Logic

Gauges, Beta—See Vol 1

Gauges, Connector—See Vol 1

Gauges, Displacement, Linear—See Vol 3

Gauges, Fuel—See Vol 1

Gauges, Ionization—See Vol 1

Gauges, Lead Bending—See Vol 3

Gauges, Photoelectric

Abtronics, Inc., Livermore, Calif.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Davidson Elctrn. Dev. Co., Erie, Pa.
De-Tec-Tronic Corp., Chicago, Ill.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Electronic Control Corp., Detroit, Mich.
H H Controls Co., Arlington, Mass.
Link Div., Binghamton, N.Y.
Optron Corp., Woodbridge, Conn.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.

Gauges, Pirani—See Vol 1

Gauges, Pressure-Also See Transducers, Pressure—See Vol 1

Gauges, Radiation, Microwave—See Vol 1

Gauges, Strain

General Electc. Semiconductor, Syracuse,, N.Y.
Hickok Elect. Instr., Cleveland, Ohio
Jonard Inds. Corp., Bronx, N.Y.
Microdot Inc., City of Industry, Cal.
Precision Monolithics, Santa Clara, Cal.
Ametek/U.S. Gauge, Sellersville, Pa
Automation Inds., Los Angeles, Cal.
Bell & Howell Co., Pasadena, Calif.
BLH Elctrns., Inc., Waltham, Mass.
Dentronics, Inc., Hackensack, N.J.
Doric Sci. Corp., San Diego, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Foxboro Co., Foxboro, Mass.
Hughes Aircraft Co, Culver City, Cal.
Innovatek Enterprise, Millerton, N.Y.
Janel, Inc., Stirling, N.J.
Kulite Semiconductor Prod., Ridgefield, N.J.
Magnaflux Corp., Chicago, Ill.
Micro-Meas. Div., Romulus, Mich.
Micro-Strain, Inc., Spring City, Pa.
Microdot Inc., S. Pasadena, Calif.
Minnetech Labs., Inc., Minneapolis, Minn.
Statham Instrs., Inc., Oxnard, Cal.
Sundstrand Data Control, Redmond, Wash.
Varied Ind'l. Prods., Inc., Paterson, N.J.
West Coast Resch. Corp., Los Angeles, Calif.

Gauges, Tension—See Vol 1

Gauges, Thickness (Electronic)—See Indicators, Film Thickness; Indicators, Material Thickness—Vol 1

Gauges, Vacuum—See Vol 1

Gauges, Wire Measuring—See Wire Measuring Gauges—Vol 3

Gear Measuring Wire—See Vol 3

Gears & Gear Mechanisms (Precision)—See Vol 3

Geiger Counters—See Counters, Geiger—Vol 3

Geiger-Mueller Tubes—See Tubes, Geiger-Mueller

Generators, A-C—See Vol 1

Generators, A-M—See Vol 1

Generators, A-M(F-M—See Vol 1

Generators, Acoustic, High Intensity Noise—See Vol 1

Generators, Audio—See Vol 1

Generators, Character—See Vol 1

Generators, Color Tv—See Vol 1

Generators, Cross Hatch—See Vol 1

Generators, D-C—See Vol 1

Generators, Digital Delay—See Vol 1

Generators, Emergency Power—See Vol 1

Generators, F-M—See Vol 1

Generators, F-M & F-M/Stereo—See Vol 1

Generators, Frequency, Harmonic—See Vol 1

Generators, Frequency-Offset—See Vol 1

Generators, Function—See Vol 1

Generators, Hall-Also See Magnetoresistors; Multipliers, Hall; Probes, Hall

American Aerospace Controls, Farmingdale, N.Y. .... p 1307
Bell, F.W., Inc., Columbus, Ohio.. p 1985
ISC Magnetics Div., Huntington, N.Y. p 1806
Ohio Semitronics, Columbus, Ohio p 1986
RFL Inds., Instr. Div., Boonton, N.J.
Scientific Columbus, Columbus, Ohio p 1987
Active Control Instrumentation, E. Northport, NY
Amplifier Corp. America, Westbury, N.Y.
Calvert Elctrns., Inc., New York, N.Y.
Central Scientific Co., Chicago, Ill.
ISC/Telephonics Div, Huntington, N.Y.
Magnetic Sys. & Instrs., Worcester, Mass.
Magnetics Sys. & Instrs., Worcester, Mass.
Micro Switch, Freeport, Ill.

Generators, Impulse-Also See Generators, Pulse—See Vol 1

Generators, Infrared—See Lamps, Infrared

Generators, Interference Raster—See Vol 1

Generators, Keyed Video Signal—See Generators, TV Signal—Vol 1

Generators, Line & Vector—See Vol 1

Generators, Low-Frequency—See Vol 1

Generators, Marker—See Vol 1

Generators, Microwave—See Vol 1

Generators, Neutron—See Vol 1

Generators, Noise, Random (Electrical)—See Vol 1

Generators, Phase—See Vol 1

Generators, Plasma—See Vol 1

Generators, Portable, Engine Driven—See Vol 1

Generators, Power, High—See Vol 1

Generators, Pulse-Also See Generators, Impulse—See Vol 1

Generators, R-F—See Vol 1

Generators, Sawtooth—See Vol 1

Generators, Signal, Standard Type—See Vol 1

Generators, Sine-Wave—See Vol 1

Generators, Single-Sideband—See Vol 1

Generators, Spectrum—See Generators, Sweep—Vol 1

Generators, Square-Wave—See Vol 1

Generators, Sweep—See Vol 1

Generators, Thermoelectric

Electro Impulse, Inc., Red Bank, N.J.
Best Elecs. Div., Seattle, Wash.
Electro-Optical Systems, Pasadena, Cal.
Hughes Aircraft Co, Culver City, Cal.
Melcor-Materials Elctrn. Prods., Trenton, N.J.
Nuclear Sys., Garland, Tex.
Sanders Nuclear Corp, Nashua, N H
3M Co., St. Paul, Minn.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Generators, Time Code—See Vol 1

Generators, Time Delay—See Vol 1

Generators, Time Delay & Gate—See Vol 1

Generators, Timing, Digital—See Vol 1

Generators, Tone—See Vol 1

Generators, Tone-Burst—See Vol 1

Generators, TV Signal—See Vol 1

Generators, TV Synch—See Vol 1

Generators, UHF(VHF—See Vol 1

Generators, Ultrasonic—See Vol 1

Generators, Word—See Vol 1

Geophysical Equip.—See Hydrophones; Transducers

Germanium—See Crystals, Semiconductor—Vol 1

Germanium Semiconductors—See Diodes; Transistors

Glass Fibers—See Insulation Materials, Glass Fiber Impregnated—Vol 3

Glass Parts—See Insulation Parts, Glass—Vol 3

Glove Boxes—See Boxes, Glove—Vol 3

Gloves, Protective, Parts Handling—See Vol 1

Glues—See Adhesives—Vol 3

Gold-Plating Solutions—See Plating Solutions—Vol 3

Goniometers—See Meters,Goniometer—Vol 1

Governors, Centrifugal

Synchro-Start Prods., Skokie, Ill.

Graphalloy Products—See Vol 3

Graphic Recording Instruments—See Recorders (As Modified)—Vol 1

Graphite Parts—See Vol 3

Greases-Also See Lubricants—See Vol 3

Grilles, Metal(Plastic—See Vol 3

Grilles, Speaker—See Vol 1

Grommets—See Vol 3

Ground Rods—See Rods & Clamps, Ground—Vol 1

Guides, Circuit Board—See Vol 3

Guns, Electron—See Tube Parts

Guns, Electron Beam (For Vacuum Equip.)—See Vol 1

Guns, Soldering—See Soldering, Guns—Vol 3

Gyrators, Microwave

Micromega, Los Angeles, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.

Gyro Compasses—See Compasses, Electronic Gyro

Gyro Testers—See Testers, Gyro—Vol 1

Gyros, Directional

Astro-Space Labs., Huntsville, Ala
Ind'l. Control Co., Farmingdale, N.Y.
AMBAC Inds., Garden City, N.Y.
A.O.I.P., 75/Paris 12eme, France
Aviation Instrument Mfg. Corp., Houston, Tex
Bendix Aerospace-Elctrns., Teterboro, N.J.
Boehme, H.O., Inc., Plainview, N.Y.
Clary Corp., San Gabriel, Calif.
Conrac Corp., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Gyrosystems, Inc., Farmingdale, N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Hughes Aircraft Co, Culver City, Cal.
Humphrey, Inc., San Diego, Calif.
King Radio Corp., Olathe, Kans.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Merix Chem. Co., Chicago, Ill.
Singer-General Precision, Inc., Little Falls, N.J.

Gyros, Displacement

Astro-Space Labs., Huntsville, Ala
AMBAC Inds., Garden City, N.Y.
Aviation Instrument Mfg. Corp., Houston, Tex
Bendix Aerospace-Elctrns., Teterboro, N.J.
Boehme, H.O., Inc., Plainview, N.Y.
Conrac Corp., New York, N.Y.
Gyrosystems, Inc., Farmingdale, N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Humphrey, Inc., San Diego, Calif.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.

Merix Chem. Co., Chicago, Ill.
Novatronics, Inc., Pompano Beach, Fla.
Singer-General Precision, Inc., Little Falls, N.J.

Gyros, Integrating

Astro-Space Labs., Huntsville, Ala
AMBAC Inds., Garden City, N.Y.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Collins Radio Co., Dallas, Tex.
Conrac Corp., New York, N.Y.
Delco Electrns. Div., Milwaukee, Wisc.
Ferranti Ltd., Hollinwood, Lancs., England
Honeywell, Aerospace & Def., Minneapolis, Minn.
Hughes Aircraft Co, Culver City, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Litton Sys., Inc., Woodland Hills, Calif.
Merix Chem. Co., Chicago, Ill.
Singer-General Precision, Inc., Little Falls, N.J.
Systron-Donner Inertial Division, Concord, Cal.

Gyros, Rate

AMBAC Inds., Garden City, N.Y.
Bendix Aerospace-Elctrns., Teterboro, N.J.
Boehme, H.O., Inc., Plainview, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
Condor Pacific Inds. Calif., Canoga Park, Cal.
Conrac Corp., New York, N.Y.
Control Data Corp., Minneapolis, Minn.
Ferranti Ltd., Hollinwood, Lancs., England
Gyrosystems, Inc., Farmingdale, N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Hughes Aircraft Co, Culver City, Cal.
Humphrey, Inc., San Diego, Calif.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Merix Chem. Co., Chicago, Ill.
Narco Avionics, Ft. Washington, Pa.
Singer-General Precision, Inc., Little Falls, N.J.
Systron-Donner Inertial Division, Concord, Cal.

Hall Effect Devices—See Generators, Hall; Magnetoresistors,Hall; Multipliers, Hall; Probes, Hall

Hammers—See Vol 3

Handles For Cabinets, Circuit Boards, Racks, etc.—See Vol 3

Handsets, Chestsets & Operator Sets—See Vol 1

Hardness Indicators—See Indicators, Hardness—Vol 1

Hardware, Antenna—See Clamps; Ground Rods; Mounts; etc.—Vol 1

Hardware—See Bolts; Brackets; Clamps; Fasteners; Terminals;etc.—Vol 3

Harmonic Analyzers—See Analyzers, Harmonic—Vol 1

Harnesses, Wire—See Cable Assemblies—Vol 3

Headers, Hermetic—See Seals, Hermetic-Also See Services, Hermetic Sealing—Vol 3

Headers, Relay & Transformer—See Vol 3

Headers, Transistor & Diode—See Vol 3

Headphones & Headsets—See Vol 1

Heads, Erase—See Vol 1

Heads, Indexing, Rotary—See Vol 1

Heads, Magnetic Drum, Memory—See Vol 1

Heads, Recording(Playback, Audio & Stereo—See Vol 1

Heads Recording(Playback, Computer—See Vol 1

Heads, Recording Disc—See Vol 1

Heads, Video, Recording/Playback—See Vol 1

Heat Dissipators—Heat Dissipators-See Transistor & Diode Heat Dissipators; Tube Heat Dissipators-Also See Heat Sinks, Soldering

Heat Exchangers & Systems—See Vol 3

Heat Guns, Production—See Vol 3

Heat Shrinkable Elastomers—See Caps, Forms & Tapes, Heat Shrinkable—Vol 3

Heat Shrinkable Plastics—See Caps, Forms & Tapes, Heat Shrinkable-Also See Tubing, Heat Shrinkable—Vol 3

Heat Sinks—See Heat Sinks, Soldering-Also See Transistor & Diode Heat Dissipators; Tube Heat Dissipators—Vol 3

Heat Sinks, Soldering—See Vol 3

Heaters & Accessories, Induction—See Vol 1

Heaters, Antenna Radome—See Vol 1

Heaters, Electrical (For Components & Equipment)-Also See Ovens

Blue M Engrg. Co., Blue Island, Ill. p 389
Cox & Co., Inc., New York, N.Y... p 1968
General Elec. Co., Schenectady, N.Y.
Ackerman Gould Co., Inc., Oceanside, N.Y.
American Standard, Franklin Pk., Ill.
BTU Engrg. Corp., Waltham, Mass.
Cahnman Hugo N. Assocs., Kew Gardens, N.Y.
Caig Labs., Inc., Westbury, N.Y.
Capps & Co., Inc., Valley Stream, N.Y.
Central Scientific Co., Chicago, Ill.
Cole-Parmer Instr. Co., Chicago, Ill.
Despatch Oven Co., Minneapolis, Minn.
Dynamic Air Engrg., Santa Ana, Calif.
Electric Parts Corp., Georgetown, Ky.
Electro-Flex Heat, Inc., Bloomfield, Conn.
Electrofilm, Inc., N. Hollywood, Calif.
Feco, Cleveland, Ohio
Fostoria-Fannon, Inc., Fostoria, Ohio
Glo-Quartz Elec. Heater Co., Mentor, Ohio
Gruenberg Elec. Co., Inc., Williamsport, Pa.
GTE Sylvania Inc., Danvers, Mass.
Hafstrom Tech. Prods., Inc., San Diego, Calif.
Jersey Tech. Conslts., Morristown, N.J.
Master Appliance Corp., Racine, Wisc.
Merco Prods. Co., Inc., Eugene, Ore.
Micro-Technical Inds., Laguna Beach, Cal.
OAL Assocs., Inc., Westbury, N.Y.
Pennsylvania Elctrns. Technology, Pittsburgh, Pa.
Precision Sci. Co., Chicago, Ill.
Rama Corp., San Jacinto, Calif.
Rosemount Engrg. Co., Minneapolis, Minn.
Sanders Assocs., Flexprint, Manchester, N.H.
Sta-Warm Elec. Co., Ravenna, Ohio
Texas Instruments, Dallas, Tex.
Therm-O-Lab Corp., N. Hollywood, Calif.
Thermal Sys., Los Angeles, Cal.
Topper Mfg. Co., Inc., Great Neck, N.Y.
Trent, Inc., Philadelphia, Pa.
Vulcan Elec. ITT, Danvers, Mass.
Watlow Elec. Mfg. Co., St. Louis, Mo.
Wiegand, Edwin L. Co., Pittsburgh, Pa.

Heaters, Infrared (Production)

General Elec. Co., Schenectady, N.Y.
Burlington Opers. Div., Burlington, Mass.
Cahnman Hugo N. Assocs., Kew Gardens, N.Y.
Caig Labs., Inc., Westbury, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Denton Vacuum, Inc., Cherry Hill, N.J.
De Vilbiss Co., The, Toledo, Ohio
Elecpac Inc., Cary, Ill.
Fostoria-Fannon, Inc., Fostoria, Ohio
Glo-Quartz Elec. Heater Co., Mentor, Ohio
GTE Sylvania Inc., Danvers, Mass.
Hanovia Lamp Div., Newark, N.J.
HJS Engrg. Co., Park Ridge, Ill.
Luminator Div., Plano, Tex.
Merco Prods. Co., Inc., Eugene, Ore.
Miskella Infra-Red Co., Cleveland, Ohio
North American Elec. Lamp Co., St. Louis, Mo.
OAL Assocs., Inc., Westbury, N.Y.
Quartz Radiation Corp., Fairfield, N.J.
Quartz & Silice, Paris 8e, France
Research, Inc., Minneapolis, Minn.
Selas Corp. America, Dresher, Pa.
Syncor Prods. Co., Inc., Malden, Mass.
Trent, Inc., Philadelphia, Pa.
Vulcan Elec. ITT, Danvers, Mass.
Watlow Elec. Mfg. Co., St. Louis, Mo.
Wiegand, Edwin L. Co., Pittsburgh, Pa.

Heating Elements

Blue M Engrg. Co., Blue Island, Ill.
Caddock Elctrns., Riverside, Cal.
Carborundum Co., Niagara Falls, N.Y.
Cox & Co., Inc., New York, N.Y... p 1968
General Elec. Co., Schenectady, N.Y.
Wall Mfg. Co., Kinston, N.C.
Ackerman Gould Co., Inc., Oceanside, N.Y.
American Standard, Franklin Pk., Ill.
Caig Labs., Inc., Westbury, N.Y.
Driver, Wilbur B. Co., Newark, N.J.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Electro-Flex Heat, Inc., Bloomfield, Conn.
Electrofilm, Inc., N. Hollywood, Calif.
Flexible Circuits, Inc., Warrington, Pa.
Glo-Quartz Elec. Heater Co., Mentor, Ohio
GTE Sylvania Inc., Danvers, Mass.
Jersey Tech. Conslts., Morristown, N.J.
Lindberg Hevi-Duty, Chicago, Ill.
Master Appliance Corp., Racine, Wisc.
Merco Prods. Co., Inc., Eugene, Ore.
Miskella Infra-Red Co., Cleveland, Ohio
Norton Co., Worcester, Mass.
OAL Assocs., Inc., Westbury, N.Y.
Precision Inc., Minneapolis, Minn
Pyco, Inc., Penndel, Pa.
Quartz Radiation Corp., Fairfield, N.J.
Rama Corp., San Jacinto, Calif.
Research Instr. Co., Westbury, N.Y.
Rex Rheostat & Co., Roosevelt, N.Y.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Safeway Products Inc., Middletown, Conn.
Sunbeam Equip. Corp., Meadville, Pa.
Therm-O-Lab Corp., N. Hollywood, Calif.
Thermal Sys., Los Angeles, Cal.
Topper Mfg. Co., Inc., Great Neck, N.Y.
Trent, Inc., Philadelphia, Pa.
Vulcan Elec. ITT, Danvers, Mass.
Waage Elec., Inc., Kenilworth, N.J.
Watlow Elec. Mfg. Co., St. Louis, Mo.
Wiegand, Edwin L. Co., Pittsburgh, Pa.
Zephyr Mfg. Co., Inglewood, Calif.
Zeva Elec. Corp., Hanover, N.J.

Hermetic Sealing—See Machines; Seals; Services, Hermetic Sealing—Vol 1

High-Pressure Equipment—See Vol 1

Hinges—See Fasteners—Vol 3

Holders & Carriers, Chip (Capacitor, IC, LSI)

Amperex Elctrn., Slatersville, R.I.
Ark-Les Switch Corp., Watertown, Mass.
Engineering Conslts., Ltd., Carson, Cal.
K-Tech., Inc., Framingham, Mass.
Robinson-Nugent, New Albany, Ind.

Holders & Carriers, IC, LSI (Packaged)

Augat Inc., Attleboro, Mass......... p 1536
Barnes Corp., Lansdowne, Pa..... p 2591
Bivar, Inc., Santa Ana, Cal.
Jonard Inds. Corp., Bronx, N.Y.
Scanbe Mfg. Corp., El Monte, Cal. p 2324
Sealectro Corp., Mamaroneck, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal. p 2722
Accurate Elctrns. Corp., Elyria, Ohio
Acme Model Engrg. Co., Ridgefield, N.J.
Ark-Les Switch Corp., Watertown, Mass.
Clover Inds. Div., Tonawanda, N.Y.
Engineering Conslts., Ltd., Carson, Cal.
Gibson/Egan Co., Arcadia, Calif.
GTE Sylvania Inc., Warren, Pa.
Jettron Prods., Hanover, N.J.
K-Tech., Inc., Framingham, Mass.
Matrix Engineering Corp., Gardena, Calif.
Methode Elctrns., Inc., Chicago, Ill.
Metropolitan Wire Goods, Wilkes-Barre, Pa.
Robinson-Nugent, New Albany, Ind.
Spec Plastics, No. Hollywood, Cal.
Textool Prods., Inc., Irving, Tex.
Veritron West, Inc., Chatsworth, Calif.
Whitaker Cable Corp., N. Kansas City, Mo.

Holders, Battery—See Retainers, Battery-Also See Connectors, Battery—Vol 3

Holders, Brush—See Brushes & Brush Assemblies

Holders, Chassis (Production Type)—See Vol 3

Holders, Circuit Board (Production Type)—See Vol 3

Holders, Crystal—See Vol 1

Holders, Fuse—See Clips & Holders, Fuse; Panels, Fuse

Holders, Lamp—See Sockets, Lamp & Lamp Assemblies

Holders, Tube—See Retainers, Tube

Hole Cutters—See Cutters, Hole—Vol 3

Honeycomb Sheets, Panels, etc.—See Vol 3

Hoods, CRT Viewing—See Viewing Hoods, Cathode-Ray Tube—Vol 3

Horns, Microwave-Also See Antennas, Microwave

American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol RF Div., Danburry, Conn.
Arra Inc., Bayshore, N.Y.
E & M Labs., Westlake Village, Cal.
Frequency Engrg. Labs., Farmingdale, N.J.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Ainslie Corp., S. Braintree, Mass.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Andrew Corp., Orland Pk., Ill.
Cardwell Condenser, Lindenhurst, N.Y.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dorne & Margolin, Inc., Bohemia, N.Y.
Elctrn. Resources Div., Los Angeles, Cal.
Gabriel Elctrns. Corp., Saco, Me.
General Microwave Corp., Farmingdale, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.

Hughes Aircraft Co, Fullerton, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Laminair, Inc., Los Angeles, Calif.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Nurad, Inc., Baltimore, Md.
Omega Labs., Inc., Rowley, Mass.
Philco-Ford Corp., Washington, D.C.
Premier Microwave, Port Chester, N.Y.
Prodelin, Inc., Hightstown, N.J.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
South Shore Metal Prods., Inc., Farmingdale, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TACO Div., Sherburne, N.Y.
Teledyne Micronetics, San Diego, Calif.
Thomson-CSF Electron Tubes, N.Y., N.Y.
TRG Prods., E. Boston, Mass.
Victor Microwave, Inc., Wakefield, Mass.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.

Horns, Speaker—See Vol 1

Housings, Circuit Module—See Plug-In Module Enclosures—Vol 3

Housings, Instrument & Meter—See Cabinets; Cases—Vol 3

Housings, Metal—See Cabinets; Cases—Vol 3

Housings, Metal, Small—See Cans—Vol 3

Housings, Photomultiplier Tube—See Photomultiplier Tube Housings

Housings, Speaker—See Enclosures, Speaker—Vol 1

Humidity Indicators—See Indicators, Humidity (Electronic)—Vol 1

Hybrid Junctions, Microwave

Alford Mfg. Co., Winchester, Mass. p 598
Arra Inc., Bayshore, N.Y.
E & M Labs., Westlake Village, Cal.
Frequency Engrg. Labs., Farmingdale, N.J.
Greenray Inds., Inc., Mechanicsburg, Pa.
Lorch Elctrns. Corp., Englewood, N.J. p 609
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Transco Prods., Inc., Venice, Cal. p 613
Vari-L Co., Inc., Denver, Colo. .... p 1568
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Americon Corp., Waltham, Mass.
Anaren Microwave, Inc., Syracuse, N.Y.
Anzac Elctrns., Waltham, Mass.
Astrolab Inc., Linden, N J
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Elctrn. Resources Div., Los Angeles, Cal.
Elctrn. Specialty, Thomaston, Conn.
Engelmann Microwave, Montville, N.J.
GAF Corp., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Olektron Corp., Dudley, Mass.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
Reeve Elctrns., Inc., Chicago, Ill.
Relcom, Mt. View, Calif.
Sanders Assocs., Nashua, N.H.
Scientific-Atlanta, Inc., Atlanta, Ga.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TACO Div., Sherburne, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Vectronics Microwave Corp., Middlesex, N.J.
Victor Microwave, Inc., Wakefield, Mass.
Wavecom, Inc., Northridge, Cal.
Western Microwave Labs., Los Gatos, Cal.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Hydrophones & Accessories—See Vol 1

Hysteresisgraphs—See Vol 1

Igniters, Arc Lamp—See Power Supplies, Arc Lamp—Vol 1

Illumination Indicators—See Meters, Light—Vol 1

Image Expanders, Oscilloscope—See Oscilloscope Image Expanders

Impedance Comparators—See Bridges, Impedance—Vol 1

Impedance Converters, Microwave—See Vol 1

Impregnating Insulating Compounds—See Insulating Compounds—Vol 3

Incremental Magnetic Recorders—See Data Recorders, Computer

Index Assemblies, Switch

Dialight Corp., Brooklyn, N.Y.
Ledex, Inc., Dayton, Ohio
Sealectro Corp., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Cole Instr., Costa Mesa, Cal.
Lear Siegler, Grand Rapids, Mich.
Micro Switch, Freeport, Ill.
Stacoswitch, Inc., Costa Mesa, Cal.
Superior Elec., Bristol, Conn.

Indicator Lights—See Lights, Dial, Panel, etc.

Indicators, Angle Also See Encoders, Shaft Position—See Vol 1

Indicators, Angle-Of-Attack—See Vol 1

Indicators, Annunciator—See Annunciators

Indicators, Antenna Position—See Vol 1

Indicators, Attitude—See Vol 1

Indicators, Azimuth—See Vol 1

Indicators, Capacitor Leakage—See Testers, Capacitor—Vol 1

Indicators, Circuit Condition, On(Off, etc. (Electromechanical)

Allard Instr. Corp., Westbury, NY p 1435
Bussmann Mfg., St. Louis, Mo.
Computer Devices of Calif., Santa Fe Springs, Cal.
Coto-Coil Co., Inc., Providence, R.I.
Daco Instr. Co., Inc., Trumbull, Conn. p 1444
Dialight Corp., Brooklyn, N.Y....... p 1447
Drake Mfg., Harwood Hgts., Ill. .. p 1449
Electro-Mechanical Instr. Div., Perkasie, Pa. .... p 451
General Illumination, Inc., St. Paul, Minn
Haydon, A. W. Co., Waterbury, Conn. p 1597
Hickok Elect. Instr., Cleveland, Ohio
HICO (Horizons Int'l.), Redwood City, Cal
Leecraft Mfg. Co., Inc., Long Island City, N.Y. .... p 1482
LVC Ind's., Inc., Corona, N.Y. ...... p 1441
Signalite, Neptune, N.J.
Simpson Elec. Co., Chicago, Ill.
Unimax Switch Corp., Wallingford, Conn.
Wagner Elec. Corp., Livingston, N.J.
Applied Control Co., Fairfield, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Bendix, S. Montrose, Pa.
Clare-Pendar Co., Post Falls, Idaho
Controls Co. of America, Folcroft, Pa.
Dataprobe, Inc., So. Hackensack, N.J.
Device Seals, Inc., Sun Valley, Calif.
Honeywell, Residential Div., Mpls., Minn.
Hughes Aircraft Co, Culver City, Cal.
IMC Magnetics Corp., Maywood, Cal.
Industrial Inventions, Inc., Monmouth Jct., N.J.
Jay-El Prods., Gardena, Calif.
Jewell Electrical Instrs., Manchester, N.H.
Magnetec Corp., Van Nuys, Calif.
Micro Switch, Freeport, Ill.
Miniature Elctrn. Comps. Corp., Holbrook, Mass.
Molex Prods. Co., Downers Grove, Ill.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
Penn Keystone Corp., Ansonia, Conn.
Singer - Tele-Signal, Woodbury, N.Y.
SSCO Standards Lab., Inc., Detroit, Mich.
Texas Instruments, Dallas, Tex.
Winterburn Mfg. Co., Putnam, Conn.

Indicators, Computer Type—See Lights; Dials

Indicators, Data Display—See Lights; Dials-Also See Readouts & Displays

Indicators, Density—See Vol 1

Indicators, Dielectric Constant—See Vol 1

Indicators, Distance, Line-Of-Sight—See Vol 1

Indicators, Distortion—See Analyzers, A-F—Vol 1

Indicators, Elapsed-Time—See Vol 1

Indicators, Electromechanical—See Indicators, Circuit Condition, On / Off

Indicators, Film Thickness—See Vol 1

Indicators, Fire—See Fire Detection & Fighting Equipment

Indicators, Fluid Conductivity—See Vol 1

Indicators, Fluid Flow—See Meters, Fluid Flow—Vol 1

Indicators, Frequency—See Meters, Frequency—Vol 1

Indicators, Ground Detector—See Vol 1

Indicators, Hardness—See Vol 1

Indicators, Humidity (Electronic)—See Vol 1

Indicators, Illumination—See Meters, Light—Vol 1

Indicators, Instrument, Flag, Pointer, Etc.—See Vol 1

Indicators, Level Position—See Vol 1

Indicators, Linear Displacement—See Vol 1

Indicators, Liquid Level

Fenwal Elctrns., Inc., Framingham, Mass.
General Elec. Co., Schenectady, N.Y.
Keystone Carbon Co., St. Marys, Pa.
Kratos Instrument Div., Pasadena, Cal p 511
Penn Airborne Prods., Southampton, Pa.
Advanced Kinetics, Costa Mesa, Calif.
Aladdin Controls, Nashville, Tenn.
Ametek/Instrs. & Controls, Feasterville, Pa.
Andonian Assocs., Inc., Waltham, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Products, Inc., Houston, Tex.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bendix Corp., Davenport, Iowa
Bristol Div, Waterbury, Conn
Chemalloy Elctrns., Santee, Cal.
Coil Co. of Amer., Northvale, N.J.
Conrac Corp., New York, N.Y.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Continental Data Sys., Dayton, Ohio
Controlotron Corp., Farmingdale, N.Y.
Decker Corp., Bala-Cynwyd, Pa.
Device Seals, Inc., Sun Valley, Calif.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Ellison Draft Gage Co., Inc., New Buffalo, Mich.
Fastex Div., Des Plaines, Ill.
Fischer & Porter Co., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
FRL, Inc., Belmont, Cal.
Gems Div., Farmington, Conn.
General Elec. Co., W. Lynn, Mass.
Haledy Elctrns. Co., New York, N.Y.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Industrial Nucleonics, Columbus, Ohio
InterOcean Systems, San Diego, Cal.
Jodee Plastics, Inc., Brooklyn, N.Y.
Joliet Control Corp., Joliet, Ill.
Kavlico Elctrns., Chatsworth, Cal.
Kay-Ray, Inc., Palatine, Ill.
Kingmann-White, Inc., Placentia, Calif.
Leupold & Stevens, Inc., Beaverton, Ore.
Mechanical Technology, Inc., Latham, N.Y.
Mueller Brass Co., Port Huron, Mich.
National Sonics, Farmingdale, N.Y.
Neill Engrg. Co., Akron, Ohio

Indicators, Liquid Level (cont'd)

Nuclear-Chicago, Des Plaines, Ill.
Nuclear Resch. Corp., Southampton, Pa.
Oxford Instr. Corp., Annapolis, Md.
Pennsylvania Elctrns. Technology, Pittsburgh, Pa.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Robertshaw Controls Co., Anaheim, Cal.
Robertson Instr., Azusa, Cal.
Robinson-Halpern Co., W. Conshohocken, Pa.
Roylyn, Glendale, Cal.
Sensor Corp., Greenwich, Conn.
Simmonds Precision Prods., Inc., Bellows Falls, Vt.
Statham Instrs., Inc., Oxnard, Cal.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Texas Instruments, Dallas, Tex.
Theta Instr. Corp., Fairfield, N.J.
Topper Mfg. Co., Inc., Great Neck, N.Y.
Trans-Sonics, Inc., Lexington, Mass.
Transducer Controls Corp., Covina, Calif.
Transducer Systems, Inc., Willow Grove, Pa.
U.O.P. Instrs. Div., Greenwich, Conn.
Vytell Corp., Arlington Hgts., Ill.
Waters Equipment Div., Framingham, Mass.
Weston Instruments, Inc., Newark, N.J.
Westronics, Inc., Ft. Worth, Tex.
Zeigler Controls, Inc., Gardena, Cal.

Indicators, Magnetic Field—See Vol 1

Indicators, Material Thickness—See Vol 1

Indicators, Modulation—See Vol 1

Indicators, Moisture (Electronic)—See Vol 1

Indicators, Motor Load—See Vol 1

Indicators, Noise-Figure—See Meters, Noise-Figure—Vol 1

Indicators, Null—See Vol 1

Indicators, Numeric Readout—See Readouts

Indicators, Oxygen(Ozone—See Vol 1

Indicators, Phase—See Vol 1

Indicators, Positioning

Astrosystems, Lake Success, N.Y.p 409
Computer Instrs., Hempstead, N.Y.
Control Technology Co., L.I.C., N.Y. p 1869
General Elec. Co., Schenectady, N.Y.
Geo Space Sys., Tampa, Fla. ..p 350,608
Icon Corp., Cambridge, Mass. .... p 1333
Ind'l. Control Co., Farmingdale, N.Y. p 1873
Ledex, Inc., Dayton, Ohio
Norden Div., Norwalk, Conn.
Remex Elctrns., Santa Ana, Cal.
Schaevitz Engrg., Pennsauken, N.J. p 1346,1991
Servo-Tek Prods. Co., Hawthorne, N.J. p 1632
United Detector Tech., Santa Monica, Cal.
Veeder-Root, Hartford, Conn.
Vernitron, Torrance, Cal.
Ade Corp., Watertown, Mass.
Allis, Louis Co., Milwaukee, Wisc.
Ametek/Instrs. & Controls, Feasterville, Pa.
Anocut Engrg. Co., Elk Grove Village, Ill.
A.R.P. Inds., Inc., Huntington, N.Y.
Astronautics Corp. of Amer., Milwaukee, Wisc.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avtron Mfg., Inc., Cleveland, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barnes Engrg. Co., Stamford, Conn.
Bendix, S. Montrose, Pa.
Bionic Instrs., Inc., Bala Cynwyd, Pa.
Boston Digital Corp., Ashland, Mass.
Carbonara, Victor E. Inc., Port Washington, N.Y.
Climatronics Corp., Hauppauge, N.Y.
Collins, G.L. Corp., Long Beach, Calif.
Computer Conversions Corp., East Northport, N.Y.
Data Technology Inc., Watertown, Mass.
De-Tec-Tronic Corp., Chicago, Ill.
Decker Corp., Bala-Cynwyd, Pa.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dynamic Data Corp., Columbus, Ohio
Dynapar Corp., Gurnee, Ill.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Edo Western Corp., Salt Lake City, Utah
Electric Tachometer Corp., Philadelphia, Pa.
Electro-Pacific, Inc., Goleta, Calif.
Farrand Controls, Inc., Valhalla, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Gap Instr. Corp., Hauppauge, N.Y.
Gems Div., Farmington, Conn.
General Sci. Equip., Phila., Pa.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co., Ind'l. Prods. Div., Oceanside, Cal.
Hughes Aircraft Co., Ind'l. Prods. Div./Ind'l. Auto, Oceanside, Cal.
Humphrey, Inc., San Diego, Calif.
IKL, Inc., Newport Beach, Calif.
Kavlico Elctrns., Chatsworth, Cal.
Kelk, George Ltd., Don Mills, Ont., Canada
Lear Siegler, Inc., Santa Monica, Calif.
Lem Instrument Corp., Farmingdale, N.Y.
McClintock Matrixes, Inc., Woodbury, Conn.
Mechanical Technology, Inc., Latham, N.Y.
Micro Switch, Freeport, Ill.
Midland Standard Inc., Elgin, Ill.
Minnetech Labs., Inc., Minneapolis, Minn.
National Sonics, Farmingdale, N.Y.
Orbit Instr. Corp., Syosset, N.Y.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Scientific-Atlanta, Inc., Atlanta, Ga.
Sensor Corp., Greenwich, Conn.
Servo Dev. Corp., Hicksville, N.Y.
Simmonds Precision Prods., Inc., Bellows Falls, Vt.
Singer-General Precision, Inc., Little Falls, N.J.
Teledyne Gurley, Troy, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
Transducer Systems, Inc., Willow Grove, Pa.
Tyco Instr. Div., Waltham, Mass.
United Aircraft Corp., Norwalk, Conn.
West Coast Resch. Corp., Los Angeles, Calif.
Western Indicator Co., So. El Monte, Cal.
Weston-Transicoil, Worcester, Pa.
Westronics, Inc., Ft. Worth, Tex.
Zehntel, Inc., Berkeley, Calif.

Indicators, Power Level—See Vol 1

Indicators, Pressure—See Gauges, Pressure—Vol 1

Indicators, Proximity

Schaevitz Engrg., Pennsauken, N.J. p 1346,1991
Solid State Elctrns., Sepulveda, Cal.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Ade Corp., Watertown, Mass.
Ametek/Instrs. & Controls, Feasterville, Pa.
A.R.P. Inds., Inc., Huntington, N.Y.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avionics, Inc., South Bend, Ind.
Bionic Instrs., Inc., Bala Cynwyd, Pa.
Collins Radio Co., Dallas, Tex.
Controlcraft Corp., West Chicago, Ill.
Cutler-Hammer, Milwaukee, Wisc.
De-Tec-Tronic Corp., Chicago, Ill.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dynamic Data Corp., Columbus, Ohio
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electro Prods. Labs., Power Supply, Chicago, Ill.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Fiber Photics, Inc., Santa Cruz, Cal.
General Dynamics, San Diego, Cal.
Hughes Aircraft Co, Culver City, Cal.
Hyde Park Elctrns., Inc., Dayton, Ohio
Kavlico Elctrns., Chatsworth, Cal.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Lion Precision Div., Newton, Mass.
McClintock Matrixes, Inc., Woodbury, Conn.
Mechanical Technology, Inc., Latham, N.Y.
Micro Switch, Freeport, Ill.
Microwave Instrs. Co., Corona del Mar, Calif.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Sensor Corp., Greenwich, Conn.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Transducer Systems, Inc., Willow Grove, Pa.
Zehntel, Inc., Berkeley, Calif.

Indicators, Pulse Rise Time—See Vol 1

Indicators, Radiation-Also See Counters, Geiger; Counters, Scintillation—See Vol 1

Indicators, R-F—See Meters, Frequency—Vol 1

Indicators, Rotary Shaft Position—See Encoders, Shaft Position—Vol 1

Indicators, Servo

Astrosystems, Lake Success, N.Y.p 409
Automation Dev., Culver City, Cal. p 1310
Bowmar Instr. Corp., Ft. Wayne, Ind.
Control Technology Co., L.I.C., N.Y. p 1869
Dynamic Instr. Corp., Plainview, N.Y.
Geo Space Sys., Tampa, Fla. .... p 608
HICO (Horizons Int'l.), Redwood City, Cal
Ind'l. Control Co., Farmingdale, N.Y. p 1873
Kratos Instrument Div., Pasadena, Cal
Norden Div., Norwalk, Conn.
North Atlantic Inds., Plainview, N.Y. p 531
Penn Airborne Prods., Southampton, Pa.
Precision Mechanisms, Westbury, N.Y.
Servo-Tek Prods. Co., Hawthorne, N.J. p 1632
Analog General Corp., Oceanside, N.Y.
Anocut Engrg. Co., Elk Grove Village, Ill.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barger Corp., Sunnyvale, Cal.
Bendix, S. Montrose, Pa.
Bendix Corp., Davenport, Iowa
Betzelt GMBH, Trogerstr. 32, W. Germany
Bristol Div, Waterbury, Conn
Carbonara, Victor E. Inc., Port Washington, N.Y.
Clifton Div., Clifton Hgts., Pa.
Collins Radio Co., Dallas, Tex.
Computer Conversions Corp., East Northport, N.Y.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Controlotron Corp., Farmingdale, N.Y.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electro-Devices, Inc., Paterson, N.J.
Gap Instr. Corp., Hauppauge, N.Y.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Henschel Corp., Amesbury, Mass.
Hickok Indicating Sys. Inc., Gardena, Cal.
Innovatek Enterprise, Millerton, N.Y.
Instru-Lec Corp., Mt. Vernon, N.Y.
Kollsman Instr. Corp., Syosset, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lewis Engrg. Co., Naugatuck, Conn.
Mast Dev. Co., Davenport, Iowa
MPC Prods. Corp., Chicago, Ill.
Northern Precision Labs., Inc., Fairfield, N.J.
Novatronics, Inc., Pompano Beach, Fla.
Orbit Instr. Corp., Syosset, N.Y.
Robertson Instr., Azusa, Cal.
Servo Dev. Corp., Hicksville, N.Y.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Sperry Marine Sys., Charlottesville, Va.
Sterling Instr., New Hyde Pk., NY
Teledyne Gurley, Troy, N.Y.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transducer Systems, Inc., Willow Grove, Pa.
United Aircraft Corp., Norwalk, Conn.
USM Corp., Wakefield, Mass.
Weston-Transicoil, Worcester, Pa.
Westronics, Inc., Ft. Worth, Tex.

Indicators, Shaft Speed—See Tachometers, Electronic

Indicators, Shorted Turn—See Testers, Coil—Vol 1

Indicators, Smoke & Combustion (Electronic)-Also See Fire Detection & Fighting Equipment—See Vol 1

Indicators, Sound Level—See Meters, Audio Level—Vol 1

Indicators, Specific Gravity

Automation Products, Inc., Houston, Tex.
Brooks Instr. Div., Hatfield, Pa.
Central Scientific Co., Chicago, Ill.
Fischer & Porter Co., Warminster, Pa.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kay-Ray, Inc., Palatine, Ill.
Mackay, A.D., Inc., New York, N.Y.
N.Y. Testing Labs., Inc., Westbury, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
NUS Corp., Paramus, N.J.
Statham Instrs., Inc., Oxnard, Cal.
Taylor Instr. Process Control Div., Rochester, N.Y.
Westronics, Inc., Ft. Worth, Tex.

Indicators, Strain (For Use With Strain Gauges)—See Vol 1

Indicators, Surface Roughness—See Vol 1

Indicators, Telemetering—See Analyzers, Telemetric Data—Vol 1

Indicators, Temperature—See Meters, Temperature—Vol 1

Indicators, Time Delay Measurement—See Vol 1

Indicators, Torque—See Vol 1

Indicators, Transient Voltage—See Vol 1

Indicators, Vacuum-Also See Gauges, Vacuum—See Vol 1

Indicators, Viscosity

Hewlett-Packard, Palo Alto, Cal.
Automation Products, Inc., Houston, Tex.
Beckman Instrs., (AISSD), Fullerton, Cal.
Brookfield Engrg. Labs., Inc., Stoughton, Mass.
Davidson Elctrn. Dev. Co., Erie, Pa.
Ferranti Elec., Inc., Plainview, N.Y.
Fischer & Porter Co., Warminster, Pa.
Instron Corp., Canton, Mass.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Norcross Corp., Newton, Mass.
Precision Sci. Co., Chicago, Ill.
Rank Precision Inds., W. Nyack, N.Y.
Taylor Instr. Process Control Div., Rochester, N.Y.

Indicators, VSWR—See Meters, Standing Wave Ratio—Vol 1

Indicators, Weight—See Scales, Production Weight—Vol 1

Indicators, Wind Direction (Electronic)—See Vol 1

Indicators, Wind Speed (Electronic)—See Vol 1

Inductance Comparators—See Bridges, Inductance—Vol 1

Inductance Standards—See Standards, Inductance—Vol 1

Induction Heating Equipment—See Heaters & Accessories, Induction—Vol 1

Induction Potentiometers—See Resolvers, Synchro

Inductors—See Coils—Vol 3

Infrared Equipment—See Comn. Systems; Detectors; Lamps; Spectrometers; etc. (As Modified By Infrared)—Vol 1

Inks For Thick Film Microcircuits

Engelhard Minerals & Chem., Murray Hill, N.J.
Acheson Colloids Co., Port Huron, Mich.
Alloys Unlimited, Inc., Encino, Calif.
Alpha Metals, Inc., Jersey City, N.J.
Etchomatic, Inc., Waltham, Mass.
Fansteel Inc., N Chicago, Ill.
Matthey Bishop Inc., Malvern, Pa.
Naz-Dar Int'l., Chicago, Ill.
Sel-Rex Corp., Nutley, N.J.
Varadyne Packaging & Mat'ls., Santa Monica, Cal.

Inks, Marking—See Vol 3

Insertion Loss Measurement Systems—See Vol 1

Inserts—See Bushings—Vol 3

Inspection Lighting & Equipment—See Fiber Optic Inspection Equipment; Lamps, Magnifying; Comparators, Optical; Ultraviolet Lighting Equipment—Vol 1

Instrument Cases—See Cabinets; Cases, Instrument—Vol 3

Instrument Parts, Precision—See Bearings; Gears; Springs; etc.

Instruments, Elect. Measuring—See Analyzers; Bridges; Comparators; Meters; etc.—Vol 1

Instruments, Graphic Recording—See Recorders, Graphic—Vol 1

Insulating Compounds, Acrylic—See Vol 3

Insulating Compounds, Asphalt & Pitch—See Vol 3

Insulating Compounds, Coil Dope—See Vol 3

Insulating Compounds, Enamel—See Vol 3

Insulating Compounds, Epoxy—See Vol 3

Insulating Coumpounds, Lacquer—See Vol 3

Insulating Compounds, Silicone—See Vol 3

Insulating Compounds, Varnish—See Vol 3

Insulating Compounds, Wax—See Vol 3

Insulation Materials, Adhesive—See Vol 3

Insulation Materials, Asbestos—See Vol 3

Insulation Materials, Ceramic—See Vol 3

Insulation Materials, Fabric—See Vol 3

Insulation Materials, Felt—See Felt—Vol 3

Insulation Materials, Fiber—See Vol 3

Insulation Materials, Film—See Vol 3

Insulation Materials, Foam—See Vol 3

Insulation Materials, Glass Bonded Mica—See Vol 3

Insulation Materials, Glass-Fiber Impregnated—See Vol 3

Insulation Materials, Mica (Natural & Synthetic)—See Vol 3

Insulation Materials, Mylar—See Vol 3

Insulation Materials, Nylon—See Vol 3

Insulation Materials, Paper—See Vol 3

Insulation Materials, Phenolic—See Vol 3

Insulation Materials, Plastic (Misc.)—See Vol 3

Insulation Materials, Polyethylene—See Vol 3

Insulation Materials , Polystyrene—See Vol 3

Insulation Materials, Powdered Metal Oxide—See Vol 3

Insulation Materials, Rubber (All Types)—See Vol 3

Insulation Materials, Steatite—See Insulation Parts, Ceramic—Vol 3

Insulation Materials, TFE—See Vol 3

Insulation Materials, Vinyl—See Vol 3

Insulation Parts, Ceramic—See Vol 3

Insulation Parts, Glass—See Vol 3

Insulation Parts, Glass Bonded Mica—See Vol 3

Insulation Parts, Glass Fiber—See Vol 3

Insulation Parts, Insulating Sleeves—See Tubing—Vol 3

Insulation Parts, Mica (Natural & Synthetic)—See Vol 3

Insulation Parts, Paper—See Vol 3

Insulation Parts, Plastic—See Vol 3

Insulation Parts, Quartz—See Vol 3

Insulation Parts, Sapphire—See Vol 3

Insulation Parts, Silicone Rubber—See Vol 3

Insulation Parts, Steatite—See Insulation Parts, Ceramic—Vol 3

Insulators—See Insulation Parts; Insulators—Vol 3

Insulators, Antenna & Spring Assemblies—See Vol 3

Insulators, Antenna Tower—See Insulators, Antenna—Vol 3

Insulators, Bushing (Metallized)—See Bushings

Insulators, Test & Battery Clip—See Vol 3

Integrated Circuit Packaging Systems

Augat Inc., Attleboro, Mass. .... p 1536
Berg Elctrns., Inc., New Cumberland, Pa.
Bivar, Inc., Santa Ana, Cal.
Datacom, Inc., Ft. Walton Bch., Fla.
Douglas Electronics, Inc., San Leandro, Cal.
Elco, Willow Grove, Pa.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
Elctrn. Molding Corp., Woonsocket, R.I.
ELFAB Crop., Dallas, Tex. .... p 2627
Ind'l. Control Co., Farmingdale, N.Y.
Multitech Microelctrns., Monterey Pk., Cal.
Scanbe Mfg. Corp., El Monte, Cal. p 2324
Tempo/UTI Div., Chatsworth, Cal. p 384
Vero Electronics, Inc., Hauppauge, N.Y. p 2329
Alloys Unlimited, Inc., Encino, Calif.
AMBAC Inds., Garden City, N.Y.
Ark-Les Switch Corp., Watertown, Mass.
Burndy Corp., Norwalk, Conn.
Coors Porcelain Co., Golden, Colo.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Data Technology Corp., Palo Alto, Cal.
Device Seals, Inc., Sun Valley, Calif.
Digitronics Corp., Albertson, N.Y.
Elctrn. Modules Corp., Timonium, Md.
Film Microelectronics, Inc., Burlington, Mass
Gridcraft, Ft. Wayne, Ind.
GTE Sylvania Inc., Warren, Pa.
Holmberg, Inc., Melville, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
IFE Div, E Providence, R.I.
Interdyne Co., Los Angeles, Cal.
Kidco, Inc., Medford, N.J.
Lockheed Elctrns. Co., Watchung, N.J.
Malco Mfg. Co., Chicago, Ill.
Megadyne Inds., Inc., Rochester, N.Y.
National Beryllia Corp., Haskell, N.J.
Radiation Sys., Inc., McLean, Va.
Robinson-Nugent, New Albany, Ind.
Schjeldahl, G.T. Co., Northfield, Minn.
Spec Plastics, No. Hollywood, Cal.
Stevens Prods., Inc., E. Orange, N.J.
Tekform Prods. Co., Anaheim, Cal.
Texas Instruments, Dallas, Tex.
Unitek Corp., Monrovia, Calif.
Veritron West, Inc., Chatsworth, Calif.

Integrated Circuits—See Circuits, Integrated

Integrators, Electro-Mechanical—See Vol 1

Integrators, Electronic—See Vol 1

Integrators, Mechanical—See Vol 1

Integrators, Optical—See Vol 1

Intensifiers, Image

Interelectronics Corp., Congers, N.Y.
Abtronics, Inc., Livermore, Calif.
Amperex Elctrn., Slatersville, R.I.
Bendix, Ann Arbor, Mich.
Calvert Elctrns., Inc., New York, N.Y.
Electro-Optical Systems, Pasadena, Cal.
EMR Div., Princeton, N.J.
Goodyear Aerospace Corp., Akron, Ohio
Heitz, Karl, Inc., New York, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co., Storage Tubes Ind'l. Prods. Div., Oceanside, Calif.
ITT Electron Tube, Easton, Pa.
Lenox Instr. Co., Philadelphia, Pa.
Nuclear-Chicago, Des Plaines, Ill.
Optics Technology, Palo Alto, Calif.
Rank Precision Inds., W. Nyack, N.Y.
TRW Instrs., El Segundo, Cal.
Varian Assocs., Palo Alto, Cal.
Varo, Inc., Electron Devices Div., Garland, Tex.
Westinghouse Elec., Elmira, N.Y.

Intercommunication Systems (Industrial)—See Vol 1

Interferometer Systems—See Vol 1

Interlocks—See Connectors, Interlock—Vol 3

Intermodulation Analyzers—See Analyzers, Intermodulation—Vol 1

Interrogator Equipment—See Receivers; Transmitters; etc.—Vol 1

Intervalometers—See Timers

Inverters, D-C To A-C, D-C To D-C—See Vol 1

Ion Traps—See Vol 1

Ionization Chambers—See Chambers, Ionization—Vol 1

Irons, Soldering—See Soldering Irons—Vol 3

Isolators, D-C Signal—See Vol 1

Isolators, Line—See Vol 1

Isolators, Microwave (All Types)

Amphenol RF Div., Danburry, Conn.
Bendix, Franklin, Ind. .... p 1555
E & M Labs., Westlake Village, Cal. p 1557
General Elec. Co., Schenectady, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Addington Labs., Inc., Santa Clara, Calif.
Electromagnetic Sci., Inc., Atlanta, Ga.
Ferranti Ltd., Hollinwood, Lancs., England
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Lieco, Inc., Lindenhurst, N.Y.
Microlab/FXR, Livingston, N.J.
Micromega, Los Angeles, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Magnetics Inc., Danvers, Mass.
Microwave Prods., Inc., Chatsworth, Cal.
N-H Microwave, Inc., Red Bank, N.J.
Pabst Engineering Equipment Co., Inc., Elizabeth, N.J.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
Raytheon Co., Waltham, Mass.

Sedco Sys., Inc., Farmingdale, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Teledyne Microwave, Sunnyvale, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Trak Microwave, Tampa, Fla.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Victor Microwave, Inc., Wakefield, Mass.
Wavecom, Inc., Northridge, Cal.
Western Microwave Labs., Los Gatos, Cal.

Isotopes, Radioactive—See Sources, Radioactive—Vol 1

Jack Adapters (All Types)—See Vol 3

Jack Covers—See Vol 3

Jack Panel Assemblies & Accessories—See Panels, Jack—Vol 3

Jack (All Types)-Also See Connectors—See Vol 3

Jewels, Instrument Bearing—See Bearings & Assemblies, Jewel—Vol 3

Jigs And Fixtures, Chassis & Circuit Board—See Vol 1

Joint Compounds, Semiconductor—See Coatings, Heat Conductive—Vol 3

Joints, Ball & Socket—See Vol 3

Joints, Rotary, Microwave

E & M Labs., Westlake Village, Cal.
Graphite Metallizing Corp., Yonkers, N.Y.
Waveline, Inc., W. Caldwell, N.J. p 1567
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Ainslie Corp., S. Braintree, Mass.
Aircom, Inc., Union, N.H.
Astrolab Inc., Linden, N J
Cardwell Condenser, Lindenhurst, N.Y.
Coax Devices Inc., Chelsea, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
ITT Gremar, Inc., Woburn, Mass.
Johnson Corp., Three Rivers, Mich.
Kevlin Mfg. Co., Woburn, Mass.
Lieco, Inc., Lindenhurst, N.Y.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
Sage Labs. Inc., Natick, Mass.
Schutter Microwave, Lindenhurst, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TRG Prods., E. Boston, Mass.
Victor Microwave, Inc., Wakefield, Mass.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.

Jumpers, Bonding—See Vol 3

Jumpers, Circuit Board—See Vol 3

Jumpers, Wire, Terminated—See Cords, Patch—Vol 3

Junction Boxes—See Boxes, Junction & Wall Plate—Vol 3

Junctions, Hybrid, Microwave—See Hybrid Junctions, Microwave—Vol 1

Keyboards, Alpha-Numeric—See Vol 1

Keyboards, Decimal—See Vol 1

Keyers & Couplers—See Vol 1

Keys, Telegraph—See Vol 1

Kits, Antenna (For Engineers)—See Vol 1

Kits, Breadboarding (For Engineers)

Alco Elctrn. Prods., Lawrence, Mass. p 1646
American Tech. Ceramics, Huntington Sta., N.Y.
Augat Inc., Attleboro, Mass. .... p 1536
Barnes Corp., Lansdowne, Pa..... p 2591
Caddel-Burns Mfg. Co., Inc., Mineola, N. Y.
Centron Engrg., Gardena, Cal. .... p 1299
Circon Corp., Goleta, Cal.
Circuit-Stik, Inc., Gardena, Cal. p 1298,1299
Douglas Electronics, Inc., San Leandro, Cal. .... p 1301
Fenwal Elctrns., Inc., Framingham, Mass.
Haydon, A. W. Co., Waterbury, Conn.
Jonard Inds. Corp., Bronx, N.Y.
LVC Ind's., Inc., Corona, N.Y.
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Precision Mechanisms, Westbury, N.Y.
Scanbe Mfg. Corp., El Monte, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
Buck Engrg. Co., Farmingdale, N.J.
Buckeye Stamping Co., Columbus, Ohio
Cambridge Thermionic, Cambridge, Mass
Circuit Structures Lab., Burbank, Calif.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
D-Cemco, Inc., Burbank, Calif.
Di/An Controls, Inc., Boston, Mass.
Dionics, Inc., Westbury, N.Y.
Ealing Corp., Cambridge, Mass.
Electraid, Inc., Cambridge, Mass.
Elgin Elctrns., Waterford, Pa.
Fairchild Semiconductor, Mountain View, Calif.
General Elctrn. Labs., Boston, Mass.
Gridcraft, Ft. Wayne, Ind.
Heath Co., Benton Harbor, Mich.
HMW Enterprises, Inc., Steelton, Pa.
Interdyne Co., Los Angeles, Cal.
Keystone Elctrns. Corp., New York, N.Y.
PIC Design Corp., Ridgefield,, Conn.
Robinson-Nugent, New Albany, Ind.
Servo Corp. America, Hicksville, N.Y.
Soltec Corp., No. Hollywood, Cal.
Spectrum Dynamics, Inc., Ft. Lauderdale, Fla.
Stark Elctrn. Instrs., Ltd., Ajax, Ont., Canada
Sterling Instr., New Hyde Pk., NY
Stop Components, Inc., Freeport, N.Y.
Varadyne Packaging & Mat'ls., Santa Monica, Cal.
Victory Engrg. Corp., Springfield, N.J.
Waldom Elctrns., Inc., Chicago, Ill.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Kits, Cable-End Sealing—See Vol 3

Kits, Computer—See Vol 1

Kits, Marking (Dial, Instrument, Equipment, etc.)

Datak Corp., Passaic, N.J. .... p 1445
Ackerman Gould Co., Inc., Oceanside, N.Y.
Avery Prods. Graphics Div., Santa Ana, Calif
Brady, W.H. Co., Milwaukee, Wisc.
Eastern Marking Mach. Corp., Island Pk., N.Y.
Globe Plastics, Pomona, Cal.
Goldsman, Inc., Philadelphia, Pa.
Heath Co., Benton Harbor, Mich.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Lectroetch, E. Cleveland, Ohio
Metalphoto Corp., Cleveland, Ohio
Miller Dial, El Monte, Calif.
N/P Co., Temple City, Calif.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Russell Inds., Inc., Lynbrook, N.Y.
Seton Name Plate Corp., New Haven, Conn.
Star Enterprises-Div., Lowell, Mass.
Techni-Tool, Inc., Philadelphia, Pa.
Techinques, Inc., Englewood, N.J.
3M Co., St. Paul, Minn.

Kits, Potentiometer—See Vol 3

Kits, Power Supply—See Vol 1

Kits, Printed Circuit

Augat Inc., Attleboro, Mass. .... p 1536
Centron Engrg., Gardena, Cal. .... p 1299
Circuit-Stik, Inc., Gardena, Cal. p 1298,1299
Douglas Electronics, Inc., San Leandro, Cal. .... p 1301
Micro-Circuits Co., New Buffalo, Mich.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Vero Electronics, Inc., Hauppauge, N.Y.
BECO Solid State Systems, Salem, Va.
Cambridge Thermionic, Cambridge, Mass
Cordover, Carl & Co., Mineola, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Eico Electronic Instrument Co., Inc., Brooklyn, N.Y.
Electro-Science Labs., Philadelphia, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Keystone Elctrns. Corp., New York, N.Y.
Techinques, Inc., Englewood, N.J.
3M Co., St. Paul, Minn.

Kits, Programming Board—See Vol 3

Kits, Pump—See Vol 1

Kits, Receiver—See Vol 1

Kits, Shielding—See Vol 3

Kits, Switch Assembling

Chicago Switch, Chicago, Ill.
Grayhill, Inc., LaGrange, Ill.
International Electro Exchange Corp., Minneapolis, Minn. .... p 1922
Jonard Inds. Corp., Bronx, N.Y.
Seacor, Inc., Norwood, N.J.
Standard Grigsby Co., Aurora, Ill. p 1955
Cole Instr., Costa Mesa, Cal.
Hughes Aircraft Co., Culver City, Cal.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Micro Switch, Freeport, Ill.
States Co., Hartford, Conn.

Kits, Terminal—See Vol 3

Kits, Test Equipment—See Vol 1

Kits, Training Aid—See Vol 3

Kits, Transistor Mounting—See Pads, Transistor Mounting

Knives & Knife Sets—See Vol 3

Knobs

Alco Elctrn. Prods., Lawrence, Mass. p 1440
Electronic Hardware, Jamaica, N.Y. p 1456
GC Elctrns., Rockford, Ill.
Ind'l. Devices, Edgewater, N.J.
Millen, James Mfg., Malden, Mass. p 1488,1489
NOBEX Div., Burlingame, Cal. p 1468,1469
Raytheon Co., Quincy, Mass.
Rogan Bros., Skokie, Ill................. p 1491
Seacor, Inc., Norwood, N.J.
Smith, Herman H., Inc., Bklyn., N.Y.
Vemaline Prods. Co., Wyckoff, N.J. p 1504
Abadak Inds., Inc., Farmingdale, N.Y.
Ackerman Engravers, Inc., Long Island City, N.Y.
Aerospace Knob Co., So. El Monte, Calif.
Alloys Unlimited, Inc., Encino, Calif.
Amatom Elctrn. Hardware, New Rochelle, N.Y.
Anchor Alloys, Inc., Brooklyn, N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Bodnar Prods. Corp., New Rochelle, N.Y.
Boonton Molding Co., Inc., Boonton, N.J.
Buckeye Stamping Co., Columbus, Ohio
Cambridge Thermionic, Cambridge, Mass
Cole-Hersee Co., S. Boston, Mass.
Davies, Harry Molding Co., Chicago, Ill.
Delta Plastics Co., Bellmawr, N.J.
Electro Assemblies, Inc., Chicago, Ill.
Eljay Corp., Columbia, Md.
Federal Screw Prods., Inc., Chicago, Ill.
Franklin Fibre-Lamitex, Wilmington, Del.
Injection Plastic Corp., Skokie, Ill.
Insulating Shapes, Inc., Bronx, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Kurz-Kasch, Inc., Dayton, Ohio
Litton Inds., Van Nuys, Calif.
Norelcom Inds., Inc., Farmingdale, N.Y.
Nutmeg Screw Mach. Prods., Waterbury, Conn.
Pacific Transducer Corp., Los Angeles, Calif.
Paul, F.H. & Stein Bros., New York, N.Y.
Philmore Mfg. Co., Richmond Hill, N.Y.
PIC Design Corp., Ridgefield,, Conn.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Radial Controls Div. Nicely Corp., Indianapolis, Ind.
Romar Plastics, Inc., St. Charles, Ill.
Rostone Corp., Lafayette, Ind.
Russell Inds., Inc., Lynbrook, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Stop Components, Inc., Freeport, N.Y.
Tekna Prods. Co., Rochester, N.Y.
USM Corp., Wakefield, Mass.
Viz Mfg. Co., Philadelphia, Pa.
Waldom Elctrns., Inc., Chicago, Ill.
Westmoreland Plastics Co., Latrobe, Pa.
Wheelabrator Corp., Mishawaka, Ind.
Whitso, Inc, Schiller Park, Ill.

Klystrons, Solid State, Microwave

Polarad Elctrn. Instrs., Lake Success, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Ferranti Ltd., Hollinwood, Lancs., England
Varian Assocs., Palo Alto, Cal.

Klystrons, Tube—See Tubes, Klystron

Labels, Pressure-Sensitive—See Vol 3

Labels, Temperature Indicating

Avery Prods. Graphics Div., Santa Ana, Calif
Brady, W.H. Co., Milwaukee, Wisc.
Camwil, Inc., Honolulu, Haw.
Ever Ready Label Corp., Belleville, N.J.
Metalphoto Corp., Cleveland, Ohio
Omega Engrg., Inc., Stamford, Conn.
Sillcocks-Miller Co., Maplewood, N.J.
Star Enterprises-Div., Lowell, Mass.
Tempil Div., So. Plainfield, N.J.
VWR Scientific, San Francisco, Cal.

Laboratories, Mobile & Field—See Vol 1

Laboratories, Testing—See Services, Electrical Measurement; Services Environmental Testing—Vol 3

Laboratory Furniture—See Benches, Consoles, Stools, Tables (Lab and Shop)—Vol 3

Lacing, Cable—See Cords & Tapes, Lacing—Vol 3

Lacquer—See Insulating Compounds, Lacquer—Vol 3

Laminar Flow Work Stations—See Work Stations—Vol 1

Laminates, Metal Clad—See Vol 3

Laminates, Plastic Impregnated (Unclad)—See Vol 3

Laminations, Magnetic Recording Head—See Vol 3

Laminations, Transformer & Inductor—See Vol 3

Lamp Adapters

Dialight Corp., Brooklyn, N.Y.
Display Devices, Inc., Encinitas, Cal. p 1450
Elctrn. Molding Corp., Woonsocket, R.I.
LVC Ind's., Inc., Corona, N.Y. ...... p 1441
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Sloan Co., Sun Valley, Cal.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
GTE Sylvania Inc., Danvers, Mass.
Int'l. Prods., Atchison, Kans.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Lamp Holders—See Sockets, Lamp & Lamp Assemblies

Lamp Pullers—See Pullers, Lamp—Vol 3

Lamps, Dial & Pilot, Incandescent

Alco Elctrn. Prods., Lawrence, Mass. p 1439
Amp Inc., Harrisburg, Pa.
Chicago Miniature Lamp Works, Chicago, Ill. .... p 1443
Circon Corp., Goleta, Cal.
Dialight Corp., Brooklyn, N.Y.
Display Devices, Inc., Encinitas, Cal. p 1450
Drake Mfg., Harwood Hgts., Ill.
Electro-Mech. Comps., S. El Monte, Cal.
General Elec., Miniature Lamp Dept. MYI-I, Cleveland, Ohio .... p 1463
General Illumination, Inc., St. Paul, Minn p 1461
Genisco Technology Corp., Eldema Div., Compton, Cal. ....p 1454,1455
GTE Sylvania Inc., Hillsboro, N.H. p 1464
Hudson Lamp Co., Kearney, N.J. p 1472
Ind'l. Devices, Edgewater, N.J. .. p 1475
Ind'l Elctrn. Engrs., Van Nuys, Cal. p 1478
Inter-Market, Inc., Glenview, Ill. .. p 1473
International Electro Exchange Corp., Minneapolis, Minn. .... p 1925
Johnson E. F. Co., Waseca, Minn.
Lamps, Inc., Torrance, Cal. ..p 1480,1481
Leecraft Mfg. Co., Inc., Long Island City, N.Y.
LVC Ind's., Inc., Corona, N.Y.
Pinlites, Fairfield, N.J. .... p 1490
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Sloan Co., Sun Valley, Cal. .... p 1499
Sorenson Lighted Controls, W. Hartford, Conn. .... p 1493
Vemaline Prods. Co., Wyckoff, N.J.
Wagner Elec. Corp., Livingston, N.J. p 1500,1501
Aerolite Electronics Corp., Union City, N.J.
American Pamcor, Inc., Paoli, Pa
Aristo-Craft Distinctive Miniatures, New York, N.Y.
Circle "F" Industries, Trenton, N.J.
Clare-Pendar Co., Post Falls, Idaho
Cole-Hersee Co., S. Boston, Mass.
Conectrix, Inc., Wheaton, Ill.
Controls Co. of America, Folcroft, Pa.
Devco Engrg., W. Caldwell, N.J.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
GTE Sylvania Inc., Danvers, Mass.
Info-Lite Corp., Ft. Lee, N.J.
Int'l. Prods., Atchison, Kans.
Jay-El Prods., Gardena, Calif.
Kirkland H. R. Co., Morristown, N.J.
Lear Siegler, Grand Rapids, Mich.
Marco-Oak, Anaheim, Cal.
Mura Corp., Jericho, N.Y.
National Acme, Cleveland, Ohio
North American Elec. Lamp Co., St. Louis, Mo.
Nucleonic Prods., Canoga Pk, Cal.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Permonite Mfg. Co., Chicago, Ill.
Philmore Mfg. Co., Richmond Hill, N.Y.
Precision Lamp Engrs., Novato, Cal.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Shigoto Inds., Ltd., New York, N.Y.
TEC, Inc., Eden Prairie, Minn.
Truco, Inc., Simsbury, Conn.
Vitality Bulbs Ltd., Suffolk, England
Westinghouse Elec., Bloomfield, N. J.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Lamps, Electroluminescent—See Panels, Electroluminescent

Lamps, Exciter, Photographic

Christie Elec., Los Angeles, Cal.
Illumination Inds., Inc., Sunnyvale, Cal. p 1644
Lamps, Inc., Torrance, Cal.
EG & G, Inc., Salem, Mass.
Electro Powerpacs Corp., Cambridge, Mass.
General Elec., Photo Lamp, Cleveland, Ohio
Gordon Alan Entprs., N. Hollywood, Cal.
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Danvers, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Torr Labs., Los Angeles, Cal.
Westinghouse Elec., Bloomfield, N. J.
Xenon Corp., Medford, Mass.

Lamps, Flashtube

Illumination Inds., Inc., Sunnyvale, Cal. p 1644
Signalite, Neptune, N.J.
Abtronics, Inc., Livermore, Calif.
Aerolux Light Co. Inc., New York, N.Y.
American Ultraviolet Co., Chatham, N.J.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Edmund Scientific Co., Barrington, N.J.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Eimac, San Carlos, Calif.
Electro Powerpacs Corp., Cambridge, Mass.
Ferranti Elec., Inc., Plainview, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
General Elec., Photo Lamp, Cleveland, Ohio
Gordon Alan Entprs., N. Hollywood, Cal.
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Danvers, Mass.
ILC, Inc., Sunnyvale, Calif.
Kemlite Labs., Inc., Chicago, Ill.
Korad Mat'ls. Sys. Div., Santa Monica, Cal.
Mura Corp., Jericho, N.Y.
Pek, Inc., Sunnyvale, Calif.
Siemens Corp., Comps. Div., Iselin, N.J.
Torr Labs., Los Angeles, Cal.
U.S. Scientific Instrs., Watertown, Mass.
Voltarc Tubes, Fairfield, Conn.
West Coast Resch. Corp., Los Angeles, Calif.
Xenon Corp., Medford, Mass.

Lamps, Glow—See Lamps, Neon

Lamps, Infrared

Chicago Miniature Lamp Works, Chicago, Ill.
Christie Elec., Los Angeles, Cal.
Illumination Inds., Inc., Sunnyvale, Cal. p 1644
Advanced Kinetics, Costa Mesa, Calif.
Aerolux Light Co. Inc., New York, N.Y.
Caig Labs., Inc., Westbury, N.Y.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Eimac, San Carlos, Calif.
Electro Optics Assocs., Palo Alto, Calif.
Fostoria-Fannon, Inc., Fostoria, Ohio
GTE Sylvania Inc., Danvers, Mass.
ILC, Inc., Sunnyvale, Calif.
Merco Prods. Co., Inc., Eugene, Ore.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
North American Elec. Lamp Co., St. Louis, Mo.
Oriel Optics Corp., Stamford, Conn.
Pek, Inc., Sunnyvale, Calif.
Quartz Radiation Corp., Fairfield, N.J.
Syncor Prods. Co., Inc., Malden, Mass.
TRW Instrs., El Segundo, Cal.
Westinghouse Elec., Bloomfield, N. J.

Lamps, Luminescent

Dialight Corp., Brooklyn, N.Y.
Lamps, Inc., Torrance, Cal. ..p 1480,1481
Acme Lite Products Co., Congers, N.Y.
Atlantic Ultraviolet Corp., Long Island City, N.Y.
Black Light Eastern, Westbury, N.Y.
Canrad Precision Inds., Inc., Pelham, N.Y.
Dri-Clave Corp., Westbury, N.Y.
GTE Sylvania Inc., Danvers, Mass.
MacDonald & Co., Glendale, Calif.
Mura Corp., Jericho, N.Y.
Shannon Luminous Mat'ls., Hollywood, Cal.

Lamps, Magnifying—See Vol 1

Lamps, Mercury Vapor

Christie Elec., Los Angeles, Cal. .. p 675
Illumination Inds., Inc., Sunnyvale, Cal. p 1644
Advanced Kinetics, Costa Mesa, Calif.
Aerolux Light Co. Inc., New York, N.Y.
American Ultraviolet Co., Chatham, N.J.
Black Light Corp. Amer., San Gabriel, Cal.
Black Light Eastern, Westbury, N.Y.
Dixson, Inc., Grand Junction, Colo.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
Epic, Inc., New York, N.Y.
Gaertner Scientific Corp., Chicago, Ill.
Gates, Geo. W. & Co., Franklin Sq., N.Y.
GTE Sylvania Inc., Danvers, Mass.
Hanovia Lamp Div., Newark, N.J.
Kemlite Labs., Inc., Chicago, Ill.
Oriel Optics Corp., Stamford, Conn.
Pek, Inc., Sunnyvale, Calif.
Quartz Radiation Corp., Fairfield, N.J.
Schoeffel Instr. Corp., Westwood, N.J.
Shannon Luminous Mat'ls., Hollywood, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Soltec Corp., No. Hollywood, Cal.
Syncor Prods. Co., Inc., Malden, Mass.
Thermal Amer. Fused Quartz, Montville, N.J.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Voltarc Tubes, Fairfield, Conn.
Westinghouse Elec., Bloomfield, N. J.
Zeiss, Carl, Inc., New York, N.Y.

Lamps, Miniature & Subminiature

Alco Elctrn. Prods., Lawrence, Mass. p 1439
Chicago Miniature Lamp Works, Chicago, Ill. .... p 1443
Circon Corp., Goleta, Cal.
Dialight Corp., Brooklyn, N.Y.
Drake Mfg., Harwood Hgts., Ill. .. p 1449
General Elec., Miniature Lamp Dept. MYI-I, Cleveland, Ohio .... p 1463
General Illumination, Inc., St. Paul, Minn p 1461
Genisco Technology Corp., Eldema Div., Compton, Cal. .... p 1452-1455
GTE Sylvania Inc., Hillsboro, N.H. p 1464
Hudson Lamp Co., Kearney, N.J. p 1472
Ind'l. Devices, Edgewater, N.J.
Ind'l Elctrn. Engrs., Van Nuys, Cal. p 1478
Inter-Market, Inc., Glenview, Ill. .. p 1473
International Electro Exchange Corp., Minneapolis, Minn. .... p 1925
Johnson E. F. Co., Waseca, Minn.
Lamps, Inc., Torrance, Cal. ..p 1480,1481
Leecraft Mfg. Co., Inc., Long Island City, N.Y. .... p 1482
LVC Ind's., Inc., Corona, N.Y.
Pinlites, Fairfield, N.J. .... p 1490
Sloan Co., Sun Valley, Cal. .... p 1498
Vemaline Prods. Co., Wyckoff, N.J.
Wagner Elec. Corp., Livingston, N.J. p 1500,1501
Allyn, W., Inc., Skaneateles Falls, N.Y.
American Pamcor, Inc., Paoli, Pa
Arcolectric Switch Co., N. Hollywood, Calif.
Aristo-Craft Distinctive Miniatures, New York, N.Y.
Controls Co. of America, Folcroft, Pa.
Eder Instrument Co., Inc., Chicago, Ill.
Edmund Scientific Co., Barrington, N.J.
EdnaLite Corp., Peekskill, N.Y.
Ferranti Elec., Inc., Plainview, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Int'l. Prods., Atchison, Kans.
Janel, Inc., Stirling, N.J.
Lumitron Co., Summit, N.J.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Mura Corp., Jericho, N.Y.
Philmore Mfg. Co., Richmond Hill, N.Y.
Precision Lamp Engrs., Novato, Cal.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Ray-O-Vac Co., Madison, Wisc.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Shigoto Inds., Ltd., New York, N.Y.
Swing-O-Lite, Inc., Hackensack, N.J.
Techni-Tool, Inc., Philadelphia, Pa.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Vitality Bulbs Ltd., Suffolk, England
Western Indicator Co., So. El Monte, Cal.
Westinghouse Elec., Bloomfield, N. J.

Lamps, Neon

Alco Elctrn. Prods., Lawrence, Mass. p 1439
Chicago Miniature Lamp Works, Chicago, Ill.
Circon Corp., Goleta, Cal.
Dialight Corp., Brooklyn, N.Y.
Drake Mfg., Harwood Hgts., Ill. .. p 1449
Electro-Mech. Comps., S. El Monte, Cal.
General Elec., Miniature Lamp Dept. MYI-I, Cleveland, Ohio .... p 1463
General Illumination, Inc., St. Paul, Minn p 1457,1458
Genisco Technology Corp., Eldema Div., Compton, Cal. ....p 1454,1455
Ind'l. Devices, Edgewater, N.J. .. p 1474
Inter-Market, Inc., Glenview, Ill. .. p 1473
Johnson E. F. Co., Waseca, Minn.
Lamps, Inc., Torrance, Cal. ..p 1480,1481
Leecraft Mfg. Co., Inc., Long Island City, N.Y.
LVC Ind's., Inc., Corona, N.Y.
Signalite, Neptune, N.J. .... p 1492
Sloan Co., Sun Valley, Cal. .... p 1498
Vemaline Prods. Co., Wyckoff, N.J.
Aerolux Light Co. Inc., New York, N.Y.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Arcolectric Switch Co., N. Hollywood, Calif.
Black Light Corp. Amer., San Gabriel, Cal.
Compu-Lite Corp., Irvine, Cal
Ealing Corp., Cambridge, Mass.
Int'l. Prods., Atchison, Kans.
Kemlite Labs., Inc., Chicago, Ill.
MacDonald & Co., Glendale, Calif.
Marco-Oak, Anaheim, Cal.
Master Specialties, Costa Mesa, Cal.
Mura Corp., Jericho, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Shigoto Inds., Ltd., New York, N.Y.
TEC, Inc., Eden Prairie, Minn.
Vitality Bulbs Ltd., Suffolk, England
Voltarc Tubes, Fairfield, Conn.

Lamps, Projection

Chicago Miniature Lamp Works, Chicago, Ill.
Christie Elec., Los Angeles, Cal. .. p 675
Drake Mfg., Harwood Hgts., Ill.
Illumination Inds., Inc., Sunnyvale, Cal. p 1644
Edmund Scientific Co., Barrington, N.J.
Eimac, San Carlos, Calif.
General Elec., Photo Lamp, Cleveland, Ohio
Gordon Alan Entprs., N. Hollywood, Cal.
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Danvers, Mass.
Hanovia Lamp Div., Newark, N.J.
ITT Electron Tube, Easton, Pa.
Pek, Inc., Sunnyvale, Calif.
Quartz Radiation Corp., Fairfield, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Strong Elec. Corp., Toledo, Ohio
Westinghouse Elec., Bloomfield, N. J.

Lamps, Solid State

Alco Elctrn. Prods., Lawrence, Mass.
General Elec., Miniature Lamp Dept. MYI-I, Cleveland, Ohio .... p 1463
General Illumination, Inc., St. Paul, Minn p 1460
Genisco Technology Corp., Eldema Div., Compton, Cal. .... p 1452,1453
LVC Ind's., Inc., Corona, N.Y.
Sloan Co., Sun Valley, Cal.
Electro-Optical Systems, Pasadena, Cal.
Ferranti Ltd., Hollinwood, Lancs., England
GTE Sylvania Inc., Danvers, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
TEC, Inc., Eden Prairie, Minn.

Lamps, Stroboscopic

Amglo Inds., Inc., Rosemont, Ill. p 1641

Lamps, Tungsten Halogen

Chicago Miniature Lamp Works, Chicago, Ill.
Edmund Scientific Co., Barrington, N.J.
Gordon Alan Entprs., N. Hollywood, Cal.
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Danvers, Mass.
McPherson Instr., Acton, Mass.
Shigoto Inds., Ltd., New York, N.Y.

Lamps, Xexon

Atlas Electric Devices, Chicago, Ill.
Ealing Corp., Cambridge, Mass.
Ferranti Ltd., Hollinwood, Lancs., England
Gaertner Scientific Corp., Chicago, Ill.
GTE Sylvania Inc., Danvers, Mass.
ILC, Inc., Sunnyvale, Calif.
Mura Corp., Jericho, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Siemens Corp., Comps. Div., Iselin, N.J.
U.S. Scientific Instrs., Watertown, Mass.
Varian Assocs., Palo Alto, Cal.
Voltarc Tubes, Fairfield, Conn.
Xenon Corp., Medford, Mass.

Laser Energy Monitors—See Monitors, Laser Energy—Vol 1

Laser Q Switches

Andersen Labs. Inc., Bloomfield, Conn.
Venus Scientific, Farmingdale, N.Y.
Advanced Kinetics, Costa Mesa, Calif.
Datalight Inc., Bloomfield, Conn.
Dell Optics Co., Inc., N. Bergen, N.J.
Electro Powerpacs Corp., Cambridge, Mass.
General Scanning, Watertown, Mass.
Gould Labs., Cleveland, Ohio
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hadron Inc., Westbury, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Malibu, Cal.
Isomet Corp., Oakland, N.J.
Korad Mat'ls. Sys. Div., Santa Monica, Cal.
LAD Electro-Sys., Inc., Hicksville, N.Y.
Lasermetrics, Inc., Rochelle Park, N.J.
Photon Sources, Inc., Ann Arbor, Mich.
Quantronix Corp., Smithtown, N.Y.
Raytheon Co., Waltham, Mass.

Lasers, Gas—See Vol 1

Lasers, Solid-State—See Vol 1

Lead Assemblies & Receptacles, High Voltage-Also See Connectors; Cable Assemblies—See Vol 3

Leads, Test—See Test Leads—Vol 1

Lens Caps, Indicator Light—See Caps, Lens, Indicator Light

Lenses, Inspection—See Magnifying Glasses, Inspection—Vol 1

Lenses, Optical & Camera

Amersil, Inc., Hillside, N.J.
Circon Corp., Goleta, Cal.
Cosmicar Optical Co., Ltd., Nerima-Ku, Tokyo, Japan .... p 1643
Cunningham, Honeoye Falls, N.Y.
Engelhard Minerals & Chem., Murray Hill, N.J.
Aerospace Controls Corp., Gardena, Cal.
AGFA-Gevaert, Inc., Teterboro, N.J.
ATV Research, Dakota City, Neb.
Bache, Semon & Co., New York, N.Y.
Barnes Engrg. Co., Stamford, Conn.
Bausch & Lomb, Rochester, N.Y.
Bendix, Ann Arbor, Mich.
Buhl Optical Co., Pittsburgh, Pa.
Burke & James, Inc., Chicago, Ill.
CAI Div. Bourns Inc., Barrington, Ill.
Cohu Elctrns., Inc., San Diego, Calif.
Concord Elctrns., Los Angeles, Cal.
Dell Optics Co., Inc., N. Bergen, N.J.
Denson Elctrns. Corp., Rockville, Conn.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
EdnaLite Corp., Peekskill, N.Y.
Electro-Optical Div., Northampton, Mass.
Electro-Optical Systems, Pasadena, Cal.
Ercona Corp., Bellmore, N.Y.
Esco Products, Oak Ridge, NJ
Exotic Materials, Inc., Costa Mesa, Cal.
Fairchild Space & Defense Sys., Syosset, N.Y.
FJW Inds., Inc., Mt. Prospect, Ill.
Gaertner Scientific Corp., Chicago, Ill.
GBC Closed Circuit TV Corp., New York, N.Y.
General Electrodynamics Corp., Garland, Tex.
General Hardware Mfg. Co., New York, N.Y.
Glidelite Inds., Inc., Hackensack, N.J.
Goerz Optical Co., Inc., Pittsburgh, Pa.
Gordon Alan Entprs., N. Hollywood, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Heitz, Karl, Inc., New York, N.Y.
Heliotek, Sylmar, Calif.
Infrared Inds., Inc., Santa Barbara, Cal.
Isomet Corp., Oakland, N.J.
Itek Corp., Lexington, Mass.
Jones, A.D. Optical Works, Burlington, Mass.
Kollsman Instr. Corp., Syosset, N.Y.
Lancaster Glass Corp., Lancaster, Ohio
Lenox Instr. Co., Philadelphia, Pa.
Liberty Mirror Div., Brackenridge, Pa.
Maurer, J.A., Inc., Woodside, N.Y.
Multi Media Engrg., Inc., Rockville, Md.
Olympus Corp. America, New Hyde Park, N.Y.
Optical Inds., Santa Ana, Cal.
Opto-Metric Tools, Rockleigh, N.J.
Oriel Optics Corp., Stamford, Conn.
Perkin-Elmer Corp., Norwalk, Conn.
Photo-Sonics, Inc., Burbank, Calif.
Photo Tech. Prods., Garden City, N.Y.
Rank Precision Inds., W. Nyack, N.Y.
Red Lake Labs, Inc., Santa Clara, Calif.
Republic Lens Co., Inc., Bronx, N.Y.
S & S Optical Co., Inc., Ft. Wayne, Ind.
Schoeffel Instr. Corp., Westwood, N.J.
Servo Corp. America, Hicksville, N.Y.
Shibaden Corp. Amer., Woodside, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Spectra-Physics, Inc., Mountain View, Calif.
Syncor Prods. Co., Inc., Malden, Mass.
Texas Instruments, Inc., Dallas, Tex.
Traid Corp., Glendale, Cal.
Zeiss, Carl, Inc., New York, N.Y.
Zenith Optical Lab., Dobbs Ferry, N.Y.
Zoomar, Inc., Glen Cove, N.Y.

Lenses, R-F—See Vol 1

Lenses, Readout & Display

Dialight Corp., Brooklyn, N.Y.
Drake Mfg., Harwood Hgts., Ill.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Sorenson Lighted Controls, W. Hartford, Conn. .... p 1493
Edmund Scientific Co., Barrington, N.J.
Esco Products, Oak Ridge, NJ
General Electrodynamics Corp., Garland, Tex.
Gordon Alan Entprs., N. Hollywood, Cal.
Info-Lite Corp., Ft. Lee, N.J.
Infrared Inds., Inc., Santa Barbara, Cal.
Lenox Instr. Co., Philadelphia, Pa.
Olympus Corp. America, New Hyde Park, N.Y.
Optical Inds., Santa Ana, Cal.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Plastiglide Mfg. Corp., Santa Monica, Cal.
Symbolic Displays, Inc., Orange, Calif.
Tekform Prods. Co., Anaheim, Cal.

Light Sources, Isotope Excited—See Sources, Light—Vol 1

Lighting Equipment, Emergency—See Vol 1

Lighting Equipment, Studio—See Vol 1

Lighting Equipment, Tower—See Vol 1

Lightning Arresters—See Arresters, Lightning

Lights, Arc

Christie Elec., Los Angeles, Cal. .. p 675
Aerospace Controls Corp., Gardena, Cal.
Atlas Electric Devices, Chicago, Ill.
Canrad Precision Inds., Inc., Pelham, N.Y.
Central Scientific Co., Chicago, Ill.
Edmund Scientific Co., Barrington, N.J.
Eimac, San Carlos, Calif.
Electro Powerpacs Corp., Cambridge, Mass.
Gates, Geo. W. & Co., Franklin Sq., N.Y.
Gordon Alan Entprs., N. Hollywood, Cal.
GTE Sylvania Inc., Danvers, Mass.
Hanovia Lamp Div., Newark, N.J.
Kemlite Labs., Inc., Chicago, Ill.
Pek, Inc., Sunnyvale, Calif.
Quartz Radiation Corp., Fairfield, N.J.
Rowe L. L. Co., Boston, Mass.
Schoeffel Instr. Corp., Westwood, N.J.
Strong Elec. Corp., Toledo, Ohio

Lights, Dial, Panel, Pilot, & Accessories

ADC Prods., Minneapolis, Minn.
Alco Elctrn. Prods., Lawrence, Mass. p 1439
Allen-Bradley Co., Milwaukee, Wisc.
Amp Inc., Harrisburg, Pa.
Chicago Miniature Lamp Works, Chicago, Ill. .... p 1443
Chicago Switch, Chicago, Ill. ...... p 1902
Circon Corp., Goleta, Cal. .... p 2937
Dialight Corp., Brooklyn, N.Y....... p 1446
Display Devices, Inc., Encinitas, Cal. p 1450
Drake Mfg., Harwood Hgts., Ill. p 1448,1449
Electro-Mech. Comps., S. El Monte, Cal.
Electro Switch Corp., Weymouth, Mass.
General Elec. Co., Schenectady, N.Y. p 1462
General Elec., Miniature Lamp Dept. MYI-I, Cleveland, Ohio .... p 1463
General Illumination, Inc., St. Paul, Minn p 1457-1459
Genisco Technology Corp., Eldema Div., Compton, Cal. ....p 1454,1455
GTE Sylvania Inc., Hillsboro, N.H.p 1464
Ind'l. Devices, Edgewater, N.J. p 1474,1475
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Inter-Market, Inc., Glenview, Ill. .. p 1473
International Electro Exchange Corp., Minneapolis, Minn.
Johnson E. F. Co., Waseca, Minn.
Lamps, Inc., Torrance, Cal.
Leecraft Mfg. Co., Inc., Long Island City, N.Y. .... p 1482
LVC Ind's., Inc., Corona, N.Y. ...... p 1441
Signalite, Neptune, N.J.
Sloan Co., Sun Valley, Cal. p 1494-1499
Sorenson Lighted Controls, W. Hartford, Conn. .... p 1493
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Union Carbide, Consumer Prods., New York, N.Y.
Vemaline Prods. Co., Wyckoff, N.J. p 1505
Wagner Elec. Corp., Livingston, N.J.
Adronics, Inc., Cedar Grove, N.J.
Aerolite Electronics Corp., Union City, N.J.
Aeronautical Elec. Co., Inc., Chicago, Ill.
Arcolectric Switch Co., N. Hollywood, Calif.
Bodnar Prods. Corp., New Rochelle, N.Y.
Clare-Pendar Co., Post Falls, Idaho
Compu-Lite Corp., Irvine, Cal
Controls Co. of America, Folcroft, Pa.
Culver Stearns Mfg. Co., Worcester, Mass.
Cutler-Hammer, Milwaukee, Wisc.
Data Display Products, Los Angeles, Cal.
Design Prods. Corp., Troy, Mich.
Devco Engrg., W. Caldwell, N.J.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
E.C.P. Corp., Cleveland, Ohio
Electro Devices, Inc., St. Louis, Mo.
Federal Screw Prods., Inc., Chicago, Ill.
Furnas Elec. Co., Batavia, Ill.
General Elec., Providence, R.I.
Glar-Ban Corp., Buffalo, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Info-Lite Corp., Ft. Lee, N.J.
Int'l. Prods., Atchison, Kans.
Korry Mfg. Co., Seattle, Wash.
Marco-Oak, Anaheim, Cal.
Master Specialties, Costa Mesa, Cal.
Molex Prods. Co., Downers Grove, Ill.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Mura Corp., Jericho, N.Y.
National Acme, Cleveland, Ohio
Nucleonic Prods., Canoga Pk, Cal.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Penn Keystone Corp., Ansonia, Conn.
Philmore Mfg. Co., Richmond Hill, N.Y.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
Square D Co., Park Ridge, Ill.
TEC, Inc., Eden Prairie, Minn.
Terado Corp., St. Paul, Minn.
T.J. Elctrns., Ft. Worth, Tex.
Vitality Bulbs Ltd., Suffolk, England
Waber Elctrns., Inc., Philadelphia, Pa.
Westmoreland Plastics Co., Latrobe, Pa.

Lights, Edge Lighting, Panel

Chicago Miniature Lamp Works, Chicago, Ill. .... p 1443
Dialight Corp., Brooklyn, N.Y....... p 1446
General Illumination, Inc., St. Paul, Minn p 1457-1459
GTE Sylvania Inc., Hillsboro, N.H.p 1464
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Inter-Market, Inc., Glenview, Ill. .. p 1473
Lamps, Inc., Torrance, Cal.
Leecraft Mfg. Co., Inc., Long Island City, N.Y. .... p 1482
LVC Ind's., Inc., Corona, N.Y. ...... p 1441
Signalite, Neptune, N.J.
Sloan Co., Sun Valley, Cal. ..p 1494,1495
Vemaline Prods. Co., Wyckoff, N.J. p 1505
Ackerman Engravers, Inc., Long Island City, N.Y.
Aerolite Electronics Corp., Union City, N.J.
Bodnar Prods. Corp., New Rochelle, N.Y.
Canrad Precision Inds., Inc., Pelham, N.Y.
Controls Co. of America, Folcroft, Pa.
Devco Engrg., W. Caldwell, N.J.
Eljay Corp., Columbia, Md.
Glar-Ban Corp., Buffalo, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Marco-Oak, Anaheim, Cal.
Mura Corp., Jericho, N.Y.
N/P Co., Temple City, Calif.
Symbolic Displays, Inc., Orange, Calif.
T.J. Elctrns., Ft. Worth, Tex.
Vitality Bulbs Ltd., Suffolk, England

Lights, Indicator—See Lights, Dial, Panel, etc-Also See Readouts & Readout Devices

Lights, Infrared

Chicago Miniature Lamp Works, Chicago, Ill.
Christie Elec., Los Angeles, Cal.
ACR Elctrns. Div., Carle Place, N.Y.
Aerospace Controls Corp., Gardena, Cal.
Autotron, Inc., Danville, Ill.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Eimac, San Carlos, Calif.
Electro-Optical Systems, Pasadena, Cal.
GTE Sylvania Inc., Danvers, Mass.
Hamilton Inds., Winter Haven, Fla.

Hanovia Lamp Div., Newark, N.J.
Luminator Div., Plano, Tex.
Miskella Infra-Red Co., Cleveland, Ohio
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Oriel Optics Corp., Stamford, Conn.
Pek, Inc., Sunnyvale, Calif.
Schoeffel Instr. Corp., Westwood, N.J.
Sensor Corp., Greenwich, Conn.
Spectra-Physics, Inc., Mountain View, Calif.

Lights, Inspection—See Lamps, Magnifying—Vol 1

Lights, Neon, Test—See Lights, Press-To-Test

Lights, Oil-Tight

Allen-Bradley Co., Milwaukee, Wisc.
Chicago Miniature Lamp Works, Chicago, Ill.
Dialight Corp., Brooklyn, N.Y....... p 1446
Drake Mfg., Harwood Hgts., Ill. .. p 1448
General Elec. Co., Schenectady, N.Y.
Johnson E. F. Co., Waseca, Minn.
Sloan Co., Sun Valley, Cal.
Vemaline Prods. Co., Wyckoff, N.J.
Controls Co. of America, Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Data Display Products, Los Angeles, Cal.
Design Prods. Corp., Troy, Mich.
E.C.P. Corp., Cleveland, Ohio
Furnas Elec. Co., Batavia, Ill.
MEKontrol Inc., Northboro, Mass.
National Acme, Cleveland, Ohio
Nucleonic Prods., Canoga Pk, Cal.
Pyle-National Co., Chgo., Ill.
Square D Co., Park Ridge, Ill.

Lights, Placard—See Lights, Dial, Panel, Pilot & Accessories

Lights, Press-To-Test

Allen-Bradley Co., Milwaukee, Wisc.
Carling Electric, W. Hartford, Conn.
Chicago Miniature Lamp Works, Chicago, Ill.
Dialight Corp., Brooklyn, N.Y....... p 1447
Drake Mfg., Harwood Hgts., Ill. .. p 1449
Electro Switch Corp., Weymouth, Mass.
General Elec. Co., Schenectady, N.Y.
General Illumination, Inc., St. Paul, Minn
Grayhill, Inc., LaGrange, Ill.
Ind'l. Devices, Edgewater, N.J.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
LVC Ind's., Inc., Corona, N.Y.
Sorenson Lighted Controls, W. Hartford, Conn. .... p 1493
Vemaline Prods. Co., Wyckoff, N.J.
Clare-Pendar Co., Post Falls, Idaho
Controls Co. of America, Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Design Prods. Corp., Troy, Mich.
E.C.P. Corp., Cleveland, Ohio
Furnas Elec. Co., Batavia, Ill.
Korry Mfg. Co., Seattle, Wash.
Marco-Oak, Anaheim, Cal.
Master Specialties, Costa Mesa, Cal.
MEKontrol Inc., Northboro, Mass.
National Acme, Cleveland, Ohio
Square D Co., Park Ridge, Ill.
TEC, Inc., Eden Prairie, Minn.
Waber Elctrns., Inc., Philadelphia, Pa.

Lights, Stroboscopic Source

Illumination Inds., Inc., Sunnyvale, Cal. p 1644
Pinlites, Fairfield, N.J.
Slaughter Co., Ardmore, Okla. .... p 559
Sticht, Herman H. Co., Inc., New York, N.Y. .... p 563
Abtronics, Inc., Livermore, Calif.
ACR Elctrns. Div., Carle Place, N.Y.
Amstro Corp., Fairfield, N.J.
Arizona Elctrns., Inc., Benson, Ariz.
Assembly Elctrns. Ltd., Niagara Falls, Can.
B & K Instrs., Inc., Cleveland, Ohio
Central Scientific Co., Chicago, Ill.
Chadwick-Helmuth Co., Inc., Monrovia, Calif.
Delta Products, Inc., Grand Junction, Colo.
Dyonics, Inc., Woburn, Mass.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Eimac, San Carlos, Calif.
Elctrn. Brazing Co., Hackensack, N.J.
Ferranti Ltd., Hollinwood, Lancs., England
General Radio Co., Concord, Mass.
GTE Sylvania Inc., Danvers, Mass.
Heitz, Karl, Inc., New York, N.Y.
ILC, Inc., Sunnyvale, Calif.
Kemlite Labs., Inc., Chicago, Ill.
Mura Corp., Jericho, N.Y.
Pek, Inc., Sunnyvale, Calif.
Power Instrs., Skokie, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
Somerset Radiation Lab., Arlington, Va.
Symbolic Displays, Inc., Orange, Calif.
U.S. Scientific Instrs., Watertown, Mass.
Xenon Corp., Medford, Mass.

Lights, Ultraviolet

Christie Elec., Los Angeles, Cal.
Illumination Inds., Inc., Sunnyvale, Cal. p 1644
Aerospace Controls Corp., Gardena, Cal.
American Atomics Corp., Tucson, Ariz.
American Ultraviolet Co., Chatham, N.J.
Atlantic Ultraviolet Corp., Long Island City, N.Y.
Atlas Electric Devices, Chicago, Ill.
Black Light Corp. Amer., San Gabriel, Cal.
Black Light Eastern, Westbury, N.Y.
Canadian Research Institute, Don Mills, Ont., Canada
Canrad Precision Inds., Inc., Pelham, N.Y.
Central Scientific Co., Chicago, Ill.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Edmund Scientific Co., Barrington, N.J.
Eimac, San Carlos, Calif.
EMR Div., Princeton, N.J.
Esco Products, Oak Ridge, NJ
Etchomatic, Inc., Waltham, Mass.
Gates, Geo. W. & Co., Franklin Sq., N.Y.
GTE Sylvania Inc., Danvers, Mass.
Hanovia Lamp Div., Newark, N.J.
ILC, Inc., Sunnyvale, Calif.
Kemlite Labs., Inc., Chicago, Ill.
Lehighton Elctrns., Inc., Lehighton, Pa.
Magnaflux Corp., Chicago, Ill.
McPherson Instr., Acton, Mass.
Mico Instr. Co., Cambridge, Mass.
Nester/Faust Mfg. Corp., Newark, Dela.
Oriel Optics Corp., Stamford, Conn.
Pek, Inc., Sunnyvale, Calif.
Quartz Radiation Corp., Fairfield, N.J.
Sara Scientific Co., San Francisco, Calif.
Schoeffel Instr. Corp., Westwood, N.J.
Shannon Luminous Mat'ls., Hollywood, Cal.
Siemens Corp., Comps. Div., Iselin, N.J.
Soltec Corp., No. Hollywood, Cal.
Spectra-Physics, Inc., Mountain View, Calif.
TRW Instrs., El Segundo, Cal.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Voltarc Tubes, Fairfield, Conn.
Xenon Corp., Medford, Mass.
Zeiss, Carl, Inc., New York, N.Y.

Limit Stops, Mechanical—See Vol 3

Limiters, Current

Airpax Elctrns., Inc., Cambridge, Md.
Arnold Magnetics, Culver City, Cal. p 651
Betamite Electronic Devices, Culver City, Calif.
Diversified Elctrns., Evansville, Ind
ISC Magnetics Div., Huntington, N.Y.
Kepco, Inc., Flushing, N.Y.
Lambda Elctrns., Melville, N.Y.
Trio Labs, Inc., Plainview, N.Y.
Burndy Corp., Norwalk, Conn.
Carbone Corp., Boonton, N.J.
CGS Units, Inc., Rochester, N.Y.
Coil Co. of Amer., Northvale, N.J.
Delta-Tronics Corp., Tempe, Ariz.
Halmar Elctrns., Inc., Columbus, Ohio
MEKontrol Inc., Northboro, Mass.
Pennsylvania Elctrns. Technology, Pittsburgh, Pa.
SKG Assocs., Inc., Boston, Mass.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Vytell Corp., Arlington Hgts., Ill.

Limiters, Microwave

American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
Arra Inc., Bayshore, N.Y.
Electro/Data, Inc., Garland, Tex.
Hewlett-Packard, Palo Alto, Cal.
Microwave Cavity Labs., La Grange, Ill.
RCA Elctrns. Comps., Harrison, N.J.
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
Watkins Johnson Co., Palo Alto, Cal.
Aertech Inds., Sunnyvale, Calif.
Astrolab Inc., Linden, N J
Calvert Elctrns., Inc., New York, N.Y.
Collins Radio Co., Dallas, Tex.
Engelmann Microwave, Montville, N.J.
Ferranti Ltd., Hollinwood, Lancs., England
General Microwave Corp., Farmingdale, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Loral Elctrn. Sys., Bronx, N.Y.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Prods., Inc., Chatsworth, Cal.
Philco-Ford Corp., Washington, D.C.
Physical Elctrn. Labs., Menlo Park, Calif.
Sanders Assocs., Nashua, N.H.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Systron-Donner Microwave Div., Van Nuys, Cal.
Varian Assocs., Palo Alto, Cal.
Varian, Beverly, Mass.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.

Limiters, Noise—See Vol 1

Limiters, Pulse—See Vol 1

Limiters, Surge

ATR Elctrns., Inc., St. Paul, Minn.
ISC Magnetics Div., Huntington, N.Y.
Joslyn Elctrn. Sys., Goleta, Cal... p 1933
Trio Labs, Inc., Plainview, N.Y.
Bradley Semiconductor Corp., New Haven, Conn.
Delta-Tronics Corp., Tempe, Ariz.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Green Elec. Corp., Fair Lawn, N.J.
RFL Inds., Comms. Div., Boonton, N.J.
Wilkinson Elctrns., Woodlyn, Pa.

Line Fault Locators—See Locators, Cable & Line Fault —Vol 1

Line Stretchers, Microwave—See Microwave Line Stretchers—Vol 1

Linear Displacement Indicators—See Indicators, Linear Displacement—Vol 1

Liners, Tube Shield—See Shields, Tube

Lines, Slotted—See Slotted Lines, Microwave—Vol 1

Links, Antenna—See Vol 1

Links, Relay—See Vol 1

Liquid Converters, Cryogenic —See Cryogenic Liquid Converters—Vol 1

Liquid Crystals—See Crystals, Liquid, Temperature Indicating

Liquid-Level Indicators—See Indicators, Liquid-Level

Load Cells—See Cells, Load

Loads, Dummy—See Dummy Loads—Vol 3

Loads, Electronic, Variable-Also See Dummy Loads—See Vol 1

Locators, Cable & Line Fault —See Vol 1

Locators, Metal—See Vol 3

Locators, Open-Short—See Vol 1

Locators, Pipe & Cable—See Locators, Metal—Vol 3

Locks, Dial & Shaft

Electronic Hardware, Jamaica, N.Y.
Jackson Bros., (London) Ltd., New York, N.Y.
Lambda Elctrns., Melville, N.Y.
Millen, James Mfg., Malden, Mass. p 1488,1489,1999
National Tel-Tronics Corp., Great Neck, N.Y. .... p 2650
Positronic Inds., Springfield, Mo.
Raytheon Co., Quincy, Mass.
Smith, Herman H., Inc., Bklyn., N.Y.
Vemaline Prods. Co., Wyckoff, N.J.
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Adams Rite Mfg. Co., Glendale, Calif.
Amatom Elctrn. Hardware, New Rochelle, N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Bowmar/Ali, Inc., Acton, Mass.
Bud Radio, Inc., Willoughby, Ohio
Federal Screw Prods., Inc., Chicago, Ill.
Helitronics Corp., Newark, N.J.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Keystone Elctrns. Corp., New York, N.Y.
Paul, F.H. & Stein Bros., New York, N.Y.
PIC Design Corp., Ridgefield,, Conn.
SECS, Inc., Long Island City, N.Y.
Waters Mfg., Inc., Wayland, Mass.

Logic Circuits—See Cards, Logic Circuits, Integrated Modules, Logic—Vol 1

Loudspeakers—See Speakers —Vol 1

Louvers, Vents, & Windows (For Equipment)—See Cabinets & Accessories, Metal—Vol 3

Lsi Circuits—See Circuits, Large Scale Integration

Lubricants-Also See Greases —See Vol 3

Lugs—See Terminals, Lug—Vol 3

Luminescent Chemicals—See Chemicals, Luminescent—Vol 3

Luminous Paints—See Paints, Luminous—Vol 3

LVDT—See Transducers, Displacement

Machines, Axial Lead Straightening, Automatic—See Vol 1

Machines, Balancing—See Balancing Equipment—Vol 1

Machines, Blueprint—See Blueprint Machines—Vol 3

Machines, Chemical Milling—See Vol 1

Machines, Cleaning-Also See Cleaners, Ultrasonic; Machines, Vapor-Degreasing—See Vol 1

Machines, Coil-Winding—See Vol 1

Machines, Coil-Winding, Toroidal—See Vol 1

Machines, Component Handling & Feeding—See Vol 1

Machines, Component Inserting—See Vol 1

Machines, Component Lead Cleaning—See Vol 1

Machines, Crimping—See Tools, Crimping—Vol 3

Machines, Crystal Manufacturing—See Vol 1

Machines, Cutting—See Vol 1

Machines, Deflashing—See Vol 1

Machines, Degreasing, Vapor—See Machines, Vapor-Degreasing—Vol 1

Machines, Drying—See Vol 1

Machines, Electrical Discharge—See Vol 1

Machines, Encapsulating—See Vol 1

Machines, Engraving & Profiling—See Engraving & Profiling Equipment—Vol 1

Machines, Etching, Printed Circuits—See Vol 1

Machines, Eyelet Installing—See Vol 1

Machines, Helixing Lathe—See Vol 1

Machines, Hermetic Sealing—See Vol 1

Machines, Hot-Stamping—See Vol 1

Machines, Impregnating—See Vol 1

Machines, Induction Heating (Electronic)—See Vol 1

Machines, Lead Cutting & Forming—See Vol 1

Machines, Marking & Numbering—See Vol 1

Machines, Mask Alignment & Exposure—See Vol 1

Machines, Material Handling (Electronic Control)—See Vol 1

Machines, Metallizing, Vacuum—See Deposition Equipment, Vacuum—Vol 1

Machines, Measuring—See Vol 1

Machines, Parts Cleaning—See Machines, Cleaning—Vol 1

Machines, Plastic Molding—See Vol 1

Machines, Plating—See Vol 1

Machines, Polishing & Buffing—See Vol 3

Machines, Printed Circuit Drilling & Punching—See Vol 1

Machines, Punching—See Vol 1

Machines, Reel Packaging—See Vol 1

Machines, Resistance Also See Resistance Adjusting Equipment For Hybrid Microcircuits—See Vol 1

Machines, Riveting—See Vol 1

Machines & Accessories, Semiconductor Manufacturing—See Vol 1

Machines, Shock Testing—See Testers, Shock—Vol 1

Machines, Sleeve Cutting—See Vol 1

Machines, Solderability Testing—See Vol 1

Machines, Soldering—See Soldering Equip.—Vol 1

Machines, Sorting—See Vol 1

Machines, Spinner, Photo-Resist—See Vol 1

Machines, Swaging—See Vol 1

Machines, Tape Winding—See Vol 1

Machines, Tape Winding, Toroidal—See Vol 1

Machines, Terminal Installing—See Vol 1

Machines, Transistor Assembling—See Vol 1

Machines, Ultrasonic Bonding—See Vol 1

Machines, Vapor-Degreasing-Also See Cleaners, Ultrasonic—See Vol 1

Machines, Vibration Fatigue Testing—See Vibration Test Systems—Vol 1

Machines, Wafer Alignment—See Machines, Mask Alignment & Exposure—Vol 1

Machines, Whiteprint—See Whiteprint Machines—Vol 3

Machines, Wire Marking, Hand & Automatic—See Wire Marking Machines—Vol 1

Machines, Wire Measuring & Cutting—See Wire Measuring & Cutting Machines—Vol 1

Machines, Wire Wrapping-Also See Wire Wrapping Tools—See Vol 1

Macroscopic Equip.—See Magnifying Glasses, Inspection—Vol 1

Magnetic Analyzers—See Analyzers, Magnetic—Vol 1

Magnetic Core Testers—See Testers, Magnetic Core—Vol 1

Magnetic Disc Storage Systems—See Vol 1

Magnetic Field Indicators—See Indicators, Magnetic Field—Vol 1

Magnetic Foil—See Foil, Magnetic—Vol 3

Magnetic Iron Oxides—See Vol 3

Magnetic Recording Tape—See Tapes, Recording, Magnetic—Vol 1

Magnetic Shields & Materials—See Shields, Magnetic—Vol 3

Magnetic Tape Recorders—See Recorders, Magnetic Tape-Also See Data Recorders—Vol 1

Magnetizers—See Vol 1

Magnetometers—See Vol 1

Magnetoresistors, Hall
American Aerospace Controls,
Farmingdale, N.Y. .... p 1307
ISC Magnetics Div., Huntington, N.Y.
p 1806
ISC/Telephonics Div, Huntington, N.Y.
Magnetic Sys. & Instrs., Worcester, Mass.
Magnetics Sys. & Instrs., Worcester, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.

Magnetron Testers—See Testers, Magnetron—Vol 1

Magnetrons—See Tubes, Magnetron

Magnets, Electromagnetic—See Vol 3

Magnets, Focusing—See Magnets, Permanent—Vol 3

Magnets (Lab Type)—See Vol 3

Magnets, Permanent—See Vol 3

Magnets, Superconducting—See Vol 3

Magnifying Glasses, Inspection-Also See Lamps, Magnifying—See Vol 1

Marker Strips—See Strips, Marker & Fanning—Vol 3

Markers, Dry Transfer—See Kits, Marking

Markers, Identification—See Labels; Nameplates—Vol 3

Markers, Luminous
Black Light Corp. Amer., San Gabriel, Cal.
Brady, W.H. Co., Milwaukee, Wisc.
GM Nameplate, Inc., Seattle, Wash.
GTE Sylvania Inc., Danvers, Mass.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Shannon Luminous Mat'ls., Hollywood, Cal.
Thomas & Betts Co., Elizabeth, N.J.
3M Co., St. Paul, Minn.
Ultra-Violet Prods., Inc., San Gabriel, Cal.

Markers, R-F—See Generators, Marker—Vol 3

Markers, Terminal—See Kits, Marking, etc.

Markers, Wire, Tab & Sleeve—See Wire Markers—Vol 3

Marking Inks—See Inks, Marking—Vol 3

Masers—See Vol 1

Mask Alignment & Exposure Systems—See Machines, Mask Alignment & Exposure—Vol 1

Masking Films—See Films, Masking—Vol 1

Masks, Aperture, Color TV—See Vol 1

Masks, Fabrication, Deposition—See Services, Mask Making—Vol 3

Masts, Antenna—See Antenna Towers & Supports—Vol 1

Material Thickness Indicators—See Indicators, Material Thickness—Vol 1

Materials, Acoustic, Sound-Absorbing—See Vol 3

Materials, Conductive Plastic—See Vol 3

Materials, Electromagnetic Wave Absorbing - Also See Coatings—See Vol 3

Materials, Ferrite - Also See Ferrite Parts—See Vol 3

Materials, Garnet - Also See Garnet Parts—See Vol 3

Materials, Graphite—See Vol 3

Materials, Self-Lubricating—See Vol 3

Matrices, Computer-Also See Boards, Programming—See Vol 1

Master Antenna TV Systems & Equipment—See Vol 1

Measuring Wire, Gear—See Gear Measuring Wire—Vol 3

Mechanical Readouts—See Readouts, Electromechanical

Medical Electronic Research Equipment—See Specific Types

Megaphones, Electrical—See Comm. Systems, Portable—Vol 1

Memory Arrays, Core—See Vol 1

Memory Arrays, Plated Wire—See Vol 1

Memory Arrays, Thin-Film, Planar—See Vol 1

Memory Planes, Core—See Vol 1

Memory Planes, Plated Wire—See Vol 1

Memory Planes, Thin-Film, Planar—See Vol 1

Memory Stacks, Core—See Vol 1

Memory Stacks, Plated Wire—See Vol 1

Memory Systems, Delay Line—See Vol 1

Memory Systems, Core—See Vol 1

Memory Systems, Disc—See Vol 1

Memory Systems, Drum—See Vol 1

Memory Systems, Tape—See Vol 1

Memory Systems, Thin-Film, Planar—See Vol 1

Memory Systems, Thin-Film, Plated Wire—See Vol 1

Memory Systems, Integrated Circuit—See Vol 1

Metal Compounds, Foils, Powders, Sheet, Stock—See Vol 3

Metal Oxides—See Vol 3

Metal Parts, Cast—See Vol 3

Metal Parts, Chemically Milled—See Vol 3

Metal Parts, Deep Drawn—See Vol 3

Metal Parts, Laminated—See Vol 3

Metal Parts, Machined—See Vol 3

Metal Parts, Powdered—See Vol 3

Metal Parts, Screw Machine—See Vol 3

Metal Parts, Spun—See Vol 3

Metal Parts, Stamped—See Vol 3

Metals, Clad—See Vol 3

Metals, High Purity—See Vol 3

Metals, Precious-Also See Powders, Precious Metal—See Vol 3

Metals, Rare—See Vol 3

Metals, Refractory—See Vol 3

Metals, Semiconductor—See Crystals, Semiconductor—Vol 1

Metal-To-Glass Alloys—See Seals, Glass-To-Metal—Vol 3

Meter Cases—See Cases, Equipment—Vol 3

Meter Controllers—See Relays, Meter

Meter Expanders—See Multipliers, Meter—Vol 1

Meter Shunts—See Shunts, Meter—Vol 1

Meter Testers—See Testers, Meter—Vol 1

Meters, Acceleration—See Vol 1

Meters, Admittance—See Vol 1

Meters, Air Permeability—See Vol 1

Meters, Ampere, A-C—See Vol 1

Meters, Ampere, D-C—See Vol 1

Meters, Ampere, R-F—See Vol 1

Meters, Ampere, True RMS—See Vol 1

Meters, Ampere-Hour—See Vol 1

Meters, Attenuation—See Vol 1

Meters, Audio Level—See Vol 1

Meters, Cable Testing—See Testers, Cable—Vol 1

Meters, Capacitance—See Vol 1

Meters, Cavitation Intensity—See Vol 1

Meters, Conductance—See Vol 1

Meters, Conductivity—See Indicators, Fluid Conductivity—Vol 1

Meters, Counting Rate, Nuclear—See Vol 1

Meters, Decibel Indicating—See Vol 1

Meters, Distortion & Noise—See Vol 1

Meters, Dynamometer—See Dynamometers—Vol 1

Meters, Edge-Wise—See Vol 1

Meters, Elapsed Time—See Indicators, Elapsed Time—Vol 1

Meters, Electrometer—See Vol 1

Meters, Electronic Micrometer—See Micrometers, Electronic

Meters, Events-Per-Unit-Time—See Counters, Mechanical; etc.

Meters, Field Strength—See Vol 1

Meters, Fluid Flow—See Vol 1

Meters, Flutter & Wow—See Vol 1

Meters, Flux—See Vol 1

Meters, F-M Deviation—See Vol 1

Meters, Frequency—See Vol 1

Meters, Frequency Deviation—See Vol 1

Meters, Frequency Digital—See Vol 1

Meters, Galvanometer—See Vol 1

Meters, Gauss—See Vol 1

Meters, Gel Time—See Vol 1

Meters, Goniometer—See Vol 1

Meters, Grid Dip—See Vol 1

Meters, Heat Transfer (Semiconductor)—See Vol 1

Meters, Illuminated Scale—See Vol 1

Meters, Impedance—See Vol 1

Meters, Inductance—See Vol 1

Meters, Infrared

Dynarad, Inc., Norwood, Mass. .... p 439
Hewlett-Packard, Palo Alto, Cal.
Barnes Engrg. Co., Stamford, Conn.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Electrophysics Corp., Nutley, N.J.
Hughes Aircraft Co, Culver City, Cal.
International Light, Newburyport, Mass.
Ircon Inc., Niles, Ill.
Omega Engrg., Inc., Stamford, Conn.
Williamson Corp., Concord, Mass.

Meters, Intermodulation—See Vol 1

Meters, Kilovolt—See Vol 1

Meters, Kilowatt—See Vol 1

Meters, Laser Energy—See Monitors, Laser Energy—Vol 1

Meters, Light, (Non Photographic)—See Vol 1

Meters, Megohm—See Vol 1

Meters, Microampere—See Vol 1

Meters, Micro-Microampere—See Meters, Nanoampere—Vol 1

Meters, Micro-Nanovolt—See Meters, Nanovolt—Vol 1

Meters, Microhm—See Vol 1

Meters, Microvolt—See Vol 1

Meters, Microwave—See Vol 1

Meters, Milliampere—See Vol 1

Meters, Milliohm—See Vol 1

Meters, Millivolt—See Vol 1

Meters, Miniature—See Vol 1

Meters, Modulation—See Vol 1

Meters, Moisture (Electronic)—See Indicators, Moisture—Vol 1

Meters, Moving Scale—See Vol 1

Meters, Multitester—See Vol 1

Meters, Multitester (Digital)—See Vol 1

Meters, Multitester (Potentiometric)—See Vol 1

Meters, Nanampere—See Vol 1

Meters, Nanovolt—See Vol 1

Meters, Noise-Figure—See Vol 1

Meters, Null—See Vol 1

Meters, Ohm—See Vol 1

Meters, Panel (D'Arsonval Movement)—See Vol 1

Meters, Panel (Digital)—See Vol 1

Meters, Peak Power—See Vol 1

Meters, Period—See Vol 1

Meters, Permeameter—See Vol 1

Meters, Phase-Angle—See Vol 1

Meters, Phase Vector Volt—See Vol 1

Meters, Photoelectric, Reflection

Artronix, Inc., St. Louis, Mo.
Canadian Research Institute, Don Mills, Ont., Canada
De-Tec-Tronic Corp., Chicago, Ill.
EG & G, Inc., Salem, Mass.
Gamma Sci., San Diego, Cal.
International Light, Newburyport, Mass.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Photovolt Corp., New York, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Weston Instruments, Inc., Newark, N.J.
Zeiss, Carl, Inc., New York, N.Y.

Meters, Picoampere—See Vol 1

Meters, Pocket—See Vol 1

Meters, Power Density—See Vol 1

Meters, Power Factor—See Vol 1

Meters, Power, R-F—See Vol 1

Meters, Pyrometer—See Vol 1

Meters, Q—See Vol 1

Meters, Radiation, Nuclear—See Counters, Geiger; Counters, Scintillation—Vol 1

Meters, Ratio—See Vol 1

Meters, Recorders & Comparators, P-H—See Vol 1

Meters, Recording—See Vol 1

Meters, Reflectometer—See Vol 1

Meters, Refractometer—See Vol 1

Meters, R-F—See Vol 1

Meters, RFI—See Vol 1

Meters, Roentgen—See Meters, X-Ray-Intensity—Vol 1

Meters, S-Units—See Vol 1

Meters, Snap-Around—See Vol 1

Meters, Sound Velocity—See Vol 1

Meters, Spectral—See Vol 1

Meters, Standing Wave Ratio—See Vol 1

Meters, Tachometer—See Tachometers, Electronic

Meters, Temperature, Dial-Type (Contacting)—See Vol 1

Meters, Temperature, Dial-Type (Non-Contacting)—See Pyrometers—Vol 1

Meters, Temperature, Digital (Contacting)—See Vol 1

Meters, Tension—See Vol 1

Meters, Thermal Coefficient Of Expansion—See Vol 1

Meters, Thermal Transfer—See Vol 1

Meters, Thermocouple—See Vol 1

Meters, Tilt—See Vol 1

Meters, Time Delay Rate—See Vol 1

Meters, Time Interval—See Timers, Interval

Meters, Torque—See Indicators, Torque—Vol 1

Meters, Ultraviolet—See Vol 1

Meters, Vacuum Tube Volt (VTVM)—See Vol 1

Meters, Vibration—See Vol 1

Meters, Viscosity (Electronic)—See Indicators, Viscosity

Meters, Volt—See Vol 1

Meters, Volt, Deviation—See Vol 1

Meters, Volt, Differential—See Meters, Volt—Vol 1

Meters, Volt, Digital (DVM) & Accessories—See Vol 1

Meters, Volt, Electrostatic—See Vol 1

Meters, Volt, Frequency Selective—See Vol 1

Meters, Volt, Log-Conversion—See Vol 1

Meters, Volt, Potentiometric—See Vol 1

Meters, Volt, R-F—See Vol 1

Meters, Volt, Sampling—See Vol 1

Meters, Volt, True RMS—See Vol 1

Meters, Volt-Ammeter—See Vol 1

Meters, Volt-Ohm—See Vol 1

Meters, Volt-OHM-Milliampere (VOM)—See Vol 1

Meters, VU—See Vol 1

Meters, Watt—See Vol 1

Meters, Watt-Hour—See Vol 1

Meters, Watt-Var—See Vol 1

Meters, Wave—See Vol 1

Meters, Waveguide—See Meters, Microwave—Vol 1

Meters, X-Ray Intensity—See Vol 1

Mica Glass Bonded—See Insulation Materials, Glass Bonded Mica—Vol 3

Microcircuit Production Equip.—See Vol 1

Microcircuits—See Circuits, Integrated; Circuits, Hybrid

Micro Film Retrieval Systems—See Vol 3

Micrometers, Electronic

Simpson Elec. Co., Chicago, Ill.
A & M Instrument, Inc., Great Neck, N.Y.
Anritsu Electric Co., Ltd., Tokyo, Japan
Bendix, Dayton, Ohio
Dice, J.W. Co., Englewood, N.J.
DoAll Co., Des Plaines, Ill.
IKL, Inc., Newport Beach, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Minnetech Labs., Inc., Minneapolis, Minn.
Opto-Metric Tools, Rockleigh, N.J.
Sensor Corp., Greenwich, Conn.
Starrett, L.S. Co., Athol, Mass.
Transducer Controls Corp., Covina, Calif.

Micromosaic Optics

Bausch & Lomb, Rochester, N.Y.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Plessey Elctrns. Corp., Farmingdale, N.Y.

Microphone Calibrators—See Calibrators, Microphone—Vol 1

Microphones, Aircraft Type—See Vol 1

Mircrophones, Carbon—See Vol 1

Microphones, Cardioid—See Vol 1

Microphones, Ceramic—See Vol 1

Microphones, Condenser—See Vol 1

Microphones, Contact—See Vol 1

Microphones, Crystal—See Vol 1

Microphones, Differential—See Vol 1

Microphones, Dynamic—See Vol 1

Microphones, Handsets, Headsets—See Headsets—Vol 1

Microphones, Hearing Aid—See Vol 1

Microphones, Interferometer

Microphones, Lapel—See Vol 1

Microphones, Lavalier—See Vol 1

Microphones, LIP—See Vol 1

Microphones, Magnetic—See Vol 1

Microphones, Noise-Cancelling—See Vol 1

Microphones, Pressure—See Vol 1

Microphones, Ribbon—See Vol 1

Microphones, Sound-Powered—See Vol 1

Microphones, Throat—See Vol 1

Microphones, Transistorized—See Vol 1

Microphones, Velocity—See Vol 1

Microphones, Wireless—See Vol 1

Microscopes-Also See Stereoscopes

Jonard Inds. Corp., Bronx, N.Y.
American Optical Corp., Buffalo, N Y
Bausch & Lomb, Rochester, N.Y.
Bycoski, Casmir T., Inc., Hartford, Conn.
Central Scientific Co., Chicago, Ill.
Corkpak Co., Inc., New Rochelle, N.Y.
DoAll Co., Des Plaines, Ill.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
Ehrenreich Photo-Optical Industries Inc., Garden City, N.Y.
Ercona Corp., Bellmore, N.Y.
Gaertner Scientific Corp., Chicago, Ill.
Hacker Instrs., Inc., W. Caldwell, N.J.
Heitz, Karl, Inc., New York, N.Y.
Lenox Instr. Co., Philadelphia, Pa.
Olympus Corp. America, New Hyde Park, N.Y.
Optical Inds., Santa Ana, Cal.
Pacific Transducer Corp., Los Angeles, Calif.
Photo Tech. Prods., Garden City, N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Tempress Inds., Inc., Los Gatos, Calif.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Unitron Instr. Co., Newton Highlands, Mass.
VWR Scientific, San Francisco, Cal.
Zeiss, Carl, Inc., New York, N.Y.

Microscopes, Electron

Bell & Howell Co., Pasadena, Calif.
Kentrox Inds., Inc., Portland, Ore.
Materials Resch. Corp., Orangeburg, N.Y.
Philips Elctrn. Instrs., Mt. Vernon, N.Y.
Siemens Corp., Measuring Instrs. Div., Iselin, N.J.
Ultek Div., Palo Alto, Calif.
Zeiss, Carl, Inc., New York, N.Y.

Microscopes, Infrared

Dynarad, Inc., Norwood, Mass. .... p 439
Barnes Engrg. Co., Stamford, Conn.
Research Devices, Elizabeth, N.J.

Microscopes, Laser

Ercona Corp., Bellmore, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hacker Instrs., Inc., W. Caldwell, N.J.

Microscopes, Measuring-Also See Machines, Measuring

CELCO, Mahwah, N.J.
DoAll Co., Des Plaines, Ill.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
Ehrenreich Photo-Optical Industries Inc., Garden City, N.Y.
Femco Div., Irwin, Pa.
Gaertner Scientific Corp., Chicago, Ill.
Hacker Instrs., Inc., W. Caldwell, N.J.
Infrared Inds., Inc., Santa Barbara, Cal.
Lenox Instr. Co., Philadelphia, Pa.
Olympus Corp. America, New Hyde Park, N.Y.
Opto-Metric Tools, Rockleigh, N.J.
Photo Tech. Prods., Garden City, N.Y.
Rank Precision Inds., W. Nyack, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Unitron Instr. Co., Newton Highlands, Mass.
Zeiss, Carl, Inc., New York, N.Y.

Microscopes, Ultraviolet

American Optical Corp., Buffalo, N Y
American Ultraviolet Co., Chatham, N.J.
Bausch & Lomb, Rochester, N.Y.
Black Light Corp. Amer., San Gabriel, Cal.
Ercona Corp., Bellmore, N.Y.
Hacker Instrs., Inc., W. Caldwell, N.J.
Schoeffel Instr. Corp., Westwood, N.J.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
VWR Scientific, San Francisco, Cal.
Zeiss, Carl, Inc., New York, N.Y.

Microwave Equipment—See Specific Types of Components & Equipment (As Modified By Microwave)—Vol 1

Microwave Line Stretchers

Alford Mfg. Co., Winchester, Mass.
Hewlett-Packard, Palo Alto, Cal.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Aircom, Inc., Union, N.H.
Coax Devices Inc., Chelsea, Mass.
Ferranti Ltd., Hollinwood, Lancs., England
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Maury Microwave Corp., Cucamonga, Calif.
Meca Elctrns., Inc., Denville, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Premier Microwave, Port Chester, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Vectronics Microwave Corp., Middlesex, N.J.
Victor Microwave, Inc., Wakefield, Mass.

Mirrors, Prism

Jonard Inds. Corp., Bronx, N.Y.
Bache, Semon & Co., New York, N.Y.
Barnes Engrg. Co., Stamford, Conn.
Bausch & Lomb, Rochester, N.Y.
Buhl Optical Co., Pittsburgh, Pa.
Dell Optics Co., Inc., N. Bergen, N.J.
Denton Vacuum, Inc., Cherry Hill, N.J.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
Electro-Optical Div., Northampton, Mass.
Evaporated Coatings, Inc., Huntingdon Valley, Pa.
Exotic Materials, Inc., Costa Mesa, Cal.
Fairchild Space & Defense Sys., Syosset, N.Y.
FJW Inds., Inc., Mt. Prospect, Ill.
Gaertner Scientific Corp., Chicago, Ill.
Goerz Optical Co., Inc., Pittsburgh, Pa.
Harshaw Chem. Co., Cleveland, Ohio
Infrared Inds., Inc., Santa Barbara, Cal.
Itek Corp., Lexington, Mass.
Jones, A.D. Optical Works, Burlington, Mass.
Lasermetrics, Inc., Rochelle Park, N.J.
Lenox Instr. Co., Philadelphia, Pa.
Liberty Mirror Div., Brackenridge, Pa.
O & S Research, Inc., Riverton, N.J.
Optical Inds., Santa Ana, Cal.
Oriel Optics Corp., Stamford, Conn.
Pacific Universal Prods. Corp., Pasadena, Calif.
Republic Lens Co., Inc., Bronx, N.Y.
S & S Optical Co., Inc., Ft. Wayne, Ind.
Schoeffel Instr. Corp., Westwood, N.J.
Spectra-Physics, Inc., Mountain View, Calif.
Techni-Tool, Inc., Philadelphia, Pa.
Texas Instruments, Inc., Dallas, Tex.
Valpey Corp., Holliston, Mass.
Zenith Optical Lab., Dobbs Ferry, N.Y.
Zoomar, Inc., Glen Cove, N.Y.

Mismatches, Microwave, Precision

Alford Mfg. Co., Winchester, Mass. p 598
Hewlett-Packard, Palo Alto, Cal.
Weinschel Engrg. Co., Gaithersburg, Md. .... p 1571
Aircom, Inc., Union, N.H.
Astrolab Inc., Linden, N J
Cardwell Condenser, Lindenhurst, N.Y.
Coax Devices Inc., Chelsea, Mass.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Omega Labs., Inc., Rowley, Mass.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Struthers Elctrns. Corp., Mamaroneck, N.Y.

Mixer-Preamplifiers, Microwave

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y.
E & M Labs., Westlake Village, Cal. p 1557
General Elec. Co., Schenectady, N.Y.
Multitech Power Sys., Costa Mesa, Cal.
RHG Elctrns. Lab., Farmingdale, N.Y. p 1562
Sierra Sys., Mountain View, Cal.
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Anzac Elctrns., Waltham, Mass.
Applied Tech., Palo Alto, Cal.
Avantek, Inc., Santa Clara, Cal.
Elctrn. Resources Div., Los Angeles, Cal.
Guide Inds., Inc., Sun Valley, Calif.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Culver City, Cal.
Industrial Microwave, Scotch Plains, N.J.
Int'l. Microwave, Cos Cob, Conn.
Itek Corp., Lexington, Mass.
Kevlin Mfg. Co., Woburn, Mass.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
MITEQ, Inc., Hauppauge, N.Y.
Olektron Corp., Dudley, Mass.
OMNI Spectra, Farmington, Mich.
Omni-Spectra, Inc., Scottsdale, Ariz.
Philco-Ford Corp., Washington, D.C.
Radiation Sys., Inc., McLean, Va.
Rodelco, Deer Park, N.Y.
Spectra Sonics, Ogden, Utah
Varian Assocs., Palo Alto, Cal.

Western Microwave Labs., Los Gatos, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Mixers, Audio—See Vol 1

Mixers, For Epoxies—See Dispensers—Vol 1

Mixers, Microwave

Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa. ... p 1552
E & M Labs., Westlake Village, Cal. p 1557
Frequency Engrg. Labs., Farmingdale, N.J. ... p 605
General Elec. Co., Schenectady, N.Y.
Greenray Inds., Inc., Mechanicsburg, Pa.
Hewlett-Packard, Palo Alto, Cal.
Lorch Elctrns. Corp., Englewood, N.J. p 609
Microwave Cavity Labs., La Grange, Ill.
Polarad Elctrn. Instrs., Lake Success, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Vari-L Co., Inc., Denver, Colo. p 1568,1569
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Americon Corp., Waltham, Mass.
Anaren Microwave, Inc., Syracuse, N.Y.
Anzac Elctrns., Waltham, Mass.
Applied Tech., Palo Alto, Cal.
Astrolab Inc., Linden, N J
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Elcom Sys., Deer Pk., N.Y.
Engelmann Microwave, Montville, N.J.
ESCA, Jupiter, Fla.
General Radio Co., Concord, Mass.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Industrial Microwave, Scotch Plains, N.J.
Int'l. Microwave, Cos Cob, Conn.
Itek Corp., Lexington, Mass.
Kevlin Mfg. Co., Woburn, Mass.
Lieco, Inc., Lindenhurst, N.Y.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Micro-Now Instr., Chicago, Ill.
Microlab/FXR, Livingston, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Microwave Prods., Inc., Chatsworth, Cal.
Mullard, Inc., Farmingdale, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Olektron Corp., Dudley, Mass.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Omni-Spectra, Inc., Scottsdale, Ariz.
Philco-Ford Corp., Washington, D.C.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Raytheon Co., Waltham, Mass.
Rodelco, Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Scientific-Atlanta, Inc., Atlanta, Ga.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Varian, Beverly, Mass.
Vectronics Microwave Corp., Middlesex, N.J.
Victor Microwave, Inc., Wakefield, Mass.
Western Microwave Labs., Los Gatos, Cal.

Mixers, R-F

C-COR Elctrns., State College, Pa.
Frequency Engrg. Labs., Farmingdale, N.J.
Hewlett-Packard, Palo Alto, Cal.
Lorch Elctrns. Corp., Englewood, N.J. p 609
RHG Elctrns. Lab., Farmingdale, N.Y.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Sierra Sys., Mountain View, Cal.
Summit Engrg. Corp., Bozeman, Mont. p 1565
Vari-L Co., Inc., Denver, Colo. p 1568,1569
Weinschel Engrg. Co., Gaithersburg, Md.
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
AMBAC Inds., Garden City, N.Y.
Americon Corp., Waltham, Mass.
Anzac Elctrns., Waltham, Mass.
Comdel, Inc., Beverly, Mass.
Edison Elctrns. Div., Manchester, N.H.
Elcom Sys., Deer Pk., N.Y.
Engelmann Microwave, Montville, N.J.
Fairchild Semiconductor, Mountain View, Calif.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Industrial Microwave, Scotch Plains, N.J.
Kevlin Mfg. Co., Woburn, Mass.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Mini-Circuits Lab., Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Olektron Corp., Dudley, Mass.
Omni-Spectra, Inc., Scottsdale, Ariz.
Philco-Ford Corp., Washington, D.C.
Radiation Sys., Inc., McLean, Va.
Relcom, Mt. View, Calif.
Rodelco, Deer Park, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Vanguard Elctrns., Inglewood, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Mobile Equipment—See Receivers; Transmitters; etc. —Vol 1

Modems—See Modulator (Demodulators)—Vol 1

Modulation Indicators—See Indicators, Modulation—Vol 1

Modulation Transfer Analyzers—See Analyzers, Transfer Function—Vol 1

Modulator(Demodulators, Data—See Vol 1

Modulator(Demodulators, Laser—See Vol 1

Modulators, A-M—See Vol 1

Modulators, F-M—See Vol 1

Modulators, Light

Andersen Labs. Inc., Bloomfield, Conn.
Illumination Inds., Inc., Sunnyvale, Cal.p 1644
Philamon, Inc., Westbury, N.Y.
Crystal Optics Resch., Inc., Ann Arbor, Mich.
Crystal Technology, Mountain View, Cal
Datalight Inc., Bloomfield, Conn.
General Scanning, Watertown, Mass.
Harshaw Chem. Co., Cleveland, Ohio
Hughes Aircraft Co, Culver City, Cal.
Infrared Inds., Inc., Santa Barbara, Cal.
Isomet Corp., Oakland, N.J.
LAD Electro-Sys., Inc., Hicksville, N.Y.
Lasermetrics, Inc., Rochelle Park, N.J.
Metrological Data Corp., Garfield, N.J.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Pek, Inc., Sunnyvale, Calif.
Resalab Inc., Advanced Development Lab., Los Angeles, Cal.
Spectra-Physics, Inc., Mountain View, Calif.
Universal Resch. Labs., Elk Grove Village, Ill

Modulators, Magnetic

Airpax Elctrns., Inc., Cambridge, Md.
American Aerospace Controls, Farmingdale, N.Y.
Amp Inc., Elizabethtown, Pa.
General Magnetics, Bloomfield, N.J.
Transmagnetics Inc., Farmingdale, N.Y.
Bertan Assocs., Inc., Plainview, N.Y.
Computer Conversions Corp., East Northport, N.Y.
Hughes Aircraft Co, Culver City, Cal.
LAD Electro-Sys., Inc., Hicksville, N.Y.

Modulators, Microwave—See Vol 1

Modulators, Phase—See Vol 1

Modulators, Pulse—See Vol 1

Modulators, R-F—See Vol 1

Modulators, Telemetering—See Vol 1

Modulators, TV—See Vol 1

Modulators, Vibrating Capacitor—See Vol 1

Modules, Logic (Encapsulated)-Also See Cards; Circuits; Networks—See Vol 1

Moisture Indicators—See Indicators, Moisture—Vol 1

Monitors, Frequency—See Vol 1

Monitors, Humidity—See Indicators, Humidity—Vol 1

Monitors, Laser Energy—See Vol 1

Monitors, Line & Program—See Vol 1

Monitors, Modulation—See Vol 1

Monitors, Nuclear Radiation—See Vol 1

Monitors, Phase-Angle—See Vol 1

Monitors, Phase Sequence & Loss—See Vol 1

Monitors, Power, A-C & D-C—See Vol 1

Monitors, Power, A-F—See Vol 1

Monitors, Power, R-F—See Vol 1

Monitors, Pulse Code Modulation—See Vol 1

Monitors, Tape-Recorder—See Vol 1

Monitors, Temperature-Also See Controls, Temperature

A. D. Data Sys., Inc., Rochester, N.Y.
Airpax Elctrns., Inc., Cambridge, Md.
API Instrs. Co., Waltham,, Mass. .. p 402
Bendix Environmtl. Sci., Baltimore, Md.
Blue M Engrg. Co., Blue Island, Ill.
Control Technology Co., L.I.C., N.Y.
Cox & Co., Inc., New York, N.Y... p 1968
Dynarad, Inc., Norwood, Mass. .... p 439
Electronic Research Co., Shawnee Mission, Kans. ... p 458
Elmwood Sensors, Inc., Cranston, R.I.
Fenwal Elctrns., Inc., Framingham, Mass.
Harrel, Inc., E. Norwalk, Conn..... p 1973
Matrix Corp., Beech Grove, Ind. .. p 361
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Oven Inds., Mechanicsburg, Pa.
PPM, Inc., Bedford, Ohio ... p 535
Quindar Elctrns., Inc., Springfield, N.J.
RFL Inds., Thermocontrol Div., Boonton, N.J. ... p 1983
Rustrak Instr. Div., Manchester, N.H.
Simpson Elec. Co., Chicago, Ill.
Tektronix, Inc., Beaverton, Ore.
Weed Instr. Co., Elgin, Tex... p 1984
Weller, Easton, Pa.
A & M Instrument, Inc., Great Neck, N.Y.
Acromag, Inc., Wixom, Mich.
Addison Div., Mountainside, N.J.
Alnor Instr. Co., Chicago, Ill.
Amprobe Instr., Lynbrook, N.Y.
Amstro Corp., Fairfield, N.J.
Andonian Assocs., Inc., Waltham, Mass.
Atkins Technical, Inc., Gainesville, Fla.
Automatic Control Elctrns. Co., San Antonio, Tex.
Bailey Instrs., Inc., Saddle Brook, N.J.
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Brady, W.H. Co., Milwaukee, Wisc.
Burling Instr. Co., Chatham, N.J.
Chatham Controls Corp., Chatham, N.J.
Climatronics Corp., Hauppauge, N.Y.
Controlotron Corp., Farmingdale, N.Y.
Dales, Franklin Co., Akron, Ohio
Davidson Elctrn. Dev. Co., Erie, Pa.
Delta Design, La Mesa, Cal
Delta-Tronics Corp., Tempe, Ariz.
Doric Sci. Corp., San Diego, Calif.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Electro-Flex Heat, Inc., Bloomfield, Conn.
Elctrn. Control Sys., Fairmont, W. Va.
Electronic Design Labs., Inc., Phila., Pa.
Elctrn. Modules Corp., Timonium, Md.
Elctrns., Ltd., Marion, Iowa
Elgin Elctrns., Waterford, Pa.
Esterline Angus Div., Indianapolis, Ind.
Fenwal, Inc., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., Cambridge, Mass.
Hafstrom Tech. Prods., Inc., San Diego, Calif.
Halmar Elctrns., Inc., Columbus, Ohio
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Instrulab, Inc., Dayton, Ohio
Instr. & Control Sys., Inc., Addison, Ill.
Instruments, Inc., San Diego, Calif.
Jersey Tech. Consits., Morristown, N.J.
K West, Westminster, Calif.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Leeds & Northrup Corp., No. Wales, Pa.
Lewis Engrg. Co., Naugatuck, Conn.
Mack Elec. Devices, Wyncote, Pa.
Mag-Con Engrg. Co., St. Paul, Minn.
Microwave Magnetics Inc., Danvers, Mass.
Neill Engrg. Co., Akron, Ohio
Norwalk Thermostat Co., Norwalk, Ohio
Power Control Corp., Pittsburgh, Pa.
Princeton Applied Resch. Corp., Princeton, N.J.
Projects Unlimited, Inc., Dayton, Ohio
Pyrometer Instr. Co., Inc., Northvale, N J
Ramsay Engrg. Co., Anaheim, Calif.
RDF Corp., Hudson, N.H.
Relco Prods., Denver, Colo.
Rochester Instr. Sys., Rochester, N.Y.
Rosemount Plug-In, Inc., Nashville, Tenn.
Scam Instr. Corp., Skokie, Ill.
Schneider Instr. Co., Cincinnati, Ohio
Sigma Instrs., Inc., Braintree, Mass.
Sloan Technology Corp., Santa Barbara, Calif.
Struthers-Dunn, Inc., Bettendorf, Iowa
Syscon Int'l., Inc., So. Bend, Ind.

Technology/Versatronics, Yellow Springs, Ohio
Tempil Div., So. Plainfield, N.J.
Thermal Sys., Los Angeles, Cal.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
Trans-Met Engrg., La Habra, Cal.
Transducer Controls Corp., Covina, Calif.
Victory Engrg. Corp., Springfield, N.J.
Vidar Corp., Mountain View, Cal.
VirTis Co., Inc., Gardiner, N.Y.
Vulcan Elec. ITT, Danvers, Mass.
Waters Instrs., Inc., Rochester, Minn
West Coast Resch. Corp., Los Angeles, Calif.
West Instr. Div., Schiller Pk., Ill.
Westronics, Inc., Ft. Worth, Tex.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Monitors, Video—See Vol 1

Monitors, Voltage—See Vol 1

Monitors, Waveform—See Oscilloscopes—Vol 1

Mos Circuits—See Circuits, Integrated, Metal Oxide Silicon

Motion Simulators—See Simulators, Motion—Vol 1

Motor & Generator Armatures, Rotors, Stators

Ametek/Lamb Elec., Kent, Ohio
Ashland Elec. Prods., L.I.C., N.Y.
EEMCO Div., Los Angeles, Cal.
Fabricast, Inc., So. El Monte, Cal. p 1592
General Elec. Co., Schenectady, N.Y.
Motronics Corp., Little Falls, N.Y.
Rotating Comps., Bay Shore, N.Y.
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
AMF Electrosystems Div., Vandalia, Ohio
Avionics, Inc., South Bend, Ind.
B & B Motor & Control, New York, NY
Barger Corp., Sunnyvale, Cal.
Bogue Elec. Mfg. Co., Paterson, N.J.
Carter Motor Co., Chicago, Ill.
Clifton Div., Clifton Hgts., Pa.
Continental Elec., Newark, N.J.
Dumore Co., Racine, Wisc.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Elctrn. Specialty, Thomaston, Conn.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
Inland Motor Corp. of Va., Radford, Va.
Jones Motrola Corp., Stamford, Conn.
Lear-Siegler, Inc., Santa Monica, Calif.
Mamco Corp., Racine, Wisc.
MSL Steel Co., Chicago, Ill.
Rae Motor Corp., McHenry, Ill.
Reliance Elec. Co., Cleveland, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Singer Co., Somerville, N.J.
Task Corp., Anaheim, Calif.
Teledyne Inet, Gardena, Cal.
Tempel Steel Co., Chicago, Ill.
Varo, Inc., Santa Barbara, Cal.
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Motor Electric Generator Sets —See Vol 1

Motor Speed Drives—See Controls, Motor Speed

Motor-Units, Multiple

EEMCO Div., Los Angeles, Cal. .. p 1591
HICO (Horizons Int'l.), Redwood City, Cal
Howard Inds., Racine, Wisc.
Yamashina Seiki Co., Ltd., Kyoto, Japan
Allis, Louis Co., Milwaukee, Wisc.
AMF Electrosystems Div., Vandalia, Ohio
B & B Motor & Control, New York, NY
Bogue Elec. Mfg. Co., Paterson, N.J.
Essex Engrg. Co., Inc., Essex, Conn.
General Dynamics, San Diego, Cal.
Hansen Mfg. Co., Princeton, Ind.
IMC Magnetics Corp., Westbury, N.Y.
Reliance Elec. Co., Cleveland, Ohio
Singer Co., Somerville, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Teledyne Inet, Gardena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.

Motors, A-C & D-C

Ametek/Lamb Elec., Kent, Ohio
Bodine Elec. Co., Chicago, Ill.
Bowmar Instr. Corp., Ft. Wayne, Ind.
EEMCO Div., Los Angeles, Cal.
General Elec. Co., Schenectady, N.Y.
General Time Corp., Torrington, Conn.
Globe Div. of TRW Inc., Dayton, Ohio
Haydon, A. W. Co., Waterbury, Conn.
HICO (Horizons Int'l.), Redwood City, Cal
Howard Inds., Racine, Wisc.
ITT Jennings, Indl Prods., San Jose, Cal
Magnedyne Inc., Carlsbad, Calif.
Motronics Corp., Little Falls, N.Y.
Rotating Comps., Bay Shore, N.Y.
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sawyer Inds., Arcadia, Cal.
Servo-Tek Prods. Co., Hawthorne, N.J.
Vernitron Corp., Deer Pk., N.Y.

Alliance Mfg. Co., Alliance, Ohio
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
AMF Electrosystems Div., Vandalia, Ohio
Aristo-Craft Distinctive Miniatures, New York, N.Y.
B & B Motor & Control, New York, NY
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Barger Corp., Sunnyvale, Cal.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bendix, Eatontown, N.J.
Bergen Labs., Inc., Paterson, N.J.
Bogue Elec. Mfg. Co., Paterson, N.J.
Brevel Prods. Corp., Carlstadt, N.J.
Carter Motor Co., Chicago, Ill.
Century Elec. Co., St. Louis, Mo.
Clifton Div., Clifton Hgts., Pa.
Continental Elec., Newark, N.J.
Cramer Div., Old Saybrook, Conn.
Doerr Electric Corp., Cedarburg, Wisc.
Dumore Co., Racine, Wisc.
Dynamic Air Engrg., Santa Ana, Calif.
EV/Game, Inc., Freeport, N.Y.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Elden Mfg. Corp., Chicago, Ill.
Electric Indicator Co., Inc., Wilton, Conn.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Elctrn. Specialty, Thomaston, Conn.
Fasco Inds., Inc., Rochester, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Fincor Div., York, Pa.
Hansen Mfg. Co., Princeton, Ind.
Haydon Switch & Instr., Waterbury, Conn.
Heller, G K, Corp., Las Vegas, Nev.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Hydro-Aire Div., Burbank, Calif.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
IMC Magnetics Corp., Westbury, N.Y.
Indiana Gen'l. Div., Oglesby, Ill.
Inland Motor Corp. of Va., Radford, Va.
Japanese Prods. Corp., New Rochelle, N.Y.
Jones Motrola Corp., Stamford, Conn.
Kato Engrg. Co., Mankato, Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Inc., Elyria, Ohio
Lincoln Elec. Co., Cleveland, Ohio
Mamco Corp., Racine, Wisc.
Minarik Elec. Co., Los Angeles, Cal.
Molon Motors & Coil, Rolling Meadows, Ill.
MPC Prods. Corp., Chicago, Ill.
Parametrics, Inc., Orange, Conn.
Pesco Prods., Bedford, Ohio
Pittman Corp., Sellersville,, Pa.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Rae Motor Corp., McHenry, Ill.
Rank Precision Inds., W. Nyack, N.Y.
Reliance Elec. Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Seco Elctrns. Corp., Hopkins, Minn.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Stock Drive Prods., New Hyde Pk., N.Y.
Task Corp., Anaheim, Calif.
Universal Elec. Co., Owosso, Mich.
Varo, Inc., Santa Barbara, Cal.
Welco Inds. Inc., Cincinnati, Ohio
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Motors, Brushless, D-C

Computer Devices of Calif., Santa Fe Springs, Cal.
Eastern Air Devices, Inc., Dover, N.H.
EEMCO Div., Los Angeles, Cal. p 1590,1591
General Elec. Co., Schenectady, N.Y. p 1595
Globe Div. of TRW Inc., Dayton, Ohio p 1604
HICO (Horizons Int'l.), Redwood City, Cal .... p 1616
Hurst Mfg. Corp., Princeton, Ind.
ITT Jennings, Indl Prods., San Jose, Cal .... p 1618
Magnetic Technology, Canoga Pk., Cal.
Motronics Corp., Little Falls, N.Y. p 1624
Precision Timer, Westbrook, Conn.
Rotating Comps., Bay Shore, N.Y. p 1627
Vernitron, Torrance, Cal.
Aeroflex Labs., Plainview, N.Y.
Alliance Mfg. Co., Alliance, Ohio
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
Barger Corp., Sunnyvale, Cal.
Bogue Elec. Mfg. Co., Paterson, N.J.
Brevel Prods. Corp., Carlstadt, N.J.
Clifton Div., Clifton Hgts., Pa.
Delta Elctrn. Control, Costa Mesa, Cal.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Electro-Pacific, Inc., Goleta, Calif.
Elctrn. Specialty, Thomaston, Conn.
Fasco Inds., Inc., Rochester, N.Y.
Haydon Switch & Instr., Waterbury, Conn.
Hydro-Aire Div., Burbank, Calif.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Inc., Elyria, Ohio
Mamco Corp., Racine, Wisc.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Robbins & Myers, Inc., Springfield, Ohio
Siemens Corp., Comps. Div., Iselin, N.J.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Sperry Marine Sys., Charlottesville, Va.
Universal Elec. Co., Owosso, Mich.
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.

Motors, Clock & Timing

Bodine Elec. Co., Chicago, Ill.
Dale Elctrns., Inc., Yankton, S.D. p 1584
Eagle-Signal Div., Davenport, Iowa
General Time Corp., Torrington, Conn. p 1321
Haydon, A. W. Co., Waterbury, Conn.
HICO (Horizons Int'l.), Redwood City, Cal
Hurst Mfg. Corp., Princeton, Ind. p 1608-1612,1615
Pennwood Numechron, Pittsburgh, Pa.
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan .... p 1630
Sealectro Corp., Mamaroneck, N.Y.
Conrac Corp., New York, N.Y.
Controls Co. of America, Schiller Park, Ill.
Cramer Div., Old Saybrook, Conn.
Gleason-Avery Co., Auburn, N.Y.
Hale Instrs., Inc., Houston, Tex.
Hansen Mfg. Co., Princeton, Ind.
Haydon Switch & Instr., Waterbury, Conn.
Int'l. Register, Chicago, Ill.
Molon Motors & Coil, Rolling Meadows, Ill.
Siemens Corp., Power Equip. Div., Iselin, N.J.

Motors, Control

Allen-Bradley Co., Milwaukee, Wisc.
Ashland Elec. Prods., L.I.C., N.Y. p 1578
Bodine Elec. Co., Chicago, Ill. .... p 1581
CML-Macarr, Inc., Edison, N.J.
Eastern Air Devices, Inc., Dover, N.H. p 1588
EEMCO Div., Los Angeles, Cal. .. p 1591
General Elec. Co., Schenectady, N.Y. p 1595
Globe Div. of TRW Inc., Dayton, Ohio p 1603
HICO (Horizons Int'l.), Redwood City, Cal .... p 1616
Magnedyne Inc., Carlsbad, Calif. p 1622
Rotating Comps., Bay Shore, N.Y. p 1627-1629
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan .... p 1630
Sawyer Inds., Arcadia, Cal. .... p 1631
Servo-Tek Prods. Co., Hawthorne, N.J. p 1632
Vernitron Corp., Deer Pk., N.Y.
Yamashina Seiki Co., Ltd., Kyoto, Japan p 1633
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
Arrow-Hart, Inc., Hartford, Conn.
B & B Motor & Control, New York, NY
Bendix, S. Montrose, Pa.
Bergen Labs., Inc., Paterson, N.J.
Bogue Elec. Mfg. Co., Paterson, N.J.
Carter Motor Co., Chicago, Ill.
Controls Co. of America, Schiller Park, Ill.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electro-Craft Corp, Hopkins, Minn
Fasco Inds., Inc., Rochester, N.Y.
Hale Instrs., Inc., Houston, Tex.
Haydon Switch & Instr., Waterbury, Conn.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
Indiana Gen'l. Div., Oglesby, Ill.
Inertial Motors Corp., Doylestown, Pa.
Inland Motor Corp. of Va., Radford, Va.
Integrated Controls, San Diego, Cal.
Japanese Prods. Corp., New Rochelle, N.Y.
Minarik Elec. Co., Los Angeles, Cal.
MPC Prods. Corp., Chicago, Ill.
Parametrics, Inc., Orange, Conn.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Rank Precision Inds., W. Nyack, N.Y.
Seco Elctrns. Corp., Hopkins, Minn.
Servotronics, Inc., Buffalo, N.Y.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Superior Elec., Bristol, Conn.
Tachtronic Instrs., Inc., New Ulm, Minn.
Teledyne Inet, Gardena, Cal.
Westinghouse Elec., Buffalo, N. Y.
Weston-Transicoil, Worcester, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Transducer Controls Corp., Covina, Calif.

Motors, Drag Cup

Eastern Air Devices, Inc., Dover, N.H.
EEMCO Div., Los Angeles, Cal.
HICO (Horizons Int'l.), Redwood City, Cal
Rotating Comps., Bay Shore, N.Y.
Vernitron Corp., Deer Pk., N.Y.
American Elctrns., Inc., Fullerton, Cal.
Bendix, S. Montrose, Pa.
Clifton Div., Clifton Hgts., Pa.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Harowe Servo Controls, W. Chester, Pa.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Tachtronic Instrs., Inc., New Ulm, Minn.

Weston-Transicoil, Worcester, Pa.

Motors, Fractional HP

Ametek/Lamb Elec., Kent, Ohio
Ashland Elec. Prods., L.I.C., N.Y.
Bodine Elec. Co., Chicago, Ill.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Dale Elctrns., Inc., Yankton, S.D.
Eastern Air Devices, Inc., Dover, N.H.
EEMCO Div., Los Angeles, Cal.
General Elec. Co., Schenectady, N.Y.
General Time Corp., Torrington, Conn.
Globe Div. of TRW Inc., Dayton, Ohio
Haydon, A. W. Co., Waterbury, Conn.
HICO (Horizons Int'l.), Redwood City, Cal
Howard Inds., Racine, Wisc.
ITT Jennings, Indl Prods., San Jose, Cal
Magnedyne Inc., Carlsbad, Calif.
McLean Engrg. Labs., Princeton Jctn., N.J.
Motronics Corp., Little Falls, N.Y.
Pennwood Numechron, Pittsburgh, Pa.
Rotating Comps., Bay Shore, N.Y.
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sawyer Inds., Arcadia, Cal.
Standard Pneumatic Motor Co., Whittier, Calif.
Vernitron Corp., Deer Pk., N.Y.
Yamashina Seiki Co., Ltd., Kyoto, Japan
Alliance Mfg. Co., Alliance, Ohio
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
AMF Electrosystems Div., Vandalia, Ohio
Aristo-Craft Distinctive Miniatures, New York, N.Y.
Avionics, Inc., South Bend, Ind.
B & B Motor & Control, New York, NY
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Beau Motor Div., N. Haven, Conn.
Bergen Labs., Inc., Paterson, N.J.
Bogue Elec. Mfg. Co., Paterson, N.J.
Brevel Prods. Corp., Carlstadt, N.J.
Carter Motor Co., Chicago, Ill.
Century Elec. Co., St. Louis, Mo.
Components Specialties, Inc., Freeport, N.Y.
Conrac Corp., New York, N.Y.
Cramer Div., Old Saybrook, Conn.
De Soto Elec. Prods., De Soto, Mo.
Doerr Electric Corp., Cedarburg, Wisc.
Dri-Clave Corp., Westbury, N.Y.
Dumore Co., Racine, Wisc.
Dynamic Air Engrg., Santa Ana, Calif.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electric Motors & Specialties, Garrett, Ind.
Elctrn. Specialty, Thomaston, Conn.
Fasco Inds., Inc., Rochester, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Fincor Div., York, Pa.
Gleason-Avery Co., Auburn, N.Y.
Hale Instrs., Inc., Houston, Tex.
Harowe Servo Controls, W. Chester, Pa.
Heller, G K, Corp., Las Vegas, Nev.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Hydro-Aire Div., Burbank, Calif.
IMC Magnetics Corp., Westbury, N.Y.
Indiana Gen'l. Div., Oglesby, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
Jones Motrola Corp., Stamford, Conn.
L & R Mfg. Co., Kearny, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Inc., Elyria, Ohio
Mamco Corp., Racine, Wisc.
Micro Switch, Freeport, Ill.
Molon Motors & Coil, Rolling Meadows, Ill.
Parametrics, Inc., Orange, Conn.
Pesco Prods., Bedford, Ohio
PIC Design Corp., Ridgefield,, Conn.
Pittman Corp., Sellersville,, Pa.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Rae Motor Corp., McHenry, Ill.
Reliance Elec. Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Sampson Elctrns. Prods. Div., Chicago, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Stock Drive Prods., New Hyde Pk., N.Y.
Superior Elec., Bristol, Conn.
Tachtronic Instrs., Inc., New Ulm, Minn.
Task Corp., Anaheim, Calif.
Universal Elec. Co., Owosso, Mich.
Uppco, Inc., Chicago, Ill.
Varo, Inc., Santa Barbara, Cal.
Welco Inds. Inc., Cincinnati, Ohio
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Zero-Max Co., Minneapolis, Minn.

Motors, Gearhead

Ametek/Lamb Elec., Kent, Ohio.. p 1573
Ashland Elec. Prods., L.I.C., N.Y.
Automation Dev., Culver City, Cal. p 1310
Bodine Elec. Co., Chicago, Ill. .... p 1581
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
Computer Devices of Calif., Santa Fe Springs, Cal.
Dale Elctrns., Inc., Yankton, S.D. p 1584
Dynamic Instr. Corp., Plainview, N.Y.
Eastern Air Devices, Inc., Dover, N.H. p 1588,1589
EEMCO Div., Los Angeles, Cal. .. p 1591
FAE Instr. Corp., Huntington Sta., N.Y. p 1587
General Elec. Co., Schenectady, N.Y. p 1595
Globe Div. of TRW Inc., Dayton, Ohio p 1598,1599,1601,1603,1606
Haydon, A. W. Co., Waterbury, Conn. p 1597
HICO (Horizons Int'l.), Redwood City, Cal
Howard Inds., Racine, Wisc. .... p 1617
Hurst Mfg. Corp., Princeton, Ind. p 1610-1612
Magnetic Technology, Canoga Pk., Cal. p 1635
Planet Instr., Ft. Wayne, Ind. p 1340,1626
Rotating Comps., Bay Shore, N.Y. p 1627
Sawyer Inds., Arcadia, Cal. .... p 1631
Servo-Tek Prods. Co., Hawthorne, N.J.
Vernitron, Torrance, Cal. .... p 1635
Vernitron Corp., Deer Pk., N.Y. .. p 1635
Yamashina Seiki Co., Ltd., Kyoto, Japan
Alliance Mfg. Co., Alliance, Ohio
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
Aubin, A.E. Co., Glastonbury, Conn.
B & B Motor & Control, New York, NY
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Beau Motor Div., N. Haven, Conn.
Bogue Elec. Mfg. Co., Paterson, N.J.
Brevel Prods. Corp., Carlstadt, N.J.
Carter Motor Co., Chicago, Ill.
Century Elec. Co., St. Louis, Mo.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Cramer Div., Old Saybrook, Conn.
Doerr Electric Corp., Cedarburg, Wisc.
Dumore Co., Racine, Wisc.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electro-Craft Corp, Hopkins, Minn
Elctrn. Specialty, Thomaston, Conn.
Essex Engrg. Co., Inc., Essex, Conn.
Geartronics Corp., N. Billerica, Mass.
Gleason-Avery Co., Auburn, N.Y.
Harowe Servo Controls, W. Chester, Pa.
Heller, G K, Corp., Las Vegas, Nev.
Holtzer-Cabot Corp., No. Attleboro, Mass.
IMC Magnetics Corp., Westbury, N.Y.
Indiana Gen'l. Div., Oglesby, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
Jones Motrola Corp., Stamford, Conn.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Inc., Elyria, Ohio
Mamco Corp., Racine, Wisc.
Meltronics Inc., Wantagh, N.Y.
Molon Motors & Coil, Rolling Meadows, Ill.
Motoresearch Mfg. Co., Racine, Wisc.
MPC Prods. Corp., Chicago, Ill.
Novatronics, Inc., Pompano Beach, Fla.
Pesco Prods., Bedford, Ohio
Rae Motor Corp., McHenry, Ill.
Rank Precision Inds., W. Nyack, N.Y.
Reliance Elec. Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Seco Elctrns. Corp., Hopkins, Minn.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Superior Elec., Bristol, Conn.
Tachtronic Instrs., Inc., New Ulm, Minn.
Task Corp., Anaheim, Calif.
Uppco, Inc., Chicago, Ill.
USM Corp., Wakefield, Mass.
Varo, Inc., Santa Barbara, Cal.
Western Gear Corp., Pasadena, Cal.
Weston-Transicoil, Worcester, Pa.

Motors, Gyro

EEMCO Div., Los Angeles, Cal.
HICO (Horizons Int'l.), Redwood City, Cal
Magnetic Technology, Canoga Pk., Cal. p 1635
Rotating Comps., Bay Shore, N.Y.
Vernitron, Torrance, Cal. .... p 1635
Vernitron Corp., Deer Pk., N.Y. .. p 1635
American Elctrns., Inc., Fullerton, Cal.
Avionics, Inc., South Bend, Ind.
Boehme, H.O., Inc., Plainview, N.Y.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Ferranti Ltd., Hollinwood, Lancs., England
Honeywell, Aerospace & Def., Minneapolis, Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Sanders Assocs., Inc., Manchester, N.H.
Singer-General Precision, Inc., Little Falls, N.J.
Weston-Transicoil, Worcester, Pa.
Wolfson, P.J. Co., New Rochelle, N.Y.

Motors, Hysteresis

Ashland Elec. Prods., L.I.C., N.Y. p 1574-1576
Bodine Elec. Co., Chicago, Ill. .... p 1581
Dale Elctrns., Inc., Yankton, S.D. p 1584
Eastern Air Devices, Inc., Dover, N.H. p 1588
EEMCO Div., Los Angeles, Cal. .. p 1591
General Time Corp., Torrington, Conn. p 1321
Globe Div. of TRW Inc., Dayton, Ohio p 1599-1602,1605
Haydon, A. W. Co., Waterbury, Conn. p 1597
Howard Inds., Racine, Wisc. .... p 1617
Hurst Mfg. Corp., Princeton, Ind. p 1608-1610,1612-1615
Magnetic Technology, Canoga Pk., Cal. p 1635
McLean Engrg. Labs., Princeton Jctn., N.J. .... p 1623
Motronics Corp., Little Falls, N.Y. p 1624
Pennwood Numechron, Pittsburgh, Pa.
Rotating Comps., Bay Shore, N.Y. p 1627-1629
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sawyer Inds., Arcadia, Cal. .... p 1631
Vernitron, Torrance, Cal. .... p 1635
Vernitron Corp., Deer Pk., N.Y. .. p 1635
Yamashina Seiki Co., Ltd., Kyoto, Japan p 1633
American Elctrns., Inc., Fullerton, Cal.
B & B Motor & Control, New York, NY
Barger Corp., Sunnyvale, Cal.
Beau Motor Div., N. Haven, Conn.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Conrac Corp., New York, N.Y.
Control Data Corp., Minneapolis, Minn.
Cramer Div., Old Saybrook, Conn.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Elctrn. Specialty, Thomaston, Conn.
Hale Instrs., Inc., Houston, Tex.
Hansen Mfg. Co., Princeton, Ind.
Harowe Servo Controls, W. Chester, Pa.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Hydro-Aire Div., Burbank, Calif.
IMC Magnetics Corp., Westbury, N.Y.
Indiana Gen'l. Div., Oglesby, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Stock Drive Prods., New Hyde Pk., N.Y.
Tachtronic Instrs., Inc., New Ulm, Minn.
Task Corp., Anaheim, Calif.
UMC Electronics Co., North Haven, Conn.
Western Gear Corp., Pasadena, Cal.
Weston-Transicoil, Worcester, Pa.

Motors, Incremental, Stepping —See Motors, Stepping

Motors, Induction

Ametek/Lamb Elec., Kent, Ohio
Ashland Elec. Prods., L.I.C., N.Y.
Bodine Elec. Co., Chicago, Ill.
Eastern Air Devices, Inc., Dover, N.H. p 1588,1589
EEMCO Div., Los Angeles, Cal. .. p 1591
General Elec. Co., Schenectady, N.Y. p 1595
General Time Corp., Torrington, Conn.
Globe Div. of TRW Inc., Dayton, Ohio p 1600-1602
Howard Inds., Racine, Wisc. .... p 1617
ITT Jennings, Indl Prods., San Jose, Cal .... p 1618
Magnedyne Inc., Carlsbad, Calif. p 1622
McLean Engrg. Labs., Princeton Jctn., N.J. .... p 1623
Motronics Corp., Little Falls, N.Y. p 1624
Rotating Comps., Bay Shore, N.Y. p 1627-1629
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sawyer Inds., Arcadia, Cal. .... p 1631
Vernitron Corp., Deer Pk., N.Y.
Yamashina Seiki Co., Ltd., Kyoto, Japan p 1633
Alliance Mfg. Co., Alliance, Ohio
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
American Elctrns., Inc., Fullerton, Cal.
Aristo-Craft Distinctive Miniatures, New York, N.Y.
B & B Motor & Control, New York, NY
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Bogue Elec. Mfg. Co., Paterson, N.J.
Brevel Prods. Corp., Carlstadt, N.J.
Carter Motor Co., Chicago, Ill.
Century Elec. Co., St. Louis, Mo.
Clifton Div., Clifton Hgts., Pa.
Conrac Corp., New York, N.Y.
Continental Elec., Newark, N.J.
De Soto Elec. Prods., De Soto, Mo.
Doerr Electric Corp., Cedarburg, Wisc.
Dynamic Air Engrg., Santa Ana, Calif.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Electric Motors & Specialties, Garrett, Ind.
Fasco Inds., Inc., Rochester, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Haydon Switch & Instr., Waterbury, Conn.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
IMC Magnetics Corp., Westbury, N.Y.
Indiana Gen'l. Div., Oglesby, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
Jerome Elec. Corp., Orange, N.J.
Kato Engrg. Co., Mankato, Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Inc., Elyria, Ohio
Lincoln Elec. Co., Cleveland, Ohio
Mamco Corp., Racine, Wisc.
Molon Motors & Coil, Rolling Meadows, Ill.
Pesco Prods., Bedford, Ohio
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Reliance Elec. Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skinner Polynoid Div., New Britain, Conn.
Skurka Engrg. Co., Los Angeles, Calif.
Tachtronic Instrs., Inc., New Ulm, Minn.

Motors, Induction (cont'd)

Task Corp., Anaheim, Calif.
Universal Elec. Co., Owosso, Mich.
Uppco, Inc., Chicago, Ill.
Varo, Inc., Santa Barbara, Cal.
Welco Inds. Inc., Cincinnati, Ohio
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.

Motors, Miniature—See Motors, Fractional Hp

Motors, Permanent Magnet

Ametek/Lamb Elec., Kent, Ohio.. p 1573
Bowmar Instr. Corp., Ft. Wayne, Ind.
EEMCO Div., Los Angeles, Cal. .. p 1591
General Elec. Co., Schenectady, N.Y. p 1595
General Time Corp., Torrington, Conn.
Globe Div. of TRW Inc., Dayton, Ohio p 1598,1599,1604
Haydon, A. W. Co., Waterbury, Conn. p 1597
HICO (Horizons Int'l.), Redwood City, Cal
ITT Jennings, Indl Prods., San Jose, Cal
Magnedyne Inc., Carlsbad, Calif. p 1622
Magnetic Technology, Canoga Pk., Cal.
McLean Engrg. Labs., Princeton Jctn., N.J.
Motronics Corp., Little Falls, N.Y. p 1624
Precision Timer, Westbrook, Conn.
Rotating Comps., Bay Shore, N.Y.
Sawyer Inds., Arcadia, Cal. .... p 1631
Servo-Tek Prods. Co., Hawthorne, N.J.
Vernitron Corp., Deer Pk., N.Y.

AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
Aristo-Craft Distinctive Miniatures, New York, N.Y.
B & B Motor & Control, New York, NY
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Barger Corp., Sunnyvale, Cal.
Bergen Labs., Inc., Paterson, N.J.
Bogue Elec. Mfg. Co., Paterson, N.J.
Brevel Prods. Corp., Carlstadt, N.J.
Carter Motor Co., Chicago, Ill.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Controls Co. of America, Schiller Park, Ill.
Cramer Div., Old Saybrook, Conn.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electro-Craft Corp, Hopkins, Minn
Elctrn. Specialty, Thomaston, Conn.
Gettys Mfg. Co., Racine, Wisc.
Heller, G K, Corp., Las Vegas, Nev.
IMC Magnetics Corp., Maywood, Cal.
Indiana Gen'l. Div., Oglesby, Ill.
Inertial Motors Corp., Doylestown, Pa.
Inland Motor Corp. of Va., Radford, Va.
Japanese Prods. Corp., New Rochelle, N.Y.
Jones Motrola Corp., Stamford, Conn.
Minarik Elec. Co., Los Angeles, Cal.
Molon Motors & Coil, Rolling Meadows, Ill.
Parametrics, Inc., Orange, Conn.
Pittman Corp., Sellersville,, Pa.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Rae Motor Corp., McHenry, Ill.
Reliance Elec. Co., Cleveland, Ohio
Servo Prods. Co., Altadena, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Stettner-Trush Inc., Cazenovia, N.Y.
Superior Elec., Bristol, Conn.
Varo, Inc., Santa Barbara, Cal.
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Motors, Selsyn—See Motors, Synchronous

Motors, Servo Electric

Ametek/Lamb Elec., Kent, Ohio.. p 1572
Bodine Elec. Co., Chicago, Ill. .... p 1581
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
Eastern Air Devices, Inc., Dover, N.H. p 1589
EEMCO Div., Los Angeles, Cal. .. p 1591
General Elec. Co., Schenectady, N.Y. p 1595
Globe Div. of TRW Inc., Dayton, Ohio
HICO (Horizons Int'l.), Redwood City, Cal
Howard Inds., Racine, Wisc.
Magnedyne Inc., Carlsbad, Calif. p 1622
Magnetic Technology, Canoga Pk., Cal. p 1634
Rotating Comps., Bay Shore, N.Y. p 1628
Sawyer Inds., Arcadia, Cal. .... p 1631
Servo-Tek Prods. Co., Hawthorne, N.J. p 1632
Vernitron, Torrance, Cal. .... p 1634
Vernitron Corp., Deer Pk., N.Y. .. p 1634
Yamashina Seiki Co., Ltd., Kyoto, Japan p 1633
American Elctrns., Inc., Fullerton, Cal.
AMF Electrosystems Div., Vandalia, Ohio
Avionics, Inc., South Bend, Ind.
B & B Motor & Control, New York, NY
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Barger Corp., Sunnyvale, Cal.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bendix, S. Montrose, Pa.
Bogue Elec. Mfg. Co., Paterson, N.J.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electro-Craft Corp, Hopkins, Minn
Elctrn. Specialty, Thomaston, Conn.
Esterline Angus Div., Indianapolis, Ind.
Harowe Servo Controls, W. Chester, Pa.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
IMC Magnetics Corp., Westbury, N.Y.
Inertial Motors Corp., Doylestown, Pa.
Japanese Prods. Corp., New Rochelle, N.Y.
Jones Motrola Corp., Stamford, Conn.
Kollsman Instr. Corp., Syosset, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Micro Switch, Freeport, Ill.
MPC Prods. Corp., Chicago, Ill.
Pittman Corp., Sellersville,, Pa.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Rank Precision Inds., W. Nyack, N.Y.
Reliance Elec. Co., Cleveland, Ohio
Sanders Assocs., Inc., Manchester, N.H.
Servo Prods. Co., Altadena, Cal.
Servotronics, Inc., Buffalo, N.Y.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Tachtronic Instrs., Inc., New Ulm, Minn.
Western Gear Corp., Pasadena, Cal.
Weston-Transicoil, Worcester, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Motors, Squirrel Cage

Ametek/Lamb Elec., Kent, Ohio
Bodine Elec. Co., Chicago, Ill.
Eastern Air Devices, Inc., Dover, N.H.
EEMCO Div., Los Angeles, Cal.
General Elec. Co., Schenectady, N.Y.
Howard Inds., Racine, Wisc.
Magnedyne Inc., Carlsbad, Calif.
Motronics Corp., Little Falls, N.Y.
Rotating Comps., Bay Shore, N.Y.
Vernitron Corp., Deer Pk., N.Y.
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
American Elctrns., Inc., Fullerton, Cal.
B & B Motor & Control, New York, NY
Bogue Elec. Mfg. Co., Paterson, N.J.
Brevel Prods. Corp., Carlstadt, N.J.
Century Elec. Co., St. Louis, Mo.
Continental Elec., Newark, N.J.
De Soto Elec. Prods., De Soto, Mo.
Doerr Electric Corp., Cedarburg, Wisc.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Elctrn. Specialty, Thomaston, Conn.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Inc., Elyria, Ohio
Lincoln Elec. Co., Cleveland, Ohio
Pesco Prods., Bedford, Ohio
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Reliance Elec. Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Task Corp., Anaheim, Calif.
Universal Elec. Co., Owosso, Mich.
Varo, Inc., Santa Barbara, Cal.
Welco Inds. Inc., Cincinnati, Ohio
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.

Motors, Stepping

Automation Dev., Culver City, Cal. p 1310
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
Computer Devices of Calif., Santa Fe Springs, Cal. .... p 1583
Computer Instrs., Hempstead, N.Y.
Eastern Air Devices, Inc., Dover, N.H.
EEMCO Div., Los Angeles, Cal.
General Elec. Co., Schenectady, N.Y.
Globe Div. of TRW Inc., Dayton, Ohio
Haydon, A. W. Co., Waterbury, Conn. p 1597
Heinemann Elec. Co., Trenton, N.J. p 1919
HICO (Horizons Int'l.), Redwood City, Cal
Icon Corp., Cambridge, Mass. .... p 1333
Ledex, Inc., Dayton, Ohio .... p 1619
Magnetic Technology, Canoga Pk., Cal. p 1635
Motronics Corp., Little Falls, N.Y. p 1624
Summit Engrg. Corp., Bozeman, Mont.
Vernitron, Torrance, Cal. .... p 1635
Vernitron Corp., Deer Pk., N.Y. .. p 1635
Abrams Instr., Lansing, Mich.
Aeroflex Labs., Plainview, N.Y.
American Elctrns., Inc., Fullerton, Cal.
B & B Motor & Control, New York, NY
Bergen Labs., Inc., Paterson, N.J.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Doerr Electric Corp., Cedarburg, Wisc.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Ferranti Ltd., Hollinwood, Lancs., England
Gap Instr. Corp., Hauppauge, N.Y.
Harowe Servo Controls, W. Chester, Pa.
IMC Magnetics Corp., Maywood, Cal.
Japanese Prods. Corp., New Rochelle, N.Y.
Kollsman Instr. Corp., Syosset, N.Y.
Micro Switch, Freeport, Ill.
MPC Prods. Corp., Chicago, Ill.
Novatronics, Inc., Pompano Beach, Fla.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Sigma Instrs., Inc., Braintree, Mass.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Superior Elec., Bristol, Conn.
USM Corp., Wakefield, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.

Motors, Synchronous

Ashland Elec. Prods., L.I.C., N.Y. p 1574-1577
Bodine Elec. Co., Chicago, Ill. .... p 1581
Computer Devices of Calif., Santa Fe Springs, Cal. .... p 1583
Dale Elctrns., Inc., Yankton, S.D. p 1584
Eastern Air Devices, Inc., Dover, N.H. p 1588
EEMCO Div., Los Angeles, Cal. .. p 1591
General Elec. Co., Schenectady, N.Y. p 1595
General Time Corp., Torrington, Conn. p 1321
Globe Div. of TRW Inc., Dayton, Ohio p 1599-1602,1605
Haydon, A. W. Co., Waterbury, Conn. p 1597
Howard Inds., Racine, Wisc. .... p 1617
Hurst Mfg. Corp., Princeton, Ind. p 1608-1615
ITT Jennings, Indl Prods., San Jose, Cal .... p 1618
Magnetic Technology, Canoga Pk., Cal. p 1635
McLean Engrg. Labs., Princeton Jctn., N.J. .... p 1623
Motronics Corp., Little Falls, N.Y. p 1624
Pennwood Numechron, Pittsburgh, Pa.
Precision Timer, Westbrook, Conn.
Rotating Comps., Bay Shore, N.Y. p 1627-1629
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sawyer Inds., Arcadia, Cal. .... p 1631
Vernitron, Torrance, Cal. .... p 1635
Vernitron Corp., Deer Pk., N.Y. .. p 1635
Yamashina Seiki Co., Ltd., Kyoto, Japan p 1633
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
American Elctrns., Inc., Fullerton, Cal.
B & B Motor & Control, New York, NY
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Beau Motor Div., N. Haven, Conn.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bendix, S. Montrose, Pa.
Bergen Labs., Inc., Paterson, N.J.
Bogue Elec. Mfg. Co., Paterson, N.J.
Clifton Div., Clifton Hgts., Pa.
Conrac Corp., New York, N.Y.
Control Data Corp., Minneapolis, Minn.
Controls Co. of America, Schiller Park, Ill.
Cramer Div., Old Saybrook, Conn.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Doerr Electric Corp., Cedarburg, Wisc.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Elctrn. Specialty, Thomaston, Conn.
Fasco Inds., Inc., Rochester, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Fincor Div., York, Pa.
Gleason-Avery Co., Auburn, N.Y.
Hale Instrs., Inc., Houston, Tex.
Hansen Mfg. Co., Princeton, Ind.
Harowe Servo Controls, W. Chester, Pa.
Haydon Switch & Instr., Waterbury, Conn.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Honeywell, Ft. Washington, Pa.
Ideal Elec. & Mfg. Co., Mansfield, Ohio
IMC Magnetics Corp., Westbury, N.Y.
Indiana Gen'l. Div., Oglesby, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
Kato Engrg. Co., Mankato, Minn.
Kollsman Instr. Corp., Syosset, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Molon Motors & Coil, Rolling Meadows, Ill.
MPC Prods. Corp., Chicago, Ill.
Novatronics, Inc., Pompano Beach, Fla.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Reliance Elec. Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Stock Drive Prods., New Hyde Pk., N.Y.
Superior Elec., Bristol, Conn.
Tachtronic Instrs., Inc., New Ulm, Minn.
Task Corp., Anaheim, Calif.
UMC Electronics Co., North Haven, Conn.
Universal Elec. Co., Owosso, Mich.
Uppco, Inc., Chicago, Ill.
USM Corp., Wakefield, Mass.
Western Gear Corp., Pasadena, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa

Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston-Transicoil, Worcester, Pa.

Motors, Synchronous, Polarized—See Motors, Snychronous

Motors, Timing—See Motors, Clock & Timing

Motors, Torque

Ametek/Lamb Elec., Kent, Ohio
Ashland Elec. Prods., L.I.C., N.Y. p 1578,1579
Bodine Elec. Co., Chicago, Ill. .... p 1581
Eastern Air Devices, Inc., Dover, N.H. p 1588
EEMCO Div., Los Angeles, Cal. .. p 1591
General Elec. Co., Schenectady, N.Y.
Globe Div. of TRW Inc., Dayton, Ohio p 1604,1605
HICO (Horizons Int'l.), Redwood City, Cal
Howard Inds., Racine, Wisc.
Magnedyne Inc., Carlsbad, Calif. p 1622
Magnetic Technology, Canoga Pk., Cal. p 1635
Motronics Corp., Little Falls, N.Y. p 1624
Rotating Comps., Bay Shore, N.Y. p 1627,1629
Sawyer Inds., Arcadia, Cal. .... p 1631
Vernitron, Torrance, Cal. .... p 1635
Vernitron Corp., Deer Pk., N.Y. .. p 1635
Yamashina Seiki Co., Ltd., Kyoto, Japan
Aeroflex Labs., Plainview, N.Y.
AMBAC Inds., Garden City, N.Y.
American Elctrns., Inc., Fullerton, Cal.
B & B Motor & Control, New York, NY
Beau Motor Div., N. Haven, Conn.
Bogue Elec. Mfg. Co., Paterson, N.J.
Carter Motor Co., Chicago, Ill.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Doerr Electric Corp., Cedarburg, Wisc.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electro-Craft Corp, Hopkins, Minn
Elctrn. Specialty, Thomaston, Conn.
Fasco Inds., Inc., Rochester, N.Y.
General Scanning, Watertown, Mass.
Glar-Ban Corp., Buffalo, N.Y.
Hobbs Mfg. Co., Worcester, Mass.
Holtzer-Cabot Corp., No. Attleboro, Mass.
IMC Magnetics Corp., Westbury, N.Y.
Indiana Gen'l. Div., Oglesby, Ill.
Inland Motor Corp. of Va., Radford, Va.
Japanese Prods. Corp., New Rochelle, N.Y.
Mechanics For Elctrns., Inc., Wilmington, Mass.
Molon Motors & Coil, Rolling Meadows, Ill.
O'Brien, D. G., Inc., Framingham, Mass.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Reliance Elec. Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Servotronics, Inc., Buffalo, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Stancil-Hoffman Corp., Hollywood, Calif.
Superior Elec., Bristol, Conn.
Task Corp., Anaheim, Calif.
UMC Electronics Co., North Haven, Conn.
Welco Inds. Inc., Cincinnati, Ohio
Western Gear Corp., Pasadena, Cal.
Weston-Transicoil, Worcester, Pa.
Wolfson, P.J. Co., New Rochelle, N.Y.

Motors, Universal, A-C Or D-C Operation

Ametek/Lamb Elec., Kent, Ohio
Bodine Elec. Co., Chicago, Ill.
General Elec. Co., Schenectady, N.Y.
Globe Div. of TRW Inc., Dayton, Ohio
Howard Inds., Racine, Wisc. .... p 1617
ITT Jennings, Indl Prods., San Jose, Cal .... p 1618
Motronics Corp., Little Falls, N.Y.
Sawyer Inds., Arcadia, Cal.
American Elctrns., Inc., Fullerton, Cal.
B & B Motor & Control, New York, NY
Bogue Elec. Mfg. Co., Paterson, N.J.
Carter Motor Co., Chicago, Ill.
Dri-Clave Corp., Westbury, N.Y.
Dumore Co., Racine, Wisc.
Dyna Technology Inc., Sioux City, Iowa
Dynamic Air Engrg., Santa Ana, Calif.
EV/Game, Inc., Freeport, N.Y.
Electric Indicator Co., Inc., Wilton, Conn.
Heller, G K, Corp., Las Vegas, Nev.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Jones Motrola Corp., Stamford, Conn.
Mamco Corp., Racine, Wisc.
Minarik Elec. Co., Los Angeles, Cal.
Parametrics, Inc., Orange, Conn.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Rae Motor Corp., McHenry, Ill.
Robbins & Myers, Inc., Springfield, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Power Equip. Div., Iselin, N.J.
Task Corp., Anaheim, Calif.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Motors, Vacuum

Ametek/Lamb Elec., Kent, Ohio.. p 2777
EEMCO Div., Los Angeles, Cal.
HICO (Horizons Int'l.), Redwood City, Cal
Mamco Corp., Racine, Wisc.
Porter, H.K. Co., Inc., Pittsburgh, Pa.
Singer Co., Somerville, N.J.
Superior Elec., Bristol, Conn.

Mounts, Antenna (Nonconsumer Applications)—See Vol 1

Mounts, CRT & Accessories

Beta Instr., Newton Upper Falls, Mass. p 337
CELCO, Mahwah, N.J. .... p 339
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Kentucky Elctrns., Owensboro, Ky.
Loranger Mfg. Corp., Warren, Pa.

Mounts, Crystal—See Vol 1

Mounts, Integrated Circuit—See Sockets, Integrated Circuit

Mounts, Klystron

Weinschel Engrg. Co., Gaithersburg, Md.
General Microwave Corp., Farmingdale, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Maury Microwave Corp., Cucamonga, Calif.
Narda Microwave Corp., Plainview, N.Y.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Rank Precision Inds., W. Nyack, N.Y.
Sage Labs. Inc., Natick, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
TRG Prods., E. Boston, Mass.

Mounts, Microwave

American Elctrn. Labs., Inc., Lansdale, Pa. .... p 1552
Hewlett-Packard, Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Aircom, Inc., Union, N.H.
Astrolab Inc., Linden, N J
CES Elctrns., Brooklyn, N.Y.
Decibel Prods., Inc., Dallas, Tex.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Gabriel Elctrns. Corp., Saco, Me.
General Microwave Corp., Farmingdale, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microflect Co., Salem, Ore.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Sage Labs. Inc., Natick, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Victor Microwave, Inc., Wakefield, Mass.

Mounts, Mobile Antenna—See Mounts, Antenna—Vol 1

Mounts, Motor

Barry Controls, Watertown, Mass.
Lord Mfg. Co., Erie, Pa.
Metropolitan Wire Goods, Wilkes-Barre, Pa.
Minisink Rubber Co., Inc., Unionville, N.Y.
Stock Drive Prods., New Hyde Pk., N.Y.

Mounts, Shock & Vibration—See Vol 3

Mounts, Tape Head—See Vol 1

Mounts, Thermistor

Hewlett-Packard, Palo Alto, Cal.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Astrolab Inc., Linden, N J
Coax Devices Inc., Chelsea, Mass.
Filmohm Div., Long Island City, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Oceanology, Inc., Cambridge, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
Maury Microwave Corp., Cucamonga, Calif.
Microlab/FXR, Livingston, N.J.
Narda Microwave Corp., Plainview, N.Y.
Omega Engrg., Inc., Stamford, Conn.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Veritron West, Inc., Chatsworth, Calif.

Mounts, Transistor—See Pads, Transistor Mounting

MSI Circuits—See Circuits, Medium Scale Integration

Multiplexers (Excluding Hi-Fi)—See Vol 1

Multipliers, Analog—See Vol 1

Multipliers, Crystal—See Vol 1

Multipliers, Diode—See Vol 1

Multipliers, Frequency—See Vol 1

Multipliers, Hall

American Aerospace Controls, Farmingdale, N.Y.
Bell, F.W., Inc., Columbus, Ohio.. p 1985
ISC Magnetics Div., Huntington, N.Y. p 1806
Ohio Semitronics, Columbus, Ohio
Scientific Columbus, Columbus, Ohio p 1987
Calvert Elctrns., Inc., New York, N.Y.
Hughes Aircraft Co, Culver City, Cal.

Multipliers, Magnetic

American Aerospace Controls, Farmingdale, N.Y.
General Magnetics, Bloomfield, N.J. p 1318
ISC Magnetics Div., Huntington, N.Y.
Light Elec. Corp., Rancocas, N.J.
Transmagnetics Inc., Farmingdale, N.Y.
Bendix, Rochester, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Magnetic Sys. & Instrs., Worcester, Mass.
Magnetics Sys. & Instrs., Worcester, Mass.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.

Multipliers, Meter—See Vol 1

Multipliers, Servo

Control Technology Co., L.I.C., N.Y.
General Magnetics, Bloomfield, N.J. p 1318
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y.
Transmagnetics Inc., Farmingdale, N.Y. p 1875
Analog General Corp., Oceanside, N.Y.
Gap Instr. Corp., Hauppauge, N.Y.
Glentek, Inc., Santa Monica, Calif.
Scientific-Atlanta, Inc., Atlanta, Ga.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Weston-Transicoil, Worcester, Pa.

Nameplates—See Vol 3

Needles—See Styli—Vol 1

Networks, Crossover—See Vol 1

Networks, Directional Antenna Phasing—See Vol 1

Networks, Ladder

Allen-Bradley Co., Milwaukee, Wisc. p 1535
Artronic Instr. Co., Silver Spring, Md.
Balco Capacitors, Orange, N.J. .. p 1296
Bowmar Instr. Corp., Ft. Wayne, Ind.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Caddock Elctrns., Riverside, Cal. p 2827
Cal-R, Inc., Cal. Resistor Div., Santa Monica, Cal. .... p 1537
Cal-R, Inc., Capacitor Div., Santa Monica, Cal. .... p 1537
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal. .... p 1537
Dale Elctrns., Inc., Columbus, Neb. p 1539
Data Delay Devices, Clifton, N.J.
DDC, Hicksville, N.Y.
Electro Sci. Inds., Portland, Ore.
Elctrn. Assocs., W. Long Branch, N.J. p 2381
Gamble, Charles T. Inds., Riverside, N.J. .... p 2852
General Resistance, Mt. Vernon, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
IRC Burlington Div. of TRW INC., Burlington, Iowa .... p 2888
Julie Research Lab., New York, N.Y.
Mepco, Inc., Morristown, N.J.
Precision Monolithics, Santa Clara, Cal.
RCL Elctrns., Inc., Irvington, N.J. p 2750
Sprague Elec. Co., No. Adams, Mass.
Tech Labs., Inc., Palisades Pk., N.J.
Tel Labs., Manchester, N.H.
TT Elctrns., Inc., Culver City, Cal.
Unisem, Philadelphia, Pa. .... p 1847
Alloys Unlimited, Inc., Encino, Calif.
American Comps., Inc., Conshohocken, Pa.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Components, Inc., Biddeford, Me.
Edison Elctrns. Div., Manchester, N.H.
Electra/Midland Corp., San Diego, Cal.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
EMC Technology Inc, Philadelphia, Pa.
General Lab. Assocs., Norwich, N.Y.
HEI, Inc., Chaska, Minn.
Hughes Aircraft Co, Fullerton, Cal.
HyComp Inc., Maynard, Mass.
Jordan Electric Co., Van Nuys, Calif.
Kelvin, Van Nuys, Cal.
Marstan Resistor, Orange, N.J.
Megadyne Inds., Inc., Rochester, N.Y.
Micro Networks, Worcester, Mass.
Pyrofilm Corp., Whippany, N.J.
Rho Engrg. Co., Los Angeles, Calif
Tanger Elctrns., Hawthorne, Cal.
Ultronix, Inc., Grand Junction, Colo.
Vanguard Elctrns., Inglewood, Cal.
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Networks, LC

Artronic Instr. Co., Silver Spring, Md.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y. p 1512
Cal-R, Inc., Cal. Resistor Div., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Columbia Components, Hempstead, N.Y.
Computer Devices, Commack, N.Y.
Data Delay Devices, Clifton, N.J.
ESC Elctrns. Corp., Palisades Pk., N.J. p 1513
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
JFD Elctrns./Sub. Riker-Maxson, Bklyn., N.Y.
Kappa Networks, Inc., Carteret, N.J. p 1520
Microtran Co., Valley Stream, N.Y.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Raytheon Co., Quincy, Mass.
RCL Elctrns., Inc., Irvington, N.J.
Southern Elctrns., Burbank, Cal. p 1548
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
TMC Systems (Ariz.), Tempe, Ariz. p 1430
TT Elctrns., Inc., Culver City, Cal.
Alloys Unlimited, Inc., Encino, Calif.
American Trans-Coil Corp., Richmond Hill, N.Y.
A.R.F. Products, Inc., Boulder, Colo.
Crystal Network Prods. Corp., Erie, Pa.
Electrocom Inds., So. Bend, Indiana
General Lab. Assocs., Norwich, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Maxwell Labs., Inc., San Diego, Calif.
"The Potter Co.", Inglewood, Calif
Rho Engrg. Co., Los Angeles, Calif
RtroN Corp., Skokie, Ill.
Spectrum Control, Inc., Fairview, Pa.
Technical Mat'l., Mamaroneck, N.Y.
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Networks, Matching—See Vol 1

Networks, Phase

Artronic Instr. Co., Silver Spring, Md.
Balco Capacitors, Orange, N.J. p 1296,2347
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Centralab, Elctrns., Milwaukee, Wisc.
Columbia Components, Hempstead, N.Y.
Computer Devices, Commack, N.Y.
Data Delay Devices, Clifton, N.J.
Dranetz Engrg. Labs., Plainfield, N.J.
Electro Cube, San Gabriel, Cal
Elctrn. Assocs., W. Long Branch, N.J. p 2381
Erie Technological Prods. (EEM), Erie, Pa.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hisonic, Inc., Olathe, Kans.
Ind'l. Test Equip., Port Washington, N.Y.
Kappa Networks, Inc., Carteret, N.J.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
PFC Mfg. Div., Great Neck, N.Y.
Torotel, Inc., Grandview, Mo.
TT Elctrns., Inc., Culver City, Cal.
Vari-L Co., Inc., Denver, Colo.
American Comps., Inc., Conshohocken, Pa.
Anzac Elctrns., Waltham, Mass.
A.R.F. Products, Inc., Boulder, Colo.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Edison Elctrns. Div., Manchester, N.H.
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Lab. Assocs., Norwich, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Kelvin, Van Nuys, Cal.
Loral Elctrn. Sys., Bronx, N.Y.
Marstan Resistor, Orange, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Olektron Corp., Dudley, Mass.
Polyphase Instr. Co., Bridgeport, Pa.
Randam Elctrns., Inc., Cincinnati, Ohio
Rantec Div., Calabasas, Calif.
Theta Instr. Corp., Fairfield, N.J.
Vanguard Elctrns., Inglewood, Cal.
Y.T. & T. Corp., Roslyn Hgts., N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Networks, Pulse Forming—See Vol 1

Networks, Rejection—See Filters

Networks, RC

Allen-Bradley Co., Milwaukee, Wisc. p 1535
AVX Aerovox Corp., New Bedford, Mass.
Balco Capacitors, Orange, N.J. p 1296,2347,2821
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Cal-R, Inc., Cal. Resistor Div., Santa Monica, Cal.
Cal-R, Inc., Capacitor Div., Santa Monica, Cal.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Centralab, Elctrns., Milwaukee, Wisc.
CTS Corp, Elkhart, Ind.
Del Elctrns. Corp., Mt. Vernon, N.Y.
Electro Cube, San Gabriel, Cal
Elctrn. Assocs., W. Long Branch, N.J. p 2381
Gamble, Charles T. Inds., Riverside, N.J. .... p 2852
General Resistance, Mt. Vernon, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Mepco, Inc., Morristown, N.J.
Midwec Corp., Scottsbluff, Neb.
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
PFC Mfg. Div., Great Neck, N.Y... p 2339
Presin Co., Inc., Shelton, Conn.
RCL Elctrns., Inc., Irvington, N.J. p 2750
Resistance Prods., Harrisburg, Pa.
Seacor, Inc., Norwood, N.J.
Shallco, Inc., Smithfield, N.C.
Southern Elctrns., Burbank, Cal. p 1548
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill. p 2475
Tel Labs., Manchester, N.H.
TMC Systems (Ariz.), Tempe, Ariz. p 1430
TT Elctrns., Inc., Culver City, Cal.
Altec, Anaheim, Calif.
American Comps., Inc., Conshohocken, Pa.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Custom Elctrns., Oneonta, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Electra/Midland Corp., San Diego, Cal.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
EMC Technology Inc, Philadelphia, Pa.
Forbes & Wagner, Inc., Silver Creek, N.Y.
General Lab. Assocs., Norwich, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Jordan Electric Co., Van Nuys, Calif.
Kelvin, Van Nuys, Cal.
Kidco, Inc., Medford, N.J.
Marstan Resistor, Orange, N.J.
Maxwell Labs., Inc., San Diego, Calif.
Megadyne Inds., Inc., Rochester, N.Y.
Polyphase Instr. Co., Bridgeport, Pa.
"The Potter Co.", Inglewood, Calif
Rho Engrg. Co., Los Angeles, Calif
RtroN Corp., Skokie, Ill.
Skottie Elctrns., Inc., Archbald, Pa.
Tanger Elctrns., Hawthorne, Cal.
Technical Mat'l., Mamaroneck, N.Y.
Ultronix, Inc., Grand Junction, Colo.
Vanguard Elctrns., Inglewood, Cal.
White Instrs., Inc., Austin, Tex.
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Networks, Resistance

Allen-Bradley Co., Milwaukee, Wisc. p 1535
Balco Capacitors, Orange, N.J. .. p 2821
Caddock Elctrns., Riverside, Cal. p 2827
Cal-R, Inc., Cal. Resistor Div., Santa Monica, Cal. ....p 1537,2831
Cal-R, Inc., Capacitor Div., Santa Monica, Cal. ....p 1537,2831
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal. ....p 1537,2831
Centralab, Elctrns., Milwaukee, Wisc.
Computer Devices, Commack, N.Y.
CTS Corp, Elkhart, Ind.................. p 2829
Dale Elctrns., Inc., Columbus, Neb. p 1539
Electro Cube, San Gabriel, Cal
Electro Sci. Inds., Portland, Ore.
General Resistance, Mt. Vernon, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
IRC Burlington Div. of TRW INC., Burlington, Iowa .... p 2888
Julie Research Lab., New York, N.Y. p 2853
Keystone Carbon Co., St. Marys, Pa.
Mepco, Inc., Morristown, N.J....... p 2864
Nytronics, Inc., Essex Elctrns. Div., Darlington, S.C.
Precision Monolithics, Santa Clara, Cal.
RCL Elctrns., Inc., Irvington, N.J.
Resistance Prods., Harrisburg, Pa.
Sage Elctrns., Rochester, N.Y.
Seacor, Inc., Norwood, N.J.
Shallco, Inc., Smithfield, N.C.
Shallcross, Selma, N.C.
Sprague Elec. Co., No. Adams, Mass.
Tech Labs., Inc., Palisades Pk., N.J.
Tel Labs., Manchester, N.H.
Vishay Resistor Prod. Div., Malvern, Pa. p 2899
Welwyn Int'l., Inc., Westlake, Ohio
Alloys Unlimited, Inc., Encino, Calif.
Altec, Anaheim, Calif.
American Comps., Inc., Conshohocken, Pa.
A.O.I.P., 75/Paris 12eme, France
Beckman Instrs., (AISSD), Fullerton, Cal.
Beckman Instrs., Helipot Div., Fullerton, Cal.
C-F Electronics, Inc., Van Nuys, Calif.
Components, Inc., Biddeford, Me.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
EMC Technology Inc, Philadelphia, Pa.
Filmohm Div., Long Island City, N.Y.
General Lab. Assocs., Norwich, N.Y.
General Oceanology, Inc., Cambridge, Mass.
HEI, Inc., Chaska, Minn.
Honeywell Information Systems, Goleta, Cal.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Jordan Electric Co., Van Nuys, Calif.
Kelvin, Van Nuys, Cal.
Lewis Engrg. Co., Naugatuck, Conn.
Marstan Resistor, Orange, N.J.
Megadyne Inds., Inc., Rochester, N.Y.
Micro Networks, Worcester, Mass.
Miller Electro-Resch. Labs., New Berlin, Wisc.
RFL Inds., Comms. Div., Boonton, N.J.
Rho Engrg. Co., Los Angeles, Calif
Tanger Elctrns., Hawthorne, Cal.
Transitron Elctrn. Corp., Wakefield, Mass.
Ultronix, Inc., Grand Junction, Colo.
Vytell Corp., Arlington Hgts., Ill.
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Neutron Detection Tubes—See Tubes, Radiation Detection

Noise Analyzers—See Analyzers, Noise—Vol 1

Nuclear Equipment—See Specific Types

Nuclear Radiation Shielding—See Shields, Nuclear Radiation—Vol 1

Null Detectors—See Indicators, Null—Vol 1

Numeric Readouts—See Readouts-Also See Tubes, Readout

Nuts, Metal—See Fasteners, Metal—Vol 3

Nuts, Plastic—See Fasteners, Plastic—Vol 3

O-Rings—See Seals, Oil—Vol 3

Oceanographic Equip. (Electronic)—See Vol 1

Oils—See Lubricants—Vol 3

Open-Short Locators—See Locators, Open-Short—Vol 1

Optical Coded Discs—See Coded Discs, Optical—Vol 1

Optical Comparators—See Comparators, Optical

Optical Image Expanders

Bausch & Lomb, Rochester, N.Y.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dyonics, Inc., Woburn, Mass.
Ealing Corp., Cambridge, Mass.
Electro-Optical Systems, Pasadena, Cal.
Fiber Photics, Inc., Santa Cruz, Cal.
Goodyear Aerospace Corp., Akron, Ohio
Hughes Aircraft Co, Culver City, Cal.
Infrared Inds., Inc., Santa Barbara, Cal.
Laser Technology, Inc., N. Hollywood, Calif.
Lenox Instr. Co., Philadelphia, Pa.
Olympus Corp. America, New Hyde Park, N.Y.
Optical Inds., Santa Ana, Cal.
Physitech, Inc., Willow Grove, Pa.
Westinghouse Elec., Elmira, N.Y.

Optics, Fiber—See Fiber Optic Bundles; Fiber Optic Inspection Equip.

Optics, Micromosaic—See Micromosaic Optics

Oscillators, Adjustable—See Oscillators (As Modified)

Oscillators, Audio—See Vol 1

Oscillators, Beat Frequency (BFO)—See Vol 1

Oscillators, Bias—See Vol 1

Oscillators, Bridge—See Vol 1

Oscillators, Cavity—See Vol 1

Oscillators, Crystal-Controlled—See Vol 1

Oscillators, Decade—See Vol 1

Oscillators, Grid Dip—See Meters, Grid-Dip

Oscillatos, Kystron—See Tubes, Klystron

Oscillators, Magnetron—See Tubes, Magnetron

Oscillators, Microwave

American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal.. p 307
Applied Microwave Lab., Andover, Mass. .... p 599
Arra Inc., Bayshore, N.Y. .... p 1553
E-H Resch. Labs., Inc., Oakland, Cal.
Electro/Data, Inc., Garland, Tex.
Frequency Engrg. Labs., Farmingdale, N.J. .... p 604
Frequency Sources, No. Chelmsford, Mass. ....p 1560,1561
General Elec. Co., Schenectady, N.Y.

Greenray Inds., Inc., Mechanicsburg, Pa. .... p 607
Hewlett-Packard, Palo Alto, Cal.
Marconi Instrs., Englewood, N.J... p 520
Microdot Inc., City of Industry, Cal.
Microwave Cavity Labs., La Grange, Ill. p 610,611
Nippon Electric/NEC America, N.Y., N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
RHG Elctrns. Lab., Farmingdale, N.Y.
Singer Instrumentation Palo Alto Oper., Palo Alto, Cal.
Texscan Corp., Indianapolis, Ind.
Watkins Johnson Co., Palo Alto, Cal.
Weinschel Engrg. Co., Gaithersburg, Md.
Addington Labs., Inc., Santa Clara, Calif.
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Aircom, Inc., Union, N.H.
AMBAC Inds., Garden City, N.Y.
Anritsu Electric Co., Ltd., Tokyo, Japan
Applied Tech., Palo Alto, Cal.
Astrolab Inc., Linden, N J
AUL Instrs., Inc., Flushng, N.Y.
Avantek, Inc., Santa Clara, Cal.
Collins Radio Co., Dallas, Tex.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
EMF Systems, Inc., State College, Pa.
Engineering Assocs., Dayton, Ohio
FKS Comms., Inc., New Hyde Park, N.Y.
GAF Corp., New York, N.Y.
General Instr. Corp., Hicksville, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co., Torrance, Cal.
Int'l. Microwave, Cos Cob, Conn.
Itek Corp., Lexington, Mass.
ITT Electron Tube, Easton, Pa.
Litton Inds., San Carlos, Calif.
Maury Microwave Corp., Cucamonga, Calif.
Micro-Now Instr., Chicago, Ill.
Micro-Power, Inc., Long Island City, N.Y.
Micromega, Los Angeles, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
MITEQ, Inc., Hauppauge, N.Y.
Narda Microwave Corp., Plainview, N.Y.
OMNI Spectra, Farmington, Mich.
Omni-Spectra, Inc., Scottsdale, Ariz.
Parametric Inds., Inc., Winchester, Mass.
Philco-Ford Corp., Washington, D.C.
Physical Elctrn. Labs., Menlo Park, Calif.
PRD Elctrns., Inc., Westbury, N.Y.
Reeve Elctrns., Inc., Chicago, Ill.
RFD, Inc., Tampa, Fla.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Scientific-Atlanta, Inc., Atlanta, Ga.
Scientific Communications, Garland, Tex.
Siemens Corp., Comps. Div., Iselin, N.J.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.
Somerset Radiation Lab., Arlington, Va.
Special Microwave Devices Oper., Waltham, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Beverly, Mass.
Varian, Beverly, Mass.
Victor Microwave, Inc., Wakefield, Mass.
Wand Elctrns., Inc., Old Bethpage, N.Y.
Wiltron Co., Palo Alto, Calif.
Zeta Labs., Inc., Mountain View, Calif.

Oscillators, Power—See Vol 1

Oscillators, Pulse—See Vol 1

Oscillators, Reed—See Vol 1

Oscillators, R-F—See Vol 1

Oscillators, Sinusoidal—See Vol 1

Oscillators, Square-Wave—See Vol 1

Oscillators, Sweep—See Vol 1

Oscillators, Telemetry—See Vol 1

Oscillators, Temperature Compensated—See Vol 1

Oscillators, Test—See Vol 1

Oscillators, Tuning-Fork Controlled—See Vol 1

Oscillators, UHF, VHF—See Vol 1

Oscillators, Ultra-Low-Frequency—See Vol 1

Oscillators, Ultrasonic—See Vol 1

Oscillators, Voltage Controlled—See Vol 1

Oscillographs, Direct Writing—See Vol 1

Oscillographs, Direct Writing, Multichannel—See Vol 1

Oscillographs, Portable—See Vol 1

Oscilloscope Amplifier Plug-Ins—See Vol 1

Oscilloscope Cameras—See Cameras, Oscilloscope

Oscilloscope Image Expanders

EdnaLite Corp., Peekskill, N.Y.

Oscilloscope Oscillator Plug-Ins—See Vol 1

Oscilloscope Preamplifier Plug-Ins—See Vol 1

Oscilloscope Probes—See Vol 1

Oscilloscope Time-Base Generator Plug-Ins—See Vol 1

Oscilloscopes, Digital Readout—See Vol 1

Oscilloscopes, General Purpose—See Vol 1

Oscilloscopes, High Frequency—See Vol 1

Oscilloscopes, Low Frequency—See Vol 1

Oscilloscopes, Medical—See Vol 1

Oscilloscopes, Multi-Beam—See Vol 1

Oscilloscopes, Multiple Channel—See Vol 1

Oscilloscopes, Portable, Battery Operated—See Vol 1

Oscilloscopes, Programmable—See Vol 1

Oscilloscopes, Projection—See Vol 1

Oscilloscopes, Sampling—See Vol 1

Oscilloscopes, Storage—See Vol 1

Oscilloscopes, Three-Dimensional—See Vol 1

Oscilloscopes, Wide-Band—See Vol 1

Ovens, Crystal & Component—See Vol 1

Ovens, Electric—See Furnaces, Electric—Vol 1

Ovens, Infrared Drying—See Vol 1

Ovens, Laboratory—See Vol 1

Ovens, Microwave—See Vol 1

Ovens, Particle Reduction—See Vol 1

Ovens, Vacuum—See Vol 1

Oxide, Aluminum—See Insulating Materials, Powdered Metal Oxide—Vol 3

Oxides, Magnetic—See Magnetic Iron Oxides—Vol 3

Oxygen Indicators—See Indicators, Oxygen / Ozone—Vol 1

Packages, Integrated Circuit

American Lava Corp., Chattanooga, Tenn.
Augat Inc., Attleboro, Mass. .... p 1536
CTS Corp, Elkhart, Ind.
Elctrn. Engrg. Co. Cal., Santa Ana, Cal.
General Elec. Co., Schenectady, N.Y.
Ind'l. Control Co., Farmingdale, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Sprague Elec. Co., No. Adams, Mass.
Teledyne Philbrick, Dedham, Mass.
Unisem, Philadelphia, Pa. .... p 1551
Vector Elctrn. Co., Inc., Sylmar, Cal.
Wagner Elec. Corp., Livingston, N.J.
Watkins Johnson Co., Palo Alto, Cal.
Adams & Assoc., Inc., Hollywood, Cal.
Algo, S. Hackensack, N.J.
Alloys Unlimited, Inc., Encino, Calif.
American Elec. Cable Co., Holyoke, Mass.
Bendix Corp., Sidney, N.Y.
Cambridge Thermionic, Cambridge, Mass
Coors Porcelain Co., Golden, Colo.
Ferranti Ltd., Hollinwood, Lancs., England
GTE Sylvania Inc., Warren, Pa.
IFE Div, E Providence, R.I.
Isotronics, Inc., New Bedford, Mass.
ITT Semiconductors, W. Palm Beach, Fla.
Lear Siegler, Inc., Santa Monica, Calif.
Micro Contacts Inc., Hicksville, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
National Beryllia Corp., Haskell, N.J.
Spec Plastics, No. Hollywood, Cal.
Stevens Prods., Inc., E. Orange, N.J.
Tekform Prods. Co., Anaheim, Cal.
Templet Ind., Inc., Plainview, N.Y.
Texas Instruments, Dallas, Tex.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Varadyne Packaging & Mat'ls., Santa Monica, Cal.
Veritron West, Inc., Chatsworth, Calif.

Packages, Semiconductor—See Cans, Semiconductor—Vol 3

Packaging, Cushioning—See Vol 1

Pads, L & T—See Attenuators—Vol 1

Pads, Transistor Mounting

American Lava Corp., Chattanooga, Tenn.
Barnes Corp., Lansdowne, Pa.
Bivar, Inc., Santa Ana, Cal. .... p 2809
Centralab, Elctrns., Milwaukee, Wisc.
Elctrn. Molding Corp., Woonsocket, R.I.
Sealectro Corp., Mamaroneck, N.Y. p 2709
Transcon Mfg. Co., Dallas, Tex. p 1844,1845
Vector Elctrn. Co., Inc., Sylmar, Cal.
AAVID Engrg., Inc., Laconia, N.H.
Abadak Inds., Inc., Farmingdale, N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Brush Beryllium Co., Cleveland, Ohio
Cinch-Monadnock, City of Industry, Cal.
Circuit Structures Lab., Burbank, Calif.
Connectron Corp., Van Nuys, Cal
D-Cemco, Inc., Burbank, Calif.
Delbert Blinn. Co., Pomona, Calif.
Dynaloy, Inc., Hanover, N.J.
Eltee, Inc., W. Caldwell, N.J.
Epoxy Plastic Molders, Irvington, N J
Globe Plastics, Pomona, Cal.
Gudebrod Bros. Silk Co., Inc., New York, N.Y.
Hecht Rubber Corp., Jacksonville, Fla.
Int'l. Elctrn. Resch., Burbank, Cal.
National Beryllia Corp., Haskell, N.J.
RCA Solid State Div., Somerville, N.J.
Robison Elctrns., Gardena, Cal.
Spec Plastics, No. Hollywood, Cal.
Staver Co., Inc., Bay Shore, N.Y.
Tekna Prods. Co., Rochester, N.Y.
Thermalloy Co., Dallas, Tex.
Union Carbide, Carbon Prods. Div., New York, N.Y.

Paging Systems—See Comm. Systems, Selective Paging—Vol 1

Paints, Conductive, Electric—See Coatings, Conductive, Electric—Vol 3

Paints, Fluorescent—See Coatings, Fluorescent—Vol 3

Paints, Luminous—See Vol 3

Paints, Metallic—See Vol 3

Paints, Radioactive—See Coatings, Radioactive—Vol 3

Paints, Reflective—See Vol 3

Paints, Resistive Also See Inks For Thick-Film Microcircuits—See Vol 3

Panel Equipment—See Dials; Connectors; Jacks; Lights; etc.

Panel Marking Kits—See Kits, Marking (Dial, Instrument, Equipment, etc.)

Panels, Electroluminescent

Nippon Electric/NEC America, N.Y., N.Y.
Ackerman Engravers, Inc., Long Island City, N.Y.
Bodnar Prods. Corp., New Rochelle, N.Y.
Bunker-Ramo Corp., Westlake Village, Cal
Franklin Fibre-Lamitex, Wilmington, Del.
Glar-Ban Corp., Buffalo, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Hughes Aircraft Co, Malibu, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
N/P Co., Temple City, Calif.
Pall Corp., Glen Cove, N.Y.
Philco-Ford Corp., Washington, D.C.
Sierra Elec., Gardena, Calif.
Singer-General Precision, Inc., Little Falls, N.J.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
Stacoswitch, Inc., Costa Mesa, Cal.
Symbolic Displays, Inc., Orange, Calif.
TEC, Inc., Eden Prairie, Minn.
Voltarc Tubes, Fairfield, Conn.
Westinghouse Elec., Elmira, N.Y.

Panels, Fuse

ADC Prods., Minneapolis, Minn.
Connector Corp., Chicago, Ill. .... p 2613
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Accurate Elctrns. Corp., Elyria, Ohio
Anchor Specialty Mfg., Teterboro, N.J.
Carter Precision Elec. Co., Skokie, Ill.
Cole-Hersee Co., S. Boston, Mass.
Ercona Corp., Bellmore, N.Y.
Franklin Fibre-Lamitex, Wilmington, Del.
Golding Mfg. Co., N. Arlington, N.J.
Graphtex Inc., Lodi, NJ
Kolton Elec. Mfg. Co., Newark, N.J.
Littelfuse, Inc., Des Plaines, Ill.

Mechanical Engraving Co., Inc., Bronx, N.Y.
Mobil Elctrns., Inc., Anderson, Ind.
Singer - Tele-Signal, Woodbury, N.Y.
Underwriters Safety Device Co., Chicago, Ill.
Wadsworth Elec. Mfg. Co., Inc., Covington, Ky.

Panels, Jack—See Vol 3

Panels, Metal—See Cabinets & Accessories, Metal—Vol 3

Panels, Meter—See Cases, Equipment, Instrument, Meter—Vol 3

Panels, Patch—See Panels, Jack—Vol 3

Panels, Power Bus—See Vol 1

Panels, Relay Rack—See Vol 3

Panoramic Adapters—See Receivers, Panoramic—Vol 1

Paper Insulation—See Insulation Materials, Paper—Vol 3

Paper Shredders—See Vol 3

Paper, Graphic Recording—See Vol 1

Passive Reflectors—See Antenna Reflectors—Vol 1

Patch Boards—See Boards, Plug-In; Boards, Programming—Vol 3

Patch Cords—See Cords, Patch—Vol 3

Pedestals, Radar—See Vol 1

Perforators, Paper Tape (Electrically Powered)—See Vol 1

Perforators, Paper Tape (Manually Operated)—See Vol 1

Permeameters—See Meters, Permeameter—Vol 1

Phase & Voltage Analyzers—See Analyzers, Phase & Voltage—Vol 1

Phase Comparators—See Comparators, Phase—Vol 1

Phase Indicators—See Indicators, Phase—Vol 1

Phase-Lock Frequency Stabilizers—See Stabilizers, Frequency—Vol 1

Phase Shifters—See Shifters, Phase—Vol 1

Phones—See Headphones & Headsets—Vol 1

Phonograph Arms, Playback—See Vol 1

Phonograph Arms, Transcription—See Vol 1

Phonograph Parts & Accessories—See Vol 1

Phonographs—See Vol 1

Phosphors—See Fluorescent Compounds—Vol 3

Photo Emulsions, Stencil—See Vol 1

Photocells & Phototubes—See Cells, Photoconductive, etc.-Also See Tubes, Photomultiplier

Photoelectric Equipment—See Alarms; Controls; Counters; etc.

Photoflash Equipment, Electronic
Abtronics, Inc., Livermore, Calif.
AGFA-Gevaert, Inc., Teterboro, N.J.
Burke & James, Inc., Chicago, Ill.
Coast Elctrns., Manhattan Beach, Cal.
Dyonics, Inc., Woburn, Mass.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Electro Powerpacs Corp., Cambridge, Mass.
General Radio Co., Concord, Mass.
Honeywell, Littleton, Colo.
ILC, Inc., Sunnyvale, Calif.
LAD Electro-Sys., Inc., Hicksville, N.Y.
Photo Tech. Prods., Garden City, N.Y.
Power Instrs., Skokie, Ill.
Sage Instruments, Inc., White Plains, N.Y.
U.S. Scientific Instrs., Watertown, Mass.
Xenon Corp., Medford, Mass.
Zeiss, Carl, Inc., New York, N.Y.

Photographic Equip.—See Cameras, etc.

Photometers—See Meters, Light—Vol 1

Photomultiplier Power Supplies—See Power Supplies, Photomultiplier—Vol 1

Photomultiplier Tube Housings
Andonian Assocs., Inc., Waltham, Mass.
Ealing Corp., Cambridge, Mass.
Electro Optics Assocs., Palo Alto, Calif.
Gamma Sci., San Diego, Cal.
Gencom Div., Plainview, N.Y.
Ind'l. Gauging & Control, Norwalk, Conn.
International Light, Newburyport, Mass.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Nanosecond Systems, Inc., Fairfield, Conn.
Oriel Optics Corp., Stamford, Conn.
Pacific Photometric Instrs., Berkeley, Cal.
Princeton Applied Resch. Corp., Princeton, N.J.
Products for Research, Inc., Danvers, Mass.
Schoeffel Instr. Corp., Westwood, N.J.
SSR Instrs. Co., Santa Monica, Cal.
Velonex, Santa Clara, Calif.

Photomultipliers—See Tubes, Photomultiplier

Physiological Equipment—See Specific Types

Pickup Cartidges—See Cartidges, Phono—Vol 1

Pickups, Industrial—See Transducers

Pickups, Magnetic—See Transducers

Pickups, Phonograph—See Phonograph Arms, Playback—Vol 1

Pickups, Proximity—See Transducers, Displacement

Pickups, Telephone (For Recording)—See Vol 1

Pickups, Torque—See Transducers, Torque

Pickups, Vibration—See Transducers, Vibration; Accelerometers

Piezoelectric Crystals—See Crystals, Piezoelectric—Vol 1

Pilot Lamps—See Lamps, Dial & Pilot

Pin Straighteners, Connector—See Vol 3

Pin Straighteners, Tube
GC Elctrns., Rockford, Ill.
Jonard Inds. Corp., Bronx, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Ercona Corp., Bellmore, N.Y.
Haydu Prods., Inc., Opa Locka, Fla.
Helitronics Corp., Newark, N.J.
Seco Elctrns. Corp., Hopkins, Minn.

Pins, Cotter, Dowel, Taper, etc.—See Pins, Mechanical—Vol 3

Pins, Electrically Conductive—See Vol 3

Pins, Mechanical—See Vol 3

Pitch—See Insulting Compounds, Asphalt & Pitch—Vol 3

Pitch & Tempo Regulators—See Regulators, Pitch & Tempo—Vol 1

Plastic Films, Rods, Sheets, etc.—See Vol 3

Plastic Filters; Pumps; Valves—See Filters, Fluid, Nonmetallic; Pumps, Nonmetallic; Valves, Nonmetallic—Vol 1

Plastic Raw Materials, Liquids, Pellets, Powders, Resins—See Vol 3

Plastics, Encapsulating—See Compounds, Encapsulating—Vol 3

Plastics, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable—Vol 3

Plated Wire Memory Systems—See Memory Systems—Vol 1

Plates, Instructional—See Nameplates—Vol 3

Plates, Name—See Nameplates—Vol 3

Plates, Silk Screen—See Nameplates—Vol 3

Plates, Switch Mounting—See Vol 3

Plating Solutions—See Vol 3

Players, Magnetic Tape—See Recorders, Magnetic Tape (Lab Type)—Vol 1

Pliers—See Vol 3

Plotters, X-Y, & Accessories—See Recorders, X-Y—Vol 1

Plotting Boards—See Boards, Plotting—Vol 1

Plug Adapters—See Vol 3

Plug & Jack Sets—See Vol 3

Plug Caps & Shells—See Vol 3

Plug-In Module Enclosures—See Vol 3

Plugboard Programming Systems—See Boards, Programming—Vol 1

Plugs, Electrical (All Types)—See Vol 3

Plugs, Fused—See Vol 3

Pointers, Dial
Electronic Hardware, Jamaica, N.Y.
Millen, James Mfg., Malden, Mass. p 1489
Rogan Bros., Skokie, Ill.
Smith, Herman H., Inc., Bklyn., N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Bodnar Prods. Corp., New Rochelle, N.Y.
Eljay Corp., Columbia, Md.
Injection Plastic Corp., Skokie, Ill.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
PIC Design Corp., Ridgefield,, Conn.
Smith, Judson A. Co., Boyertown, Pa.
Waldom Elctrns., Inc., Chicago, Ill.
Zierick Mfg. Corp., Mt. Kisco, N.Y.

Polarimeters—See Vol 1

Polyester Insulating Film—See Insulation Materials, Film—Vol 3

Porcelain—See Insulation Materials, Ceramic—Vol 3

Porosimeters—See Vol 1

Posts, Binding—See Vol 3

Posts, Harness Board—See Vol 3

Potentiometers, Carbon Ceramic—See Vol 3

Potentiometers, Carbon Film—See Vol 3

Potentiometers, Ceramic-Metal (Cermet)—See Vol 3

Potentiometers, Composition, Carbon—See Vol 3

Potentiometers, Conductive Plastic—See Vol 3

Potentiometers, Hot Molded—See Vol 3

Potentiometers, Lab Type—See Vol 1

Potentiometers, Metal Film—See Vol 3

Potentiometers, Metal, Glazed—See Potentiometers, Ceramic-Metal—Vol 3

Potentiometers, Motorized—See Potentiometers, Servo Mount—Vol 3

Potentiometers, Non-Linear—See Potentiometers (As Modified)—Vol 3

Potentiometers, Rectilinear—See Vol 3

Potentiometers, Rheostat—See Rheostats—Vol 3

Potentiometers, Servo Mount
Amphenol Controls Div., Janesville, Wisc. .... p 2906
Amphenol Sales Div., Broadview, Ill. p 2906
Bowmar Instr. Corp., Ft. Wayne, Ind.
Carter Mfg. Corp., Hudson, Mass.
Computer Instrs., Hempstead, N.Y. p 2914,2915
Dale Elctrns., Inc., Columbus, Neb. p 2917
Dale Elctrns., Inc., Yankton, S.D. p 1584
Ind'l. Control Co., Farmingdale, N.Y. p 1873
IRC St. Peterburg Div. of TRW Inc., St. Petersburg, Fla. .... p 2931
New England Instr., Natick, Mass. p 2920,2921
Perkin-Elmer Corp., Wilton, Conn.
Spectrol Elctrns., City of Industry, Cal. p 2924,2925
Ace Elctrn. Assocs., Inc., Somerville, Mass.

Beckman Instrs., Helipot Div., Fullerton, Cal.
Betzelt GMBH, Trogerstr. 32, W. Germany
Bourns, Inc., Riverside, Cal.
Bowmar/TIC, Inc., Newbury Park, Calif.
Clarostat Mfg. Co., Inc., Dover, N.H.
Duncan Elctrns., Inc., Costa Mesa, Cal.
Fischer & Porter Co., Warminster, Pa.
Honeywell, Ft. Washington, Pa.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Keltron Corp., Waltham, Mass.
Larson Aero Dev., Concord, Calif.
Samarius, Inc., Derby, Conn.
Subminiature Instrs. Corp., Riverside, Calif.
Voak Engrg. Co., Inc., Upland, Calif.
Voltronics, Inc., Chicago, Ill.
Waters Mfg., Inc., Wayland, Mass.
Weston Comps. Div., Archbald, Pa.

Potentiometers, Trimmer, Carbon Ceramic—See Vol 3

Potentiometers, Trimmer, Carbon Composition—See Vol 3

Potentiometers, Trimmer, Carbon Film—See Vol 3

Potentiometers, Trimmer, Ceramic-Metal (Cermet)—See Vol 3

Potentiometers, Trimmer, Conductive Plastic—See Vol 3

Potentiometers, Trimmer, Metal Film—See Vol 3

Potentiometers, Trimmer, Wirewound—See Vol 3

Potentiometers, Wirewound—See Vol 3

Powders, Precious Metal—See Vol 3

Power Outlet Boxes—See Boxes, Power Outlet—Vol 3

Power Supplies, AC Output-60 CPS—See Vol 1

Power Supplies, AC Output-400 CPS—See Vol 1

Power Supplies, AC Output, Other Than 60 or 400 CPS—See Vol 1

Power Supplies, D-C Output, Other Than 60 or 400 CPS Input—See Vol 1

Power Supplies, 60 or 60/400 CPS Input, Up To 30 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 60 or 60/400 CPS Input, Up To 100 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 60 or 60/400 CPS Input, Up To 1,000 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 60 or 60/400 CPS Input, Up To 10,000 VDC output, Voltage Regulated—See Vol 1

Power Supplies, 60 or 60/400 CPS Input, Up To 50,000 VDC output, Voltage Regulated—See Vol 1

Power Supplies, 60 or 60/400 CPS Input, Up To 500,000 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 60 or 60/400 CPS Input, Over 500,000 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 60-400 CPS Input, Unregulated D-C Ouput—See Vol 1

Power Supplies, 400 CPS Input Only, D-C Output, Voltage Regulated—See Vol 1

Power Supplies, 400 CPS Input Only, D-C Output, Voltage Unregulated—See Vol 1

Power Supplies, 60 or 400 CPS Input, D-C Output, Current Regulated—See Vol 1

Power Supplies, 28 VDC Input, Up To 100 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 28 VDC Input, Up To 1,000 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 28 VDC Input, Up To 10,000 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 28 VDC Input, Over 10,000 VDC Output, Voltage Regulated—See Vol 1

Power Supplies, 28 VDC Input, D-C Output, Unregulated—See Vol 1

Power Supplies, Arc Lamp—See Vol 1

Power Supplies, Bi-Polar—See Vol 1

Power Supplies, CRT—See Vol 1

Power Supplies, D-C Input, A-C Output—See Inverters D-C To A-C, D-C To D-C—Vol 1

Power Supplies, D-C Welding—See Vol 1

Power Supplies, Electroplating Equipment—See Vol 1

Power Supplies, Energy Storage—See Vol 1

Power Supplies, Intergrated Circuit—See Vol 1

Power Supplies, Klystron-Also See Power Supplies By Output Voltage Range—See Vol 1

Power Supplies, Lab, Multiple Output—See Vol 1

Power Supplies, Laser—See Vol 1

Power Supplies, Operational—See Vol 1

Power Supplies, Photomultiplier—See Vol 1

Power Supplies, Programmable—See Vol 1

Power Supplies, R-F—See Vol 1

Power Supplies, Readout & Display—See Vol 1

Power Supplies, Strain Gauge & Transducer—See Vol 1

Power Supplies, Switch-Over Automatic (Self-Contained Battery)—See Vol 1

Power Supplies, Thermoelectric—See Vol 1

Power Supplies, TWT—See Vol 1

Power Supplies, Xenon Lamp—See Power Supplies, Arc Lamp—Vol 1

Preamplifiers, Audio

Arvee Engrg. Co., Torrance, Calif.
Austron, Inc., Austin, Tex.
Clarke - Hess, New York, N.Y.
Crown Int'l., Elkhart, Ind.
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Melcor Elctrns. Corp., Farmingdale, N.Y.
Multitech Communications, Monterey Pk., Cal. .... p 324
North Hills Elctrns., Inc., Glen Cove, N.Y.
Opamp Labs., Los Angeles, Cal. p 1292
Quan-Tech, Whippany, N.J.
Solid State Elctrns., Sepulveda, Cal.
Weinschel Engrg. Co., Gaithersburg, Md.
Advanced Kinetics, Costa Mesa, Calif.
AGAC-Derritron, Inc., Alexandria, Va.
Amperex Elctrn., Slatersville, R.I.
Amplifier Corp. America, Westbury, N.Y.
Audio Instr. Co., Union City, N.J.
Auricord, Long Island City, N.Y.
Bogen Div., Paramus, N.J.
CCA Elctrns. Corp., Gloucester, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dyna Magnetic Devices, Inc., Hicksville, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Fairchild Semiconductor, Mountain View, Calif.
Hughes Aircraft Co, Fullerton, Cal.
ISC/Telephonics Div, Huntington, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Lansing, James B. Sound, Los Angeles, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Levell Electronics Ltd., High Barnet, Herts,, England
Millivac Instrs., Schenectady, N.Y.
Newcomb Audio Prods. Co., Sylmar, Calif.
Paraplegics Mfg., Bensenville, Ill.
Perry Amplifier, Brookline, Mass.
Philmore Mfg. Co., Richmond Hill, N.Y.
Private Tele-Comms., Inc., Chicago, Ill.
RHA-Audio Communications, W. New York, N.J.
Servo Corp. America, Hicksville, N.Y.
Shure Bros., Inc., Evanston, Ill.
Signetics Corp., Sunnyvale, Calif.
Singer - Tele-Signal, Woodbury, N.Y.
Spectra Sonics, Ogden, Utah
Wilkinson Elctrns., Woodlyn, Pa.

Preamplifiers, D-C

Arvee Engrg. Co., Torrance, Calif.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
California Elctrn. Mfg. Co., Alamo, Calif.
Control Technology Co., L.I.C., N.Y.
Data-Control Systems, Danbury, Conn.
DDC, Hicksville, N.Y.
Ectron Corp., San Diego, Cal....... p 1283
Hewlett-Packard, Palo Alto, Cal.
Hybrid Sys. Corp., Burlington, Mass.
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Melcor Elctrns. Corp., Farmingdale, N.Y.
Neff Instr. Corp., Duarte, Calif.
Precision Monolithics, Santa Clara, Cal.
Preston Scientific, Anaheim, Cal.
Solid State Elctrns., Sepulveda, Cal.
Teledyne Philbrick, Dedham, Mass.
Acromag, Inc., Wixom, Mich.
Analog Devices, Inc., Norwood, Mass.
Analogic, Wakefield, Mass.
B & W Elctrn. Resch. Labs., Dallas, Tex.
Bell & Howell Co., Pasadena, Calif.
Bio-Medical Elctrns., Inc., Rockville, Md.
Burr-Brown Resch. Corp., Tucson, Ariz.
CGS/Lawrence, Southampton, Pa.
Computer Dynamics, Torrington, Conn.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Doric Sci. Corp., San Diego, Calif.
Dorsett Elctrns., Tulsa, Okla.
Elctrns., Ltd., Marion, Iowa
Esterline Angus Div., Indianapolis, Ind.
Fairchild Semiconductor, Mountain View, Calif.
Fairlane Electronics, Inc., Long Valley, N.J.
Glentek, Inc., Santa Monica, Calif.
Incor Instr., Plainview, N.Y.
Keithley Instrs., Inc., Cleveland, Ohio
Magnetics, Inc., Butler, Pa.
Magnetics, Sandy Lake, Pa.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Milletron, Inc., Pittsburgh, Pa.
Newport Labs., Inc., Santa Ana, Cal.
Nuclear Diodes, Prairie View, Ill.
Optical Elctrns., Tucson, Ariz.
Perry Amplifier, Brookline, Mass.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Princeton Applied Resch. Corp., Princeton, N.J.
Quartz Radiation Corp., Fairfield, N.J.
Rawco Instrs., Inc., Ft. Worth, Tex.
Santa Barbara Resch. Ctr., Goleta, Calif.
Soltec Corp., No. Hollywood, Cal.
Transidyne-General Corp., Ann Arbor, Mich.
Trepac Corp. America, Englewood, N.J.

Preamplifiers, I-F

Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif.
Melcor Elctrns. Corp., Farmingdale, N.Y.
RHG Elctrns. Lab., Farmingdale, N.Y.
Sierra Sys., Mountain View, Cal.
Aertech Inds., Sunnyvale, Calif.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Anzac Elctrns., Waltham, Mass.
A.R.F. Products, Inc., Boulder, Colo.
Avantek, Inc., Santa Clara, Cal.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Fairchild Semiconductor, Mountain View, Calif.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Int'l. Microwave, Cos Cob, Conn.
Koch Inds., Anaheim, Cal.
Loral Elctrn. Sys., Bronx, N.Y.
Micro-Tel Corp., Baltimore, Md.
Microwave Assocs., Inc., Burlington, Mass.
Nuclear Diodes, Prairie View, Ill.
Olektron Corp., Dudley, Mass.
OMNI Spectra, Farmington, Mich.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Princeton Applied Resch. Corp., Princeton, N.J.
Rodelco, Deer Park, N.Y.
Trak Microwave, Tampa, Fla.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Western Microwave Labs., Los Gatos, Cal.

Preamplifiers, Meter—See Vol 1

Preamplifiers, Microphone-See Preamplifiers, Audio

Preamplifiers, Microwave—See Vol 1

Preamplifiers, Oscilloscope Plug-In—See Oscilloscope Preamplifier Plug-Ins—Vol 1

Preamplifiers, Receiver—See Vol 1

Preamplifiers, R-F

American Elctrn. Labs., Inc., Lansdale, Pa.
Applied Research Inc., Port Washington, N.Y.
Arvee Engrg. Co., Torrance, Calif.
C-COR Elctrns., State College, Pa. p 1280,1281
Cook Electric Co., Morton Grove, Ill.

Electro/Data, Inc., Garland, Tex.
Honeywell, Denver, Colo.
Lorch Elctrns. Corp., Englewood, N.J.
Microwave Cavity Labs., La Grange, Ill.
Multitech Power Sys., Costa Mesa, Cal.
RHG Elctrns. Lab., Farmingdale, N.Y.
Sierra Sys., Mountain View, Cal.
Aerolite Electronics Corp., Union City, N.J.
Aertech Inds., Sunnyvale, Calif.
AMBAC Inds., Garden City, N.Y.
Anzac Elctrns., Waltham, Mass.
Arenberg Ultrasonic Lab., Inc., Jamaica Plain, Mass.
A.R.F. Products, Inc., Boulder, Colo.
Astro Comm. Lab., Gaithersburg, Md.
Avantek, Inc., Santa Clara, Cal.
Beukers Labs., Inc., Hauppauge, N.Y.
BF Elctrns., Solana Beach, Calif.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Communication Elctrns., Rockville, Md.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Navigation Inds., Inc., Rochester, N.Y.
Entron, Inc., Silver Spring, Md.
Finney Co., Bedford, Ohio
General Radio Co., Concord, Mass.
Hope Elctrns., Clifton, N.J.
HRB-Singer, Inc., State College, Pa.
Hughes Aircraft Co, Fullerton, Cal.
Industrial Microwave, Scotch Plains, N.J.
Int'l. Microwave, Cos Cob, Conn.
Itek Corp., Lexington, Mass.
Jerrold Elctrns. Corp., Philadelphia, Pa.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Koch Inds., Anaheim, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Locus, Inc, State College, Pa.
Loral Elctrn. Sys., Bronx, N.Y.
Micromega, Los Angeles, Cal.
Microwave Assocs., Inc., Burlington, Mass.
MITEQ, Inc., Hauppauge, N.Y.
Nuclear Diodes, Prairie View, Ill.
Olektron Corp., Dudley, Mass.
Perry Amplifier, Brookline, Mass.
Philco-Ford Corp., Washington, D.C.
Philips Elctrns. Inds., Ltd., Toronto 17, Can.
Princeton Applied Resch. Corp., Princeton, N.J.
Rodelco, Deer Park, N.Y.
Rust Corp., Everett, Mass.
Sage Labs. Inc., Natick, Mass.
Scientific Communications, Garland, Tex.
Varian Assocs., Palo Alto, Cal.

Preamplifiers, Servo

Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Control Technology Co., L.I.C., N.Y.
DDC, Hicksville, N.Y. .... p 1282
Ind'l. Control Co., Farmingdale, N.Y.
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Melcor Elctrns. Corp., Farmingdale, N.Y.
AMBAC Inds., Garden City, N.Y.
Behlman Engrg. Corp., Santa Barbara, Cal.
CGS/Lawrence, Southampton, Pa.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Hughes Aircraft Co, Culver City, Cal.
McFadden Elctrns. Co., South Gate, Calif.
Perry Amplifier, Brookline, Mass.
Sanders Assocs., Inc., Manchester, N.H.
Scientific-Atlanta, Inc., Atlanta, Ga.
Singer-General Precision, Inc., Little Falls, N.J.
Soltec Corp., No. Hollywood, Cal.
Ten Bosch, M., Inc., Pleasantville, N.Y.

Preamplifiers, Telemetry—See Vol 1

Preamplifiers, Transducer Signal-Also See Signal Conditioners

A. D. Data Sys., Inc., Rochester, N.Y.
Arvee Engrg. Co., Torrance, Calif.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
California Elctrn. Mfg. Co., Alamo, Calif.
Control Technology Co., L.I.C., N.Y.
Data-Control Systems, Danbury, Conn.
DDC, Hicksville, N.Y.
Gould, Inc., Cleveland, Ohio
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Hybrid Sys. Corp., Burlington, Mass.
Ithaco, Inc., Ithaca, N.Y. .... p 1287
Natel Engrg. Co., Canoga Pk., Cal.
Neff Instr. Corp., Duarte, Calif.
Precision Monolithics, Santa Clara, Cal.
RO Assocs., Menlo Pk., Cal.
Solid State Elctrns., Sepulveda, Cal.
Tektronix, Inc., Beaverton, Ore.
Teledyne Geotech, Dallas, Tex.
United Detector Tech., Santa Monica, Cal. .... p 1639
Universal Ad-Yu Elctrns., Inc., Passaic, N.J. .... p 2752
Acromag, Inc., Wixom, Mich.
Active Control Instrumentation, E. Northport, NY
Altec, Anaheim, Calif.
AMBAC Inds., Garden City, N.Y.
Analogic, Wakefield, Mass.
Applied Control Co., Fairfield, N.J.
B & K Instrs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Bio-Medical Elctrns., Inc., Rockville, Md.
Biocom, Inc., Culver City, Cal.
Brower Laboratories, Inc., Waltham, Mass.
Burr-Brown Resch. Corp., Tucson, Ariz.
CGS/Lawrence, Southampton, Pa.
Chesapeake Instr. Corp., Shadyside, Md.
Columbia Resch. Labs., Woodlyn, Pa.
Datum, Inc., Anaheim, Calif.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Doric Sci. Corp., San Diego, Calif.
Dorsett Elctrns., Tulsa, Okla.
Dynalex, Inc., Burbank, Cal.
EDC (Electro Dev.), Lynnwood, Wash.
Edo Western Corp., Salt Lake City, Utah
Elctrns., Ltd., Marion, Iowa
Endevco, Pasadena, Calif.
Genisco Tech. Corp., Instr. Div., Compton, Cal.
Geo Space, Houston, Tex.
Glentek, Inc., Santa Monica, Calif.
Incor Instr., Plainview, N.Y.
Infrared Inds., Inc., Santa Barbara, Cal.
Infrared Inds., Waltham, Mass.
Interlind Elctrns., Doraville, Ga.
InterOcean Systems, San Diego, Cal.
K West, Westminster, Calif.
Keithley Instrs., Inc., Cleveland, Ohio
Magnetics, Inc., Butler, Pa.
Massa Div., Hingham, Mass.
Mennen-Greatbatch Elctrns., Inc., Clarence, N.Y.
Newport Labs., Inc., Santa Ana, Cal.
Nuclear Diodes, Prairie View, Ill.
NUS Corp., Paramus, N.J.
Princeton Applied Resch. Corp., Princeton, N.J.
Rawco Instrs., Inc., Ft. Worth, Tex.
Sensor Corp., Greenwich, Conn.
Sensotec, Inc., Columbus, Ohio
Servo Corp. America, Hicksville, N.Y.
Spectra Sonics, Ogden, Utah
Telmar, Inc., Columbus, Ohio
Tyco Instr. Div., Waltham, Mass.
Unholtz-Dickie Corp., Hamden, Conn.

Prebonding Etchants—See Chemicals, Etching—Vol 3

Predetection Equipment, Recorders(Playbacks—See Vol 1

Preforms, Precious Metal -Also See Solder Preforms —See Vol 3

Preparation Systems, Paper-Tape—See Vol 1

Prescalers—See Vol 1

Preselector-Mixers

Applied Research Inc., Port Washington, N.Y.
Electro/Data, Inc., Garland, Tex.
Frequency Engrg. Labs., Farmingdale, N.J.
Lorch Elctrns. Corp., Englewood, N.J. p 609
Microwave Cavity Labs., La Grange, Ill.
Ryka Scientific, Inc., Sunnyvale, Cal. p 1564
Sierra Sys., Mountain View, Cal.
AIL, Div. Cutler-Hammer, Inc., Deer Park, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Industrial Microwave, Scotch Plains, N.J.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microphase Corp., Cos Cob, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
N-H Microwave, Inc., Red Bank, N.J.
Olektron Corp., Dudley, Mass.
Peninsula Microwave Labs., Mountain View, Cal.
Rodelco, Deer Park, N.Y.
Sage Labs. Inc., Natick, Mass.
Scientific Communications, Garland, Tex.
Zeta Labs., Inc., Mountain View, Calif.

Preselectors—See Vol 1

Pressure Sensitive Paint—See Coatings, Transducer Forming

Pressure Vessels—See Chambers, Pressure—Vol 1

Pressure Indicators—See Gauges, Pressure—Vol 1

Pressurization Equipment, Cable—See Cable Pressurization Equipment—Vol 1

Pressurization Systems, Equipment Cabinet—See Vol 3

Pressurization Units—See Chambers, Pressure—Vol 1

Primers, Bonding & Potting—See Vol 3

Printed Circuit Boards, Additive Process (Without Components)

A. D. Data Sys., Inc., Rochester, N.Y.
American Lava Corp., Chattanooga, Tenn.
Cinch-Graphik, City of Industry, Cal. p 1297
Digital Equip. Corp., Maynard, Mass.
Elctrn. Assocs., W. Long Branch, N.J.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Systron-Donner Concord Instr. Div., Concord, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
Acme Model Engrg. Co., Ridgefield, N.J.
Advanced Circuitry Div., Springfield, Mo.
Agard Elctrns. Corp., New Hyde Park, N.Y.
American Pamcor, Inc., Paoli, Pa
Ansley Div. ACI Inc., Perkasie, Pa.
Ansley Elctrns. Corp., Doylestown, Pa.
Ansley Elctrns. Corp., Los Angeles, Cal.
Avionics, Ltd., Niagara-on-the-Lake, Ont., Can.
Beckman Instrs., Porterville, Cal.
Bishop Graphics, No. Hollywood, Cal.
Bunker-Ramo Corp., Westlake Village, Cal
Bureau Engraving, Inc., Minneapolis, Minn.
Celtic Inds., Inc., Van Nuys, Cal.
Computer Art Svc., New Hyde Pk., N.Y.
Control Data, Minneapolis, Minn.
Defiance Circuit Corp., Lawrence, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dorsett Elctrns., Tulsa, Okla.
Electro-Science Labs., Philadelphia, Pa.
Electrol Co., Inc., York, Pa.
Elgin Elctrns., Waterford, Pa.
Eljay Corp., Columbia, Md.
Fansteel Inc., N Chicago, Ill.
General Circuits, Inc., Rochester, N.Y.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
Gulton Inds., Albuquerque, N.M.
Hughes Aircraft Co, Culver City, Cal.
Int'l. Elctrn. Resch., Burbank, Cal.
Lockheed Elctrns. Co., Watchung, N.J.
Radiation Sys., Inc., McLean, Va.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Rogers Corp., Rogers, Conn.
Sanders Assocs., Flexprint, Manchester, N.H.
Sibley Co., Haddam, Conn
Techinques, Inc., Englewood, N.J.
3M Co., St. Paul, Minn.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Viz Mfg. Co., Philadelphia, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Printed Circuit Boards, Etched Process (Without Components)

A. D. Data Sys., Inc., Rochester, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa.
Augat Inc., Attleboro, Mass. .... p 1536
Austron, Inc., Austin, Tex.
Chicago Dynamic Inds., Chicago, Ill.
Cinch-Graphik, City of Industry, Cal. p 1297
Datacom, Inc., Ft. Walton Bch., Fla.
Digital Equip. Corp., Maynard, Mass.
Douglas Electronics, Inc., San Leandro, Cal. .... p 1300,1301
EBY, Hugh H. Co., Phila., Pa.
EIP, Inc., Santa Clara, Cal.
Elctrn. Assocs., W. Long Branch, N.J.
ELFAB Crop., Dallas, Tex. .... p 2627
Rosemount Plug-In, Nashville, Tenn.
Systron-Donner Concord Instr. Div., Concord, Cal.
Tempo/UTI Div., Chatsworth, Cal.
Vector Elctrn. Co., Inc., Sylmar, Cal. p 2722
Vero Electronics, Inc., Hauppauge, N.Y.
Abacus Elctrns. Corp., Dobbs Ferry, N.Y.
A C Electronics Co., Santa Monica, Cal.
Advanced Circuitry Div., Springfield, Mo.
Agard Elctrns. Corp., New Hyde Park, N.Y.
Allegri-Tech, Inc., Nutley, N.J.
Ampex Corp., Redwood City, Calif.
Ansley Div. ACI Inc., Perkasie, Pa.
Ansley Elctrns. Corp., Doylestown, Pa.
Ansley Elctrns. Corp., Los Angeles, Cal.
A.R.F. Products, Inc., Boulder, Colo.
A.R.F. Products, Inc., Raton, N.M.
Argent Inds., Inc., Dayton, Ohio
Astrodata, Anaheim, Cal.
Automatic Control Elctrns. Co., San Antonio, Tex.
Avionics, Ltd., Niagara-on-the-Lake, Ont., Can.
Aydin Data Systems, Ft. Washington, Pa
Beckman Instrs., Porterville, Cal.
BECO Solid State Systems, Salem, Va.
Benthos, Inc., N. Falmouth, Mass.
Bowers Elctrn. Labs., Evansville, Ind.
Buckbee-Mears Co., St. Paul, Minn.
Bunker-Ramo Corp., Westlake Village, Cal
Bureau Engraving, Inc., Minneapolis, Minn.
Cambridge Thermionic, Cambridge, Mass
Celtic Inds., Inc., Van Nuys, Cal.
Centerline Specialties, Boulder, Colo.
Chem Aero, Inc., Wilmington, Cal.
Circuits, Inc., Berlin, Conn.
CMS Div. Instrumatics, Cleveland, Ohio
Collins Radio Co., Cedar Rapids, Iowa
Computer Art Svc., New Hyde Pk., N.Y.
Conductorlab, Inc., Groton, Mass.
Conductron Corp., St. Charles, Mo.
Control Data, Minneapolis, Minn.
Cordover, Carl & Co., Mineola, N.Y.
Data Technology Corp., Palo Alto, Cal.
Defiance Circuit Corp., Lawrence, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dorsett Elctrns., Tulsa, Okla.
Eagle-Picher Inds., Inc., Joplin, Mo.
E.D.I. Inc., Cairo, Ill.
Electro Chemical Engraving Co., Bronx, N.Y.
Electro-Etch Circuits, Inc., Los Angeles, Cal.
Electro-Sonics Inc., Spofford, N.H.
Electrol Co., Inc., York, Pa.
Elctrn. Enterprises, Pasadena, Calif.
Elctrn. Ideas, Wyncote, Pa.
Elctrn. Modules Corp., Timonium, Md.
Elgin Elctrns., Waterford, Pa.
Fansteel Inc., N Chicago, Ill.
Flexible Circuits, Inc., Warrington, Pa.
General Circuits, Inc., Rochester, N.Y.
General Comps., Inc., St. Petersburg, Fla.
General Instr. of Can., Waterloo, Ont., Can.
General Plastics Corp., Bloomfield, N.J.
Graphtex Inc., Lodi, NJ

Gridcraft, Ft. Wayne, Ind.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
Gulton Inds., Albuquerque, N.M.
HMW Enterprises, Inc., Steelton, Pa.
Honeywell Information Systems, Goleta, Cal.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Int'l. Elctrn. Resch., Burbank, Cal.
J-Tron, Anaheim, Cal.
Joliet Control Corp., Joliet, Ill.
Jordan Controls, Milwaukee, Wisc.
Kahn & Co., Inc., Wethersfield, Conn.
Kaiser CATV, Phoenix, Ariz
Keltron Corp., Waltham, Mass.
Kentrox Inds., Inc., Portland, Ore.
Keystone Elctrns. Corp., New York, N.Y.
Komak, Inc., Phila., Pa.
La Pointe Inds., Inc., Rockville, Conn.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Lehighton Elctrns., Inc., Lehighton, Pa.
Lockheed Elctrns. Co., Watchung, N.J.
Lockheed Elctrns. Co., Los Angeles, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Maxson Elctrns. Div., Great River, N.Y.
Micro-Strain, Inc., Spring City, Pa.
Mid-West Metal Prods., Kansas City, Kans.
Midland Standard Inc., Elgin, Ill.
Ney, J.M. Co., Bloomfield, Conn.
Northern Sci., Inc., Middleton, Wisc.
Nuclear Corp. Amer., Denville, N.J.
Omega Labs., Inc., Rowley, Mass.
Philco-Ford Corp., Washington, D.C.
Philway Prods., Ashland, Ohio
Plastic Assocs., Inc., Inwood, N.Y.
Power Control Corp., Pittsburgh, Pa.
Radiation Sys., Inc., McLean, Va.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Rogers Corp., Rogers, Conn.
Rosemount Engrg. Co., Minneapolis, Minn.
Rowe Engravers, Clifton, N.J.
Safeway Products Inc., Middletown, Conn.
Sanders Assocs., Flexprint, Manchester, N.H.
Schjeldahl, G.T. Co., Northfield, Minn.
Shigoto Inds., Ltd., New York, N.Y.
Sibley Co., Haddam, Conn
Singer - Tele-Signal, Woodbury, N.Y.
Sparton Southwest, Inc., Albuquerque, N.M.
Spruce Pine Mica Co Inc., Spruce Pine, N.C.
Stanford Applied Engrg., Santa Clara, Cal.
Strandberg Engrg. Labs., Inc., Greensboro, N.C.
Taft Electrosystems, Inc., Metuchen, N. J.
Tech-Etch, Inc., Hingham, Mass.
Techinques, Inc., Englewood, N.J.
Technograph, Inc., Winston-Salem, N.C.
Techron Corp., Boston, Mass.
3M Co., St. Paul, Minn.
Transitron Elctrn. Corp., Wakefield, Mass.
Tri-Tronics Lab., Euless, Tex.
Triad Distributor Div., Huntington, Ind.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Vitro Laboratories, Silver Spring, Md.
Viz Mfg. Co., Philadelphia, Pa.
Welwyn Elec., Ltd., Bedlington, Northumberland, England
Zenrad Controls Co., Santa Barbara, Cal.
Zonic Tech. Labs., Cincinnati, Ohio

Printed Circuit Etchants—See Vol 3

Printed Circuit Screens

Cinch-Graphik, City of Industry, Cal.
Allegri-Tech, Inc., Nutley, N.J.
Cambridge Thermionic, Cambridge, Mass
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dorsett Elctrns., Tulsa, Okla.
Hughes Aircraft Co, Culver City, Cal.
Kepro Cir. Sys., Inc., St. Louis, Mo.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Anaheim, Cal.
Mech-Tronic Equip. Co., Silver Spring, Md.
Naz-Dar Int'l., Chicago, Ill.
Podgor, Joseph Co., Pennsauken, N.J.
Podgor, Joseph E. Co., Inc., Phila., Pa.
Radiation Sys., Inc., McLean, Va.
Rowe Engravers, Clifton, N.J.
Techinques, Inc., Englewood, N.J.
W. S. Tyler Inc., Mentor, Ohio
Zenrad Controls Co., Santa Barbara, Cal.

Printed Circuits (With Components)—See Cards, Linear Function

Printed Circuits, Multilayer

Cinch-Graphik, City of Industry, Cal. p 1297
Datacom, Inc., Ft. Walton Bch., Fla.
Inter-Computer Elctrns., Lansdale, Pa.
Advanced Circuitry Div., Springfield, Mo.
Agard Elctrns. Corp., New Hyde Park, N.Y.
Allegri-Tech, Inc., Nutley, N.J.
Ansley Div. ACI Inc., Perkasie, Pa.
Ansley Elctrns. Corp., Doylestown, Pa.
Ansley Elctrns. Corp., Los Angeles, Cal.
Avco Corp., Cincinnati, Ohio
Buckbee-Mears Co., St. Paul, Minn.
Bureau Engraving, Inc., Minneapolis, Minn.
Cambridge Thermionic, Cambridge, Mass
Chem Aero, Inc., Wilmington, Cal.
Circuits, Inc., Berlin, Conn.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Newport Beach, Calif.
Computer Art Svc., New Hyde Pk., N.Y.
Control Data, Minneapolis, Minn.
Defiance Circuit Corp., Lawrence, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Fansteel Inc., N Chicago, Ill.
Flexible Circuits, Inc., Warrington, Pa.
General Circuits, Inc., Rochester, N.Y.
General Comps., Inc., St. Petersburg, Fla.
Goodyear Aerospace Corp., Akron, Ohio
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
Gulton Inds., Albuquerque, N.M.
Honeywell Information Systems, Goleta, Cal.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
La Pointe Inds., Inc., Rockville, Conn.
Lockheed Elctrns. Co., Watchung, N.J.
Lockheed Elctrns. Co., Los Angeles, Calif.
Loral Elctrn. Sys., Bronx, N.Y.
Philco-Ford Corp., Washington, D.C.
Philway Prods., Ashland, Ohio
Rogers Corp., Rogers, Conn.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Sanders Assocs., Flexprint, Manchester, N.H.
Sibley Co., Haddam, Conn
Sparton Southwest, Inc., Albuquerque, N.M.
Thiokol Chemical Div., Trenton, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Welwyn Elec., Ltd., Bedlington, Northumberland, England

Printers, Dial, Meter Scale—See Vol 1

Printers, Digital—See Vol 1

Printers, High Speed—See Printers, Digital—Vol 1

Printers, Keyboard—See Vol 1

Printers, Line—See Printers, Digital—Vol 1

Printers, Microfilm To Paper—See Vol 1

Printers, Tape-Listing—See Printers, Digital—Vol 1

Printing, Dry Transfer—See Kits, Marking (Dial Instrument)

Prisms

Bache, Semon & Co., New York, N.Y.
Bausch & Lomb, Rochester, N.Y.
Buhl Optical Co., Pittsburgh, Pa.
Dell Optics Co., Inc., N. Bergen, N.J.
Ealing Corp., Cambridge, Mass.
Electro-Optical Div., Northampton, Mass.
Electro-Optical Systems, Pasadena, Cal.
Exotic Materials, Inc., Costa Mesa, Cal.
Fairchild Space & Defense Sys., Syosset, N.Y.
Gaertner Scientific Corp., Chicago, Ill.
General Electrodynamics Corp., Garland, Tex.
Goerz Optical Co., Inc., Pittsburgh, Pa.
Harshaw Chem. Co., Cleveland, Ohio
Infrared Inds., Inc., Santa Barbara, Cal.
Isomet Corp., Oakland, N.J.
Itek Corp., Lexington, Mass.
Jones, A.D. Optical Works, Burlington, Mass.
Lasermetrics, Inc., Rochelle Park, N.J.
Lenox Instr. Co., Philadelphia, Pa.
Liberty Mirror Div., Brackenridge, Pa.
O & S Research, Inc., Riverton, N.J.
Optical Inds., Santa Ana, Cal.
Photo Tech. Prods., Garden City, N.Y.
Republic Lens Co., Inc., Bronx, N.Y.
S & S Optical Co., Inc., Ft. Wayne, Ind.
Sawyer Resch. Prods., Inc., Eastlake, Ohio
Schoeffel Instr. Corp., Westwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Spectra-Physics, Inc., Mountain View, Calif.
Syncor Prods. Co., Inc., Malden, Mass.
Thermal Amer. Fused Quartz, Montville, N.J.
Zenith Optical Lab., Dobbs Ferry, N.Y.

Probability Distribution Analyzers—See Analyzers, Probability Density—Vol 1

Probes, Crystal—See Vol 1

Probes, Hall

American Aerospace Controls, Farmingdale, N.Y.
Bell, F.W., Inc., Columbus, Ohio.... p 418
ISC Magnetics Div., Huntington, N.Y. p 1806
Ohio Semitronics, Columbus, Ohio p 1986
RFL Inds., Instr. Div., Boonton, N.J. p 554
Scientific Columbus, Columbus, Ohio
Tektronix, Inc., Beaverton, Ore.
Empire Sci., Ind'l. Instr., Garden City, N.Y.
ISC/Telephonics Div, Huntington, N.Y.
Magnetic Sys. & Instrs., Worcester, Mass.
Magnetics Sys. & Instrs., Worcester, Mass.
Thomas & Skinner, Inc., Indianapolis, Ind.

Probes, High-Voltage—See Vol 1

Probes, Microwave

Boonton Elctrns., Parsippany, N.J.
Hewlett-Packard, Palo Alto, Cal.
Polarad Elctrn. Instrs., Lake Success, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Aircom, Inc., Union, N.H.
Astrolab Inc., Linden, N J
CES Elctrns., Brooklyn, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Filmohm Div., Long Island City, N.Y.
General Microwave Corp., Farmingdale, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Projects Unlimited, Inc., Dayton, Ohio
Sage Labs. Inc., Natick, Mass.
Scientific Communications, Garland, Tex.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Victor Microwave, Inc., Wakefield, Mass.

Probes, Oscilloscope—See Oscilloscope Probes—Vol 1

Probes, R-F—See Vol 1

Probes, Temperature-Also See Thermocouples; Transducers

Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Electro Sci. Inds., Portland, Ore.
Engelhard Minerals & Chem., Murray Hill, N.J.
Fenwal Elctrns., Inc., Framingham, Mass. .... p 1971
Harrel, Inc., E. Norwalk, Conn. .... p 1973
Hewlett-Packard, Palo Alto, Cal.
Keystone Carbon Co., St. Marys, Pa. p 1979
Matrix Corp., Beech Grove, Ind.
Micro Elctrns. Corp., Palmdale, Cal
RFL Inds., Instr. Div., Boonton, N.J.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Rustrak Instr. Div., Manchester, N.H.
Simpson Elec. Co., Chicago, Ill.
Tektronix, Inc., Beaverton, Ore.
Triac Elctrn. Sys., N.Y., N.Y.
Weed Instr. Co., Elgin, Tex.......... p 1984
Addison Div., Mountainside, N.J.
Aladdin Controls, Nashville, Tenn.
Alnor Instr. Co., Chicago, Ill.
Alpha-Monarch Corp., Dallas, Tex.
Amprobe Instr., Lynbrook, N.Y.
Andonian Assocs., Inc., Waltham, Mass.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bell & Howell Co., Pasadena, Calif.
Bendix Corp., Davenport, Iowa
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., Minneapolis, Minn.
Climatronics Corp., Hauppauge, N.Y.
Conax Corp., Buffalo, N.Y.
Conklin Instr. Corp., Pleasant Valley, N.Y.
Consolidated Controls Corp., El Segundo, Calif.
Control Prods. Corp., Chicago, Ill.
Cryotronics, Inc., High Bridge, N.J.
Device Seals, Inc., Sun Valley, Calif.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
EG & G, Inc., Salem, Mass.
Elctrn. Dev. Labs., Plainview, N.Y.
Exotic Materials, Inc., Costa Mesa, Cal.
Fenwal, Inc., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
General Lab. Assocs., Norwich, N.Y.
Gow-Mac Instr. Co., Madison, N.J.
Hafstrom Tech. Prods., Inc., San Diego, Calif.
Harco Labs., Inc., Branford, Conn.
High Temperature Instr., W. Conshohocken, Pa.
Honeywell, Ft. Washington, Pa.
Hy-Cal Engrg., Santa Fe Springs, Cal.
InterOcean Systems, San Diego, Cal.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Lewis Engrg. Co., Naugatuck, Conn.
Malaker Corp., High Bridge, N.J.
Marlin Mfg. Corp., Cleveland, Ohio
Marshall Instrs., Inc., Van Nuys, Calif.
Medistor Instr. Co., Seattle, Wash.
Micro-Technical Inds., Laguna Beach, Cal.
Mura Corp., Jericho, N.Y.
Norwalk Thermostat Co., Norwalk, Ohio
Omega Engrg., Inc., Stamford, Conn.
Pacific Transducer Corp., Los Angeles, Calif.
Pennsylvania Elctrns. Technology, Pittsburgh, Pa.
Projects Unlimited, Inc., Dayton, Ohio
RDF Corp., Hudson, N.H.
Relco Prods., Denver, Colo.
Riverbank Labs., Geneva, Ill.
Sensotec, Inc., Columbus, Ohio
Smith, Robert Elec. Co., Hartford, Conn.
Syscon Int'l., Inc., So. Bend, Ind.
T & T Controls Co., Media, Pa.
Technology/Versatronics, Yellow Springs, Ohio
Texas Instruments, Inc., Attleboro, Mass.
Thermal Sys., Los Angeles, Cal.
Thermotronic Devices, Inc., Conshohocken, Pa.
Tylan Corp., Torrance, Calif.
United Elec. Controls Co., Watertown, Mass.
United Sensor & Control Co., Watertown, Mass.
United Sys. Corp., Dayton, Ohio
Versitherm, Inc., Farmingdale, N.Y.
Victory Engrg. Corp., Springfield, N.J.

VirTis Co., Inc., Gardiner, N.Y.
VWR Scientific, San Francisco, Cal.
West Coast Resch. Corp., Los Angeles, Calif.
West Instr. Div., Schiller Pk., Ill.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Probes, Test Lead—See Vol 1

Probes, Ultrasonic—See Vol 1

Profileometer—See Indicators, Surface Roughness—Vol 1

Profiling—See Engraving—Vol 1

Programmers, Broadcasting—See Vol 1

Programmers, Computer—See Vol 1

Programmers, Curve Following—See Vol 1

Programmers, Power Supply—See Vol 1

Programmers, Punched Card—See Vol 1

Projection Units, TV—See Vol 1

Protectors, Contact—See Suppressors, Arc

Protectors, Surge-Also See Suppressors, Arc; Arresters, Electrical Surge

Acopian Corp., Easton, Pa.
Airpax Elctrns., Inc., Cambridge, Md. p 1877
ATR Elctrns., Inc., St. Paul, Minn.
Betamite Electronic Devices, Culver City, Calif.
Cober Elctrns., Inc., Stamford, Conn.
Dale Elctrns., Inc., Yankton, S.D. p 1906
Dressen-Barnes Elctrns., Pasadena, Cal. .... p 690
Dynage, Bloomfield, Conn.
Electrons Co., Fairfield, N.J. .... p 1451
International Rectifier, El Segundo, Cal. p 1807
Joslyn Elctrn. Sys., Goleta, Cal... p 1933
Kepco, Inc., Flushing, N.Y. .... p 766
Lambda Elctrns., Melville, N.Y. ...... p 800
Presin Co., Inc., Shelton, Conn.
Ross Engrg. Corp., Campbell, Cal. p 1786
Signalite, Neptune, N.J. .... p 1952
Sprague Elec. Co., No. Adams, Mass.
Technipower, Ridgefield, Conn.
Todd Prods., Farmingdale, N.Y.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Cardion Communications, Woodbury, N.Y.
Eastern Delta Corp., Fair Lawn, N.J.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Green Rectifier Corp., Fair Lawn, N.J.
GTE Sylvania Inc., Danvers, Mass.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
MCG Elctrns., Inc., Deer Park, N.Y.
Rectifier Engrg. & Supply, St. Louis, Mo.
Siemens Corp., Comps. Div., Iselin, N.J.
Staffall, Inc., Providence, R.I.
Westinghouse Elec., Buffalo, N. Y.
Wuerth Prods. Corp., Hollywood, Fla.

Proximity Indicators—See Indicators, Proximity

Public Address Systems—See Vol 1

Pullers, Circuit Board—See Vol 3

Pullers, Fuse—See Vol 3

Pullers, Lamp—See Vol 3

Pullers, Tube—See Vol 3

Pulse Analyzers—See Analyzers, Pulse—Vol 1

Pulse-Form Restorers—See Restorers, Pulse-Form—Vol 1

Pulse Networks—See Networks, Pulse

Pulse Rise Time Indicators—See Indicators, Pulse Rise Time—Vol 1

Pumps, Cryogenic—See Vol 1

Pumps, Nonmetallic—See Vol 1

Pumps, Sealless—See Pumps, Nonmetallic—Vol 1

Pumps, Vacuum—See Vol 1

Punched Card Equipment—See Vol 1

Punches, Chassis—See Vol 3

Pyrometers, Infrared—See Vol 1

Pyrometers, Optical, Non-Infrared—See Vol 1

Pyrometers, Recording—See Vol 1

Pyrometers, Resistance-Type—See Vol 1

Pyrometers, Thermocouple-Type—See Vol 1

Quartz, Fused—See Vol 1

Quartz, Raw—See Crystals, Quartz

RFI Measuring Equipment—See Vol 1

RFI Shielding—See Shields, R-F—Vol 3

RFI Testing Services—See Services, Electrical Measurement—Vol 3

Racks, Aging—See Vol 3

Racks, Cabinet—See Vol 3

Racks, Desk & Console—See Vol 3

Racks, Circuit Board—See Vol 3

Racks, Module-Also See Racks, Circuit Board—See Vol 3

Racks, Relay & Mounting—See Vol 3

Radar Equipment—See Analyzers; Testers; Simulators; etc.—Vol 1

Radar Systems—See Vol 1

Radar Testers—See Testers, Radar—Vol 1

Radiation Equip., Nuclear—See Dosimeters; Counters, Geiger;Counters, Scintillation; Film Badges—Vol 1

Radioactive Light Sources—See Sources, Light, Radioactive—Vol 1

Radio Comm. Systems—See Comm. Systems (As Modified)—Vol 1

Radiographic Equipment—See X-Ray Inspection Equipment—Vol 1

Radiometers—See Vol 1

Radomes—See Vol 1

Range Finder Systems—See Vol 1

Rare Earths—See Metals, Rare—Vol 3

Rate-Of-Turn Tables—See Tables, Rate-of-Turn—Vol 1

Reactors, Charging—See Vol 3

Reactors, Epitaxial—See Machines, Semiconductor Manufacturing—Vol 1

Reactors, Filter—See Vol 3

Reactors, Loading—See Vol 3

Reactors, Saturable—See Vol 3

Readers, Character—See Vol 1

Readers, Magnetic Tape (Computer Type)—See Vol 1

Readers, Microfinche—See Vol 1

Readers, Punched Card—See Punched Card Equipment—Vol 1

Readers, Punched Tape—See Vol 1

Readouts & Readout Devices—See Specific Types

Readouts, Dot Matrix

LVC Ind's., Inc., Corona, N.Y.
Info-Lite Corp., Ft. Lee, N.J.
TEC, Inc., Eden Prairie, Minn.

Readouts, Edge-Lighted

Alco Elctrn. Prods., Lawrence, Mass.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Inter-Market, Inc., Glenview, Ill.
LVC Ind's., Inc., Corona, N.Y.
Ackerman Engravers, Inc., Long Island City, N.Y.
Bodnar Prods. Corp., New Rochelle, N.Y.
Dyonics, Inc., Woburn, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Milman Engrg. Co., Inc., Santa Monica, Calif.
Robertson Instr., Azusa, Cal.

Readouts, Electroluminescent

Bowmar Instr. Corp., Ft. Wayne, Ind.

Readouts, Electro Mechanical

Allard Instr. Corp., Westbury, NY p 1435
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1312,1442
Digitran Co., Pasadena, Cal.
Digitron Corp., Norristown, Pa.
Haydon, A. W. Co., Waterbury, Conn.
Hecon Corp., New Shrewsbury, N.J.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
LVC Ind's., Inc., Corona, N.Y.
Magnetic Technology, Canoga Pk., Cal. p 1503
Norden Div., Norwalk, Conn.
Veeder-Root, Hartford, Conn....... p 1352
Vernitron, Torrance, Cal. .... p 1503
Vernitron Corp., Deer Pk., N.Y. .. p 1503
Cramer Div., Old Saybrook, Conn.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
ENM Co., Chicago, Ill.
Gap Instr. Corp., Hauppauge, N.Y.
Kenney Engrg. Corp., Monrovia, Cal.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
Parametrics, Inc., Orange, Conn.
Patwin Div., Waterbury, Conn.
Penn Keystone Corp., Ansonia, Conn.
Phaostron Instr. & Elctrn. Co., So. Pasadena, Cal.
Robertson Instr., Azusa, Cal.
Servo Dev. Corp., Hicksville, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
United Aircraft Corp., Norwalk, Conn.

Readouts, Lighted, Segmented

Alco Elctrn. Prods., Lawrence, Mass. p 1438
API Instrs. Co., Waltham,, Mass. .. p 402
Chicago Miniature Lamp Works, Chicago, Ill.
Computer Prods., Ft. Lauderdale, Fla. p 341
Dialight Corp., Brooklyn, N.Y....... p 1447
Electrons Co., Fairfield, N.J. .... p 1451
Ind'l Elctrn. Engrs., Van Nuys, Cal. p 1477
Inter-Market, Inc., Glenview, Ill.
Legi Elctrns. Corp., Los Angeles, Cal. p 1483
LVC Ind's., Inc., Corona, N.Y.
Nippon Electric/NEC America, N.Y., N.Y.
Pinlites, Fairfield, N.J. .... p 1490
Wagner Elec. Corp., Livingston, N.J. p 1502
Analogic, Wakefield, Mass.
Bomac Elctrns., Inc., Northridge, Cal.
Burroughs Corp., Plainfield, N.J.
Cooke Engrg. Co., Alexandria, Va.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dyonics, Inc., Woburn, Mass.
Ealing Corp., Cambridge, Mass.
Elecpac Inc., Cary, Ill.
Fiber Photics, Inc., Santa Cruz, Cal.
Info-Lite Corp., Ft. Lee, N.J.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Luminetics Corp., Pompano Beach, Fla.
Master Specialties, Costa Mesa, Cal.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Mura Corp., Jericho, N.Y.
National Elctrns., Geneva, Ill.
Parametrics, Inc., Orange, Conn.
Penn Keystone Corp., Ansonia, Conn.
Rank Precision Inds., W. Nyack, N.Y.
Robertson Instr., Azusa, Cal.
Singer-General Precision, Inc., Little Falls, N.J.
TEC, Inc., Eden Prairie, Minn.

Readouts, Rear-Projection

Ind'l Elctrn. Engrs., Van Nuys, Cal. p 1476,1477
Bendix, Sturbridge, Mass.
Burroughs Corp., Plainfield, N.J.
TEC, Inc., Eden Prairie, Minn.

Readouts, Semiconductor Type Incl. Light-Emitting Diodes & Switches

Alco Elctrn. Prods., Lawrence, Mass.
Dialight Corp., Brooklyn, N.Y....... p 1447
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Rectifier, El Segundo, Cal.
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Nippon Electric/NEC America, N.Y., N.Y. .... p 1487
Sensor Tech., Van Nuys, Cal....... p 1638
Analogic, Wakefield, Mass.
Luminetics Corp., Pompano Beach, Fla.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Robertson Instr., Azusa, Cal.
TEC, Inc., Eden Prairie, Minn.

Receivers, A-M (Precision Test)—See Vol 1

Receivers, Beacon—See Vol 1

Receivers, Carrier Telegraph—See Vol 1

Receivers, Command—See Vol 1

Receivers, Communication & Amateur—See Vol 1

Receivers, Diplexer—See Vol 1

Receivers, Diversity Reception—See Vol 1

Receivers, Duplexer—See Vol 1

Receivers, Facsimile—See Vol 1

Receivers, Field Intensity, Microwave—See Receivers, Microwave—Vol 1

Receivers, Fixed Frequency—See Vol 1

Receivers, F-m (Precision Test)—See Vol 1

Receivers, Frequency Shift—See Vol 1

Receivers, Headphone—See Headphones—Vol 1

Receivers, I-F—See Vol 1

Recievers, Infrared

Dynarad, Inc., Norwood, Mass.
Abtronics, Inc., Livermore, Calif.
Advanced Kinetics, Costa Mesa, Calif.
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
Arco Systems Inc., Palo Alto, Cal
Avco Corp., Cincinnati, Ohio
Collins Radio Co., Dallas, Tex.
De-Tec-Tronic Corp., Chicago, Ill.
Infrared Inds., Inc., Santa Barbara, Cal.
Loral Elctrn. Sys., Bronx, N.Y.
Molectron Corp., Sunnyvale, Cal.
Philips Broadcast Equipment Corp., Montvale, N.J.
Raytheon Co., Lexington, Mass.
Sanders Assocs., Nashua, N.H.

Receivers, Interrogation—See Vol 1

Receivers, Logarithmic—See Vol 1

Receivers, Loran, Lab Test—See Vol 1

Receivers, Loran, Timing—See Vol 1

Receivers, Microwave—See Vol 1

Receivers, Monitoring, Communications—See Vol 1

Receivers, Multiplex—See Vol 1

Receivers, Panoramic—See Vol 1

Receivers, Phase Lock—See Vol 1

Receivers, Radar—See Vol 1

Receivers, Radio Paging—See Comm. Systems, Selective Paging—Vol 1

Receivers, Radiometric—See Radiometers—Vol 1

Receivers, Rebroadcast—See Vol 1

Receivers, Search & Countermeasure—See Vol 1

Receivers, Single-Sideband—See Vol 1

Receivers, Telemetry—See Vol 1

Receivers, Time Code—See Vol 1

Receivers, Tone—See Vol 1

Receivers, Transmissometer—See Vol 1

Receivers, Tropospheric Scatter—See Vol 1

Receivers, Tv—See Monitors, Video—Vol 1

Receivers, UHF & VHF—See Vol 1

Receivers, Ultraviolet—See Vol 1

Receivers, VLF—See Vol 1

Receivers, WWV—See Vol 1

Receptacles—See Connectors; Jacks; Sockets—Vol 3

Receptacles, Antenna Tapping—See Vol 3

Recorders, Antenna Pattern—See Vol 1

Recorders, Blood Pressure—See Vol 1

Recorders, Code—See Vol 1

Recorders, Computer Data—See Data Recorders, Computer—Vol 1

Recorders, Disc—See Vol 1

Recorders, Electronic, Rotary Stylus—See Vol 1

Recorders, Electrostatic—See Vol 1

Recorders, Event—See Vol 1

Recorders, F-M—See Recorders, Magnetic Tape—Vol 1

Recorders, Facsimile—See Vol 1

Recorders, Film

Beta Instr., Newton Upper Falls, Mass. p 337
Teledyne Geotech, Dallas, Tex.
Artronix, Inc., St. Louis, Mo.
Geo Space, Houston, Tex.
Gordon Alan Entprs., N. Hollywood, Cal.
Heitz, Karl, Inc., New York, N.Y.
KDI Adtrol, Inc., Broomall, Pa.
Litton Inds., San Carlos, Calif.
Maurer, J.A., Inc., Woodside, N.Y.
Miles Reproducer Co., Inc., New York, N.Y.
Photo-Sonics, Inc., Burbank, Calif.
RCA Corp., Camden, N.J.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Stancil-Hoffman Corp., Hollywood, Calif.
Tensitron, Inc., Harvard, Mass.
Traid Corp., Glendale, Cal.
Video Resch. Corp., Rockville, Md.

Recorders, Film Strip, Magnetic—See Vol 1

Recorders, Flight—See Vol 1

Recorders, Frequency—See Vol 1

Recorders, Graphic—See Recorders (As Modified)—Vol 1

Recorders, Humidity (Electronic)—See Vol 1

Recorders, Long-Term Tape—See Recorders, Magnetic Tape—Vol 1

Recorders, Magnetic Tape (Lab Type)—See Vol 1

Recorders, Moisture (Electronic)—See Vol 1

Recorders, Oxygen(Ozone—See Vol 1

Recorders, Polar—See Vol 1

Recorders, Power-Level—See Vol 1

Recorders, Pressure (Electronic)—See Vol 1

Recorders, Pyrometer—See Pyrometers, Recording—Vol 1

Recorders, Smoke & Combustion (Electronic)—See Vol 1

Recorders, Sound Level—See Vol 1

Recorders, Stereophonic Tape (Nonentertainment)—See Vol 1

Recorders, Strain—See Vol 1

Recorders, Strip-Chart—See Vol 1

Recorders, Synchronized Film-Tape—See Vol 1

Recorders, Tape Loop (Lab Type)—See Vol 1

Recorders, Telemetering—See Vol 1

Recorders, Teletype—See Vol 1

Recorders, Temperature (Electronic)—See Vol 1

Recorders, Timing—See Vol 1

Recorders, Torque (Electronic)—See Vol 1

Recorders, Transient—See Vol 1

Recorders, Vacuum—See Recorders, Pressure—Vol 1

Recorders, Vibration—See Vol 1

Recorders, Video Tape—See Vol 1

Recorders, X-Y—See Vol 1

Recording Paper (For Strip-Chart Recorders, Oscillographs, X-Y)—See Paper, Graphic Recording—Vol 1

Recording Tape, Magnetic—See Tapes, Recording, Magnetic—Vol 1

Records, Frequency Test—See Vol 1

Records, Instruction-Code, Language, etc.—See Vol 1

Rectifier Power Units (Power Supply Type)—See Vol 1

Rectifiers, Copper Oxide

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Schauer Mfg. Corp., Cincinnati, Ohio
Bradley Semiconductor Corp., New Haven, Conn.
Edal Inds., Inc., E. Haven, Conn.
Mura Corp., Jericho, N.Y.
Rectifier Engrg. & Supply, St. Louis, Mo.

Rectifiers, Copper Sulfide

General Electc. Semiconductor, Syracuse,, N.Y.
Rectifier Engrg. & Supply, St. Louis, Mo.

Rectifiers, Electron Tube—See Tubes, Rectifying

Rectifiers, Germanium

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
International Rectifier, El Segundo, Cal.
Calvert Elctrns., Inc., New York, N.Y.
Franel Corp., So. River, N.J.
Int'l. Elctrns., Melville, N.Y.
Mullard, Inc., Farmingdale, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
State Labs, Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Wolfson, P.J. Co., New Rochelle, N.Y.

Rectifiers, Germanium Stack

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Opad Elec. Co., Inc., New York, N.Y.
Argent Inds., Inc., Dayton, Ohio
Franel Corp., So. River, N.J.
Mullard, Inc., Farmingdale, N.Y.
Wolfson, P.J. Co., New Rochelle, N.Y.
Y.T. & T. Corp., Roslyn Hgts., N.Y.

Rectifiers, Selenium

Elctrn. Devices, Yonkers, N.Y.
Gates Elctrn. Co., Bronx, N.Y.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
International Rectifier, El Segundo, Cal. p 1807
Ledex, Inc., Dayton, Ohio
Opad Elec. Co., Inc., New York, N.Y.
Rectifier Comps. Corp., Freeport, N.Y. p 1815
Action Systems Co., Meriden, Conn.
Alpha Comps. Corp., Venice, Calif.
Bradley Semiconductor Corp., New Haven, Conn.
Connolly & Co., Inc., Mt. View, Calif.
Darrah Elec. Co., Inc., Cleveland, Ohio
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Electro-Standards Labs., Inc., Miami, Fla.
Franel Corp., So. River, N.J.
General Elec., Providence, R.I.
General Instr. of Can., Waterloo, Ont., Can.
General Instr. Corp., Hicksville, N.Y.
Green Elec. Corp., Fair Lawn, N.J.
Green Rectifier Corp., Fair Lawn, N.J.
ITT Semiconductors, W. Palm Beach, Fla.
M & T Chemicals Inc., Rahway, N.J.
Miller, Sanford Corp., Brooklyn, N.Y.
Power Conversion Prods. Inc., Crystal Lake, Ill.
Ramm Rectifier Co., Inc., Bronx, N.Y.
Rapid Elec. Co., Bronx, N.Y.
Rectico, Inc., Cedar Grove, N.J.
Rectifier Engrg. & Supply, St. Louis, Mo.
Sarkes Tarzian, Inc., Bloomington, Ind.
Sel-Rex Corp., Nutley, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Syntron Div., Homer City, Pa.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Buffalo, N. Y.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Wolfson, P.J. Co., New Rochelle, N.Y.

Rectifiers, Selenium Stack

Gates Elctrn. Co., Bronx, N.Y.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
International Rectifier, El Segundo, Cal. p 1807
Opad Elec. Co., Inc., New York, N.Y.
Rectifier Comps. Corp., Freeport, N.Y. p 1815
Alpha Comps. Corp., Venice, Calif.
Bradley Semiconductor Corp., New Haven, Conn.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Electro-Standards Labs., Inc., Miami, Fla.
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
Green Elec. Corp., Fair Lawn, N.J.
Green Rectifier Corp., Fair Lawn, N.J.
ITT Semiconductors, W. Palm Beach, Fla.
M & T Chemicals Inc., Rahway, N.J.
Miller, Sanford Corp., Brooklyn, N.Y.
Power Conversion Prods. Inc., Crystal Lake, Ill.
Ramm Rectifier Co., Inc., Bronx, N.Y.
Rapid Elec. Co., Bronx, N.Y.
Rectifier Engrg. & Supply, St. Louis, Mo.
Sarkes Tarzian, Inc., Bloomington, Ind.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Syntron Div., Homer City, Pa.
Westinghouse Elec., Buffalo, N. Y.
Wolfson, P.J. Co., New Rochelle, N.Y.

Y.T. & T. Corp., Roslyn Hgts., N.Y.

Rectifiers, Silicon

Carter Semiconductor, Amityville, N.Y.
Centralab Semiconductor, El Monte, Cal. ....p 1796,1797
Christie Elec., Los Angeles, Cal.
CML-Macarr, Inc., Edison, N.J.
Delco Elctrns. Div., Kokomo, Ind. p 1801
Elctrn. Devices, Yonkers, N.Y. p 1803,1804
Erie Technological Prods. (EEM), Erie, Pa.
Gates Elctrn. Co., Bronx, N.Y.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal. p 1807
Ledex, Inc., Dayton, Ohio
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal. p 1811-1813
Nippon Electric/NEC America, N.Y., N.Y.
Opad Elec. Co., Inc., New York, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Rectifier Comps. Corp., Freeport, N.Y. p 1815
Semtech Corp., Newbury Pk., Cal. p 1816,1817,1819
Solid State Devices, Santa Fe Springs, Cal. ....p 1836,1837
Unitrode, Watertown, Mass. p 1852,1853
Unitrode Corp., Watertown, Mass. p 1852,1853
Wagner Elec. Corp., Livingston, N.J. p 1841,1842
Westinghouse Elec., Youngwood, Pa. p 1858,1859
Allis-Chalmers, Milwaukee, Wisc.
Alpha Comps. Corp., Venice, Calif.
American Semiconductor Corp., Arlington Hgts., Ill.
Bradley Semiconductor Corp., New Haven, Conn.
Calvert Elctrns., Inc., New York, N.Y.
Computer Diode, Fair Lawn, N.J.
Cordover, Carl & Co., Mineola, N.Y.
Darrah Elec. Co., Inc., Cleveland, Ohio
Dickson Elctrns. Corp., Scottsdale, Ariz
Edal Inds., Inc., E. Haven, Conn.
Electronic Transistors, Flushing, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Elec., Providence, R.I.
General Instr. of Can., Waterloo, Ont., Can.
General Instr. Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Isofilm Int'l., Chatsworth, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
La Rose, W.T. & Assocs., Troy, N.Y.
M & T Chemicals Inc., Rahway, N.J.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Power Physics Corp., Eatontown, N.J.
Price & Rutzebeck, Hayward, Calif.
Ramm Rectifier Co., Inc., Bronx, N.Y.
Rapid Elec. Co., Bronx, N.Y.
Rectifier Engrg. & Supply, St. Louis, Mo.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Sel-Rex Corp., Nutley, N.J.
Semicon Inc., Burlington, Mass.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
Syntron Div., Homer City, Pa.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Varo, Inc., Semiconductor Div., Garland, Tex.
Vidaire Electronics Mfg. Corp., Freeport, N.Y.
Wolfson, P.J. Co., New Rochelle, N.Y.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Rectifiers, Silicon Controlled —See Thyristors

Rectifiers, Silicon Stack

Elctrn. Devices, Yonkers, N.Y. p 1802,1804,1805
Gates Elctrn. Co., Bronx, N.Y.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
International Rectifier, El Segundo, Cal. p 1807
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal. p 1811
Nippon Electric/NEC America, N.Y., N.Y.
Opad Elec. Co., Inc., New York, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Rectifier Comps. Corp., Freeport, N.Y. p 1815
Semtech Corp., Newbury Pk., Cal. p 1820
Solid State Devices, Santa Fe Springs, Cal.
Unitrode, Watertown, Mass. .... p 1854
Unitrode Corp., Watertown, Mass. p 1854
Wagner Elec. Corp., Livingston, N.J. p 1843
Westinghouse Elec., Youngwood, Pa. p 1858,1859
Argent Inds., Inc., Dayton, Ohio
Bradley Semiconductor Corp., New Haven, Conn.
Calvert Elctrns., Inc., New York, N.Y.
Computer Diode, Fair Lawn, N.J.
Dickson Elctrns. Corp., Scottsdale, Ariz
Edal Inds., Inc., E. Haven, Conn.
Electro-Standards Labs., Inc., Miami, Fla.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Isofilm Int'l., Chatsworth, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
M & T Chemicals Inc., Rahway, N.J.
Miller, Sanford Corp., Brooklyn, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Power Conversion Prods. Inc., Crystal Lake, Ill.
Power Physics Corp., Eatontown, N.J.
Ramm Rectifier Co., Inc., Bronx, N.Y.
Rectifier Engrg. & Supply, St. Louis, Mo.
Sarkes Tarzian, Inc., Bloomington, Ind.
Semicon Inc., Burlington, Mass.
Syntron Div., Homer City, Pa.
Transitron Elctrn. Corp., Wakefield, Mass.
Varian Assocs., Palo Alto, Cal.
Varo, Inc., Semiconductor Div., Garland, Tex.
Wilkinson Elctrns., Woodlyn, Pa.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Rectifiers, Thyratron—See Tubes, Thyratron

Reducers, Speed-Also See Gear Mechanisms

Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
Computer Instrs., Hempstead, N.Y.
FAE Instr. Corp., Huntington Sta., N.Y. p 1587
General Elec. Co., Schenectady, N.Y.
Haydon, A. W. Co., Waterbury, Conn.
Planet Instr., Ft. Wayne, Ind. ...... p 1626
Precision Mechanisms, Westbury, N.Y. p 1876
Advance Gear & Mach., Los Angeles, Cal.
Allis, Louis Co., Milwaukee, Wisc.
Analog General Corp., Oceanside, N.Y.
Dynamic Gear, Ft. Lauderdale, Fla.
Essex Engrg. Co., Inc., Essex, Conn.
Geartronics Corp., N. Billerica, Mass.
Holtzer-Cabot Corp., No. Attleboro, Mass.
Insco Corp., Groton, Mass.
Instru-Lec Corp., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Juall Gear Co., Inc., Hawthorne, N.J.
Lem Instrument Corp., Farmingdale, N.Y.
Link Div., Binghamton, N.Y.
McNally Bros. Mach. & Gear, Mipls., Minn.
Meltronics Inc., Wantagh, N.Y.
Metron Instrs., Inc., Denver, Colo.
Orbit Instr. Corp., Syosset, N.Y.
PIC Design Corp., Ridgefield,, Conn.
Reliance Elec. Co., Cleveland, Ohio
Singer-General Precision, Inc., Little Falls, N.J.
Sterling Instr., New Hyde Pk., NY
Stop Components, Inc., Freeport, N.Y.
USM Corp., Wakefield, Mass.
Waldom Elctrns., Inc., Chicago, Ill.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Wolfson, P.J. Co., New Rochelle, N.Y.
Zero-Max Co., Minneapolis, Minn.

Reels, Cord & Cable—See Vol 3

Reels, Tape—See Tape Recording Accessories—Vol 1

Reference Books—See Technical Books—Vol 3

References, D-C Voltage—See Vol 1

Reflectors, Passive—See Antenna Reflectors—Vol 1

Refrigerants, Spray—See Vol 3

Refrigerated Cooling Equipment—See Air Conditioners—Vol 3

Regulators, Current—See Vol 1

Regulators, Frequency—See Vol 1

Regulators, Pitch & Tempo—See Vol 1

Regulators & References, Silicon-Also See Diodes, Zener

Beckman Instrs., Cedar Grove, N.J.
Centralab, Elctrns., Milwaukee, Wisc.
Centralab Semiconductor, El Monte, Cal. ....p 1796,1797
Dynage, Bloomfield, Conn.
Elcor Prods. Welex Elctrns., Silver Spring, Md.
Electronic Resch. Assocs., Cedar Grove, N.J.
General Elec. Co., Schenectady, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal. p 1807
Kepco, Inc., Flushing, N.Y.
Precision Monolithics, Santa Clara, Cal.
Solid State Devices, Santa Fe Springs, Cal.
Stevens-Arnold, Inc., So. Boston, Mass.
Teledyne Philbrick, Dedham, Mass.
Tempo/UTI Div., Chatsworth, Cal.
Trio Labs, Inc., Plainview, N.Y.
Victoreen Instr., Cleveland, Ohio
Advanced Energy Conversion, Menlo Pk., Cal.
AMBAC Inds., Garden City, N.Y.
Computer Diode, Fair Lawn, N.J.
Dickson Elctrns. Corp., Scottsdale, Ariz
E-Tronics, Van Nuys, Cal.
Eastron Corp., Haverhill, Mass.
Ferranti Ltd., Hollinwood, Lancs., England
General Instr. Corp., Hicksville, N.Y.
Instrulab, Inc., Dayton, Ohio
ITT Semiconductors, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Rapid Elec. Co., Bronx, N.Y.
Sarkes Tarzian, Inc., Bloomington, Ind.
Semicon Inc., Burlington, Mass.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.

Regulators & Stabilizers, Voltage Also See Transformers, Voltage Regulating—See Vol 1

Relay Covers, Cases, Enclosures—See Cans, Relay—Vol 3

Relay Tools—See Tools, Relay Servicing—Vol 3

Relays, Antenna—See Relays, R-F (Including Antenna & Coaxial)

Relays, Audio Operated—See Relays, Frequency Selective

Relays, Coaxial—See Relays, R-F (Including Antenna And Coaxial)

Relays, Contact—See Relays, Power

Relays, Crystal Can—See Relays, Miniature & Subminiature

Relays, Current Sensing

Autronics Corp., Pasadena, Calif. p 1311
Babcock Relays, Costa Mesa, Calif.
Diversified Elctrns., Evansville, Ind p 1684
Elctrn. Applications, S. El Monte, Cal.
Elctrn. Instr. & Specialty, Winchester, Mass.
Flight Sys., Inc., Mechanicsburg, Pa.
General Elec. Co., Schenectady, N.Y. p 1709
Hart-Advance Relay Div., Crystal Lake, Ill.
Heinemann Elec. Co., Trenton, N.J. p 1919
Hi-G, Windsor Locks, Conn. p 1733,1737
Kratos Precision Prods., Los Angeles, Cal.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Ohmite Mfg. Co., Skokie, Ill.
Potter & Brumfield, Princeton, Ind. p 1776
Self-Organizing Sys., Inc., Dallas, Tex.
Teledyne Relays, Hawthorne, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
Automatic Switch Co., Florham Park, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Deutsch Relay Div., East Northport, NY
General Automatic Corp., Bayonne, N.J.
Hartman Electrical Mfg., Mansfield, Ohio
Hillburn Relay Corp., Farmingdale, N.Y.
Hoagland Instr., Red Bank, N.J.
Isotech Inc., Westford, Mass.
Kurman Instrs. Corp., Syosset, N.Y.
Line Elec. Div., Parsippany, N.J.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Robicon Corp., Pittsburgh, Pa
Sensor Corp., Greenwich, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Teledyne Inet, Gardena, Cal.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Inc., Attleboro, Mass.
Universal Relay Corp., New York, N.Y.

Relays, Differential

Clare, C.P. & Co., Chicago, Ill.
Comar Electric, Chicago, Ill.
DDC, Hicksville, N.Y. .... p 1282
Diversified Elctrns., Evansville, Ind
General Elec. Co., Schenectady, N.Y.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Kratos Precision Prods., Los Angeles, Cal.
La Marche Mfg. Co., Des Plaines, Ill.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Magnecraft Elec., Chicago, Ill.
Ohmite Mfg. Co., Skokie, Ill.
Potter & Brumfield, Princeton, Ind.
Printact Relay Div., Long Island City, N.Y. .... p 1784
Teledyne Relays, Hawthorne, Cal.
Automatic Switch Co., Florham Park, N.J.
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Fifth Dimension, Princeton, N.J.
General Automatic Corp., Bayonne, N.J.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Iso-Switch Corp., Costa Mesa, Cal.

Isotech Inc., Westford, Mass.
Lear Siegler, Inc., Santa Monica, Calif.
Line Elec. Div., Parsippany, N.J.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relays, Inc., New York, N.Y.
Robicon Corp., Pittsburgh, Pa
Rochester Instr. Sys., Rochester, N.Y.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Texas Instruments, Inc., Attleboro, Mass.
Universal Relay Corp., New York, N.Y.

Relays, Electrostrictive

RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Standard Relay Corp., W. Babylon, N.Y.

Relays, Frequency Selective

Autronics Corp., Pasadena, Calif. p 1311
Babcock Relays, Costa Mesa, Calif.
Betamite Electronic Devices, Culver City, Calif. .... p 1660
Biddle, James G., Plymouth Meeting, Pa.
Bramco Controls, Piqua, Ohio .... p 1406
Douglas Randall Div., Pawcatuck, Conn. p 1381
Frequency Control, Inc., Austin, Tex.
General Elec. Co., Schenectady, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hi-G, Windsor Locks, Conn.
J-B-T Instrs., Inc., New Haven, Conn. p 1929
Logitek, Inc., Farmingdale, N.Y. .. p 1752
North Hills Elctrns., Inc., Glen Cove, N.Y. .... p 1339
Solid State Elctrns., Sepulveda, Cal.
Stevens-Arnold, Inc., So. Boston, Mass. p 2007
Automatic Switch Co., Florham Park, N.J.
Communication Elctrns., Rockville, Md.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Lakeshore Electric Corp., Bedford, Ohio
Lear Siegler, Inc., Santa Monica, Calif.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Standard Relay Corp., W. Babylon, N.Y.
Teledyne Inet, Gardena, Cal.
Tempo Instr., Plainview, N.Y.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.

Relays, General Purpose

Alco Elctrn. Prods., Lawrence, Mass. p 1646
Allen-Bradley Co., Milwaukee, Wisc.
American Zettler, Costa Mesa, Calif. p 1647-1650,1652,1653
Babcock Relays, Costa Mesa, Calif. p 1658
Chicago Dynamic Inds., Chicago, Ill.
Clare, C.P. & Co., Chicago, Ill. .... p 1673
Comar Electric, Chicago, Ill. p 1676-1680
Computer Prods., Ft. Lauderdale, Fla.
Connector Corp., Chicago, Ill. .... p 2613
Couch S.H. Div., Boston, Mass... p 1675
Dale Elctrns., Inc., Yankton, S.D.
Deltrol Controls, Milwaukee, Wisc. p 1692
Douglas Randall Div., Pawcatuck, Conn.
Eagle-Signal Div., Davenport, Iowa p 1693
General Elec. Co., Schenectady, N.Y. p 1709
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1710
Guardian Elec. Mfg. Co., Chicago, Ill. p 1712,1713
Hamlin Elctrns., Inc., Phoenix, Ariz.
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Hi-G, Windsor Locks, Conn.
ITT Jennings, Indl Prods., San Jose, Cal .... p 1739
Kratos Precision Prods., Los Angeles, Cal.
Liberty Controls, Joliet, Ill. .... p 1748
Magnecraft Elec., Chicago, Ill. p 1762,1763
Midtex/Aemco, Mankato, Minn.. p 1761
Ohmite Mfg. Co., Skokie, Ill. .... p 1769
Potter & Brumfield, Princeton, Ind. p 1771-1774
Printact Relay Div., Long Island City, N.Y. .... p 1784
Schrack Elec. Sls., New York, N.Y. p 1787
Self-Organizing Sys., Inc., Dallas, Tex.
Solid State Elctrns., Sepulveda, Cal.
Sorenson Lighted Controls, W. Hartford, Conn.
Stevens-Arnold, Inc., So. Boston, Mass. p 2007
T-Bar Inc., Wilton, Conn. .... p 1697
Teledyne Relays, Hawthorne, Cal.
Westinghouse Elec. Corp., Newark, N.J.
Wheelock Signals, Long Branch, N.J.
Adams & Westlake, Elkhart, Ind.
Aemco Div., Mankato, Minn.
Allied Elctrns. Corp., Chicago, Ill.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Switch Co., Florham Park, N.J.
Branson Corp., Denville, N.J.
Cornell-Dubilier Elctrns., Newark, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Davis Elec. Co., Cape Girardeau, Mo.
Deutsch Relay Div., East Northport, NY
Elec-Trol, Inc., Saugus, Cal.
Furnas Elec. Co., Batavia, Ill.
G-V Controls, Livingston, N.J.
General Automatic Corp., Bayonne, N.J.
General Elec., Providence, R.I.
General Relay Corp., Dover, N.J.
GTE Automatic Elec., Northlake, Ill.
Guardian California, Culver City, Cal.
H-B Instr. Co., Phila., Pa.
Hillburn Relay Corp., Farmingdale, N.Y.
HJS Engrg. Co., Park Ridge, Ill.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Residential Div., Mpls., Minn.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kurman Instrs. Corp., Syosset, N.Y.
Leach Corp., Los Angeles, Cal.
Line Elec. Div., Parsippany, N.J.
Mack Elec. Devices, Wyncote, Pa.
Micro Switch, Freeport, Ill.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Pacific Relays, Inc., Van Nuys, Calif.
Pollak, Joseph Corp., Boston, Mass.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Sls., Inc., Ft. Myers, Fla.
Relay Service Co., Chicago, Ill.
Relay Specialties, Inc., Fair Lawn, N.J.
Relays, Inc., New York, N.Y.
Rowan Controller, Westminister, Md.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sealectric Switch & Relay Co., Chicago, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Sierra Elec., Gardena, Calif.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
WABCO Aerospace Dept., Pittsburgh, Pa.
Ward Leonard, Mt. Vernon, N.Y.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Weston Instruments, Inc., Newark, N.J.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, High-Speed

Airpax Elctrns., Inc., Cambridge, Md.
American Zettler, Costa Mesa, Calif. p 1651
Babcock Relays, Costa Mesa, Calif. p 1654-1656,1658
Clare, C.P. & Co., Chicago, Ill. p 1662-1665,1667
Comar Electric, Chicago, Ill.
Computer Comps., Jamaica, N.Y. p 1661
Computer Prods., Ft. Lauderdale, Fla.
Coto-Coil Co., Inc., Providence, R.I. p 1683
Couch S.H. Div., Boston, Mass... p 1675
DDC, Hicksville, N.Y.
Douglas Randall Div., Pawcatuck, Conn. p 1686
Dow-Key, Santa Barbara, Cal. p 1744,1745
Elctrn. Applications, S. El Monte, Cal. p 1694,1695
Elctrn. Instr. & Specialty, Winchester, Mass. .... p 1706
Flight Sys., Inc., Mechanicsburg, Pa. p 1707
General Elec. Co., Schenectady, N.Y. p 1709
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1710,1711
Guardian Elec. Mfg. Co., Chicago, Ill.
Hamlin Elctrns., Inc., Phoenix, Ariz. p 1724
Hathaway Comps., Denver, Colo. p 1715
Hi-G, Windsor Locks, Conn. p 1729,1730
James Elctrns., Inc., Chicago, Ill. p 1742
Kilovac Corp., Santa Barbara, Cal. p 1744,1745
Liberty Controls, Joliet, Ill.
Magnecraft Elec., Chicago, Ill.
Multitech Automation Prods., Monterey Pk., Cal. .... p 362
Ohmite Mfg. Co., Skokie, Ill. .... p 1769
Penta Labs., Santa Barbara, Cal. p 1744,1745
Potter & Brumfield, Princeton, Ind. p 1778,1779
Printact Relay Div., Long Island City, N.Y.
Self-Organizing Sys., Inc., Dallas, Tex. p 1790
Solid State Elctrns., Sepulveda, Cal.
Stevens-Arnold, Inc., So. Boston, Mass. p 2007
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Adams & Westlake, Elkhart, Ind.
Automatic Switch Co., Florham Park, N.J.
Bristol Div, Waterbury, Conn
Cutler-Hammer, Milwaukee, Wisc.
Deutsch Relay Div., East Northport, NY
Elec-Trol, Inc., Saugus, Cal.
Electro-Sonic Control, Manteca, Calif.
Fifth Dimension, Princeton, N.J.
General Automatic Corp., Bayonne, N.J.
General Reed Co., Clark, N.J.
GTE Automatic Elec., Northlake, Ill.
H-B Instr. Co., Phila., Pa.
Hartman Electrical Mfg., Mansfield, Ohio
Iso-Switch Corp., Costa Mesa, Cal.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kurman Instrs. Corp., Syosset, N.Y.
Leach Corp., Los Angeles, Cal.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Sls., Inc., Ft. Myers, Fla.
Relays, Inc., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Thermosen, Inc., Stamford, Conn.
Torr Labs., Los Angeles, Cal.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.
WABCO Aerospace Dept., Pittsburgh, Pa.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, High Voltage

American Zettler, Costa Mesa, Calif.
Babcock Relays, Costa Mesa, Calif.
Beckman Instrs., Cedar Grove, N.J.
Clare, C.P. & Co., Chicago, Ill. .... p 1669
Cober Elctrns., Inc., Stamford, Conn.
Computer Comps., Jamaica, N.Y.
Coto-Coil Co., Inc., Providence, R.I.
Del Elctrns. Corp., Mt. Vernon, N.Y.
Douglas Randall Div., Pawcatuck, Conn. p 1381,1687
Dow-Key, Santa Barbara, Cal. p 1744,1745
Elctrn. Applications, S. El Monte, Cal. p 1695
Elctrn. Instr. & Specialty, Winchester, Mass.
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1710
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Hi-G, Windsor Locks, Conn.
Hipotronics, Inc., Brewster, N.Y.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal. p 1740,1928
ITT Jennings, Dunellen,, N.J. p 1740,1928
James Elctrns., Inc., Chicago, Ill. p 1742
Kilovac Corp., Santa Barbara, Cal. p 1744,1745
Kilovolt Corp., Hackensack, N.J.
Light Elec. Corp., Rancocas, N.J.
Magnecraft Elec., Chicago, Ill. .... p 1767
Midtex/Aemco, Mankato, Minn.
Penta Labs., Santa Barbara, Cal. p 1744,1745
Potter & Brumfield, Princeton, Ind.
Ross Engrg. Corp., Campbell, Cal. p 1786
Schrack Elec. Sls., New York, N.Y. p 1787
Self-Organizing Sys., Inc., Dallas, Tex.
Solid State Elctrns., Sepulveda, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
Westinghouse Elec. Corp., Newark, N.J.
Wheelock Signals, Long Branch, N.J.
Aemco Div., Mankato, Minn.
Arrow-Hart, Inc., Hartford, Conn.
Automatic Switch Co., Florham Park, N.J.
Clinton Instr. Co., Clinton, Conn.
Cornell-Dubilier Elctrns., Newark, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Deutsch Relay Div., East Northport, NY
Elec-Trol, Inc., Saugus, Cal.
H-B Instr. Co., Phila., Pa.
HJS Engrg. Co., Park Ridge, Ill.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kurman Instrs. Corp., Syosset, N.Y.
Leach Corp., Los Angeles, Cal.
Line Elec. Div., Parsippany, N.J.
Mack Elec. Devices, Wyncote, Pa.
Matrix Sys. Corp., Chatsworth, Cal.
Peschel Instrs., Cape Coral, Fla.
Pollak, Joseph Corp., Boston, Mass.
Price Elec. Co., Frederick, Md.
Relays, Inc., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Texas Instruments, Inc., Attleboro, Mass.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, Impulse

American Zettler, Costa Mesa, Calif.
Clare, C.P. & Co., Chicago, Ill.
Comar Electric, Chicago, Ill. .... p 1679
Dale Elctrns., Inc., Yankton, S.D.
Douglas Randall Div., Pawcatuck, Conn.
Gordos Corp., Bloomfield, N.J.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Guardian Elec. Mfg. Co., Chicago, Ill.
Potter & Brumfield, Princeton, Ind. p 1775
Ross Engrg. Corp., Campbell, Cal.
Schrack Elec. Sls., New York, N.Y.
Solid State Elctrns., Sepulveda, Cal.
Aemco Div., Mankato, Minn.
Cornell-Dubilier Elctrns., Newark, N.J.
Deutsch Relay Div., East Northport, NY
Fifth Dimension, Princeton, N.J.
General Automatic Corp., Bayonne, N.J.
GTE Automatic Elec., Northlake, Ill.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Leach Corp., Los Angeles, Cal.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Service Co., Chicago, Ill.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Torr Labs., Los Angeles, Cal.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.

Relays, Indicating Light

Comar Electric, Chicago, Ill.
Electrospace Corp., Westbury...... p 323
General Elec. Co., Schenectady, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Magnecraft Elec., Chicago, Ill.
Ohmite Mfg. Co., Skokie, Ill.

Potter & Brumfield, Princeton, Ind. p 1772
Schrack Elec. Sls., New York, N.Y. p 1787
Self-Organizing Sys., Inc., Dallas, Tex.
Sorenson Lighted Controls, W. Hartford, Conn.
Aemco Div., Mankato, Minn.
Cutler-Hammer, Milwaukee, Wisc.
Fifth Dimension, Princeton, N.J.
Hartman Electrical Mfg., Mansfield, Ohio
Hillburn Relay Corp., Farmingdale, N.Y.
Kurman Instrs. Corp., Syosset, N.Y.
Line Elec. Div., Parsippany, N.J.
Parker Instr. Corp., Stamford, Conn.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Vanguard Relay Corp., Lindenhurst, N.Y.
Comar Electric, Chicago, Ill.

Relays, Keying & Break-In

Clare, C.P. & Co., Chicago, Ill.
Computer Comps., Jamaica, N.Y.
Flight Sys., Inc., Mechanicsburg, Pa.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Magnecraft Elec., Chicago, Ill.
Aemco Div., Mankato, Minn.
AMBAC Inds., Garden City, N.Y.
Barron Controls & Relay Corp., Grayslake, Ill.
Diamond Repeater Co., Madison, N.J.
Fifth Dimension, Princeton, N.J.
General Automatic Corp., Bayonne, N.J.
Iso-Switch Corp., Costa Mesa, Cal.
Kurman Instrs. Corp., Syosset, N.Y.
Leach Corp., Los Angeles, Cal.
Relay Sls., Inc., Ft. Myers, Fla.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.

Relays, Latching, Magnetic

Allen-Bradley Co., Milwaukee, Wisc.
American Zettler, Costa Mesa, Calif.
Babcock Relays, Costa Mesa, Calif. p 1654,1655,1658
Chicago Dynamic Inds., Chicago, Ill.
Clare, C.P. & Co., Chicago, Ill. .... p 1668
Comar Electric, Chicago, Ill. .... p 1679
Computer Comps., Jamaica, N.Y.
Coto-Coil Co., Inc., Providence, R.I. p 1683
Deltrol Controls, Milwaukee, Wisc. p 1692
Douglas Randall Div., Pawcatuck, Conn.
Eagle-Signal Div., Davenport, Iowa p 1693
Elctrn. Applications, S. El Monte, Cal. p 1694,1695
Elctrn. Instr. & Specialty, Winchester, Mass.
Electronic Specialty Div., Portland, Ore p 1698,1699,1701-1704
General Elec. Co., Schenectady, N.Y. p 1708
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hamlin Elctrns., Inc., Phoenix, Ariz. p 1725
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Hi-G, Windsor Locks, Conn. .... p 1735
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
ITT Jennings, Indl Prods., San Jose, Cal .... p 1739
Kilovac Corp., Santa Barbara, Cal.
Kratos Precision Prods., Los Angeles, Cal. .... p 1783
Lectrohm, Inc., Chicago, Ill. .... p 1760
Ledex, Inc., Dayton, Ohio
Liberty Controls, Joliet, Ill. ..p 1747,1748
Magnecraft Elec., Chicago, Ill. p 1763,1766
Midtex/Aemco, Mankato, Minn... p 1761
New Prod. Engrg., Wabash, Ind. p 1792
North Elec. Co., Galion, Ohio
Ohmite Mfg. Co., Skokie, Ill.
Potter & Brumfield, Princeton, Ind. p 1771,1775-1777
Printact Relay Div., Long Island City, N.Y. .... p 1784
Ross Engrg. Corp., Campbell, Cal.
Schrack Elec. Sls., New York, N.Y. p 1787
Self-Organizing Sys., Inc., Dallas, Tex.
Solid State Elctrns., Sepulveda, Cal.
T-Bar Inc., Wilton, Conn. .... p 1697
Teledyne Relays, Hawthorne, Cal. p 1788
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Adams & Westlake, Elkhart, Ind.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Aemco Div., Mankato, Minn.
AMBAC Inds., Garden City, N.Y.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Branson Corp., Denville, N.J.
Cornell-Dubilier Elctrns., Newark, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Deutsch Relay Div., East Northport, NY
Elec-Trol, Inc., Saugus, Cal.
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
General Automatic Corp., Bayonne, N.J.
General Reed Co., Clark, N.J.
GTE Automatic Elec., Northlake, Ill.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Leach Corp., Los Angeles, Cal.
Line Elec. Div., Parsippany, N.J.
Matrix Sys. Corp., Chatsworth, Cal.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Pollak, Joseph Corp., Boston, Mass.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
Relay Sls., Inc., Ft. Myers, Fla.
Relay Specialties, Inc., Fair Lawn, N.J.
Rowan Controller, Westminister, Md.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sealectric Switch & Relay Co., Chicago, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
Ward Leonard, Mt. Vernon, N.Y.
Weston Instruments, Inc., Newark, N.J.

Relays, Latching, Mechanical

Allen-Bradley Co., Milwaukee, Wisc.
American Zettler, Costa Mesa, Calif.
Gordos Corp., Bloomfield, N.J.
Hart-Advance Relay Div., Crystal Lake, Ill.
Liberty Controls, Joliet, Ill. .... p 1748
Magnecraft Elec., Chicago, Ill.
Ohmite Mfg. Co., Skokie, Ill.
Schrack Elec. Sls., New York, N.Y. p 1787
Trompeter Elctrns., Chatsworth, Cal.
Westinghouse Elec. Corp., Newark, N.J.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Barron Controls & Relay Corp., Grayslake, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Davis Elec. Co., Cape Girardeau, Mo.
Fifth Dimension, Princeton, N.J.
General Automatic Corp., Bayonne, N.J.
General Elec., Providence, R.I.
Hillburn Relay Corp., Farmingdale, N.Y.
Leach Corp., Los Angeles, Cal.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Service Co., Chicago, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Torr Labs., Los Angeles, Cal.
Vanguard Relay Corp., Lindenhurst, N.Y.

Relays, Mercury Displacement

Clare, C.P. & Co., Chicago, Ill. .... p 1669
James Elctrns., Inc., Chicago, Ill.
Philadelphia Sci. Controls, Croydon, Pa.
Self-Organizing Sys., Inc., Dallas, Tex.
Adams & Westlake, Elkhart, Ind.
Fifth Dimension, Princeton, N.J.
H-B Instr. Co., Phila., Pa.
Haledy Elctrns. Co., New York, N.Y.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Milli-Switch Corp., Gladwyne, Pa.
Relay Sls., Inc., Ft. Myers, Fla.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Universal Relay Corp., New York, N.Y.

Relays, Mercury-Wetted Contacts

Babcock Relays, Costa Mesa, Calif. p 1659
Clare, C.P. & Co., Chicago, Ill. .... p 1662
Computer Comps., Jamaica, N.Y. p 1661
Computer Prods., Ft. Lauderdale, Fla. p 341
Coto-Coil Co., Inc., Providence, R.I. p 1683
Douglas Randall Div., Pawcatuck, Conn.
Elctrn. Applications, S. El Monte, Cal. p 1695
Elctrn. Instr. & Specialty, Winchester, Mass.
Electronic Specialty Div., Portland, Ore
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1710
James Elctrns., Inc., Chicago, Ill. p 1742
Kratos Precision Prods., Los Angeles, Cal. .... p 1783
Magnecraft Elec., Chicago, Ill. .... p 1767
Midtex/Aemco, Mankato, Minn... p 1761
New Prod. Engrg., Wabash, Ind. p 1792
Nippon Electric/NEC America, N.Y., N.Y.
Potter & Brumfield, Princeton, Ind. p 1779
Self-Organizing Sys., Inc., Dallas, Tex. p 1790
Trompeter Elctrns., Chatsworth, Cal.
Wheelock Signals, Long Branch, N.J. p 1791
Acrodyne Ltd., Janesville,, Wisc.
Adams & Westlake, Elkhart, Ind.
Aemco Div., Mankato, Minn.
Durakool, Inc., Elkhart, Ind.
Elec-Trol, Inc., Saugus, Cal.
Fifth Dimension, Princeton, N.J.
GTE Automatic Elec., Northlake, Ill.
H-B Instr. Co., Phila., Pa.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Matrix Sys. Corp., Chatsworth, Cal.
Mercoid Corp., Chicago, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Universal Relay Corp., New York, N.Y.

Relays, Meter

Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla.
API Instrs. Co., Waltham,, Mass. .. p 402
Beede Electrical Instr. Co., Inc., Penacook, N.H. .... p 416
Elctrn. Applications, S. El Monte, Cal.
General Elec. Co., Schenectady, N.Y. p 484
Hickok Elect. Instr., Cleveland, Ohio
Larson Instr. Co., Inc., Orangeburg, N.Y. p 513
Simpson Elec. Co., Chicago, Ill.
Teledyne Relays, Hawthorne, Cal.
A & M Instrument, Inc., Great Neck, N.Y.
Elctrn. Control Sys., Fairmont, W. Va.
General Reed Co., Clark, N.J.
Guide Inds., Inc., Sun Valley, Calif.
Int'l. Instrs., Orange, Conn.
Lewis Engrg. Co., Naugatuck, Conn.
Parker Instr. Corp., Stamford, Conn.
Q.V.S., Inc., East Orange, N.J.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Stark Elctrn. Instrs., Ltd., Ajax, Ont., Canada
Universal Relay Corp., New York, N.Y.
Weston Instruments, Inc., Newark, N.J.

Relays, Miniature & Subminiature

Airpax Elctrns., Inc., Cambridge, Md.
American Zettler, Costa Mesa, Calif.p 1647-1650
Babcock Relays, Costa Mesa, Calif. p 1654-1656,1658
Clare, C.P. & Co., Chicago, Ill. p 1664-1666,1670
Comar Electric, Chicago, Ill. .... p 1676
Computer Comps., Jamaica, N.Y. p 1661
Computer Prods., Ft. Lauderdale, Fla.
Coto-Coil Co., Inc., Providence, R.I. p 1682,1683
Couch S.H. Div., Boston, Mass... p 1675
DDC, Hicksville, N.Y. .... p 1282
Deltrol Controls, Milwaukee, Wisc. p 1692
Douglas Randall Div., Pawcatuck, Conn. p 1686,1687
Elctrn. Applications, S. El Monte, Cal. p 1694,1695
Elctrn. Instr. & Specialty, Winchester, Mass. .... p 1706
Electronic Specialty Div., Portland, Ore p 1698-1704
Flight Sys., Inc., Mechanicsburg, Pa.
General Elec. Co., Schenectady, N.Y. p 1708,1709
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1710
Guardian Elec. Mfg. Co., Chicago, Ill. p 1713
Hart-Advance Relay Div., Crystal Lake, Ill.
Hathaway Comps., Denver, Colo. p 1715,1716
Hi-G, Windsor Locks, Conn. p 1726-1733,1735-1738
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
ITT Jennings, Indl Prods., San Jose, Cal .... p 1739
James Elctrns., Inc., Chicago, Ill. p 1742
Kratos Precision Prods., Los Angeles, Cal. .... p 1783
Lectrohm, Inc., Chicago, Ill. .... p 1760
Liberty Controls, Joliet, Ill.
Magnecraft Elec., Chicago, Ill. p 1764-1767
Midtex/Aemco, Mankato, Minn... p 1761
Multitech Automation Prods., Monterey Pk., Cal. .... p 362
Ohmite Mfg. Co., Skokie, Ill. .... p 1769
Potter & Brumfield, Princeton, Ind. p 1776-1778
Printact Relay Div., Long Island City, N.Y.
Schrack Elec. Sls., New York, N.Y. p 1787
Self-Organizing Sys., Inc., Dallas, Tex. p 1790
Solid State Elctrns., Sepulveda, Cal.
T-Bar Inc., Wilton, Conn.
Teledyne Relays, Hawthorne, Cal. p 1788,1789
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Trompeter Elctrns., Chatsworth, Cal.
Wheelock Signals, Long Branch, N.J. p 1791
Acrodyne Ltd., Janesville,, Wisc.
Adams & Westlake, Elkhart, Ind.
Aemco Div., Mankato, Minn.
Anritsu Electric Co., Ltd., Tokyo, Japan
Barron Controls & Relay Corp., Grayslake, Ill.
Branson Corp., Denville, N.J.
Bristol Div, Waterbury, Conn
Cornell-Dubilier Elctrns., Newark, N.J.
Davis Elec. Co., Cape Girardeau, Mo.
Deutsch Relay Div., East Northport, NY
Elec-Trol, Inc., Saugus, Cal.
Fifth Dimension, Princeton, N.J.
General Automatic Corp., Bayonne, N.J.
General Reed Co., Clark, N.J.
GTE Sylvania Inc., Danvers, Mass.
Hillburn Relay Corp., Farmingdale, N.Y.
HJS Engrg. Co., Park Ridge, Ill.
Instrument Resistors, Brick Town, N.J.
Iso-Switch Corp., Costa Mesa, Cal.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kurman Instrs. Corp., Syosset, N.Y.
Leach Corp., Los Angeles, Cal.
Line Elec. Div., Parsippany, N.J.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Pacific Relays, Inc., Van Nuys, Calif.
Pollak, Joseph Corp., Boston, Mass.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Sls., Inc., Ft. Myers, Fla.

Relay Service Co., Chicago, Ill.
Relay Specialties, Inc., Fair Lawn, N.J.
Relays, Inc., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sealectric Switch & Relay Co., Chicago, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Terado Corp., St. Paul, Minn.
Texas Instruments, Inc., Attleboro, Mass.
Thermosen, Inc., Stamford, Conn.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
WABCO Aerospace Dept., Pittsburgh, Pa.
Weston Instruments, Inc., Newark, N.J.

Relays, Motor Driven

Eagle-Signal Div., Davenport, Iowa
General Elec. Co., Schenectady, N.Y.
Haydon, A. W. Co., Waterbury, Conn.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Midtex/Aemco, Mankato, Minn.
Aemco Div., Mankato, Minn.
Essex Engrg. Co., Inc., Essex, Conn.
Relay Specialties, Inc., Fair Lawn, N.J.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Teledyne Kinetics, Solana Beach, Cal.
Universal Relay Corp., New York, N.Y.
Zenith Controls Inc., Chicago, Ill.
Allen-Bradley Co., Milwaukee, Wisc.
Coto-Coil Co., Inc., Providence, R.I.
Elctrn. Applications, S. El Monte, Cal.
Elctrn. Instr. & Specialty, Winchester, Mass.
Electronic Specialty Div., Portland, Ore
General Elec. Co., Schenectady, N.Y.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Ledex, Inc., Dayton, Ohio
Magnecraft Elec., Chicago, Ill.
Potter & Brumfield, Princeton, Ind.
Schrack Elec. Sls., New York, N.Y.
T-Bar Inc., Wilton, Conn.
Arrow-Hart, Inc., Hartford, Conn.
Automatic Switch Co., Florham Park, N.J.
Barron Controls & Relay Corp., Grayslake, Ill.
Elec-Trol, Inc., Saugus, Cal.
Furnas Elec. Co., Batavia, Ill.
Matrix Sys. Corp., Chatsworth, Cal.
Price Elec. Co., Frederick, Md.
Relay Service Co., Chicago, Ill.
Rowan Controller, Westminister, Md.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Thermosen, Inc., Stamford, Conn.
Universal Relay Corp., New York, N.Y.
Ward Leonard, Mt. Vernon, N.Y.
Zenith Controls Inc., Chicago, Ill.

Relays, Overload

Allen-Bradley Co., Milwaukee, Wisc.
Autronics Corp., Pasadena, Calif.
Betamite Electronic Devices, Culver City, Calif.
Comar Electric, Chicago, Ill.
Diversified Elctrns., Evansville, Ind
Elctrn. Applications, S. El Monte, Cal.
Electronic Specialty Div., Portland, Ore
Flight Sys., Inc., Mechanicsburg, Pa.
General Elec. Co., Schenectady, N.Y.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Heinemann Elec. Co., Trenton, N.J. p 1919
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Potter & Brumfield, Princeton, Ind. p 1775
Ross Engrg. Corp., Campbell, Cal. p 1786
Schrack Elec. Sls., New York, N.Y. p 1787
Teledyne Relays, Hawthorne, Cal.
Aemco Div., Mankato, Minn.
Arrow-Hart, Inc., Hartford, Conn.
Automatic Switch Co., Florham Park, N.J.
Barron Controls & Relay Corp., Grayslake, Ill.
Basler Elec. Co., Highland, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Furnas Elec. Co., Batavia, Ill.
General Automatic Corp., Bayonne, N.J.
GTE Sylvania Inc., Danvers, Mass.
Hartman Electrical Mfg., Mansfield, Ohio
Hoagland Instr., Red Bank, N.J.
Kurman Instrs. Corp., Syosset, N.Y.
MEKontrol Inc., Northboro, Mass.
Relays, Inc., New York, N.Y.
Rowan Controller, Westminister, Md.
Sensor Corp., Greenwich, Conn.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Teledyne Kinetics, Solana Beach, Cal.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Universal Relay Corp., New York, N.Y.
Ward Leonard, Mt. Vernon, N.Y.
Westinghouse Elec., Buffalo, N. Y.
Weston Instruments, Inc., Newark, N.J.

Relays, Over-Current & Under-Current

Betamite Electronic Devices, Culver City, Calif.
Diversified Elctrns., Evansville, Ind p 1684
Elctrn. Applications, S. El Monte, Cal.
Electronic Specialty Div., Portland, Ore
Hart-Advance Relay Div., Crystal Lake, Ill.
Hi-G, Windsor Locks, Conn.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Magnecraft Elec., Chicago, Ill.
Teledyne Relays, Hawthorne, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
Hartman Electrical Mfg., Mansfield, Ohio
Hoagland Instr., Red Bank, N.J.
Instr. & Control Sys., Inc., Addison, Ill.
Kurman Instrs. Corp., Syosset, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Tempo Instr., Plainview, N.Y.

Relays, Over-Frequency & Under-Frequency

Airpax Elctrns., Inc., Cambridge, Md.
Autronics Corp., Pasadena, Calif. p 1311
Babcock Relays, Costa Mesa, Calif. p 1657
Betamite Electronic Devices, Culver City, Calif. .... p 1660
Bramco Controls, Piqua, Ohio .... p 1406
Douglas Randall Div., Pawcatuck, Conn. p 1381
Electronic Specialty Div., Portland, Ore
Frequency Control, Inc., Austin, Tex.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Haydon, A. W. Co., Waterbury, Conn.
Hi-G, Windsor Locks, Conn.
International Rectifier, El Segundo, Cal.
Liberty Controls, Joliet, Ill.
Logitek, Inc., Farmingdale, N.Y. .. p 1752
Potter & Brumfield, Princeton, Ind.
Solid State Elctrns., Sepulveda, Cal. p 954
Westinghouse Elec. Corp., Newark, N.J.
Automatic Switch Co., Florham Park, N.J.
Avtron Mfg., Inc., Cleveland, Ohio
Basler Elec. Co., Highland, Ill.
G-V Controls, Livingston, N.J.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Hi-Tek Corp., Santa Ana, Calif.
Hillburn Relay Corp., Farmingdale, N.Y.
Lakeshore Electric Corp., Bedford, Ohio
Lark Elctrns., Inc., New York, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Motor Generator Div., Troy, Ohio
Parker Instr. Corp., Stamford, Conn.
Robicon Corp., Pittsburgh, Pa
Rochester Instr. Sys., Rochester, N.Y.
Standard Relay Corp., W. Babylon, N.Y.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Inc., Attleboro, Mass.
Weston Instruments, Inc., Newark, N.J.

Relays, Over-Voltage & Under-Voltage

Airpax Elctrns., Inc., Cambridge, Md.
Allen-Bradley Co., Milwaukee, Wisc.
Almond Instrs. Co., Covina, Cal
American Zettler, Costa Mesa, Calif.
API Instrs. Co., Waltham,, Mass.
Autronics Corp., Pasadena, Calif. p 1311
Babcock Relays, Costa Mesa, Calif. p 1657
Betamite Electronic Devices, Culver City, Calif. .... p 1660
California Elctrn. Mfg. Co., Alamo, Calif.
Computer Comps., Jamaica, N.Y.
DDC, Hicksville, N.Y.
Deltron, Inc., N. Wales, Pa.
Diversified Elctrns., Evansville, Ind p 1684,1685
Elctrn. Applications, S. El Monte, Cal.
Electronic Specialty Div., Portland, Ore
General Elec. Co., Schenectady, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Haydon, A. W. Co., Waterbury, Conn.
Hi-G, Windsor Locks, Conn.
International Rectifier, El Segundo, Cal.
Logitek, Inc., Farmingdale, N.Y. p 1338,1751
Magnecraft Elec., Chicago, Ill.
Potter & Brumfield, Princeton, Ind. p 1777
Ross Engrg. Corp., Campbell, Cal.
Schrack Elec. Sls., New York, N.Y.
Simpson Elec. Co., Chicago, Ill.
Solid State Elctrns., Sepulveda, Cal.
Teledyne Relays, Hawthorne, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
Westinghouse Elec. Corp., Newark, N.J.
Automatic Switch Co., Florham Park, N.J.
Avtron Mfg., Inc., Cleveland, Ohio
Coil Co. of Amer., Northvale, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Fifth Dimension, Princeton, N.J.
G-V Controls, Livingston, N.J.
General Automatic Corp., Bayonne, N.J.
General Reed Co., Clark, N.J.
General Relay Corp., Dover, N.J.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Hi-Tek Corp., Santa Ana, Calif.
Hillburn Relay Corp., Farmingdale, N.Y.
Hoagland Instr., Red Bank, N.J.
Instr. & Control Sys., Inc., Addison, Ill.
Kurman Instrs. Corp., Syosset, N.Y.
Lakeshore Electric Corp., Bedford, Ohio
Lark Elctrns., Inc., New York, N.Y.
Larson Aero Dev., Concord, Calif.
Lear Siegler, Inc., Santa Monica, Calif.
Motor Generator Div., Troy, Ohio
Parker Instr. Corp., Stamford, Conn.
Relays, Inc., New York, N.Y.
Robicon Corp., Pittsburgh, Pa
Rochester Instr. Sys., Rochester, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Teledyne Kinetics, Solana Beach, Cal.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Inc., Attleboro, Mass.
Trepac Corp. America, Englewood, N.J.
Ward Leonard, Mt. Vernon, N.Y.
Weston Instruments, Inc., Newark, N.J.
Zenith Controls Inc., Chicago, Ill.

Relays, Phase-Sensing

Allen-Bradley Co., Milwaukee, Wisc.
Autronics Corp., Pasadena, Calif. p 1311
Babcock Relays, Costa Mesa, Calif. p 1657
Betamite Electronic Devices, Culver City, Calif. .... p 1660
Diversified Elctrns., Evansville, Ind p 1684
General Elec. Co., Schenectady, N.Y. p 1709
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1711
Guardian Elec. Mfg. Co., Chicago, Ill.
Hi-G, Windsor Locks, Conn. p 1326,1327,1733
Logitek, Inc., Farmingdale, N.Y.
Potter & Brumfield, Princeton, Ind.
Avtron Mfg., Inc., Cleveland, Ohio
Cutler-Hammer, Milwaukee, Wisc.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Hi-Tek Corp., Santa Ana, Calif.
Hillburn Relay Corp., Farmingdale, N.Y.
Lark Elctrns., Inc., New York, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Standard Relay Corp., W. Babylon, N.Y.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Inc., Attleboro, Mass.

Relays, Photoelectric

Betamite Electronic Devices, Culver City, Calif.
Computer Comps., Jamaica, N.Y.
General Elec. Co., Schenectady, N.Y.
James Elctrns., Inc., Chicago, Ill.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Nat'l. Semiconductors, Plattsburgh, N.Y.
Raytheon Co., Quincy, Mass.
Ripley Co., Inc., Middletown, Conn.
Slaughter Co., Ardmore, Okla.
Stevens-Arnold, Inc., So. Boston, Mass.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., Danville, Ill.
Coil Co. of Amer., Northvale, N.J.
Cutler-Hammer, Milwaukee, Wisc.
De-Tec-Tronic Corp., Chicago, Ill.
Decor Elctrns. Corp., Austin, Tex.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Electro-Sonic Control, Manteca, Calif.
Electronic Control Corp., Detroit, Mich.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Frost Electronics Corp., Bellingham, Mass.
General Automatic Corp., Bayonne, N.J.
Hughey & Phillips, Inc., Burbank, Cal.
Lark Elctrns., Inc., New York, N.Y.
Mack Elec. Devices, Wyncote, Pa.
MEKontrol Inc., Northboro, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Parker Instr. Corp., Stamford, Conn.
Photobell Co., Inc., New York, N.Y.
Photomation, Inc., Mountain View, Calif.
Power Instrs., Skokie, Ill.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Service Co., Chicago, Ill.
Sensor Corp., Greenwich, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Tri-Tronics Co., Oak Brook, Ill.
Weston Instruments, Inc., Newark, N.J.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, Plate Circuit

American Zettler, Costa Mesa, Calif.
Clare, C.P. & Co., Chicago, Ill.
Comar Electric, Chicago, Ill.
Computer Comps., Jamaica, N.Y.
Couch S.H. Div., Boston, Mass.. p 1675
Dale Elctrns., Inc., Yankton, S.D.
Deltrol Controls, Milwaukee, Wisc. p 1692
Douglas Randall Div., Pawcatuck, Conn.
Eagle-Signal Div., Davenport, Iowa p 1693
Elctrn. Applications, S. El Monte, Cal.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Hi-G, Windsor Locks, Conn.
Magnecraft Elec., Chicago, Ill. .... p 1762
Midtex/Aemco, Mankato, Minn.
Ohmite Mfg. Co., Skokie, Ill. .... p 1769
Potter & Brumfield, Princeton, Ind. p 1776
Schrack Elec. Sls., New York, N.Y.
Aemco Div., Mankato, Minn.
Artisan Elctrns. Corp., Parsippany, N.J.
Davis Elec. Co., Cape Girardeau, Mo.
Frost Electronics Corp., Bellingham, Mass.
General Automatic Corp., Bayonne, N.J.
General Relay Corp., Dover, N.J.
Guardian California, Culver City, Cal.
Hillburn Relay Corp., Farmingdale, N.Y.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kurman Instrs. Corp., Syosset, N.Y.
Leach Corp., Los Angeles, Cal.
Line Elec. Div., Parsippany, N.J.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.

Relay Sls., Inc., Ft. Myers, Fla.
Relay Service Co., Chicago, Ill.
Relays, Inc., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.

Relays, Plunger

Comar Electric, Chicago, Ill.
Dale Elctrns., Inc., Yankton, S.D.
Hart-Advance Relay Div., Crystal Lake, Ill.
James Elctrns., Inc., Chicago, Ill.
T-Bar Inc., Wilton, Conn.
Adams & Westlake, Elkhart, Ind.
H-B Instr. Co., Phila., Pa.
Kahl Scientific Instr. Corp., El Cajon, Calif.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.

Relays, Polarized

Babcock Relays, Costa Mesa, Calif.
Clare, C.P. & Co., Chicago, Ill.
Computer Comps., Jamaica, N.Y.
Cook Elec. Co., Morton Grove, Ill.
Coto-Coil Co., Inc., Providence, R.I. p 1683
Deltrol Controls, Milwaukee, Wisc.
Douglas Randall Div., Pawcatuck, Conn.
Elctrn. Applications, S. El Monte, Cal.
Flight Sys., Inc., Mechanicsburg, Pa.
General Elec. Co., Schenectady, N.Y.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Liberty Controls, Joliet, Ill.
Magnecraft Elec., Chicago, Ill.
Midtex/Aemco, Mankato, Minn.
Potter & Brumfield, Princeton, Ind. p 1776,1777
Printact Relay Div., Long Island City, N.Y.
Solid State Elctrns., Sepulveda, Cal.
T-Bar Inc., Wilton, Conn.
Wheelock Signals, Long Branch, N.J.
Adams & Westlake, Elkhart, Ind.
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Branson Corp., Denville, N.J.
Fifth Dimension, Princeton, N.J.
General Automatic Corp., Bayonne, N.J.
GTE Automatic Elec., Northlake, Ill.
Hartman Electrical Mfg., Mansfield, Ohio
Iso-Switch Corp., Costa Mesa, Cal.
Leach Corp., Los Angeles, Cal.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Pacific Relays, Inc., Van Nuys, Calif.
Price Elec. Co., Frederick, Md.
Relays, Inc., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.

Relays, Power

Allen-Bradley Co., Milwaukee, Wisc.
American Zettler, Costa Mesa, Calif. p 1652,1653
ATR Elctrns., Inc., St. Paul, Minn.
Babcock Relays, Costa Mesa, Calif. p 1658
Clare, C.P. & Co., Chicago, Ill. .... p 1669
Comar Electric, Chicago, Ill. p 1678,1679
Deltrol Controls, Milwaukee, Wisc. p 1692
Eagle-Signal Div., Davenport, Iowa p 1693
General Elec. Co., Schenectady, N.Y. p 1709
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1710,1711
Guardian Elec. Mfg. Co., Chicago, Ill. p 1712,1713
Hamlin Elctrns., Inc., Phoenix, Ariz. p 1724,1725
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Hi-G, Windsor Locks, Conn. p 1732,1735
International Rectifier, El Segundo, Cal.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal. p 1740,1928
ITT Jennings, Dunellen,, N.J. p 1740,1928
ITT Jennings, Indl Prods., San Jose, Cal. .... p 1739
James Elctrns., Inc., Chicago, Ill. p 1742
Johnson E. F. Co., Waseca, Minn.
Liberty Controls, Joliet, Ill. .... p 1748
Magnecraft Elec., Chicago, Ill. p 1762,1763,1767
Midtex/Aemco, Mankato, Minn.
Ohmite Mfg. Co., Skokie, Ill.
Potter & Brumfield, Princeton, Ind. p 1773,1774
Ross Engrg. Corp., Campbell, Cal. p 1786
Schrack Elec. Sls., New York, N.Y. p 1787
Solid State Elctrns., Sepulveda, Cal.
T-Bar Inc., Wilton, Conn. .... p 1697
Wheelock Signals, Long Branch, N.J.
Adams & Westlake, Elkhart, Ind.
Aemco Div., Mankato, Minn.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Switch Co., Florham Park, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Davis Elec. Co., Cape Girardeau, Mo.
Deutsch Relay Div., East Northport, NY
Dynamic Controls Corp., S. Windsor, Conn.
Electro-Sonic Control, Manteca, Calif.
Euclid Elec. & Mfg. Div., Madison, Ohio
Frost Electronics Corp., Bellingham, Mass.
Gems Div., Farmington, Conn.
General Automatic Corp., Bayonne, N.J.
GTE Automatic Elec., Northlake, Ill.
Guardian California, Culver City, Cal.
H-B Instr. Co., Phila., Pa.
Hartman Electrical Mfg., Mansfield, Ohio
HJS Engrg. Co., Park Ridge, Ill.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Residential Div., Mpls., Minn.
Kurman Instrs. Corp., Syosset, N.Y.
Leach Corp., Los Angeles, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Line Elec. Div., Parsippany, N.J.
Mack Elec. Devices, Wyncote, Pa.
Pollak, Joseph Corp., Boston, Mass.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Sls., Inc., Ft. Myers, Fla.
Relays, Inc., New York, N.Y.
Rowan Controller, Westminister, Md.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Texas Instruments, Inc., Attleboro, Mass.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
Ward Leonard, Mt. Vernon, N.Y.
Weston Instruments, Inc., Newark, N.J.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Zenith Controls Inc., Chicago, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, Proximity

Computer Comps., Jamaica, N.Y.
Douglas Randall Div., Pawcatuck, Conn.
Elctrn. Applications, S. El Monte, Cal.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Magnecraft Elec., Chicago, Ill.
Solid State Elctrns., Sepulveda, Cal.
Adams & Westlake, Elkhart, Ind.
Cutler-Hammer, Milwaukee, Wisc.
De-Tec-Tronic Corp., Chicago, Ill.
Electro-Sonic Control, Manteca, Calif.
Electronic Control Corp., Detroit, Mich.
Hyde Park Elctrns., Inc., Dayton, Ohio
Kahl Scientific Instr. Corp., El Cajon, Calif.
Larson Aero Dev., Concord, Calif.
MEKontrol Inc., Northboro, Mass.
Micro Switch, Freeport, Ill.
Sensor Corp., Greenwich, Conn.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Texas Instruments, Inc., Attleboro, Mass.
Westinghouse Elec., Buffalo, N. Y.

Relays, Pulse & Telegraph

Liberty Controls, Joliet, Ill. .... p 1746
Magnecraft Elec., Chicago, Ill.
Potter & Brumfield, Princeton, Ind.
Adams & Westlake, Elkhart, Ind.
Fifth Dimension, Princeton, N.J.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Telemodem, Inc., Queens Village, N.Y.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
Western Telematic, Inc., Arcadia, Cal.

Relays, R-F (Including Antenna & Coaxial)

American Zettler, Costa Mesa, Calif.
Amphenol RF Div., Danburry, Conn. p 1886
Amphenol Sales Div., Broadview, Ill. p 1886
Babcock Relays, Costa Mesa, Calif.
Clare, C.P. & Co., Chicago, Ill.
Computer Comps., Jamaica, N.Y.
Daico Inds., Inc., Compton, Cal.
Dow-Key, Santa Barbara, Cal. p 1688-1691
E & M Labs., Westlake Village, Cal.
Elctrn. Instr. & Specialty, Winchester, Mass. .... p 1706
Electronic Specialty Div., Portland, Ore
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Hewlett-Packard, Palo Alto, Cal.
Hi-G, Windsor Locks, Conn. .... p 1734
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal. p 1741,1928
ITT Jennings, Dunellen,, N.J. p 1741,1928
Kilovac Corp., Santa Barbara, Cal. p 1688-1691
Kratos Precision Prods., Los Angeles, Cal. .... p 1783
Magnecraft Elec., Chicago, Ill. .... p 1764
Midtex/Aemco, Mankato, Minn.. p 1761
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Ross Engrg. Corp., Campbell, Cal.
Self-Organizing Sys., Inc., Dallas, Tex.
Teledyne Relays, Hawthorne, Cal. p 1788
Transco Prods., Inc., Venice, Cal.
Trompeter Elctrns., Chatsworth, Cal.
Aemco Div., Mankato, Minn.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Fifth Dimension, Princeton, N.J.
General Reed Co., Clark, N.J.
Guide Inds., Inc., Sun Valley, Calif.
Hillburn Relay Corp., Farmingdale, N.Y.
Hughes Aircraft Co, Fullerton, Cal.
Kurman Instrs. Corp., Syosset, N.Y.
Matrix Sys. Corp., Chatsworth, Cal.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Pollak, Joseph Corp., Boston, Mass.
Relay Sls., Inc., Ft. Myers, Fla.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
Whistler Elctrns., Inc., Northridge, Cal.

Relays, Reed

ADC Prods., Minneapolis, Minn.
A.L.A. Inds., Inc., Harrison, N.Y... p 1645
Allen-Bradley Co., Milwaukee, Wisc.
Astro-Space Labs., Huntsville, Ala
Babcock Relays, Costa Mesa, Calif. p 1654,1655
Biddle, James G., Plymouth Meeting, Pa.
Clare, C.P. & Co., Chicago, Ill. p 1664-1668,1674
Computer Comps., Jamaica, N.Y. p 1661
Computer Prods., Ft. Lauderdale, Fla. p 341
Coto-Coil Co., Inc., Providence, R.I. p 1682,1683
Douglas Randall Div., Pawcatuck, Conn. p 1381,1686,1687
Elctrn. Applications, S. El Monte, Cal. p 1694-1696
Elctrn. Instr. & Specialty, Winchester, Mass. .... p 1706
Electronic Specialty Div., Portland, Ore p 1705
General Elec. Co., Schenectady, N.Y. p 1709
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1710
Hathaway Comps., Denver, Colo. p 1715-1722
ITT Jennings, Indl Prods., San Jose, Cal .... p 1739
James Elctrns., Inc., Chicago, Ill. p 1742,1743
Kratos Precision Prods., Los Angeles, Cal. .... p 1783
Lectrohm, Inc., Chicago, Ill. .... p 1760
Liberty Controls, Joliet, Ill.
Magnecraft Elec., Chicago, Ill. p 1765,1766
Midtex/Aemco, Mankato, Minn.
Multitech Automation Prods., Monterey Pk., Cal.
New Prod. Engrg., Wabash, Ind. p 1792,1793
Nippon Electric/NEC America, N.Y., N.Y.
Potter & Brumfield, Princeton, Ind. p 1778,1782
Schrack Elec. Sls., New York, N.Y.
Self-Organizing Sys., Inc., Dallas, Tex. p 1790
Solid State Elctrns., Sepulveda, Cal. p 954
Transco Prods., Inc., Venice, Cal.
Trompeter Elctrns., Chatsworth, Cal.
Wheelock Signals, Long Branch, N.J. p 1791
Acrodyne Ltd., Janesville,, Wisc.
Adams & Westlake, Elkhart, Ind.
Component Specialties, Temple City, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Dormeyer Inds., Chicago, Ill.
Elec-Trol, Inc., Saugus, Cal.
Endicott Coil Co., Binghamton, N.Y.
Frost Electronics Corp., Bellingham, Mass.
General Automatic Corp., Bayonne, N.J.
General Reed Co., Clark, N.J.
GTE Automatic Elec., Northlake, Ill.
Guide Inds., Inc., Sun Valley, Calif.
Instrument Resistors, Brick Town, N.J.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Line Elec. Div., Parsippany, N.J.
Matrix Sys. Corp., Chatsworth, Cal.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Silicone Seals, Chicago, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Thermosen, Inc., Stamford, Conn.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
Western Transformer Co., Tijeras, N. M.
Whistler Elctrns., Inc., Northridge, Cal.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Relays, Resistance-Sensitive

Computer Comps., Jamaica, N.Y.
General Elec. Co., Schenectady, N.Y.
Grigsby-Barton, Inc., Rolling Meadows, Ill.
Guardian Elec. Mfg. Co., Chicago, Ill.
Magnecraft Elec., Chicago, Ill.
Applied Control Co., Fairfield, N.J.
Deutsch Relay Div., East Northport, NY
Frost Electronics Corp., Bellingham, Mass.
Guardian California, Culver City, Cal.
Guide Inds., Inc., Sun Valley, Calif.
H-B Instr. Co., Phila., Pa.
Haledy Elctrns. Co., New York, N.Y.
Hillburn Relay Corp., Farmingdale, N.Y.
Hoagland Instr., Red Bank, N.J.
Hughes Aircraft Co, Fullerton, Cal.
Kurman Instrs. Corp., Syosset, N.Y.
Line Elec. Div., Parsippany, N.J.
Mack Elec. Devices, Wyncote, Pa.
Mag-Con Engrg. Co., St. Paul, Minn.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.

Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Tempo Instr., Plainview, N.Y.
Trepac Corp. America, Englewood, N.J.
Weston Instruments, Inc., Newark, N.J.

Relays, Reverse-Current

General Elec. Co., Schenectady, N.Y. p 1709
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Magnecraft Elec., Chicago, Ill.
Adams & Westlake, Elkhart, Ind.
Aemco Div., Mankato, Minn.
Automatic Switch Co., Florham Park, N.J.
Basler Elec. Co., Highland, Ill.
Guardian California, Culver City, Cal.
Hartman Electrical Mfg., Mansfield, Ohio
Lakeshore Electric Corp., Bedford, Ohio
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relays, Inc., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Trepac Corp. America, Englewood, N.J.

Relays, Rotary

Clare, C.P. & Co., Chicago, Ill.
Couch S.H. Div., Boston, Mass... p 1675
Dale Elctrns., Inc., Yankton, S.D. p 1584
Guardian Elec. Mfg. Co., Chicago, Ill.
Hi-G, Windsor Locks, Conn.
Ledex, Inc., Dayton, Ohio
Potter & Brumfield, Princeton, Ind.
Schrack Elec. Sls., New York, N.Y.
Branson Corp., Denville, N.J.
GTE Automatic Elec., Northlake, Ill.
Leach Corp., Los Angeles, Cal.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
Price Elec. Co., Frederick, Md.
Standard Relay Corp., W. Babylon, N.Y.
Universal Relay Corp., New York, N.Y.
WABCO Aerospace Dept., Pittsburgh, Pa.

Relays, Sensitive

Airpax Elctrns., Inc., Cambridge, Md.
American Zettler, Costa Mesa, Calif. p 1647,1653
ATR Elctrns., Inc., St. Paul, Minn.
Babcock Relays, Costa Mesa, Calif. p 1654-1656
Clare, C.P. & Co., Chicago, Ill. p 1662,1665,1670
Comar Electric, Chicago, Ill. .... p 1677
Computer Comps., Jamaica, N.Y. p 1661
Coto-Coil Co., Inc., Providence, R.I. p 1682,1683
Couch S.H. Div., Boston, Mass... p 1675
DDC, Hicksville, N.Y.
Diversified Elctrns., Evansville, Ind
Douglas Randall Div., Pawcatuck, Conn. p 1686,1687
Elctrn. Applications, S. El Monte, Cal. p 1694-1696
Elctrn. Instr. & Specialty, Winchester, Mass. .... p 1706
Electronic Specialty Div., Portland, Ore p 1698-1705
Flight Sys., Inc., Mechanicsburg, Pa. p 1707
General Elec. Co., Schenectady, N.Y.
General Magnetics, Bloomfield, N.J.
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1710
Guardian Elec. Mfg. Co., Chicago, Ill. p 1713
Hamlin Elctrns., Inc., Phoenix, Ariz. p 1725
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Hi-G, Windsor Locks, Conn. p 1727-1731,1734
ITT Jennings, Indl Prods., San Jose, Cal
Kratos Precision Prods., Los Angeles, Cal. .... p 1783
La Marche Mfg. Co., Des Plaines, Ill.
Liberty Controls, Joliet, Ill.
Magnecraft Elec., Chicago, Ill. ..... p 1765
Midtex/Aemco, Mankato, Minn... p 1761
New Prod. Engrg., Wabash, Ind. p 1793
Ohmite Mfg. Co., Skokie, Ill. .... p 1769
Potter & Brumfield, Princeton, Ind. p 1773,1775,1778,1782
Schrack Elec. Sls., New York, N.Y. p 1787
Self-Organizing Sys., Inc., Dallas, Tex. p 1790
Solid State Elctrns., Sepulveda, Cal.
Teledyne Relays, Hawthorne, Cal. p 1788,1789
Transmagnetics Inc., Farmingdale, N.Y.
Acromag, Inc., Wixom, Mich.
Adams & Westlake, Elkhart, Ind.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Switch Co., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Barber-Colman Co., Electro-Mechanical Prods. Div., Rockford, Ill.
Cornell-Dubilier Elctrns., Newark, N.J.
Deutsch Relay Div., East Northport, NY
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Elec-Trol, Inc., Saugus, Cal.
Fifth Dimension, Princeton, N.J.
Frost Electronics Corp., Bellingham, Mass.
General Automatic Corp., Bayonne, N.J.
General Reed Co., Clark, N.J.
Guide Inds., Inc., Sun Valley, Calif.
H-B Instr. Co., Phila., Pa.
Hartman Electrical Mfg., Mansfield, Ohio
Hillburn Relay Corp., Farmingdale, N.Y.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kurman Instrs. Corp., Syosset, N.Y.
Larson Aero Dev., Concord, Calif.
Line Elec. Div., Parsippany, N.J.
Mack Elec. Devices, Wyncote, Pa.
MEKontrol Inc., Northboro, Mass.
Pacific Relays, Inc., Van Nuys, Calif.
Parker Instr. Corp., Stamford, Conn.
Pollak, Joseph Corp., Boston, Mass.
Price Elec. Co., Frederick, Md.
Princo Instrs., Southampton, Pa.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Specialties, Inc., Fair Lawn, N.J.
Relays, Inc., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
WABCO Aerospace Dept., Pittsburgh, Pa.
Ward Leonard, Mt. Vernon, N.Y.
Weston Instruments, Inc., Newark, N.J.
Zenith Controls Inc., Chicago, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, Sequence

American Zettler, Costa Mesa, Calif.
Autronics Corp., Pasadena, Calif.
Betamite Electronic Devices, Culver City, Calif. .... p 1660
Clare, C.P. & Co., Chicago, Ill.
Dale Elctrns., Inc., Yankton, S.D. p 1584
Elctrn. Instr. & Specialty, Winchester, Mass.
Gordos Corp., Bloomfield, N.J.
Guardian Elec. Mfg. Co., Chicago, Ill. p 1714
Hi-G, Windsor Locks, Conn.
Ledex, Inc., Dayton, Ohio
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Midtex/Aemco, Mankato, Minn.
Potter & Brumfield, Princeton, Ind. p 1775,1776
Precision Timer, Westbrook, Conn. p 1342
Trompeter Elctrns., Chatsworth, Cal.
Agastat Div., Elizabeth, N.J.
Automatic Switch Co., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Avtron Mfg., Inc., Cleveland, Ohio
GTE Automatic Elec., Northlake, Ill.
Guardian California, Culver City, Cal.
Guide Inds., Inc., Sun Valley, Calif.
Hartman Electrical Mfg., Mansfield, Ohio
Hoagland Instr., Red Bank, N.J.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Tempo Instr., Plainview, N.Y.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.

Relays, Solenoid—See Relays, Plunger

Relays, Solid-State

ADC Prods., Minneapolis, Minn.
Airpax Elctrns., Inc., Cambridge, Md.
API Instrs. Co., Waltham,, Mass.
Autronics Corp., Pasadena, Calif.
Betamite Electronic Devices, Culver City, Calif. .... p 1660
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.... p 1865
Deltron, Inc., N. Wales, Pa.
Diversified Elctrns., Evansville, Ind p 1685
Eagle-Signal Div., Davenport, Iowa p 1317
Elctrn. Instr. & Specialty, Winchester, Mass.
Electronic Specialty Div., Portland, Ore p 1704
Flight Sys., Inc., Mechanicsburg, Pa. p 1707
General Elec. Co., Schenectady, N.Y.
General Magnetics, Bloomfield, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Geo Space Sys., Tampa, Fla. .... p 608
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1711
Guardian Elec. Mfg. Co., Chicago, Ill.
Hamlin Elctrns., Inc., Phoenix, Ariz. p 1724
Hart-Advance Relay Div., Crystal Lake, Ill.
Hi-G, Windsor Locks, Conn.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal.
Ledex, Inc., Dayton, Ohio
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill. ...... p 1768
Midtex/Aemco, Mankato, Minn.
New Prod. Engrg., Wabash, Ind.
Ohmite Mfg. Co., Skokie, Ill. .... p 1769
Philadelphia Sci. Controls, Croydon, Pa. p 1770
Potter & Brumfield, Princeton, Ind. p 1777,1780,1782
Precision Timer, Westbrook, Conn.
Self-Organizing Sys., Inc., Dallas, Tex.
Solid State Elctrns., Sepulveda, Cal. p 954
Sonex, Inc., Bethayres, Pa.
Stevens-Arnold, Inc., So. Boston, Mass.
Teledyne Relays, Hawthorne, Cal. p 1789
Thunder Int'l. Corp., Middletown, Conn. p 895
Transco Prods., Inc., Venice, Cal.
Transmagnetics Inc., Farmingdale, N.Y.
Triac Elctrn. Sys., N.Y., N.Y.
Adams & Westlake, Elkhart, Ind.
Agastat Div., Elizabeth, N.J.
Applied Control Co., Fairfield, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Switch Co., Florham Park, N.J.
Avtron Mfg., Inc., Cleveland, Ohio
Beltone Electronics Corp., Chicago, Ill.
Branson Corp., Denville, N.J.
Coil Co. of Amer., Northvale, N.J.
Collins Radio Co., Dallas, Tex.
Controlotron Corp., Farmingdale, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
De-Tec-Tronic Corp., Chicago, Ill.
Decor Elctrns. Corp., Austin, Tex.
Design Prods. Corp., Troy, Mich.
Diamond Repeater Co., Madison, N.J.
EDC Data Comps. Corp., Massapequa, N.Y.
Elctrn. Control Sys., Fairmont, W. Va.
Endicott Coil Co., Binghamton, N.Y.
Frost Electronics Corp., Bellingham, Mass.
Furnas Elec. Co., Batavia, Ill.
G-V Controls, Livingston, N.J.
Gems Div., Farmington, Conn.
General Automatic Corp., Bayonne, N.J.
Guardian California, Culver City, Cal.
Guide Inds., Inc., Sun Valley, Calif.
H-B Instr. Co., Phila., Pa.
Hartman Electrical Mfg., Mansfield, Ohio
Hillburn Relay Corp., Farmingdale, N.Y.
Hoagland Instr., Red Bank, N.J.
Honeywell, Apparatus Controls, Mpls., Minn.
Hughes Aircraft Co, Fullerton, Cal.
Ind'l. Solid State Controls, York, Pa.
Instr. & Control Sys., Inc., Addison, Ill.
Integrated Controls, San Diego, Cal.
Iso-Switch Corp., Costa Mesa, Cal.
Isotech Inc., Westford, Mass.
Jordan Controls, Milwaukee, Wisc.
Lark Elctrns., Inc., New York, N.Y.
Leach Corp., Los Angeles, Cal.
Lear Siegler, Inc., Santa Monica, Calif.
Liebel-Flarsheim Co., Cincinnati, Ohio
Mag-Con Engrg. Co., St. Paul, Minn.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Midland Standard Inc., Elgin, Ill.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
Neutronic Corp., Bridgeton, Mo.
Oeco Corp., Portland, Ore.
Power Control Corp., Pittsburgh, Pa.
Princo Instrs., Southampton, Pa.
Profile Elctrns., Inc., Concord, N.H.
Ragen Precision Inds., Inc., N. Arlington, N.J.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Specialties, Inc., Fair Lawn, N.J.
Robicon Corp., Pittsburgh, Pa
Sensor Corp., Greenwich, Conn.
Servo Dev. Corp., Hicksville, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Singer - Tele-Signal, Woodbury, N.Y.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Taft Electrosystems, Inc., Metuchen, N. J.
Teledyne Inet, Gardena, Cal.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Inc., Attleboro, Mass.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.
Vectrol, Inc., Rockville, Md.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Western Telematic, Inc., Arcadia, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, Stepping, Ratchet

Clare, C.P. & Co., Chicago, Ill.
Comar Electric, Chicago, Ill. .... p 1680
Dale Elctrns., Inc., Yankton, S.D. p 1584
Guardian Elec. Mfg. Co., Chicago, Ill. p 1714
Ledex, Inc., Dayton, Ohio
North Elec. Co., Galion, Ohio
Potter & Brumfield, Princeton, Ind.
Schrack Elec. Sls., New York, N.Y.
Sealectro Corp., Mamaroneck, N.Y.
Trompeter Elctrns., Chatsworth, Cal.
Cornell-Dubilier Elctrns., Newark, N.J.
GTE Automatic Elec., Northlake, Ill.
Imtra Corp., Medford, Mass.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Sls., Inc., Ft. Myers, Fla.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Universal Relay Corp., New York, N.Y.

Relays, Telephone

American Zettler, Costa Mesa, Calif.
ATR Elctrns., Inc., St. Paul, Minn.
Clare, C.P. & Co., Chicago, Ill. p 1672,1673
Comar Electric, Chicago, Ill. .... p 1680
Flight Sys., Inc., Mechanicsburg, Pa.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Liberty Controls, Joliet, Ill. ..p 1746,1747
Magnecraft Elec., Chicago, Ill. ..... p 1764
Nippon Electric/NEC America, N.Y., N.Y.
North Elec. Co., Galion, Ohio
Ohmite Mfg. Co., Skokie, Ill.
Potter & Brumfield, Princeton, Ind. p 1776
Printact Relay Div., Long Island City, N.Y.
Schrack Elec. Sls., New York, N.Y.
T-Bar Inc., Wilton, Conn.
Wheelock Signals, Long Branch, N.J.

Aemco Div., Mankato, Minn.
Barron Controls & Relay Corp., Grayslake, Ill.
Branson Corp., Denville, N.J.
Davis Elec. Co., Cape Girardeau, Mo.
Frost Electronics Corp., Bellingham, Mass.
General Automatic Corp., Bayonne, N.J.
GTE Automatic Elec., Northlake, Ill.
Guardian California, Culver City, Cal.
Kurman Instrs. Corp., Syosset, N.Y.
Line Elec. Div., Parsippany, N.J.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Pollak, Joseph Corp., Boston, Mass.
Price Elec. Co., Frederick, Md.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Sls., Inc., Ft. Myers, Fla.
Relay Service Co., Chicago, Ill.
Relays, Inc., New York, N.Y.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Sealectric Switch & Relay Co., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Stromberg Carlson Corp., Rochester, N.Y.
Universal Relay Corp., New York, N.Y.

Relays, Temperature-Compensated

API Instrs. Co., Waltham,, Mass.
Computer Prods., Ft. Lauderdale, Fla.
Hi-G, Windsor Locks, Conn.
La Marche Mfg. Co., Des Plaines, Ill.
Larson Instr. Co., Inc., Orangeburg, N.Y.
Multitech Automation Prods., Monterey Pk., Cal.
Self-Organizing Sys., Inc., Dallas, Tex.
Branson Corp., Denville, N.J.
G-V Controls, Livingston, N.J.
General Automatic Corp., Bayonne, N.J.
Guide Inds., Inc., Sun Valley, Calif.
Hoagland Instr., Red Bank, N.J.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Jettron Prods., Hanover, N.J.
Livingston Elctrn., Hanover, N.J.
Relay Specialties, Inc., Fair Lawn, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Texas Instruments, Inc., Attleboro, Mass.
Weston Instruments, Inc., Newark, N.J.

Relays, Thermal

Elctrn. Instr. & Specialty, Winchester, Mass. .... p 1706
Elmwood Sensors, Inc., Cranston, R.I.
General Elec. Co., Schenectady, N.Y.
Hart-Advance Relay Div., Crystal Lake, Ill.
Hi-G, Windsor Locks, Conn. .... p 1738
Magnetic Windings Co., Easton, Pa.
New Prod. Engrg., Wabash, Ind.
Wagner Elec. Corp., Livingston, N.J.
Westinghouse Elec. Corp., Newark, N.J.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Branson Corp., Denville, N.J.
Dales, Franklin Co., Akron, Ohio
E-T-A Prods. Co. America, Chicago, Ill.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Furnas Elec. Co., Batavia, Ill.
G-V Controls, Livingston, N.J.
GTE Sylvania Inc., Danvers, Mass.
Hoagland Instr., Red Bank, N.J.
Honeywell, Apparatus Controls, Mpls., Minn.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Jettron Prods., Hanover, N.J.
Livingston Elctrn., Hanover, N.J.
Networks Elctrn. Corp., Chatsworth, Calif.
Norwalk Thermostat Co., Norwalk, Ohio
Princo Instrs., Southampton, Pa.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Specialties, Inc., Fair Lawn, N.J.
Square D Co., Park Ridge, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Texas Instruments, Inc., Attleboro, Mass.
Transitron Elctrn. Corp., Wakefield, Mass.
Universal Relay Corp., New York, N.Y.
Westinghouse Elec., Buffalo, N. Y.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Relays, Time-Delay

Allen-Bradley Co., Milwaukee, Wisc.
American Time Products, Woodside, N.Y.
American Zettler, Costa Mesa, Calif. p 1651
Autronics Corp., Pasadena, Calif.
Babcock Relays, Costa Mesa, Calif. p 1657
Betamite Electronic Devices, Culver City, Calif. .... p 1660
Bissett-Berman, Los Angeles, Cal.
Bulova Watch Elctrns. Div. Amer. Time Prods., Woodside, N.Y.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
California Elctrn. Mfg. Co., Alamo, Calif.
Clare, C.P. & Co., Chicago, Ill. .... p 1669
Comar Electric, Chicago, Ill.
Computer Comps., Jamaica, N.Y.
Connor-Winfield Corp., Winfield, Ill.
Diversified Elctrns., Evansville, Ind p 1685
Eagle-Signal Div., Davenport, Iowa p 1317
Elctrn. Applications, S. El Monte, Cal.
Electronic Specialty Div., Portland, Ore
Flight Sys., Inc., Mechanicsburg, Pa.
General Elec. Co., Schenectady, N.Y. p 1709
General Time Corp., Torrington, Conn.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill.
Haydon, A. W. Co., Waterbury, Conn.
Heinemann Elec. Co., Trenton, N.J. p 1919
Hi-G, Windsor Locks, Conn. p 1324,1325
Ledex, Inc., Dayton, Ohio
Liberty Controls, Joliet, Ill. .... p 1748
Logitek, Inc., Farmingdale, N.Y. p 1338,1754,1757
Magnecraft Elec., Chicago, Ill. .... p 1768
Magnetic Windings Co., Easton, Pa.
Midtex/Aemco, Mankato, Minn... p 1761
Ohmite Mfg. Co., Skokie, Ill.
Pennwood Numechron, Pittsburgh, Pa.
Philadelphia Sci. Controls, Croydon, Pa.
Potter & Brumfield, Princeton, Ind. p 1780,1781
Precision Timer, Westbrook, Conn. p 1342,1343
Quindar Elctrns., Inc., Springfield, N.J.
Solid State Elctrns., Sepulveda, Cal.
Syracuse Elctrns. Corp., Syracuse, N.Y. p 1348
Teledyne Relays, Hawthorne, Cal.
Tempo/UTI Div., Chatsworth, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
Westinghouse Elec. Corp., Newark, N.J.
Adams & Westlake, Elkhart, Ind.
Aemco Div., Mankato, Minn.
Agastat Div., Elizabeth, N.J.
Air-O-Tronics Prods., Morrisville, N.Y.
Amperite Co., Inc., Union City, N.J.
Anritsu Electric Co., Ltd., Tokyo, Japan
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Switch Co., Florham Park, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., Danville, Ill.
Barron Controls & Relay Corp., Grayslake, Ill.
Bergen Labs., Inc., Paterson, N.J.
Branson Corp., Denville, N.J.
Controlotron Corp., Farmingdale, N.Y.
Cornell-Dubilier Elctrns., Newark, N.J.
Cramer Div., Old Saybrook, Conn.
Cutler-Hammer, Milwaukee, Wisc.
De-Tec-Tronic Corp., Chicago, Ill.
Diamond Repeater Co., Madison, N.J.
Durakool, Inc., Elkhart, Ind.
E-T-A Prods. Co. America, Chicago, Ill.
E-Tronics, Van Nuys, Cal.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Electronic Control Corp., Detroit, Mich.
Essex Engrg. Co., Inc., Essex, Conn.
Frost Electronics Corp., Bellingham, Mass.
Furnas Elec. Co., Batavia, Ill.
G-V Controls, Livingston, N.J.
Gems Div., Farmington, Conn.
General Automatic Corp., Bayonne, N.J.
GTE Automatic Elec., Northlake, Ill.
Guardian California, Culver City, Cal.
Guide Inds., Inc., Sun Valley, Calif.
Hartman Electrical Mfg., Mansfield, Ohio
Haydon Switch & Instr., Waterbury, Conn.
Hi-Tek Corp., Santa Ana, Calif.
Hillburn Relay Corp., Farmingdale, N.Y.
Hoagland Instr., Red Bank, N.J.
Honeywell, Residential Div., Mpls., Minn.
Ind'l. Solid State Controls, York, Pa.
Instr. & Control Sys., Inc., Addison, Ill.
Integrated Controls, San Diego, Cal.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Jay-El Prods., Gardena, Calif.
Jettron Prods., Hanover, N.J.
Leach Corp., Los Angeles, Cal.
Line Elec. Div., Parsippany, N.J.
Livingston Elctrn., Hanover, N.J.
Mack Elec. Devices, Wyncote, Pa.
McElroy Elctrns. Corp., Shirley, Mass.
MEKontrol Inc., Northboro, Mass.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Midland Standard Inc., Elgin, Ill.
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
Neutronic Corp., Bridgeton, Mo.
Norwalk Thermostat Co., Norwalk, Ohio
Oeco Corp., Portland, Ore.
Photobell Co., Inc., New York, N.Y.
Pollak, Joseph Corp., Boston, Mass.
Rawco Instrs., Inc., Ft. Worth, Tex.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Relay Specialties, Inc., Fair Lawn, N.J.
Rhodes, M.H., Inc., Avon, Conn.
Rowan Controller, Westminister, Md.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Pitman, N.J.
Techmetric Co., Redwood City, Calif.
Tempo Instr., Plainview, N.Y.
Tenor Co., Inc., New Berlin, Wisc.
Texas Instruments, Inc., Attleboro, Mass.
Transitron Elctrn. Corp., Wakefield, Mass.
Trepac Corp. America, Englewood, N.J.
Universal Relay Corp., New York, N.Y.
Vanguard Relay Corp., Lindenhurst, N.Y.
Ward Leonard, Mt. Vernon, N.Y.
Zenith Controls Inc., Chicago, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, Transmitting—See Relays, Keying & Break-In

Relays, Vacuum Contact

Computer Comps., Jamaica, N.Y.
Coto-Coil Co., Inc., Providence, R.I.
Douglas Randall Div., Pawcatuck, Conn.
Dow-Key, Santa Barbara, Cal. p 1690,1691,1744,1745
Grigsby-Barton, Inc., Rolling Meadows, Ill.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal. p 1740,1741,1928
ITT Jennings, Dunellen,, N.J. p 1740,1741,1928
Kilovac Corp., Santa Barbara, Cal. p 1690,1691,1744,1745
Magnecraft Elec., Chicago, Ill.
Penta Labs., Santa Barbara, Cal. p 1744,1745
Ross Engrg. Corp., Campbell, Cal. p 1786
H-B Instr. Co., Phila., Pa.
Jettron Prods., Hanover, N.J.
Livingston Elctrn., Hanover, N.J.
Mack Elec. Devices, Wyncote, Pa.
Pollak, Joseph Corp., Boston, Mass.
Standard Relay Corp., W. Babylon, N.Y.
Struthers-Dunn, Inc., Pitman, N.J.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.

Relays, Vibrating Reed

ADC Prods., Minneapolis, Minn.
Allen-Bradley Co., Milwaukee, Wisc.
ATR Elctrns., Inc., St. Paul, Minn.
Biddle, James G., Plymouth Meeting, Pa.
Bramco Controls, Piqua, Ohio .... p 1406
Douglas Randall Div., Pawcatuck, Conn.
J-B-T Instrs., Inc., New Haven, Conn. p 1929
Stevens-Arnold, Inc., So. Boston, Mass. p 2007
GTE Automatic Elec., Northlake, Ill.
Standard Relay Corp., W. Babylon, N.Y.
Universal Relay Corp., New York, N.Y.

Relays, Vibration-Sensitive

Metrix Instr. Co., Houston, Tex.
Reliance Elec. Co., Cleveland, Ohio
Standard Relay Corp., W. Babylon, N.Y.

Relays, Voltage Sensitive

American Zettler, Costa Mesa, Calif. p 1651
Autronics Corp., Pasadena, Calif. p 1311
California Elctrn. Mfg. Co., Alamo, Calif.
Comar Electric, Chicago, Ill.
Diversified Elctrns., Evansville, Ind p 1685
Elctrn. Applications, S. El Monte, Cal.
Flight Sys., Inc., Mechanicsburg, Pa.
General Elec. Co., Schenectady, N.Y.
Hart-Advance Relay Div., Crystal Lake, Ill.
Hi-G, Windsor Locks, Conn.
International Rectifier, El Segundo, Cal.
Kratos Precision Prods., Los Angeles, Cal.
Logitek, Inc., Farmingdale, N.Y. p 1338,1751
Magnecraft Elec., Chicago, Ill.
Potter & Brumfield, Princeton, Ind. p 1776,1777
Self-Organizing Sys., Inc., Dallas, Tex.
Teledyne Relays, Hawthorne, Cal.
Barron Controls & Relay Corp., Grayslake, Ill.
Deutsch Relay Div., East Northport, NY
Electronic Modules, Inc., Pasadena, Cal.
Frost Electronics Corp., Bellingham, Mass.
General Automatic Corp., Bayonne, N.J.
Hillburn Relay Corp., Farmingdale, N.Y.
Hoagland Instr., Red Bank, N.J.
Lakeshore Electric Corp., Bedford, Ohio
Line Elec. Div., Parsippany, N.J.
Relay Service Co., Chicago, Ill.
Sigma Instrs., Inc., Braintree, Mass.
Tempo Instr., Plainview, N.Y.
Universal Relay Corp., New York, N.Y.
Zenrad Controls Co., Santa Barbara, Cal.

Relays, Wire Contact

American Zettler, Costa Mesa, Calif.
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.

Repeaters, Passive, Microwave—See Vol 1

Repeaters, Servo

Astrosystems, Lake Success, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Control Technology Co., L.I.C., N.Y.
Ind'l. Control Co., Farmingdale, N.Y. p 1873
North Atlantic Inds., Plainview, N.Y.
Planet Instr., Ft. Wayne, Ind.
Analog General Corp., Oceanside, N.Y.
Bendix, S. Montrose, Pa.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Gap Instr. Corp., Hauppauge, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Grand Rapids, Mich.
Lewis Engrg. Co., Naugatuck, Conn.
Orbit Instr. Corp., Syosset, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Servo Dev. Corp., Hicksville, N.Y.
Singer-General Precision, Inc., Little Falls, N.J.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Weston-Transicoil, Worcester, Pa.

Repeaters, Teletype—See Vol 1

Repeating Equipment, Broadcast—See Vol 1

Resins, Encapsulating—See Compounds, Encapsulating—Vol 3

Resins, Synthetic—See Plastic Raw Materials—Vol 3

Resistance Adjusting Equipment For Hybrid Microcircuits-Also See Machines, Resistance Adjusting—See Vol 1

Resistance Comparators—See Bridges, Resistance—Vol 1

Resistance Thermometers—See Networks, Resistance

Resistor Networks—See Networks, Resistance

Resistors, Adjustable-Also See Potentiometers—See Vol 3

Resistors, Ballast Tube—See Tubes, Ballast

Resistors, Barretter—See Vol 3

Resistors, Beryllia Core—See Resistors, Integral Heat Dissapator—Vol 3

Resistors, Carbon Film—See Vol 3

Resistors, Ceramic—See Vol 3

Resistors, Chip (For Microcircuits)—See Vol 3

Resistors, Composition, Carbon—See Vol 3

Resistors, Decade—See Vol 3

Resistors, Disc-Also See Resistors By Material Type—See Vol 3

Resistors, Film, Metal—See Vol 3

Resistors, Film, Nonmetallized—See Vol 3

Resistors, Flexible—See Vol 3

Resistors, Flux-Sensitive—See Vol 3

Resistors, Fuse

Cal-R, Inc., Cal. Resistor Div., Santa Monica, Cal.
Dale Elctrns., Inc., Columbus, Neb. p 2846
Gamble, Charles T. Inds., Riverside, N.J.
IRC Boone Div. of TRW Inc., Boone, N.C.
Lectrohm, Inc., Chicago, Ill.
Milwaukee Resistor, Milwaukee, Wisc. p 2862
RCL Elctrns., Inc., Irvington, N.J.
Sage Elctrns., Rochester, N.Y.
Bradohm, Inc., Salamanca, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Kelvin, Van Nuys, Cal.
Megadyne Inds., Inc., Rochester, N.Y.
Ohio Carbon Co., Cleveland, Ohio
United Mineral & Chem. Corp., New York, N.Y.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Resistors, Glass—See Vol 3

Resistors, Heat Sink Encased—See Resistors, Integral Heat Dissipator—Vol 3

Resistors, High Frequency—See Vol 3

Resistors, High Megohm—See Vol 3

Resistors, High Temperature—See Vol 3

Resistors, High Voltage—See Vol 3

Resistors, Hot Molded—See Vol 3

Resistors, Integral Heat Dissipator—See Vol 3

Resistors, Low Temperature Coefficient—See Vol 3

Resistors, Metal Glazed—See Vol 3

Resistors, Microwave—See Vol 3

Resistors, Negative Temperature Coefficient

Amperex Elctrn. Corp., Hauppauge, N.Y. p 2818
Cal-R, Inc., Cal. Resistor Div., Santa Monica, Cal. .... p 1963
Cal-R, Inc., Capacitor Div., Santa Monica, Cal. .... p 1963
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal. .... p 1963
Carborundum Co., Niagara Falls, N.Y. p 1964,2834
Continental-Wirt Elctrns. Corp., Warminster, Pa.
Dale Elctrns., Inc., Columbus, Neb. p 2847
Fenwal Elctrns., Inc., Framingham, Mass. .... p 1971
Gamble, Charles T. Inds., Riverside, N.J.
General Resistance, Mt. Vernon, N.Y.
IRC Boone Div. of TRW Inc., Boone, N.C. .... p 2890,2892
Keystone Carbon Co., St. Marys, Pa. p 1974,1975
Mepco, Inc., Morristown, N.J....... p 2864
Multitech Microelctrns., Monterey Pk., Cal.
National Lead Co., Hightstown, N.J. p 1980
New England Instr., Natick, Mass.
RCL Elctrns., Inc., Irvington, N.J. p 2870,2871
Resistance Prods., Harrisburg, Pa.
Shallcross, Selma, N.C.
Sprague Elec. Co., No. Adams, Mass.
Tel Labs., Manchester, N.H.
Vishay Resistor Prod. Div., Malvern, Pa. p 2932
AMBAC Inds., Garden City, N.Y.
Beman Mfg., Inc., New Cumberland, Pa.
Carbone Corp., Boonton, N.J.
Consolidated Resistance Amer., Yonkers, N.Y.
Consolidated Resistance Sls., Yonkers, N.Y.
Constanta Co. of Can., Montreal, Can.
Edison Elctrns. Div., Manchester, N.H.
Elctrn. Precision Comps., Mt. Vernon, N.Y.
Film Microelectronics, Inc., Burlington, Mass
Kelvin, Van Nuys, Cal.
Kidco, Inc., Medford, N.J.
Marstan Resistor, Orange, N.J.
Pyrofilm Corp., Whippany, N.J.
Rodan Inds., Anaheim, Cal.
Siemens Corp., Comps. Div., Iselin, N.J.
Tanger Elctrns., Hawthorne, Cal.
United Mineral & Chem. Corp., New York, N.Y.
Vac-Ohm Elctrns. Co., Haddonfield, N.J.
Victory Engrg. Corp., Springfield, N.J.

Resistors, Non-Inductive—See Vol 3

Resistors, Oil Filled—See Vol 3

Resistors, Plug-In—See Vol 3

Resistors, Positive Temperature Coefficient—See Vol 3

Resistors, Power—See Vol 3

Resistors, Pressure Sensitive—See Vol 3

Resistors, Rectilinear—See Vol 3

Resistors, Rheostat—See Rheostats—Vol 3

Resistors, Standards—See Standards, Resistance—Vol 1

Resistors, Strip—See Vol 3

Resistors, Suppressor—See Vol 3

Resistors, Surge—See Vol 3

Resistors, Tapped—See Vol 3

Resistors, Temperature Sensitive—See Thermistors

Resistors, Tin Oxide—See Vol 3

Resistors, Variable—See Potentiometers—Vol 3

Resistors, Voltage-Sensitive—See Vol 3

Resistors, Wirewound—See Vol 3

Resistors, Wire Woven—See Vol 3

Resists—See Coatings, Films, Transfers, Etchant Resisting—Vol 3

Resolver Testers—See Testers, Synchro / Resolver—Vol 1

Resolvers, Synchro

Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
Transmagnetics Inc., Farmingdale, N.Y.
Vernitron, Torrance, Cal.
American Elctrns., Inc., Fullerton, Cal.
Bendix, S. Montrose, Pa.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Digiac Corp., Plainview, N.Y.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Farrand Controls, Inc., Valhalla, N.Y.
Harowe Servo Controls, W. Chester, Pa.
Hughes Aircraft Co, Culver City, Cal.
IMC Magnetics Corp., Maywood, Cal.
Nucleonic Prods., Canoga Pk, Cal.
Singer-General Precision, Inc., Little Falls, N.J.
Weston-Transicoil, Worcester, Pa.

Resonators, Microwave

E & M Labs., Westlake Village, Cal.
Frequency Engrg. Labs., Farmingdale, N.J.
Microwave Cavity Labs., La Grange, Ill.
Aircom, Inc., Union, N.H.
Collins Radio Co., Dallas, Tex.
General Microwave Corp., Farmingdale, N.Y.
Industrial Microwave, Scotch Plains, N.J.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Micromega, Los Angeles, Cal.
Premier Microwave, Port Chester, N.Y.
Zeta Labs., Inc., Mountain View, Calif.

Restorers, Pulse Form—See Vol 1

Retainers, Battery—See Vol 3

Retainers, Relay

American Zettler, Costa Mesa, Calif. p 1653

Retainers, Transistor & Diode

Birnbach Co., Inc., Freeport, N.Y.
Birtcher Corp., Monterey Park, Cal.
Eby Sls. Co., Jamaica, N.Y.
Gudebrod Bros. Silk Co., Inc., New York, N.Y.
Int'l. Elctrn. Resch., Burbank, Cal.
Jettron Prods., Hanover, N.J.
Keystone Elctrns. Corp., New York, N.Y.
Wakefield Engrg., Inc., Wakefield, Mass.

Retainers, Tube

Birtcher Corp., Monterey Park, Cal.
Eby Sls. Co., Jamaica, N.Y.
Int'l. Elctrn. Resch., Burbank, Cal.
Kestler Elctrns., Temple City, Cal
Litton Inds., Van Nuys, Calif.
Royal Inds, El Segundo, Calif
Staver Co., Inc., Bay Shore, N.Y.

Reticles—See Scales & Reticles

Retractile Cords—See Cords, Retractile—Vol 3

Rheostats—See Vol 3

Rings, Brazing—See Vol 3

Rings, Carbon Packing—See Seals, Carbon—Vol 3

Rings, Oil Sealing—See Seals, Oil—Vol 3

Rings, Retaining—See Vol 3

Rings, Slip-Brush Assemblies—See Slip Ring Assemblies

Rivets—See Vol 3

Rods & Clamps, Ground—See Vol 1

Rooms, Clean, Dust-Free—See Vol 1

Rooms, Environmental—See Vol 1

Rooms, Screen—See Screen Rooms—Vol 1

Rooms, Shielded—See Screen Rooms—Vol 1

Rotary Joints, Microwave—See Joints, Rotary, Microwave—Vol 1

Rotators—See Antenna Rotators—Vol 1

Rotors, Motor & Generator—See Motor & Generator Armatures, Rotors, Stators

Rubber, Conductive—See Vol 3

Rubber Guards (For Equipment)—See Bumpers—Vol 3

Rubber, Silicone—See Vol 3

Sapphire Parts—See Vol 3

Saws For Semiconductor Crystals—See Vol 1

Scale Expanders, Meter—See Multipliers, Meter—Vol 1

Scalers, Binary, Decade—See Vol 1

Scales & Reticles, Optical

Alloys Unlimited, Inc., Encino, Calif.
Buckbee-Mears Co., St. Paul, Minn.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
Gaertner Scientific Corp., Chicago, Ill.
Infrared Inds., Inc., Santa Barbara, Cal.
Keuffel & Esser Co., Morristown, N.J.
Metrological Data Corp., Garfield, N.J.
Micro-Line, Jamestown, N.Y.
Optical Inds., Santa Ana, Cal.
Techni-Tool, Inc., Philadelphia, Pa.
Teledyne Gurley, Troy, N.Y.
Texas Instruments, Inc., Dallas, Tex.

Scales, Dial

Datak Corp., Passaic, N.J.
Millen, James Mfg., Malden, Mass.p 1489
Smith, Herman H., Inc., Bklyn., N.Y.
Vemaline Prods. Co., Wyckoff, N.J.
Ackerman Engravers, Inc., Long Island City, N.Y.

Apahouser Corp. of N.E., Boston, Mass.
Beckman Instrs., (AISSD), Fullerton, Cal.
Chatillon John & Sons, Kew Gardens, N.Y.
Detecto Scales, Inc., Brooklyn, N.Y.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Eljay Corp., Columbia, Md.
Exact Weight Scale Co., Columbus, Ohio
Fairbanks Morse Weighing Sys., St. Johnsbury, Vt.
Franklin Fibre-Lamitex, Wilmington, Del.
Gentape Corp., Bloomfield, N.J.
GM Nameplate, Inc., Seattle, Wash.
Howe Richardson Scale Co., Clifton, N.J.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Master Engraving, East Paterson, N.J.
Mechanical Engraving Co., Inc., Bronx, N.Y.
Metalphoto Corp., Cleveland, Ohio
Metrological Data Corp., Garfield, N.J.
Miller Dial, El Monte, Calif.
Photo Chemical Prods. Cal., Santa Monica, Cal.
Sillcocks-Miller Co., Maplewood, N.J.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tech-Etch, Inc., Hingham, Mass.
Teledyne Gurley, Troy, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Toledo Scale, Toledo, Ohio
Torsion Balance Co., Clifton, N.J.
Waldom Elctrns., Inc., Chicago, Ill.

Scales, Production Weight—See Vol 1

Scanners, Crossbar—See Vol 1

Scanners, Flying Spot—See Vol 1

Scanners, Infrared—See Vol 1

Scanners, Instrument, Input/Output—See Vol 1

Scanners, Magnetic Tape—See Readers, Magnetic Tape—Vol 1

Scanners, Radiochromatogram—See Vol 1

Scanners, Solid State—See Vol 1

Scintillation Crystals—See Crystals, Scintillation—Vol 1

Scissors—See Vol 3

Scope Dollies—See Carts, Instrument & Equipment—Vol 3

Scopes—See Oscilloscopes—Vol 1

SCR's—See Thyristors

SCR Firing Controls—See Controls, SCR

Scramblers, Speech—See Vol 1

Screen Room Filters—See Filters, Screen Room

Screen Rooms—See Vol 1

Screwdrivers—See Vol 3

Screws, Lead, Feed & Translatory—See Drives & Drive Mechanisms

Screws—See Fasteners—Vol 3

Scribers, Wafer-Also See Machines & Accessories, Semiconductor Manufacturing—See Vol 1

Sealers—See Coatings—Vol 3

Sealing Kits, Cable End—See Kits, Cable-End Sealing—Vol 3

Sealing Service, Hermetic—See Services, Hermetic Sealing—Vol 3

Seals & Feedthrust, Environmental-See Feedthrust & Seals, Environmental—See Vol 3

Seals, Carbon—See Vol 3

Seals, Ceramic To Metal—See Vol 3

Seals, Glass To Metal—See Vol 3

Seals, Hermetic-Also See Services, Hermetic Sealing—See Vol 3

Seals, Metal To Metal—See Vol 3

Seals, Microwave—See Gaskets, Shielding, R-F; Seals, Waveguide—Vol 3

Seals, Oil—See Vol 3

Seals, Plastic—See Vol 3

Seals, Rubber—See Vol 3

Seals, Rubber To Metal—See Vol 3

Seals, Silicone Rubber—See Vol 3

Seals, Waveguide—See Vol 1

Search Unit, Magnetic Tape—See Tape Search Equipment—Vol 1

Selective Calling Devices—See Comm. Systems, Selective Paging—Vol 1

Self-Lubricating Materials—See Materials, Self-Lubricating—Vol 3

Selsyns—See Motors, Synchronous

Semiconductor Cases—See Cans, Semiconductor—Vol 3

Semiconductor Joint Compound

Isochem Resins Co., Lincoln, R.I.
Leico Inds., Inc., New York, N.Y.
Wakefield Engrg., Inc., Wakefield, Mass.

Semiconductor Material—See Crystals, Semiconductor—Vol 1

Semiconductor Readouts—See Readouts, Semiconductor

Semiconductor Wafer Fabrication, Artwork (Precision)

Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Integrated Circuit Engrg., Phoenix, Ariz.

Semiconductor Wafer Fabrication, Assembling (Packaging)

Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Amperex Elctrn., Slatersville, R.I.
Mostek Corp., Carrollton,, Tex.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Wentworth Labs, Inc., Broadfield, Conn.

Semiconductor Wafer Fabrication, Designing (Topological)

Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Dionics, Inc., Westbury, N.Y.
Integrated Circuit Engrg., Phoenix, Ariz.
Macrodata, Chatsworth, Cal.
Mostek Corp., Carrollton,, Tex.

Semiconductor Wafer Fabrication, Processing

Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Advanced Memory Systems, Inc., Sunnyvale, Cal
Dionics, Inc., Westbury, N.Y.
HLS, Inc., Santa Clara, Cal.
Integrated Circuit Engrg., Phoenix, Ariz.
Mostek Corp., Carrollton,, Tex.
NuTek Industries, Mountain View, Cal.
Research Devices, Elizabeth, N.J.
Union Carbide, San Diego, Cal.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Semiconductor Wafer Fabrication, Testing

Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Datalogic Sys., Inc., Merrimac, Mass.
Dionics, Inc., Westbury, N.Y.
Hacker Instrs., Inc., W. Caldwell, N.J.
Mechanization Assocs., Mt. View, Calif.
Research Devices, Elizabeth, N.J.
Research Instr. Co., Westbury, N.Y.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Wentworth Labs, Inc., Broadfield, Conn.
Zeiss, Carl, Inc., New York, N.Y.

Semiconductors—See Diodes; Rectifiers; Transistors

Sensors, Ice, Sleet & Snow—See Detectors, Ice, Sleet & Snow

Sensors, Temperature—See Bolometers, Thermistors, Transducers

Services, Assembly & Fabrication—See Vol 3

Services, Calibration & Instrument Repair—See Vol 3

Services, Coating (All-Types)—See Vol 3

Services, Design (Circuits, Components, Equipment, Systems, etc.)—See Vol 3

Services, Electrical Measurement—See Vol 3

Services, Encapsulation—See Vol 3

Services, Engraving & Profiling—See Vol 3

Services, Environmental Testing—See Vol 3

Services, Film Badge—See Vol 3

Services, Glass Blowing & Fabrication—See Vol 3

Services, Hermetic Sealing—See Vol 3

Services, High Vacuum—See Vol 3

Services, Hydraulic Assembly—See Vol 3

Services, Mask Making—See Vol 3

Services, Metallizing—See Vol 3

Services, Molding—See Vol 3

Services, Plastics Fabrication—See Vol 3

Services, Plating—See Vol 1

Services, Qualification—See Services, Environmental Testing—Vol 3

Services, Rental, Electronic Instrumentation—See Vol 3

Services, RFI Measuring—See Services, Electrical Measurement—Vol 3

Services, Silk Screening—See Vol 3

Services, Tower Erection & Maintenance—See Vol 1

Services, Training Aids—See Vol 3

Services, Vibration Surveys—See Vol 3

Services, Waveform Analysis—See Vol 3

Services, Wire Cutting & Stripping—See Vol 3

Services, Wire Wrapping—See Vol 3

Servo Analyzers—See Analyzers, Servo

Servo Controls—See Controls, Servo System

Servo Dampers—See Dampers, Servo

Servo Indicators—See Indicators, Servo

Servo Motors—See Motors, Servo

Servo Multipliers—See Multipliers, Servo

Servo Repeaters—See Repeaters, Servo

Servo Systems

Astro-Space Labs., Huntsville, Ala
Astrosystems, Lake Success, N.Y.
Automation Dev., Culver City, Cal. p 1310
Bafco, Inc., Warminster, Pa.
Bowmar Instr. Corp., Ft. Wayne, Ind. p 1313
Control Technology Co., L.I.C., N.Y.
Dranetz Engrg. Labs., Plainfield, N.J.
Dynamic Instr. Corp., Plainview, N.Y.
General Elec. Co., Schenectady, N.Y.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l. Control Co., Farmingdale, N.Y. p 1872,1873
International Rectifier, El Segundo, Cal.
Norden Div., Norwalk, Conn.
North Atlantic Inds., Plainview, N.Y. p 530
Parabam, Inc., Compton, Cal.
Planet Instr., Ft. Wayne, Ind. ...... p 1626
Precision Mechanisms, Westbury, N.Y.
Transmagnetics Inc., Farmingdale, N.Y.
Vernitron, Torrance, Cal.
Vernitron Corp., Deer Pk., N.Y.
Aeroflex Labs., Plainview, N.Y.
American Elctrns., Inc., Fullerton, Cal.
Analog General Corp., Oceanside, N.Y.
Andrew Corp., Orland Pk., Ill.
Applied Control Co., Fairfield, N.J.
Austin Elctrns., Roselle, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.

Beckman Instrs., Helipot Div., Fullerton, Cal.
Bendix, S. Montrose, Pa.
Betzelt GMBH, Trogerstr. 32, W. Germany
Carbonara, Victor E. Inc., Port Washington, N.Y.
Clifton Div., Clifton Hgts., Pa.
Collins Radio Co., Dallas, Tex.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Control Data Corp., Minneapolis, Minn.
Control Sys. Resch., Inc., Pittsburgh, Pa.
Digiac Corp., Plainview, N.Y.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Farrand Controls, Inc., Valhalla, N.Y.
Gap Instr. Corp., Hauppauge, N.Y.
General Oceanology, Inc., Cambridge, Mass.
Glar-Ban Corp., Buffalo, N.Y.
Goerz Optical Co., Inc., Pittsburgh, Pa.
Goldak Co., Inc., Glendale, Calif.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Henschel Corp., Amesbury, Mass.
H H Controls Co., Arlington, Mass.
Hughes Aircraft Co, Culver City, Cal.
Hydro-Aire Div., Burbank, Calif.
IMC Magnetics Corp., Maywood, Cal.
Instru-Lec Corp., Mt. Vernon, N.Y.
Jordan Controls, Milwaukee, Wisc.
Keltron Corp., Waltham, Mass.
Kollsman Instr. Corp., Syosset, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Link Div., Binghamton, N.Y.
LTV Electrosystems, Dallas, Tex.
Luft Instrs., Inc., Lincoln, Mass.
McFadden Elctrns. Co., South Gate, Calif.
Moog, Inc., East Aurora, N.Y.
MPC Prods. Corp., Chicago, Ill.
Nat'l. Water Lift Co., Kalamazoo, Mich.
Northern Precision Labs., Inc., Fairfield, N.J.
Orbit Instr. Corp., Syosset, N.Y.
Perfect Gear & Instr. Corp., Northridge, Calif.
Radiation Sys., Inc., McLean, Va.
Randtronics, Inc., Palo Alto, Cal.
Reflectone, Inc., Stamford, Conn.
Sanders Assocs., Inc., Manchester, N.H.
Scientific-Atlanta, Inc., Atlanta, Ga.
SECS, Inc., Long Island City, N.Y.
Servo Dev. Corp., Hicksville, N.Y.
Singer Co., Somerville, N.J.
Singer-General Precision, Inc., Little Falls, N.J.
Spectral Dynamics Corp. San Diego, San Diego, Cal.
Sperry Marine Sys., Charlottesville, Va.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Stop Components, Inc., Freeport, N.Y.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Theta Instr. Corp., Fairfield, N.J.
Transducer Systems, Inc., Willow Grove, Pa.
Unholtz-Dickie Corp., Hamden, Conn.
United Aircraft Corp., Norwalk, Conn.
USM Corp., Wakefield, Mass.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Westamp, Inc., Santa Monica, Cal.
Weston Hydraulics, Div., Van Nuys, Calif.
Weston-Transicoil, Worcester, Pa.

Servo Testers—See Testers, Servo—Vol 1

Shaft Couplings—See Couplings, Shaft

Shaft Encoders, Shaft Position—Vol 1

Shafts & Adapters, Flexible-Also See Couplings, Shaft

Johnson E. F. Co., Waseca, Minn.
Millen, James Mfg., Malden, Mass. p 1999
Vemaline Prods. Co., Wyckoff, N.J.
Abbott Prods., Inc., College Point, N.Y.
Amatom Elctrn. Hardware, New Rochelle, N.Y.
Avionics, Inc., South Bend, Ind.
Bendix, Utica, N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Britec Ltd., London, W.C.2, England
Farrand Controls, Inc., Valhalla, N.Y.
Helitronics Corp., Newark, N.J.
Instru-Lec Corp., Mt. Vernon, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Jones Motrola Corp., Stamford, Conn.
Kahlenberg Bros. Co., Two Rivers, Wisc.
Keystone Elctrns. Corp., New York, N.Y.
Lear Siegler, Inc., Santa Monica, Calif.
Perfect Gear & Instr. Corp., Northridge, Calif.
SECS, Inc., Long Island City, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Stop Components, Inc., Freeport, N.Y.
Stow Mfg. Co., Binghamton, N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Zephyr Mfg. Co., Inglewood, Calif.

Shafts, Rigid-Also See Couplings, Shaft

Johnson E. F. Co., Waseca, Minn.
Precision Mechanisms, Westbury, N.Y.
Abbott Prods., Inc., College Point, N.Y.
Advance Gear & Mach., Los Angeles, Cal.
Birnbach Co., Inc., Freeport, N.Y.
Dynamic Gear, Ft. Lauderdale, Fla.
Helitronics Corp., Newark, N.J.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Kahlenberg Bros. Co., Two Rivers, Wisc.
Keystone Elctrns. Corp., New York, N.Y.
Mechanical Technology, Inc., Latham, N.Y.
PIC Design Corp., Ridgefield,, Conn.
SECS, Inc., Long Island City, N.Y.
Sterling Instr., New Hyde Pk., NY
Stock Drive Prods., New Hyde Pk., N.Y.
Torrington Co., Torrington, Conn.

Shafts, Threaded—See Vol 3

Shake Tables—See Vibration Test Systems—Vol 1

Shells, Encapsulation—See Cups, Encapsulation—Vol 3

Shelters, Outdoor Equipment—See Laboratories, Mobile & Field—Vol 1

Shields, Cathode-Ray Tube

Arnold Engrg. Co., Marengo, Ill.
CELCO, Mahwah, N.J. .... **p 339**
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y. .... **p 2759**
Millen, James Mfg., Malden, Mass. **p 2762,2763**
Perfection Mica Co., Bensenville, Ill. **p 2002**
Ainslie Corp., S. Braintree, Mass.
Amuneal Mfg. Corp., Philadelphia, Pa.
Eagle Magnetic Co., Indianapolis, Ind.
Fansteel Inc., N Chicago, Ill.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Liberty Mirror Div., Brackenridge, Pa.
Litton Inds., San Carlos, Calif.
Russell Inds., Inc., Lynbrook, N.Y.
Technical Wire Prods., Inc., Cranford, NJ
Technical Wire Prods., Inc., Santa Barbara, Cal.

Shields, Coil—See Vol 3

Shields, Corona—See Vol 3

Shields, Electrostatic—See Shields, Tube

Shields, Heat—See Tube Heat Dissipators

Shields, Indicator Light—See Vol 3

Shields, Magnetic—See Vol 3

Shields, Nuclear Radiation—See Vol 1

Shields, R-F-Also See Gaskets, Shielding, R-F—See Vol 3

Shields, Switch

Cole Instr., Costa Mesa, Cal.
Eagle Magnetic Co., Indianapolis, Ind.
LectroMagnetics, Los Angeles, Cal.
Staver Co., Inc., Bay Shore, N.Y.
Technical Wire Prods., Inc., Cranford, NJ
Technical Wire Prods., Inc., Santa Barbara, Cal.

Shields, Transformer—See Vol 3

Shields, Tube

Amphenol Ind'l. Div., Chicago, Ill. p 2542
Amphenol Sales Div., Broadview, Ill. **p 2542**
Arnold Engrg. Co., Marengo, Ill.
EBY, Hugh H. Co., Phila., Pa.
General Elec., Richmond Hgts., Ohio
Millen, James Mfg., Malden, Mass. **p 1999,2762**
Perfection Mica Co., Bensenville, Ill. **p 2002,2003**
Ainslie Corp., S. Braintree, Mass.
Amuneal Mfg. Corp., Philadelphia, Pa.
Braun, H., Tool & Instr. Co., Hawthorne, N.J.
Cinch Mfg. Co., Elk Grove Village, Ill.
Collins Radio Co., Dallas, Tex.
Eagle Magnetic Co., Indianapolis, Ind.
Eby Sls. Co., Jamaica, N.Y.
GTE Sylvania Inc., Warren, Pa.
Int'l. Elctrn. Resch., Burbank, Cal.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Kinetron Corp., Asbury Park, N.J.
Mirro Aluminum Co., Manitowoc, Wisc.
Russell Inds., Inc., Lynbrook, N.Y.
Staver Co., Inc., Bay Shore, N.Y.
Technical Wire Prods., Inc., Cranford, NJ
Technical Wire Prods., Inc., Santa Barbara, Cal.
Waldom Elctrns., Inc., Chicago, Ill.
Waterbury Pressed Metal Co., Waterbury, Conn.
Zippertubing Co., Los Angeles, Calif.

Shields, Wire—See Braid, Cable & Wire Shielding—Vol 3

Shifters, Phase, Microwave

Alford Mfg. Co., Winchester, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
Arra Inc., Bayshore, N.Y.
Bendix, Franklin, Ind. .... **p 1555**
Daico Inds., Inc., Compton, Cal.
E & M Labs., Westlake Village, Cal.
Frequency Engrg. Labs., Farmingdale, N.J.
Hewlett-Packard, Palo Alto, Cal.
Universal Ad-Yu Elctrns., Inc., Passaic, N.J. .... **p 2752**
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md.
Aircom, Inc., Union, N.H.
AMBAC Inds., Garden City, N.Y.
Coax Devices Inc., Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Core-Tronics, Inc., Orange, N.J.
Dell Optics Co., Inc., N. Bergen, N.J.
Elctrn. Specialty, Thomaston, Conn.
ESCA, Jupiter, Fla.
GRFF, Port Salerno, Fla.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Omega Labs., Inc., Rowley, Mass.
Premier Microwave, Port Chester, N.Y.
Prodelin, Inc., Hightstown, N.J.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
Raytheon Co., Waltham, Mass.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Reeve Elctrns., Inc., Chicago, Ill.
RF Systems, Inc., Cohasset, Mass.
Sage Labs. Inc., Natick, Mass.
Sedco Sys., Inc., Farmingdale, N.Y.
TRG Prods., E. Boston, Mass.
Vectronics Microwave Corp., Middlesex, N.J.
Victor Microwave, Inc., Wakefield, Mass.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.
Wiltron Co., Palo Alto, Calif.

Shifters, Phase, R-F—See Vol 1

Shifters, Phase 60/400 CPS—See Vol 1

Shipping Containers—See Containers, Metal & Fiberglass, Shipping (Reusable)—Vol 3

Shock Mounts—See Mounts, Shock—Vol 3

Shock Testers—See Testers, Shock—Vol 1

Shorting Bars—See Bars, Shorting—Vol 3

Shredders, Paper—See Paper Shredders—Vol 3

Shrinkable Plastics & Elastomers—See Caps, Forms & Tapes, Heat Shrinkable-Also See Tubing, Heat Shrinkable—Vol 3

Shunts, Meter—See Vol 1

Shutters, Microwave

Microwave Cavity Labs., La Grange, Ill.
Waveline, Inc., W. Caldwell, N.J.
CES Elctrns., Brooklyn, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Labs. America, Brooklyn, N.Y.
Omega Labs., Inc., Rowley, Mass.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Varian Assocs., Palo Alto, Cal.

Signal Averagers,—See Averagers, Signal—Vol 1

Signal Conditoners & Equipment—See Vol 1

Signal Tracers—See Testers, Signal Tracing—Vol 1

Silica, Fused—See Vol 3

Silicon Semiconductors—See Diodes; Transistors

Silicone Insulators & Insulation—See Insulating Compounds, Silicone—Vol 3

Silicone Rubber—See Rubber, Silicone—Vol 3

Silk Screen Processing Services—See Services, Silk Screening—Vol 3

Simulators, Line—See Vol 1

Simulators, Motion—See Vol 1

Simulators, Radar—See Vol 1

Simulators, Solar—See Solar Simulators—Vol 1

Simulators & Trainers—See Vol 1

Sinks, Heat—See Transister & Diode Heat Dissipators; Tube Heat Dissipators-Also See Heat Sinks, Soldering

Sleeves—See Tubing—Vol 3

Slide Rules (Circuitry Computing)—See Vol 3

Slides, Cabinet & Chassis—See Vol 3

Sliding Loads, Microwave—See Vol 1

Slip & Shaker Tables—See Vibration Test Systems—Vol 1

Slip-Rings & Assemblies

Airflyte Elctrns. Co., Bayonne, N.J. p 1580
Engelhard Minerals & Chem., Murray Hill, N.J.
Fabricast, Inc., So. El Monte, Cal. p 1592,1593
Graphite Metallizing Corp., Yonkers, N.Y. p 1596
Aero-Motive Mfg. Co., Kalamazoo, Mich.
Avionics, Inc., South Bend, Ind.
Collectron Corp., New York, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
General Devices, Inc., Princeton, N.J.
Hansen Mfg. Co., Princeton, Ind.
Haydu Prods., Inc., Opa Locka, Fla.
Ind'l. Elec. Reels, Omaha, Neb.
Instrument Engineering Co., Austin, Tex
Meridian Laboratory, Inc., Madison, Wisc.
Michigan Sci. Corp., Milford, Mich.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Nippert Co., Delaware, Ohio
Northern Precision Labs., Inc., Fairfield, N.J.
Poly-Scientific, Blacksburg, Va.
Rostone Corp., Lafayette, Ind.
Superior Carbon Prods., Inc., Cleveland, Ohio
Teledyne Kinetics, Solana Beach, Cal.
Toledo Commutator Co., Owosso, Mich.
Welco Inds. Inc., Cincinnati, Ohio
Wendon Co., Inc., Stamford, Conn.

Slotted Lines, Microwave—See Vol 1

Smith Chart Impedance Plotters, Automatic—See Vol 1

Smoke Indicators—See Fire Detection & Fighting Equipment

Snips—See Wire Cutters—Vol 1

Socket Adapters—See Vol 3

Sockets, Breadboard

Augat Inc., Attleboro, Mass. p 1536
Barnes Corp., Lansdowne, Pa. p 2591
Berg Elctrns., Inc., New Cumberland, Pa.
Douglas Electronics, Inc., San Leandro, Cal.
EBY, Hugh H. Co., Phila., Pa. p 2620
Elctrn. Molding Corp., Woonsocket, R.I.
Pomona Elctrns. Co., Inc., Pomona, Cal. p 2662
Sealectro Corp., Mamaroneck, N.Y.
Vector Elctrn. Co., Inc., Sylmar, Cal.
Azimuth Elctrns., San Clemente, Cal.
Cinch Mfg. Co., Elk Grove Village, Ill.
Connectron Corp., Van Nuys, Cal
Dynatech Corp., Santa Ana, Cal.
Eby Sls. Co., Jamaica, N.Y.
Electraid, Inc., Cambridge, Mass.
Epoxy Plastic Molders, Irvington, N J
IFE Div, E Providence, R.I.
Jettron Prods., Hanover, N.J.
Robinson-Nugent, New Albany, Ind.
Textool Prods., Inc., Irving, Tex.
United Mineral & Chem. Corp., New York, N.Y.
Waldom Elctrns., Inc., Chicago, Ill.

Sockets, Capacitor—See Vol 3

Sockets, Crystal—See Vol 1

Sockets, Diode

Barnes Corp., Lansdowne, Pa. p 2591
Berg Elctrns., Inc., New Cumberland, Pa.
Connector Corp., Chicago, Ill. p 2613
EBY, Hugh H. Co., Phila., Pa. p 2620
Elctrn. Molding Corp., Woonsocket, R.I. p 2626
Sealectro Corp., Mamaroneck, N.Y. p 2709
Smith, Herman H., Inc., Bklyn., N.Y.
Auto-Swage Products, Inc., Shelton, Conn.
Azimuth Elctrns., San Clemente, Cal.
Cinch Mfg. Co., Elk Grove Village, Ill.
Connectron Corp., Van Nuys, Cal
Eby Sls. Co., Jamaica, N.Y.
Epoxy Plastic Molders, Irvington, N J
Industrial Elctrn. Hardware, New York, N.Y.
Jettron Prods., Hanover, N.J.
Loranger Mfg. Corp., Warren, Pa.
Methode Elctrns., Inc., Chicago, Ill.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Molex Prods. Co., Downers Grove, Ill.
Robinson-Nugent, New Albany, Ind.
Tekna Prods. Co., Rochester, N.Y.
Textool Prods., Inc., Irving, Tex.
United Mineral & Chem. Corp., New York, N.Y.
U.S. Terminals, Inc., Cincinnati, Ohio
Waldom Elctrns., Inc., Chicago, Ill.

Sockets, Integrated Circuit

Amp Inc., Harrisburg, Pa.
Augat Inc., Attleboro, Mass. p 1536
Barnes Corp., Lansdowne, Pa. p 2591
Berg Elctrns., Inc., New Cumberland, Pa.
Bivar, Inc., Santa Ana, Cal.
Cinch Div. TRW INC., Elk Grove Village, Ill. p 2604
Connector Corp., Chicago, Ill. p 2613
Continental Connector, Woodside, N.Y.
Elco, Willow Grove, Pa. p 2625
Elctrn. Molding Corp., Woonsocket, R.I. p 2626
ELFAB Crop., Dallas, Tex. p 2627
SAE Advanced Packaging, Santa Ana, Cal. p 2713
Scanbe Mfg. Corp., El Monte, Cal. p 2324
Sealectro Corp., Mamaroneck, N.Y. p 2709
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Vector Elctrn. Co., Inc., Sylmar, Cal.
Abadak Inds., Inc., Farmingdale, N.Y.
Ackerman Engravers, Inc., Long Island City, N.Y.
Ansley Elctrns. Corp., Doylestown, Pa.
Ansley Elctrns. Corp., Los Angeles, Cal.
Auto-Swage Products, Inc., Shelton, Conn.
Azimuth Elctrns., San Clemente, Cal.
Chemelec Prods., Inc., Cherry Hill, N.J.
Cinch Mfg. Co., Elk Grove Village, Ill.
Dynatech Corp., Santa Ana, Cal.
Eby Sls. Co., Jamaica, N.Y.
Epoxy Plastic Molders, Irvington, N J
Fabri-Tek, Inc., Minneapolis, Minn.
IFE Div, E Providence, R.I.
Industrial Elctrn. Hardware, New York, N.Y.
Interdyne Co., Los Angeles, Cal.
Jettron Prods., Hanover, N.J.
K-Tech., Inc., Framingham, Mass.
Loranger Mfg. Corp., Warren, Pa.
Malco Mfg. Co., Chicago, Ill.
Methode Elctrns., Inc., Chicago, Ill.
Pylon Co., Inc., Attleboro, Mass.
Robinson-Nugent, New Albany, Ind.
Stanford Applied Engrg., Santa Clara, Cal.
Tekna Prods. Co., Rochester, N.Y.
Textool Prods., Inc., Irving, Tex.
United Mineral & Chem. Corp., New York, N.Y.
U.S. Terminals, Inc., Cincinnati, Ohio
Viking Inds., Inc., Chatsworth, Calif.

Sockets, Lamp & Lamp Assemblies

ADC Prods., Minneapolis, Minn.
Alco Elctrn. Prods., Lawrence, Mass. p 1439
Amphenol Ind'l. Div., Chicago, Ill. p 2541
Amphenol Sales Div., Broadview, Ill. p 2541
Augat Inc., Attleboro, Mass.
Chicago Miniature Lamp Works, Chicago, Ill.
Chicago Switch, Chicago, Ill. p 1902
Circon Corp., Goleta, Cal.
Connector Corp., Chicago, Ill.
Dialight Corp., Brooklyn, N.Y.
Display Devices, Inc., Encinitas, Cal.
Drake Mfg., Harwood Hgts., Ill. p 1448
Elctrn. Molding Corp., Woonsocket, R.I. p 2626
General Illumination, Inc., St. Paul, Minn
Genisco Technology Corp., Eldema Div., Compton, Cal. p 1454,1455
Grayhill, Inc., LaGrange, Ill. p 1915
GTE Sylvania Inc., Hillsboro, N.H. p 1465
Illumination Inds., Inc., Sunnyvale, Cal.
Ind'l. Devices, Edgewater, N.J.
Inter-Market, Inc., Glenview, Ill. p 1473
International Electro Exchange Corp., Minneapolis, Minn.
Johnson E. F. Co., Waseca, Minn.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Leecraft Mfg. Co., Inc., Long Island City, N.Y. p 1482
LVC Ind's., Inc., Corona, N.Y. p 1441
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan p 2715
Sloan Co., Sun Valley, Cal.
Trimm, Inc., Libertyville, Ill. p 2718
Wiremold Co., W. Hartford, Conn.
Abtronics, Inc., Livermore, Calif.
Adronics, Inc., Cedar Grove, N.J.
Aerolite Electronics Corp., Union City, N.J.
Aeronautical Elec. Co., Inc., Chicago, Ill.
American Ultraviolet Co., Chatham, N.J.
Arcolectric Switch Co., N. Hollywood, Calif.
Aristo-Craft Distinctive Miniatures, New York, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Auto-Swage Products, Inc., Shelton, Conn.
Cable Elec. Prods., Inc., Providence, R.I.
Cinch Mfg. Co., Elk Grove Village, Ill.
Circle "F" Industries, Trenton, N.J.
Cole-Hersee Co., S. Boston, Mass.
Connectron Corp., Van Nuys, Cal
Controls Co. of America, Folcroft, Pa.
Culver Stearns Mfg. Co., Worcester, Mass.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Eby Sls. Co., Jamaica, N.Y.
General Elec., Providence, R.I.
GTE Sylvania Inc., Danvers, Mass.
GTE Sylvania Inc., Warren, Pa.
Industrial Elctrn. Hardware, New York, N.Y.
Joy Mfg. Co., New Phila., Ohio
K-Tech., Inc., Framingham, Mass.
Korry Mfg. Co., Seattle, Wash.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Luminator Div., Plano, Tex.
Molex Prods. Co., Downers Grove, Ill.
Oriel Optics Corp., Stamford, Conn.
Paraplegics Mfg., Bensenville, Ill.
Pek, Inc., Sunnyvale, Calif.
Permonite Mfg. Co., Chicago, Ill.
Philips Elmet Corp., Lewiston, Me.
Philmore Mfg. Co., Richmond Hill, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
Shigoto Inds., Ltd., New York, N.Y.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
Stacoswitch, Inc., Costa Mesa, Cal.
Stanford Applied Engrg., Santa Clara, Cal.
Symbolic Displays, Inc., Orange, Calif.
TEC, Inc., Eden Prairie, Minn.
T.J. Elctrns., Ft. Worth, Tex.
Underwriters Safety Device Co., Chicago, Ill.
Union Insulating Co., Parkersburg, W. Va.
Western Indicator Co., So. El Monte, Cal.
Whitaker Cable Corp., N. Kansas City, Mo.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Socket, Miniature & Subminiature—See Sockets, Diode; IC; Transistor

Sockets, Relay

Airborn, Inc., Dallas, Tex.
American Zettler, Costa Mesa, Calif. p 1653
Amphenol Ind'l. Div., Chicago, Ill. p 2540,2541
Amphenol Sales Div., Broadview, Ill. p 2540,2541
Augat Inc., Attleboro, Mass.
Barnes Corp., Lansdowne, Pa. p 2591
Berg Elctrns., Inc., New Cumberland, Pa.
Computer Comps., Jamaica, N.Y.
Continental Connector, Woodside, N.Y.
EBY, Hugh H. Co., Phila., Pa. p 2620
Elco, Willow Grove, Pa.
Hughes Aircraft Co., Connecting Devices, Newport Beach, Cal.
Potter & Brumfield, Princeton, Ind. p 1781
RDI, Glen Ellyn, Ill. p 1785
Schrack Elec. Sls., New York, N.Y.
Sealectro Corp., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Winchester Elctrns. Div., Oakville, Conn.
Armel Elctrns., Inc., N. Bergen, N.J.
Azimuth Elctrns., San Clemente, Cal.
Branson Corp., Denville, N.J.
Burndy Corp., Norwalk, Conn.
Cinch Mfg. Co., Elk Grove Village, Ill.
Curtis Dev. & Mfg., Milwaukee, Wisc.
Deutsch Co., Banning, Calif.
Deutsch Relay Div., East Northport, NY
Eby Sls. Co., Jamaica, N.Y.
GTE Automatic Elec., Northlake, Ill.
Industrial Elctrn. Hardware, New York, N.Y.
Jettron Prods., Hanover, N.J.
Methode Elctrns., Inc., Chicago, Ill.
Molex Prods. Co., Downers Grove, Ill.
Photologic Co., Orange, Cal.
Robinson-Nugent, New Albany, Ind.
Solatron Enterprises, Inglewood, Calif.
Struthers-Dunn, Inc., Pitman, N.J.
Textool Prods., Inc., Irving, Tex.
Viking Inds., Inc., Chatsworth, Calif.
WABCO Aerospace Dept., Pittsburgh, Pa.

Sockets, SCR

Amphenol Ind'l. Div., Chicago, Ill. p 2541
Amphenol Sales Div., Broadview, Ill. p 2541
Jettron Prods., Hanover, N.J.

Sockets, Test—See Vol 3

Sockets, Transistor

Augat Inc., Attleboro, Mass. p 1536
Barnes Corp., Lansdowne, Pa. p 2591
Berg Elctrns., Inc., New Cumberland, Pa.
Bivar, Inc., Santa Ana, Cal.
Connector Corp., Chicago, Ill. p 2613
EBY, Hugh H. Co., Phila., Pa. p 2620
Elco, Willow Grove, Pa. p 2625
Elctrn. Molding Corp., Woonsocket, R.I. p 2626
Grayhill, Inc., LaGrange, Ill. p 1915
Millen, James Mfg., Malden, Mass.
Pomona Elctrns. Co., Inc., Pomona, Cal. p 2662,2666
Sealectro Corp., Mamaroneck, N.Y. p 2709
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., Bklyn., N.Y.
UID Elctrns. Corp., Hollywood, Fla. p 1959
Vector Elctrn. Co., Inc., Sylmar, Cal.
Abadak Inds., Inc., Farmingdale, N.Y.
Accurate Elctrns. Corp., Elyria, Ohio
Azimuth Elctrns., San Clemente, Cal.
Chemelec Prods., Inc., Cherry Hill, N.J.
Cinch Mfg. Co., Elk Grove Village, Ill.
Connectron Corp., Van Nuys, Cal
Delbert Blinn. Co., Pomona, Calif.
Eby Sls. Co., Jamaica, N.Y.
Epoxy Plastic Molders, Irvington, N J
Fabri-Tek, Inc., Minneapolis, Minn.
Grayhill Moldtronics, Inc., Downers Grove, Ill.

Industrial Elctrn. Hardware, New York, N.Y.
Jettron Prods., Hanover, N.J.
Loranger Mfg. Corp., Warren, Pa.
Methode Elctrns., Inc., Chicago, Ill.
Molex Prods. Co., Downers Grove, Ill.
Robinson-Nugent, New Albany, Ind.
Tekna Prods. Co., Rochester, N.Y.
Textool Prods., Inc., Irving, Tex.
U.S. Terminals, Inc., Cincinnati, Ohio
Waldom Elctrns., Inc., Chicago, Ill.

Sockets, Transmitting & Industrial Tube

Amphenol Ind'l. Div., Chicago, Ill. p 2541,2542
Amphenol Sales Div., Broadview, Ill. p 2541,2542
Connector Corp., Chicago, Ill. p 2612,2613
EBY, Hugh H. Co., Phila., Pa. ...... p 2620
Erie Technological Prods. (EEM), Erie, Pa.
Johnson E. F. Co., Waseca, Minn.
Millen, James Mfg., Malden, Mass. p 1999,2762
Pomona Elctrns. Co., Inc., Pomona, Cal.
Raytheon Co., Quincy, Mass.
RDI, Glen Ellyn, Ill.
UID Elctrns. Corp., Hollywood, Fla.
Azimuth Elctrns., San Clemente, Cal.
Birnbach Co., Inc., Freeport, N.Y.
Cinch Mfg. Co., Elk Grove Village, Ill.
Eby Sls. Co., Jamaica, N.Y.
Eimac, San Carlos, Calif.
GTE Sylvania Inc., Warren, Pa.
Industrial Elctrn. Hardware, New York, N.Y.
Jettron Prods., Hanover, N.J.
Livingston Elctrn., Hanover, N.J.
Stettner-Trush Inc., Cazenovia, N.Y.

Sockets, Tube

Amphenol Ind'l. Div., Chicago, Ill. p 2540,2541
Amphenol Sales Div., Broadview, Ill. p 2540,2541
Augat Inc., Attleboro, Mass.
AVX Aerovox Corp., New Bedford, Mass.
Barnes Corp., Lansdowne, Pa.
Berg Elctrns., Inc., New Cumberland, Pa.
Connector Corp., Chicago, Ill. .... p 2612
EBY, Hugh H. Co., Phila., Pa. ...... p 2620
Elco, Willow Grove, Pa. .... p 2625
Grayhill, Inc., LaGrange, Ill. .... p 1915
Johnson E. F. Co., Waseca, Minn.
Millen, James Mfg., Malden, Mass. p 1999
Penta Labs., Santa Barbara, Cal.
Pomona Elctrns. Co., Inc., Pomona, Cal.
Raytheon Co., Quincy, Mass.
RDI, Glen Ellyn, Ill. .... p 1785
Rye Inds., Inc., Mamaroneck, N.Y. p 2708
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan p 2715
UID Elctrns. Corp., Hollywood, Fla. p 1959
Vector Elctrn. Co., Inc., Sylmar, Cal.
Abadak Inds., Inc., Farmingdale, N.Y.
Associated Engrg. & Mfg. Corp., Glen Ridge, N.J.
Azimuth Elctrns., San Clemente, Cal.
Burroughs Corp., Plainfield, N.J.
Chemelec Prods., Inc., Cherry Hill, N.J.
Cinch Mfg. Co., Elk Grove Village, Ill.
Eby Sls. Co., Jamaica, N.Y.
Eimac, San Carlos, Calif.
GTE Sylvania Inc., Warren, Pa.
Industrial Elctrn. Hardware, New York, N.Y.
Jan Hardware Mfg. Co., Inc., Long Island City, N.Y.
Jettron Prods., Hanover, N.J.
Livingston Elctrn., Hanover, N.J.
Loranger Mfg. Corp., Warren, Pa.
Methode Elctrns., Inc., Chicago, Ill.
Molex Prods. Co., Downers Grove, Ill.
National Elctrns., Geneva, Ill.
Norelcom Inds., Inc., Farmingdale, N.Y.
Permonite Mfg. Co., Chicago, Ill.
Philmore Mfg. Co., Richmond Hill, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Staffall, Inc., Providence, R.I.
Stettner-Trush Inc., Cazenovia, N.Y.
Viz Mfg. Co., Philadelphia, Pa.
Waldom Elctrns., Inc., Chicago, Ill.

Sockets, Vibrator

Connector Corp., Chicago, Ill.
EBY, Hugh H. Co., Phila., Pa. ...... p 2620
Eby Sls. Co., Jamaica, N.Y.
Industrial Elctrn. Hardware, New York, N.Y.

Solar Cells—See Cells, Photovoltaic

Solar Simulators—See Vol 1

Solder (All Types)—See Vol 3

Solder Pots—See Vol 3

Solder Preforms (Including Rings)-Also See Preforms,Precious Metal—See Vol 3

Soldering Accessories—See Vol 3

Soldering Equip., Hot Gas—See Vol 1

Soldering Equip., Induction Heating—See Vol 1

Soldering Equip., Printed Circuit—See Vol 1

Soldering Equip., Reflow—See Vol 1

Soldering Equip., Resistance—See Vol 1

Soldering Equip., Temperature Controlled—See Vol 3

Soldering Equip., Ultrasonic—See Vol 1

Soldering Flux—See Flux, Brazing & Soldering—Vol 3

Soldering Guns—See Vol 3

Soldering Irons—See Vol 3

Solenoid Drivers, Solid-State

Fork Standards, W. Chicago, Ill.
Hamlin Elctrns., Inc., Phoenix, Ariz.
Ledex, Inc., Dayton, Ohio
Artisan Elctrns. Corp., Parsippany, N.J.
Coil Co. of Amer., Northvale, N.J.
Controlcraft Corp., West Chicago, Ill.
Delta Elctrn. Control, Costa Mesa, Cal.
EDC Data Comps. Corp., Massapequa, N.Y.
Guardian California, Culver City, Cal.
Lehigh Valley Elctrn., Inc., Fogelsville, Pa.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Moore Inds., Van Nuys, Cal.
National Acme, Cleveland, Ohio
Trepac Corp. America, Englewood, N.J.
Voltex Co., Inc., Farmingdale, N.Y.
Warner Elec. Brake & Clutch Co., Beloit, Wisc.
Zenrad Controls Co., Santa Barbara, Cal.

Solenoids, Linear

Allen-Bradley Co., Milwaukee, Wisc.
American Zettler, Costa Mesa, Calif. p 1309
Comar Electric, Chicago, Ill. .... p 1681
Delevan Div., Coil Prods., E. Aurora, N.Y.
Deltrol Controls, Milwaukee, Wisc. p 1692
Dynamic Instr. Corp., Plainview, N.Y.
General Elec. Co., Schenectady, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill.
Hart-Advance Relay Div., Crystal Lake, Ill. .... p 1723
Hi-G, Windsor Locks, Conn. p 1330,1331
James Elctrns., Inc., Chicago, Ill.
Ledex, Inc., Dayton, Ohio .... p 1620
Liberty Controls, Joliet, Ill. .... p 1749
Magnetic Technology, Canoga Pk., Cal.
A.P.W. Co., Inc., Rockaway, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Switch Co., Florham Park, N.J.
Bicron Elctrns. Co., Canaan, Conn.
Bradohm, Inc., Salamanca, N.Y.
Coil Co. of Amer., Northvale, N.J.
Component Specialties, Temple City, Cal.
Controls Co. of America, Schiller Park, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Device Seals, Inc., Sun Valley, Calif.
Dormeyer Inds., Chicago, Ill.
Electro-Mechanisms, Inc., Azusa, Cal.
Electroid Co., Union, N.J.
General Relay Corp., Dover, N.J.
General Scanning, Watertown, Mass.
Hammond Mfg. Co., Ltd., Guelph, Ont., Can.
HJS Engrg. Co., Park Ridge, Ill.
IMC Magnetics Corp., Tempe, Ariz.
IMC Magnetics Corp., Maywood, Cal.
Koontz-Wagner Elec., South Bend, Ind.
Lisk, G.W. Co., Clifton Springs, N.Y.
Magnetec Corp., Van Nuys, Calif.
Meltronics Inc., Wantagh, N.Y.
Modelectric Prods. Corp., Asbury Park, N.J.
National Acme, Cleveland, Ohio
Naybor, E.V. Labs., Inc., Port Washington, N.Y.
Pollak, Joseph Corp., Boston, Mass.
Preferred Electronics, Inc., Westfield, Mass.
Servotronics, Inc., Buffalo, N.Y.
Skurka Engrg. Co., Los Angeles, Calif.
Synchro-Start Prods., Skokie, Ill.
Universal Relay Corp., New York, N.Y.
U.S. Elctrns., Lyndhurst, N.J.
Valcor Engrg. Corp., Kenilworth, N.J.
West Coast Elec. Mfg. Co., Los Angeles, Cal.

Solenoids, Rotary

Comar Electric, Chicago, Ill. .... p 1681
Daco Instr. Co., Inc., Trumbull, Conn.
Dynamic Instr. Corp., Plainview, N.Y.
Ledex, Inc., Dayton, Ohio .... p 1621
Oak Mfg., Crystal Lake, Ill. .... p 1943
Abrams Instr., Lansing, Mich.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Device Seals, Inc., Sun Valley, Calif.
HJS Engrg. Co., Park Ridge, Ill.
IMC Magnetics Corp., Tempe, Ariz.
IMC Magnetics Corp., Maywood, Cal.
Lisk, G.W. Co., Clifton Springs, N.Y.
Magnuson Engrs., Inc., San Jose, Calif.
Plessey Elctrns. Corp., Farmingdale, N.Y.
Preferred Electronics, Inc., Westfield, Mass.
Universal Relay Corp., New York, N.Y.

Solvents—See Cleaners & Solvents—Vol 3

Sonic Analyzers—See Analyzers, Sonic & Subsonic—Vol 1

Sorters—See Machines, Sorting—Vol 1

Sound Level Indicators—See Meters, Audio Level—Vol 1

Sound Recording Equip.—See Microphones; Recorders; etc.—Vol 1

Sources, Light, Isotope Excited—See Vol 1

Sources, Light, Radioactive—See Vol 1

Sources, Light, Stroboscopic—See Lights, Stroboscopic Source

Sources, Radioactive—See Vol 1

Spacers—See Vol 3

Spaghetti—See Tubing, Spaghetti—Vol 3

Spark Gap Capacitors—See Capacitors, Overvoltage Protected—Vol 3

Spark Gaps

Bel Fuse, Inc., Jersey City, N.J.
Centralab, Elctrns., Milwaukee, Wisc.
Dale Elctrns., Inc., Yankton, S.D. p 1906
Electrons Co., Fairfield, N.J.
General Elec. Co., Schenectady, N.Y.
Joslyn Elctrn. Sys., Goleta, Cal... p 1933
Kilovolt Corp., Hackensack, N.J. .. p 773
Light Elec. Corp., Rancocas, N.J.
Radio Materials Co., Chicago, Ill.
Raytheon Co., Quincy, Mass.
Ross Engrg. Corp., Campbell, Cal. p 1786
Signalite, Neptune, N.J. .... p 1952
Sprague Elec. Co., No. Adams, Mass.
Tobe Deutschmann Labs., Inc., Canton, Mass.
Victoreen Instr., Cleveland, Ohio p 2897
Calvert Elctrns., Inc., New York, N.Y.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Energy Systems, Palo Alto, Cal.
ITT Electron Tube, Easton, Pa.
LAD Electro-Sys., Inc., Hicksville, N.Y.
Maxwell Labs., Inc., San Diego, Calif.
Pek, Inc., Sunnyvale, Calif.
Siemens Corp., Comps. Div., Iselin, N.J.
Varian Assocs., Palo Alto, Cal.

Speaker Cones & Parts—See Vol 1

Speaker Drivers—See Drivers, Speaker—Vol 1

Speaker Enclosures—See Enclosures, Speaker—Vol 1

Speaker Horns—See Horns, Speaker—Vol 1

Speaker Systems (Industrial)—See Vol 1

Speakers, Ceramic—See Vol 1

Speakers, Column—See Vol 1

Speakers, Dynamic, Electro—See Vol 1

Speakers, Dynamic, P-M—See Vol 1

Speakers, Explosion & Flame Proof—See Vol 1

Speakers, Horn—See Vol 1

Speakers, Paging & Talk Back—See Vol 1

Speakers, Pillow—See Vol 1

Speakers, Submergence-Proof—See Vol 1

Speakers, Weatherproof—See Vol 1

Specific Gravity Indicators—See Indicators, Specific Gravity

Spectral Light Sources

Pinlites, Fairfield, N.J.
Signalite, Neptune, N.J.
American Atomics Corp., Tucson, Ariz.
American Ultraviolet Co., Chatham, N.J.
Black Light Corp. Amer., San Gabriel, Cal.
Black Light Eastern, Westbury, N.Y.
Cintra Physics Int'l., Sunnyvale, Cal.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Ealing Corp., Cambridge, Mass.
Edmund Scientific Co., Barrington, N.J.
EG & G, Inc., Salem, Mass.
Eimac, San Carlos, Calif.
Electro-Optical Systems, Pasadena, Cal.
Electro Optics Assocs., Palo Alto, Calif.
Esco Products, Oak Ridge, NJ
Gaertner Scientific Corp., Chicago, Ill.
Gamma Sci., San Diego, Cal.
Mackay, A.D., Inc., New York, N.Y.
McPherson Instr., Acton, Mass.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Pek, Inc., Sunnyvale, Calif.
Quartz Radiation Corp., Fairfield, N.J.

Rank Precision Inds., W. Nyack, N.Y.
Sara Scientific Co., San Francisco, Calif.
Schoeffel Instr. Corp., Westwood, N.J.
TRW Instrs., El Segundo, Cal.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
U.S. Scientific Instrs., Watertown, Mass.
Varian Aerograph, Walnut Creek, Calif.
VWR Scientific, San Francisco, Cal.

Spectrographs & Spectrometers—See Vol 1

Spectrometers, Infrared—See Vol 1

Spectrometers, Mass—See Vol 1

Spectrophotometers—See Vol 1

Spectroradiometers—See Vol 1

Spectrum Analyzers—See Analyzers, Spectrum—Vol 1

Speech Scramblers—See Scramblers, Speech—Vol 1

Speed Drives, Motor—See Controls, Motor Speed

Spiral Wrap—See Tubing, Spiral Wrap—Vol 3

Splicers, Coaxial Cable—See Vol 3

Splicers, Wire (Butt & Cap Types)—See Vol 3

Splicing Equipment, Magnetic Tape—See Vol 1

Splicing Equipment, Paper Tape—See Vol 1

Spoolers, Punched Tape—See Readers, Punched Tape—Vol 1

Spray Systems, Electrostatic Paint—See Vol 1

Springs (All Types)—See Vol 3

Springs, Compression (Helical)—See Vol 3

Springs, Flat—See Vol 3

Sputtering Equipment—See Vol 1

Stabilizers, Frequency—See Vol 1

Stabilizers, Line Impedance—See Vol 1

Stabilizers, Voltage—See Regulators & Stabilizers, Voltage-Also See Transformers, Voltage Regulating

Stalos—See Oscillators, Microwave—Vol 1

Stamped Circuit Boards—See Circuit Boards, Stamped

Standards, Atomic Beam—See Vol 1

Standards, Capacitance—See Vol 1

Standards, Current—See Vol 1

Standards, Delay Line—See Vol 3

Standards, Frequency—See Vol 1

Standards, Inductance—See Vol 1

Standards, Noise—See Vol 1

Standards, Phase—See Vol 1

Standards, Q—See Vol 1

Standards, Resistance—See Vol 1

Standards, Resistance Transfer—See Vol 1

Standards, Synchro & Resolver—See Vol 1

Standards, Temperature—See Vol 1

Standards, Time—See Vol 1

Standards, Voltage—See Vol 1

Standards, Voltage Ratio—See Vol 1

Standards, Voltage Reference—See Vol 1

Standing Wave Detectors—See Detectors, Standing Wave—Vol 1

Stands, Waveguide

Amphenol RF Div., Danburry, Conn.
Hewlett-Packard, Palo Alto, Cal.
Waveline, Inc., W. Caldwell, N.J.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Cardwell Condenser, Lindenhurst, N.Y.
CES Elctrns., Brooklyn, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Rohde & Schwarz Sls., Passaic, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
TRG Prods., E. Boston, Mass.

Stators, Motor & Generator—See Motor & Generator Armatures,Rotors, Stators

Steatite—See Insulation Parts, Ceramic—Vol 3

Stereoscopes, Magnifying

American Optical Corp., Buffalo, N Y
Bausch & Lomb, Rochester, N.Y.
Buhl Optical Co., Pittsburgh, Pa.
DoAll Co., Des Plaines, Ill.
Edmund Scientific Co., Barrington, N.J.
Ehrenreich Photo-Optical Industries Inc., Garden City, N.Y.
Fairchild Space & Defense Sys., Syosset, N.Y.
Gordon Alan Entprs., N. Hollywood, Cal.
Hacker Instrs., Inc., W. Caldwell, N.J.
Olympus Corp. America, New Hyde Park, N.Y.
Rank Precision Inds., W. Nyack, N.Y.
Techni-Tool, Inc., Philadelphia, Pa.
Titan Tool Supply Co., Inc., Buffalo, N.Y.
Unitron Instr. Co., Newton Highlands, Mass.
VWR Scientific, San Francisco, Cal.
Zeiss, Carl, Inc., New York, N.Y.

Stools—See Benches, Consoles, Stools, Tables (Lab & Shop)—Vol 3

Stops, Limit—See Limit Stops, Mechanical—Vol 3

Staighteners, Tube Pin—See Pin Straighteners, Tube

Strain Gauges—See Gauges, Strain

Strain Indicators—See Indicators, Strain—Vol 1

Strain Reliefs, Cable & Wire—See Vol 3

Stretchers, Microwave—See Microwave Line Stretchers—Vol 1

Strip-Line Components, Microwave

Alford Mfg. Co., Winchester, Mass. p 598
American Elctrn. Labs., Inc., Lansdale, Pa.
American Tech. Ceramics, Huntington Sta., N.Y.
Bendix, Franklin, Ind.
E & M Labs., Westlake Village, Cal. p 1557
Frequency Engrg. Labs., Farmingdale, N.J.
Hewlett-Packard, Palo Alto, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Aertech Inds., Sunnyvale, Calif.
Alloys Unlimited, Inc., Encino, Calif.
Anaren Microwave, Inc., Syracuse, N.Y.
Astrolab Inc., Linden, N J
Coax Devices Inc., Chelsea, Mass.
Conductron Corp., St. Charles, Mo.
EMC Technology Inc, Philadelphia, Pa.
Filmohm Div., Long Island City, N.Y.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Industrial Microwave, Scotch Plains, N.J.
Kevlin Mfg. Co., Woburn, Mass.
Kings Elctrns., Tuckahoe, N.Y.
Meca Elctrns., Inc., Denville, N.J.
Megadyne Inds., Inc., Rochester, N.Y.
MI-KRO Connector Div., Long Island City, N.Y.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
Polymer Corp., Reading, Pa.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
Rogers Corp., Rogers, Conn.
Rowe Engravers, Clifton, N.J.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Teledyne Micronetics, San Diego, Calif.
Vac-Ohm Elctrns. Co., Haddonfield, N.J.
Varian Assocs., Palo Alto, Cal.
Vectronics Microwave Corp., Middlesex, N.J.
Wavecom, Inc., Northridge, Cal.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.
Wiltron Co., Palo Alto, Calif.
Zeta Labs., Inc., Mountain View, Calif.

Strippers & Twisters, Wire—See Wire Strippers—Vol 1

Strippers, Wire—See Wire Strippers—Vol 1

Strippers, Wire, Chemical—See Chemicals, Wire Stripping—Vol 3

Strips, Ground—See Vol 1

Strips, Marker & Fanning—See Vol 3

Strips, Terminal—See Vol 3

Stroboscopes—See Lights, Stroboscopic Source

Studio Equipment—See Consoles; Cameras; Lighting Equip.; etc

Styli, Marking & Engraving-Also See Engraving & Profiling Equip.—See Vol 3

Styli, Recording & Playback—See Vol 1

Substrates, Ceramic—See Vol 3

Substrates, Flexible—See Vol 3

Substrates, Glass—See Vol 3

Superconducting Magnets—See Magnets, Superconducting—Vol 3

Supports, Tube—See Retainers, Tube

Suppressors, Arc

Carborundum Co., Niagara Falls, N.Y.
Dale Elctrns., Inc., Yankton, S.D. p 1906
General Elec. Co., Schenectady, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hopkins Engrg., San Fernando, Cal.
International Rectifier, El Segundo, Cal. p 1807
Joslyn Elctrn. Sys., Goleta, Cal... p 1933
Ledex, Inc., Dayton, Ohio
Presin Co., Inc., Shelton, Conn.
Signalite, Neptune, N.J. .... p 1952
Sprague Elec. Co., No. Adams, Mass.
Standard Condenser Corp., Chicago, Ill.
Triac Elctrn. Sys., N.Y., N.Y.
Basic Ceramics Inc., Hawthorne, N.J.
Bradley Semiconductor Corp., New Haven, Conn.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
General Instr. Corp., Hicksville, N.Y.
Green Rectifier Corp., Fair Lawn, N.J.
ITT Semiconductors, W. Palm Beach, Fla.
Rectifier Engrg. & Supply, St. Louis, Mo.
RtroN Corp., Skokie, Ill.
Sarkes Tarzian, Inc., Bloomington, Ind.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.

Suppressors, Harmonic—See Vol 1

Suppressors, Noise—See Vol 3

Suppressors, Transient Voltage (Rectifier Type)

Continental-Wirt Elctrns. Corp., Warminster, Pa. .... p 1895
Elgar Corp., San Diego, Cal.
Elin Div., San Diego, Cal.
General Elec. Co., Schenectady, N.Y.
International Rectifier, El Segundo, Cal. p 1807
Joslyn Elctrn. Sys., Goleta, Cal... p 1933
Ledex, Inc., Dayton, Ohio
Microsemiconductor Div. Standard Resources Corp., Culver City, Cal.
Silicon Transistor Corp., Garden City, N.Y. .... p 1835
Bradley Semiconductor Corp., New Haven, Conn.
Eastern Delta Corp., Fair Lawn, N.J.
Edal Inds., Inc., E. Haven, Conn.
Electro-Standards Labs., Inc., Miami, Fla.
General Semiconductor Corp., Tempe, Ariz.
Green Rectifier Corp., Fair Lawn, N.J.
ITT Semiconductors, W. Palm Beach, Fla.
Motorola Semiconductor Prods., Phoenix, Ariz.
Power Conversion Prods. Inc., Crystal Lake, Ill.
Rectifier Engrg. & Supply, St. Louis, Mo.
Sarkes Tarzian, Inc., Bloomington, Ind.
Siemens Corp., Comps. Div., Iselin, N.J.

Surface Analyzers—See Indicators, Surface Roughness—Vol 1

Surge Arresters, Electrical—See Arresters, Electrical Surge

Switchboards

Electrospace Corp., Westbury...... p 323
General Elec. Co., Schenectady, N.Y.
K.C.C. Shokai, Ltd., Naka-ku, Kobe, Japan
LVC Ind's., Inc., Corona, N.Y.
Nippon Electric/NEC America, N.Y., N.Y.
North Elec. Co., Galion, Ohio
Sealectro Corp., Mamaroneck, N.Y.
AMBAC Inds., Garden City, N.Y.
Anchor Specialty Mfg., Teterboro, N.J.
Anritsu Electric Co., Ltd., Tokyo, Japan
Control Prods. Corp., Chicago, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Devco Engrg., W. Caldwell, N.J.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hughes Aircraft Co, Fullerton, Cal.
Info-Lite Corp., Ft. Lee, N.J.
Kolton Elec. Mfg. Co., Newark, N.J.
Lakeshore Electric Corp., Bedford, Ohio
Lehighton Elctrns., Inc., Lehighton, Pa.
Merchant, Robert C. Co., Carmel Valley, Calif.
N/P Co., Temple City, Calif.
Philco-Ford Corp., Washington, D.C.
Private Tele-Comms., Inc., Chicago, Ill.
Ramm Rectifier Co., Inc., Bronx, N.Y.
Rowe L. L. Co., Boston, Mass.
Siemens Corp., Comm. Eq. Div., Iselin, N.J.
Singer - Tele-Signal, Woodbury, N.Y.
Square D Co., Park Ridge, Ill.
Stevenson Engrg. & Mfg., Portland, Ore.
Stromberg Carlson Corp., Rochester, N.Y.
Webster Elec. Co., Inc., Racine, Wisc.
Westinghouse Elec. Int'l., New York, N.Y.

Switchers, R-F—See Vol 1

Switchers, Video—See Vol 1

Switches, Acceleration—See Accelerometers

Switches, Air Flow Actuated

Cook Elec. Co., Morton Grove, Ill. p 1903
Cook Electric Co., Morton Grove, Ill. p 1903
Rotron, Inc., Woodstock, N.Y. .... p 2805
Tapeswitch Corp. Amer., Farmingdale, N.Y. .... p 1956
Automation Devices, Inc., Fairview, Pa.
Columbus Elec. Mfg. Co., Columbus, Ohio
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Dynacool Mfg. Co., Inc., Saugerties, N.Y.
G-V Controls, Livingston, N.J.
Gems Div., Farmington, Conn.
Honeywell, Residential Div., Mpls., Minn.
Texas Instruments, Dallas, Tex.
United Elec. Controls Co., Watertown, Mass.
U.O.P. Instrs. Div., Greenwich, Conn.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Wintriss Controls, New York, N.Y.

Switches, Antenna Changeover

Alco Elctrn. Prods., Lawrence, Mass.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal.. p 307
Amphenol RF Div., Danburry, Conn. p 1885
Amphenol Sales Div., Broadview, Ill. p 1885
Bird Elctrn., Cleveland, Ohio.......... p 421
Centralab, Elctrns., Milwaukee, Wisc.
Daico Inds., Inc., Compton, Cal... p 1556
Dow-Key, Santa Barbara, Cal. ..... p 1688
Hewlett-Packard, Palo Alto, Cal.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.p 1740
ITT Jennings, Dunellen,, N.J. .... p 1740
Johnson E. F. Co., Waseca, Minn.
Kilovac Corp., Santa Barbara, Cal. p 1688
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Ross Engrg. Corp., Campbell, Cal.
Sealectro Corp., Mamaroneck, N.Y.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Transco Prods., Inc., Venice, Cal. p 613
Trompeter Elctrns., Chatsworth, Cal.
Andrew Corp., Orland Pk., Ill.
Cable Elec. Prods., Inc., Providence, R.I.
Cole Instr., Costa Mesa, Cal.
Continental Elctrns. Mfg., Dallas, Tex.
Delta Elctrns., Alexandria, Va.
Electromagnetic Sci., Inc., Atlanta, Ga.
Elctrn. Resources Div., Los Angeles, Cal.
Fifth Dimension, Princeton, N.J.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Lieco, Inc., Lindenhurst, N.Y.
Matrix Sys. Corp., Chatsworth, Cal.
McElroy Elctrns. Corp., Shirley, Mass.
Microwave Div, Nashua, N.H.
Mobil Elctrns., Inc., Anderson, Ind.
Pollak, Joseph Corp., Boston, Mass.
Premier Microwave, Port Chester, N.Y.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
Sanders Assocs., Nashua, N.H.
Scherma, F.A. Mfg. Co., Inc., New York, N.Y.
Shigoto Inds., Ltd., New York, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Teledyne Microwave, Sunnyvale, Cal.
Torr Labs., Los Angeles, Cal.
Whistler Elctrns., Inc., Northridge, Cal.

Switches, Barometric

Computer Instrs., Hempstead, N.Y.
Cook Elec. Co., Morton Grove, Ill.
Betzelt GMBH, Trogerstr. 32, W. Germany
Bourns, Inc., Riverside, Calif.
Bristol Div, Waterbury, Conn
Precision Sensors, Inc., Trumbull, Conn
Sparton Southwest, Inc., Albuquerque, N.M.
Stow Labs., Inc., Hudson, Mass.
U.O.P. Instrs. Div., Greenwich, Conn.
Viz Mfg. Co., Philadelphia, Pa.

Switches, Cam

Allen-Bradley Co., Milwaukee, Wisc.
Carter Mfg. Corp., Hudson, Mass.
Chicago Switch, Chicago, Ill.
Connector Corp., Chicago, Ill.
Electro Switch Corp., Weymouth, Mass.
General Elec. Co., Schenectady, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill. p 1916
Haydon, A. W. Co., Waterbury, Conn.
Licon Div., Chicago, Ill.................... p 1935
Midtex/Aemco, Mankato, Minn.
Precision Mechanisms, Westbury, N.Y. p 1876
Sealectro Corp., Mamaroneck, N.Y.
Smith, Herman H., Inc., Bklyn., N.Y.
Tech Labs., Inc., Palisades Pk., N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bowmar/TIC, Inc., Newbury Park, Calif.
Cole Instr., Costa Mesa, Cal.
Controls Co. of America, Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
General Control Co., Boston, Mass.
Maxwell Labs., Inc., San Diego, Calif.
Micro Switch, Freeport, Ill.
Poly-Scientific, Blacksburg, Va.
Precision Switch, Port Chester, N.Y.
Relay Service Co., Chicago, Ill.
Sealectric Switch & Relay Co., Chicago, Ill.
Zenith Controls Inc., Chicago, Ill.

Switches, Cam, Adjustable—See Switches, Cam

Switches, Canopy

Smith, Herman H., Inc., Bklyn., N.Y.
Cable Elec. Prods., Inc., Providence, R.I.
Circle "F" Industries, Trenton, N.J.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
McGill Mfg. Co., Valparaiso, Ind.
Philmore Mfg. Co., Richmond Hill, N.Y.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Texas Instruments, Dallas, Tex.

Switches, Centrifugal

Chicago Switch, Chicago, Ill.
Gibbs Mfg. & Resch., Janesville, Wisc.p 1401
Cole Instr., Costa Mesa, Cal.
Euclid Elec. & Mfg. Div., Madison, Ohio
Jones Motrola Corp., Stamford, Conn.
Micro Design Assocs., Burbank, Cal.
Roltec, Inc., Minneapolis, Minn.
Synchro-Start Prods., Skokie, Ill.
Winterburn Mfg. Co., Putnam, Conn.

Switches, Coaxial Cable

A. D. Data Sys., Inc., Rochester, N.Y.
American Elctrn. Labs., Inc., Lansdale, Pa... p 1552
American Nucleonics Corp., Woodland Hills, Cal.. p 307
Amphenol RF Div., Danburry, Conn. p 1884-1887
Amphenol Sales Div., Broadview, Ill. p 1884-1888
Arra Inc., Bayshore, N.Y. .... p 1553
Automated Meas., Oakland, Calif.
Bird Elctrn., Cleveland, Ohio......... p 421
Daico Inds., Inc., Compton, Cal... p 1556
Dow-Key, Santa Barbara, Cal. .... p 1691
E & M Labs., Westlake Village, Cal.
Elctrn. Instr. & Specialty, Winchester, Mass.
Hewlett-Packard, Palo Alto, Cal.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Kay Elemetrics, Pine Brook, N.J.
Kilovac Corp., Santa Barbara, Cal. p 1691
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Texscan Corp., Indianapolis, Ind.
Transco Prods., Inc., Venice, Cal. p 613
Trompeter Elctrns., Chatsworth, Cal.
Universal Ad-Yu Elctrns., Inc., Passaic, N.J. .... p 2752
Waveline, Inc., W. Caldwell, N.J. p 1567
Weinschel Engrg. Co., Gaithersburg, Md.
Aertech Inds., Sunnyvale, Calif.
Andrew Corp., Orland Pk., Ill.
Barker & Williamson, Bristol, Pa.
Blonder-Tongue Labs., Inc., Old Bridge, N.J.
Cable Elec. Prods., Inc., Providence, R.I.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Collins Radio Co., Dallas, Tex.
Delta Elctrns., Alexandria, Va.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Edison Elctrns. Div., Manchester, N.H.
Electromagnetic Sci., Inc., Atlanta, Ga.
Elctrn. Resources Div., Los Angeles, Cal.
Fifth Dimension, Princeton, N.J.
Gold Line Connector, Inc., Norwalk, Conn.
Herley Inds., Inc., Syosset, N.Y.
Hyletronics Corp., Littleton, Mass.
Jerrold/Watkins Div., Toronto, 395, Ont., Can.
Kevlin Mfg. Co., Woburn, Mass.
Kings Elctrns., Tuckahoe, N.Y.
Lieco, Inc., Lindenhurst, N.Y.
Matrix Sys. Corp., Chatsworth, Cal.
Maury Microwave Corp., Cucamonga, Calif.
McClintock Matrixes, Inc., Woodbury, Conn.
MCS Corp., Monrovia, Calif.
Microwave Labs. America, Brooklyn, N.Y.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Sanders Assocs., Nashua, N.H.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Subminiature Instrs. Corp., Riverside, Calif.
Technical Mat'l., Mamaroneck, N.Y.
Teledyne Microwave, Sunnyvale, Cal.
Vectronics Microwave Corp., Middlesex, N.J.
Wavecom, Inc., Northridge, Cal.
Whistler Elctrns., Inc., Northridge, Cal.
Winslow Tele-Tronics, Inc., Eatontown, N.J.

Switches, Code

Airflyte Elctrns. Co., Bayonne, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Chicago Dynamic Inds., Chicago, Ill.
Digitran Co., Pasadena, Cal.
Grayhill, Inc., LaGrange, Ill. .... p 1915
Interswitch, Burlingame, Cal. .... p 1927
ISC Magnetics Div., Huntington, N.Y.
LVC Ind's., Inc., Corona, N.Y.
North Elec. Co., Galion, Ohio ...... p 2651
AMBAC Inds., Garden City, N.Y.
Cole Instr., Costa Mesa, Cal.
Consolidated Resistance Sls., Yonkers, N.Y.
Hughes Aircraft Co, Fullerton, Cal.
Ney, J.M. Co., Bloomfield, Conn.
Nucleonic Prods., Canoga Pk, Cal.
Subminiature Instrs. Corp., Riverside, Calif.

Switches, Commutator—See Commutators, Switching

Switches, Crossbar

Amphenol RF Div., Danburry, Conn.
Cherry Electrical Prods., Waukegan, Ill p 1899
Cunningham, Honeoye Falls, N.Y. p 322
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
LVC Ind's., Inc., Corona, N.Y. ...... p 2617
Nippon Electric/NEC America, N.Y., N.Y.
North Elec. Co., Galion, Ohio ...... p 2651
T-Bar Inc., Wilton, Conn. .... p 1697
Trompeter Elctrns., Chatsworth, Cal. p 1958
AMBAC Inds., Garden City, N.Y.
Andrew Corp., Orland Pk., Ill.
Delta Elctrns., Alexandria, Va.
Dynair Elctrns. Inc., San Diego, Calif.
Fifth Dimension, Princeton, N.J.
Matrix Sys. Corp., Chatsworth, Cal.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Permonite Mfg. Co., Chicago, Ill.
Rust Corp., Everett, Mass.
Square D Co., Park Ridge, Ill.
Torr Labs., Los Angeles, Cal.
Universal Relay Corp., New York, N.Y.
Virginia Elctrns. Co., Inc., Falls Church, Va.
Whistler Elctrns., Inc., Northridge, Cal.

Switches, Data-Sampling

A. D. Data Sys., Inc., Rochester, N.Y. p 328
Airflyte Elctrns. Co., Bayonne, N.J.
Amphenol RF Div., Danburry, Conn.
Bendix Environmtl. Sci., Baltimore, Md.
Chicago Dynamic Inds., Chicago, Ill.
Cunningham, Honeoye Falls, N.Y. p 322
Digitran Co., Pasadena, Cal. .... p 1904
Hickok Elect. Instr., Cleveland, Ohio
Hybrid Sys. Corp., Burlington, Mass.
LVC Ind's., Inc., Corona, N.Y. ...... p 2617
Matrix Corp., Beech Grove, Ind. .. p 361
Monitor Labs, Inc., San Diego, Cal. p 364
RCL Elctrns., Inc., Irvington, N.J.
Sealectro Corp., Mamaroneck, N.Y. p 2711
Solid State Elctrns., Sepulveda, Cal.
Sonex, Inc., Bethayres, Pa.
T-Bar Inc., Wilton, Conn.
Transco Prods., Inc., Venice, Cal.
Trompeter Elctrns., Chatsworth, Cal. p 1958
Unimax Switch Corp., Wallingford, Conn.
AMBAC Inds., Garden City, N.Y.
A.O.I.P., 75/Paris 12eme, France
Bowmar/TIC, Inc., Newbury Park, Calif.
CGS/Datametrics, Watertown, Mass.
Cole Instr., Costa Mesa, Cal.
Fifth Dimension, Princeton, N.J.
General Devices, Inc., Princeton, N.J.
General Reed Co., Clark, N.J.
Gosh Instrs., Inc., Wethersfield, Conn.
Instrument Data Products, Camarillo, Cal.
Instrumentation Tech. Corp., Northridge, Calif.
Iso-Switch Corp., Costa Mesa, Cal.
Marathon Instrs. Div., Pico Rivera, Calif.
Markite Corp., New York, N.Y.
Matrix Sys. Corp., Chatsworth, Cal.
Sigma Instrs., Inc., Braintree, Mass.
Space Diversity Sys., Totowa, N.J.
Whistler Elctrns., Inc., Northridge, Cal.

Switches, Decade

A. D. Data Sys., Inc., Rochester, N.Y.
Amp Inc., Harrisburg, Pa.........p 330,1881
Bowmar Instr. Corp., Ft. Wayne, Ind.
C & K Components, Watertown, Mass.
Centralab, Elctrns., Milwaukee, Wisc.
Chicago Dynamic Inds., Chicago, Ill. p 1900
Digitran Co., Pasadena, Cal. .... p 1904
Durant Digital Instrs., Milwaukee, Wisc. p 1316
ISC Magnetics Div., Huntington, N.Y.
LVC Ind's., Inc., Corona, N.Y.
Matrix Corp., Beech Grove, Ind.

Oak Mfg., Crystal Lake, Ill. .... p 1942
RCL Elctrns., Inc., Irvington, N.J. p 1946
Sealectro Corp., Mamaroneck, N.Y. p 2711
Shallcross, Selma, N.C.
T-Bar Inc., Wilton, Conn. .... p 1697
Tech Labs., Inc., Palisades Pk., N.J. p 1957
UID Elctrns. Corp., Hollywood, Fla.
Veeder-Root, Hartford, Conn.
Weinschel Engrg. Co., Gaithersburg, Md.
AMBAC Inds., Garden City, N.Y.
Cole Instr., Costa Mesa, Cal.
Consolidated Resistance Sls., Yonkers, N.Y.
Edison Elctrns. Div., Manchester, N.H.
GTE Automatic Elec., Northlake, Ill.
Muirhead, Inc., Mountainside, N.J.

Switches, Electronic—See Controls

Switches, Float

Allen-Bradley Co., Milwaukee, Wisc.
General Elec. Co., Schenectady, N.Y.
Gordos Corp., Bloomfield, N.J.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Signalite, Neptune, N.J.
Allis-Chalmers, Milwaukee, Wisc.
Autocall Co., The, Shelby, Ohio
Controls Co. of America, Schiller Park, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Essex Cryogenics Inds., St. Louis, Mo.
Furnas Elec. Co., Batavia, Ill.
Gems Div., Farmington, Conn.
Mercoid Corp., Chicago, Ill.
Precision Sensors, Inc., Trumbull, Conn
Revere Elctrn. Div., Wallingford, Conn.
Square D Co., Park Ridge, Ill.
U.O.P. Instrs. Div., Greenwich, Conn.

Switches, Foot-Pedal, Mat, Ribbon, etc.

Alco Elctrn. Prods., Lawrence, Mass. p 1880
Allen-Bradley Co., Milwaukee, Wisc.
Chicago Switch, Chicago, Ill.
General Elec. Co., Schenectady, N.Y.
Rye Inds., Inc., Mamaroneck, N.Y.
Tapeswitch Corp. Amer., Farmingdale, N.Y. .... p 1956
Vemaline Prods. Co., Wyckoff, N.J.
Allis-Chalmers, Milwaukee, Wisc.
Atlas Sound Div., Parsippany, N.J.
Barwood Elctrns., Inc., Glendale, Cal.
Cable Elec. Prods., Inc., Providence, R.I.
Cutler-Hammer, Milwaukee, Wisc.
Furnas Elec. Co., Batavia, Ill.
General Control Co., Boston, Mass.
Lektra Labs., Inc., College Point, N.Y.
Line Elec. Div., Parsippany, N.J.
Linemaster Switch Corp., Woodstock, Conn.
Micro Switch, Freeport, Ill.
On-Guard Corp. America, Carlstadt, N.J.
Pioneer Foot Switch Co., Chicago, Ill.
Rowe L. L. Co., Boston, Mass.
Square D Co., Park Ridge, Ill.
Superior Switch Co., Richmond, Va.

Switches, High Voltage

Allen-Bradley Co., Milwaukee, Wisc.
Beckman Instrs., Cedar Grove, N.J.
Clare, C.P. & Co., Chicago, Ill.
CTS Corp, Elkhart, Ind.................. p 1894
Del Elctrns. Corp., Mt. Vernon, N.Y.
Gordos Corp., Bloomfield, N.J. p 1912,1913
Hipotronics, Inc., Brewster, N.Y.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Janco Corp., Burbank, Cal.
Kilovac Corp., Santa Barbara, Cal.
Kilovolt Corp., Hackensack, N.J.
Light Elec. Corp., Rancocas, N.J.
Millen, James Mfg., Malden, Mass. p 1489
Ross Engrg. Corp., Campbell, Cal. p 1786
Sealectro Corp., Mamaroneck, N.Y.
Shallco, Inc., Smithfield, N.C. ...... p 1951
Shallcross, Selma, N.C.
Tech Labs., Inc., Palisades Pk., N.J. p 1957
UID Elctrns. Corp., Hollywood, Fla.
Cole Instr., Costa Mesa, Cal.
Consolidated Resistance Sls., Yonkers, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Edison Elctrns. Div., Manchester, N.H.
Hamlin, Inc., Lake Mills, Wisc.
Kentrox Inds., Inc., Portland, Ore.
Mason Electric Co. Inc., Los Angeles, Cal.
Matrix Sys. Corp., Chatsworth, Cal.
Maxwell Labs., Inc., San Diego, Calif.
McClintock Matrixes, Inc., Woodbury, Conn.
Micro Switch, Freeport, Ill.
Pollak, Joseph Corp., Boston, Mass.
Queensboro Transformer & Mach., College Pt., N.Y.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Siemens Corp., Comps. Div., Iselin, N.J.
Square D Co., Park Ridge, Ill.
Subminiature Instrs. Corp., Riverside, Calif.
Texas Instruments, Inc., Attleboro, Mass.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Switches, Illuminated

Alco Elctrn. Prods., Lawrence, Mass. p 1879
American Zettler, Costa Mesa, Calif. p 1882,1883
Amphenol Switch Div., Broadview, Ill. p 1888
Bowmar Instr. Corp., Ft. Wayne, Ind.
Capitol Machine & Switch Co., Danbury, Conn. .... p 1896
Carling Electric, W. Hartford, Conn. p 1897
Chicago Dynamic Inds., Chicago, Ill.
Chicago Switch, Chicago, Ill.
Clare, C.P. & Co., Chicago, Ill.
Dialight Corp., Brooklyn, N.Y....... p 1447
Digitran Co., Pasadena, Cal.
Drake Mfg., Harwood Hgts., Ill.
Electro-Mech. Comps., S. El Monte, Cal. p 1907
Electro Switch Corp., Weymouth, Mass. p 1908
Elctrn. Engrg. Co. Cal., Santa Ana, Cal. p 1909
General Elec. Co., Schenectady, N.Y. p 1911
General Illumination, Inc., St. Paul, Minn
Grayhill, Inc., LaGrange, Ill.......... p 1915
Guardian Elec. Mfg. Co., Chicago, Ill. p 1916
Ind'l. Devices, Edgewater, N.J.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Electro Exchange Corp., Minneapolis, Minn. ....p 1922,1923
Interswitch, Burlingame, Cal.
Leecraft Mfg. Co., Inc., Long Island City, N.Y. .... p 1482
Licon Div., Chicago, Ill..................... p 1935
LVC Ind's., Inc., Corona, N.Y.
Maxi-Switch Co., Minneapolis, Minn.
Oak Mfg., Crystal Lake, Ill. .... p 1942
Seacor, Inc., Norwood, N.J. .... p 1949
Sorenson Lighted Controls, W. Hartford, Conn. .... p 1493
UID Elctrns. Corp., Hollywood, Fla. p 1959
Unimax Switch Corp., Wallingford, Conn. .... p 1960
Vemaline Prods. Co., Wyckoff, N.J.
Wild Rover Corp., Closter, N.J. .. p 1962
Arcolectric Switch Co., N. Hollywood, Calif.
Burgess Switch Co., Ltd., Scarborough, Ont., Can.
Cable Elec. Prods., Inc., Providence, R.I.
Clare-Pendar Co., Post Falls, Idaho
Cole Instr., Costa Mesa, Cal.
Compu-Lite Corp., Irvine, Cal
Conectrix, Inc., Wheaton, Ill.
Consolidated Resistance Sls., Yonkers, N.Y.
Controls Co. of America, Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Eby Sls. Co., Jamaica, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Furnas Elec. Co., Batavia, Ill.
General Automatic Corp., Bayonne, N.J.
General Control Co., Boston, Mass.
Info-Lite Corp., Ft. Lee, N.J.
Jay-El Prods., Gardena, Calif.
Korry Mfg. Co., Seattle, Wash.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Marco-Oak, Anaheim, Cal.
Master Specialties, Costa Mesa, Cal.
McGill Mfg. Co., Valparaiso, Ind.
Micro Switch, Freeport, Ill.
Molex Prods. Co., Downers Grove, Ill.
Mossman, Donald P., Inc., Brewster, N.Y.
National Acme, Cleveland, Ohio
Nucleonic Prods., Canoga Pk, Cal.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Shigoto Inds., Ltd., New York, N.Y.
Sierra Elec., Gardena, Calif.
Stacoswitch, Inc., Costa Mesa, Cal.
Superior Switch Co., Richmond, Va.
Switchcraft, Inc., Chicago, Ill.
Symbolic Displays, Inc., Orange, Calif.
TEC, Inc., Eden Prairie, Minn.
Truco, Inc., Simsbury, Conn.
Waldom Elctrns., Inc., Chicago, Ill.

Switches, Inertia—See Accelerometers

Switches, Keyboard

Alco Elctrn. Prods., Lawrence, Mass. p 1880
American Zettler, Costa Mesa, Calif.
Amphenol Switch Div., Broadview, Ill. p 1888
Cherry Electrical Prods., Waukegan, Ill p 1899
Chicago Switch, Chicago, Ill.
Clare, C.P. & Co., Chicago, Ill.
Electro-Mech. Comps., S. El Monte, Cal.
Gordos Corp., Bloomfield, N.J.
Grayhill, Inc., LaGrange, Ill.
Hathaway Comps., Denver, Colo.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Electro Exchange Corp., Minneapolis, Minn.
Licon Div., Chicago, Ill..................... p 357
Maxi-Switch Co., Minneapolis, Minn. p 1941
Oak Mfg., Crystal Lake, Ill. .... p 1942
Raytheon Co., Quincy, Mass. ...... p 2005
Seacor, Inc., Norwood, N.J.
Unimax Switch Corp., Wallingford, Conn.
Wild Rover Corp., Closter, N.J. .. p 1962
Airpax Elctrns., So. El Monte, Cal.
Ark-Les Switch Corp., Watertown, Mass.
Chomerics, Inc., Woburn, Mass.
Clare-Pendar Co., Post Falls, Idaho
Datanetics Corp., Redondo Beach, Cal
Fifth Dimension, Princeton, N.J.
Flex Key Corp., Waltham, Mass.
Luminator Div., Plano, Tex.
Micro Switch, Freeport, Ill.
Mossman, Donald P., Inc., Brewster, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Stacoswitch, Inc., Costa Mesa, Cal.
TEC, Inc., Eden Prairie, Minn.

Switches, Key-Lock

Alco Elctrn. Prods., Lawrence, Mass.
Allen-Bradley Co., Milwaukee, Wisc.
Chicago Lock Co., Chicago, Ill. .. p 1901
Electro Switch Corp., Weymouth, Mass. p 1908
GC Elctrns., Rockford, Ill.
Grayhill, Inc., LaGrange, Ill.
Janco Corp., Burbank, Cal. .... p 1930
Trimm, Inc., Libertyville, Ill.
Ark-Les Switch Corp., Watertown, Mass.
Birnbach Co., Inc., Freeport, N.Y.
Circle "F" Industries, Trenton, N.J.
Clare-Pendar Co., Post Falls, Idaho
Cole-Hersee Co., S. Boston, Mass.
Cole Instr., Costa Mesa, Cal.
Culver Stearns Mfg. Co., Worcester, Mass.
Cutler-Hammer, Milwaukee, Wisc.
Edison Elctrns. Div., Manchester, N.H.
Furnas Elec. Co., Batavia, Ill.
General Elec., Providence, R.I.
Honeywell, Ft. Washington, Pa.
Indak Mfg. Corp., Northbrook, Ill.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
MEKontrol Inc., Northboro, Mass.
Micro Switch, Freeport, Ill.
Nucleonic Prods., Canoga Pk, Cal.
On-Guard Corp. America, Carlstadt, N.J.
Philmore Mfg. Co., Richmond Hill, N.Y.
Pollak, Joseph Corp., Boston, Mass.
Robot Inds., Inc., Dearborn, Mich.
Sierra Elec., Gardena, Calif.
Stettner-Trush Inc., Cazenovia, N.Y.
Stromberg Carlson Corp., Rochester, N.Y.
Superior Switch Co., Richmond, Va.
Truco, Inc., Simsbury, Conn.

Switches, Knife

GC Elctrns., Rockford, Ill.
General Elec. Co., Schenectady, N.Y.
Ross Engrg. Corp., Campbell, Cal.
Birnbach Co., Inc., Freeport, N.Y.
Cable Elec. Prods., Inc., Providence, R.I.
Circle "F" Industries, Trenton, N.J.
Cutler-Hammer, Milwaukee, Wisc.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Edison Elctrns. Div., Manchester, N.H.
Kolton Elec. Mfg. Co., Newark, N.J.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Philmore Mfg. Co., Richmond Hill, N.Y.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Shigoto Inds., Ltd., New York, N.Y.
Square D Co., Park Ridge, Ill.
States Co., Hartford, Conn.
Superior Switchboard & Devices Div., Canton, Ohio
Wadsworth Elec. Mfg. Co., Inc., Covington, Ky.

Switches, Lever

Alco Elctrn. Prods., Lawrence, Mass. p 1879
C & K Components, Watertown, Mass. p 1892,1893
Capitol Machine & Switch Co., Danbury, Conn. .... p 1896
Carling Electric, W. Hartford, Conn. p 1897
Centralab, Elctrns., Milwaukee, Wisc. p 1898
Clare, C.P. & Co., Chicago, Ill.
Digitran Co., Pasadena, Cal.......... p 1905
Electrospace Corp., Westbury...... p 323
General Elec. Co., Schenectady, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill. p 1916
International Electro Exchange Corp., Minneapolis, Minn. .... p 1923
J-B-T Instrs., Inc., New Haven, Conn. p 1929
Ledex, Inc., Dayton, Ohio
Licon Div., Chicago, Ill.................. p 1934
Oak Mfg., Crystal Lake, Ill. .... p 1942
Potter & Brumfield, Princeton, Ind.
Robertshaw Controls, Columbus, Ohio p 1944
Rye Inds., Inc., Mamaroneck, N.Y.
Seacor, Inc., Norwood, N.J. .... p 1949
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., Bklyn., N.Y.
Sorenson Lighted Controls, W. Hartford, Conn.
Standard Grigsby Co., Aurora, Ill.p 1955
T-Bar Inc., Wilton, Conn.
Unimax Switch Corp., Wallingford, Conn. .... p 1960
Arcolectric Switch Co., N. Hollywood, Calif.
Birnbach Co., Inc., Freeport, N.Y.
Cole-Hersee Co., S. Boston, Mass.
Cole Instr., Costa Mesa, Cal.
Consolidated Resistance Sls., Yonkers, N.Y.
Controls Co. of America, Schiller Park, Ill.
Controls Co. of America, Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Edison Elctrns. Div., Manchester, N.H.
Furnas Elec. Co., Batavia, Ill.
General Control Co., Boston, Mass.
GTE Automatic Elec., Northlake, Ill.
Haydon Switch & Instr., Waterbury, Conn.
Indak Mfg. Corp., Northbrook, Ill.
Mallory Controls, Frankfort, Ind.
Mason Electric Co. Inc., Los Angeles, Cal.
McGill Mfg. Co., Valparaiso, Ind.
Mercoid Corp., Chicago, Ill.
Micro Switch, Freeport, Ill.
Milli-Switch Corp., Gladwyne, Pa.
Mossman, Donald P., Inc., Brewster, N.Y.
Network Inds., Inc., Bayonne, N.J.
Precision Switch, Port Chester, N.Y.
Reed Switch Dev., Greenwich, Conn.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Shigoto Inds., Ltd., New York, N.Y.
Square D Co., Park Ridge, Ill.
Switchcraft, Inc., Chicago, Ill.
Telephone Comps., Inc., Northport, N.Y.
Texas Instruments, Dallas, Tex.

Tower Mfg. Corp., Providence, R.I.

Switches, Limit

Alco Elctrn. Prods., Lawrence, Mass.
Allen-Bradley Co., Milwaukee, Wisc.
Buchanan Elec. Prods., Union, N.J.
Douglas Randall Div., Pawcatuck, Conn.
General Elec. Co., Schenectady, N.Y.
Gordos Corp., Bloomfield, N.J.
Grayhill, Inc., LaGrange, Ill.
ISC Magnetics Div., Huntington, N.Y.
Janco Corp., Burbank, Cal.
Licon Div., Chicago, Ill. .... p 1935
Precision Mechanisms, Westbury, N.Y. p 1876
RDI, Glen Ellyn, Ill.
Robertshaw Controls, Columbus, Ohio p 1945
Smith, Herman H., Inc., Bklyn., N.Y.
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Unimax Switch Corp., Wallingford, Conn.
Allis-Chalmers, Milwaukee, Wisc.
Arcolectric Switch Co., N. Hollywood, Calif.
Arrow-Hart, Inc., Hartford, Conn.
Birnbach Co., Inc., Freeport, N.Y.
Bowmar/TIC, Inc., Newbury Park, Calif.
Burgess Switch Co., Ltd., Scarborough, Ont., Can.
Chatham Controls Corp., Chatham, N.J.
Cole-Hersee Co., S. Boston, Mass.
Cole Instr., Costa Mesa, Cal.
Controls Co. of America, Schiller Park, Ill.
Controls Co. of America, Folcroft, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Euclid Elec. & Mfg. Div., Madison, Ohio
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
General Control Co., Boston, Mass.
General Equip. & Mfg., Louisville, Ky.
GTE Automatic Elec., Northlake, Ill.
Haydon Switch & Instr., Waterbury, Conn.
Mason Electric Co. Inc., Los Angeles, Cal.
McClintock Matrixes, Inc., Woodbury, Conn.
McGill Mfg. Co., Valparaiso, Ind.
Mercoid Corp., Chicago, Ill.
Micro Switch, Freeport, Ill.
National Acme, Cleveland, Ohio
Photobell Co., Inc., New York, N.Y.
Precision Switch, Port Chester, N.Y.
Reed Switch Dev., Greenwich, Conn.
Sealectric Switch & Relay Co., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Sigma Instrs., Inc., Braintree, Mass.
Special Microwave Devices Oper., Waltham, Mass.
Square D Co., Park Ridge, Ill.
Sterling Instr., New Hyde Pk., NY
Teledyne Kinetics, Solana Beach, Cal.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Vulcan Elec. ITT, Danvers, Mass.
Westinghouse Elec., Buffalo, N. Y.

Switches, Liquid Level/Pressure

Computer Instrs., Hempstead, N.Y. p 2915
Cook Elec. Co., Morton Grove, Ill. p 1903
Cook Electric Co., Morton Grove, Ill. p 1903
Gordos Corp., Bloomfield, N.J.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Kratos Instrument Div., Pasadena, Cal
Autocall Co., The, Shelby, Ohio
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Automation Products, Inc., Houston, Tex.
Bourns, Inc., Riverside, Calif.
Bristol Div, Waterbury, Conn
Broadview Inds. Corp., Hempstead, N.Y.
Controlotron Corp., Farmingdale, N.Y.
Controls Co. of America, Schiller Park, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Essex Cryogenics Inds., St. Louis, Mo.
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
Gagne Assocs., Inc., Binghamton, N.Y.
Gems Div., Farmington, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Kingmann-White, Inc., Placentia, Calif.
MEKontrol Inc., Northboro, Mass.
Mercoid Corp., Chicago, Ill.
National Sonics, Farmingdale, N.Y.
Precision Sensors, Inc., Trumbull, Conn
Revere Elctrn. Div., Wallingford, Conn.
Robertshaw Controls Co., Anaheim, Cal.
Roylyn, Glendale, Cal.
Simmonds Precision Prods., Inc., Bellows Falls, Vt.
Sparton Southwest, Inc., Albuquerque, N.M.
Square D Co., Park Ridge, Ill.
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Dallas, Tex.
Trans-Sonics, Inc., Lexington, Mass.
United Elec. Controls Co., Watertown, Mass.
U.O.P. Instrs. Div., Greenwich, Conn.
Vulcan Elec. ITT, Danvers, Mass.

Switches, Lock—See Switches, Key-Lock

Switches, Magnetic Reed

A. D. Data Sys., Inc., Rochester, N.Y. p 328
Alco Elctrn. Prods., Lawrence, Mass. p 1879
Allen-Bradley Co., Milwaukee, Wisc.
Amphenol RF Div., Danburry, Conn.
Amphenol Switch Div., Broadview, Ill.
Clare, C.P. & Co., Chicago, Ill.
Coto-Coil Co., Inc., Providence, R.I. p 1682
Douglas Randall Div., Pawcatuck, Conn.
General Elec. Co., Schenectady, N.Y.
Gordos Corp., Bloomfield, N.J. p 1912,1913
ITT Jennings, Indl Prods., San Jose, Cal
Maxi-Switch Co., Minneapolis, Minn.
New Prod. Engrg., Wabash, Ind.
RDI, Glen Ellyn, Ill.
Tech Labs., Inc., Palisades Pk., N.J.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Transco Prods., Inc., Venice, Cal.
Trompeter Elctrns., Chatsworth, Cal.
Clare-Pendar Co., Post Falls, Idaho
Cole Instr., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
EDC (Electro Dev.), Lynnwood, Wash.
General Reed Co., Clark, N.J.
GTE Automatic Elec., Northlake, Ill.
Hamlin, Inc., Lake Mills, Wisc.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Matrix Sys. Corp., Chatsworth, Cal.
McClintock Matrixes, Inc., Woodbury, Conn.
Micro Switch, Freeport, Ill.
Mullard, Inc., Farmingdale, N.Y.
National Acme, Cleveland, Ohio
Sigma Instrs., Inc., Braintree, Mass.
TEC, Inc., Eden Prairie, Minn.
Torr Labs., Los Angeles, Cal.
Whistler Elctrns., Inc., Northridge, Cal.
Wintriss Controls, New York, N.Y.

Switches, Magnetically Actuated

Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla. p 1308
Alco Elctrn. Prods., Lawrence, Mass. p 1879
Allen-Bradley Co., Milwaukee, Wisc.
Chicago Lock Co., Chicago, Ill.
Clare, C.P. & Co., Chicago, Ill.
Coto-Coil Co., Inc., Providence, R.I. p 1682
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Douglas Randall Div., Pawcatuck, Conn.
Electro-Mech. Comps., S. El Monte, Cal.
Elmwood Sensors, Inc., Cranston, R.I.
General Elec. Co., Schenectady, N.Y.
Gordos Corp., Bloomfield, N.J. p 1912,1913
ISC Magnetics Div., Huntington, N.Y.
ITT Jennings, Indl Prods., San Jose, Cal
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Kilovac Corp., Santa Barbara, Cal.
Ledex, Inc., Dayton, Ohio
Liberty Controls, Joliet, Ill.
Licon Div., Chicago, Ill. .... p 1935
Maxi-Switch Co., Minneapolis, Minn.
Ohmite Mfg. Co., Skokie, Ill.
RDI, Glen Ellyn, Ill.
Sorenson Lighted Controls, W. Hartford, Conn.
T-Bar Inc., Wilton, Conn.
Trompeter Elctrns., Chatsworth, Cal.
Unimax Switch Corp., Wallingford, Conn.
Veeder-Root, Hartford, Conn.
Adams & Westlake, Elkhart, Ind.
Allis-Chalmers, Milwaukee, Wisc.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Switch Co., Florham Park, N.J.
Birnbach Co., Inc., Freeport, N.Y.
Clare-Pendar Co., Post Falls, Idaho
Cole Instr., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Electro-Mechanisms, Inc., Azusa, Cal.
Essex Cryogenics Inds., St. Louis, Mo.
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
Gems Div., Farmington, Conn.
General Equip. & Mfg., Louisville, Ky.
General Reed Co., Clark, N.J.
GTE Automatic Elec., Northlake, Ill.
GTE Sylvania Inc., Danvers, Mass.
Gulton Inds., Costa Mesa, Cal.
H-B Instr. Co., Phila., Pa.
Hamlin, Inc., Lake Mills, Wisc.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Matrix Sys. Corp., Chatsworth, Cal.
McClintock Matrixes, Inc., Woodbury, Conn.
Mercoid Corp., Chicago, Ill.
Micro Switch, Freeport, Ill.
Mosler Electronic Systems Div., Danbury, Conn.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Reed Switch Dev., Greenwich, Conn.
Rowan Controller, Westminister, Md.
Sigma Instrs., Inc., Braintree, Mass.
Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Pitman, N.J.
TEC, Inc., Eden Prairie, Minn.
Teledyne Kinetics, Solana Beach, Cal.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Whistler Elctrns., Inc., Northridge, Cal.
Wintriss Controls, New York, N.Y.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Switches, Matrix—See Switches, Crossbar-Also See Boards, Programming

Switches, Mercury Displacement

Gordos Corp., Bloomfield, N.J. .. p 1914
Sonex, Inc., Bethayres, Pa.
Adams & Westlake, Elkhart, Ind.
Beltone Electronics Corp., Chicago, Ill.
Durakool, Inc., Elkhart, Ind.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Fifth Dimension, Princeton, N.J.
H-B Instr. Co., Phila., Pa.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Mack Elec. Devices, Wyncote, Pa.
Mechanical Enterprises, Alexandria, Va.
Mercoid Corp., Chicago, Ill.
Micro Switch, Freeport, Ill.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Sierra Elec., Gardena, Calif.
Westinghouse Elec., Elmira, N.Y.

Switches, Mercury Wetted Contacts

A. D. Data Sys., Inc., Rochester, N.Y.
Alco Elctrn. Prods., Lawrence, Mass.
Douglas Randall Div., Pawcatuck, Conn.
Gordos Corp., Bloomfield, N.J. p 1912-1914
Nippon Electric/NEC America, N.Y., N.Y.
Trompeter Elctrns., Chatsworth, Cal.
Adams & Westlake, Elkhart, Ind.
Cutler-Hammer, Milwaukee, Wisc.
Elec-Trol, Inc., Saugus, Cal.
Fifth Dimension, Princeton, N.J.
General Elec., Providence, R.I.
General Equip. & Mfg., Louisville, Ky.
H-B Instr. Co., Phila., Pa.
Hamlin, Inc., Lake Mills, Wisc.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Matrix Sys. Corp., Chatsworth, Cal.
McClintock Matrixes, Inc., Woodbury, Conn.
Reed Switch Dev., Greenwich, Conn.
Whistler Elctrns., Inc., Northridge, Cal.

Switches, Microwave—See Switches, Coaxial Cable; Switches, Waveguide

Switches, Motor-Driven

Airflyte Elctrns. Co., Bayonne, N.J.
Arra Inc., Bayshore, N.Y.
Automation Dev., Culver City, Cal.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Chicago Dynamic Inds., Chicago, Ill.
Chicago Switch, Chicago, Ill.
Eagle-Signal Div., Davenport, Iowa
Electro Switch Corp., Weymouth, Mass.
General Elec. Co., Schenectady, N.Y.
Haydon, A. W. Co., Waterbury, Conn.
Hickok Elect. Instr., Cleveland, Ohio
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Janco Corp., Burbank, Cal.
Ledex, Inc., Dayton, Ohio
Midtex/Aemco, Mankato, Minn.
Oak Mfg., Crystal Lake, Ill.
Ohmite Mfg. Co., Skokie, Ill.
Precision Mechanisms, Westbury, N.Y. p 1876
Ross Engrg. Corp., Campbell, Cal.
Sealectro Corp., Mamaroneck, N.Y. p 2711
Shallcross, Selma, N.C.
Tech Labs., Inc., Palisades Pk., N.J. p 1957
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bowmar/TIC, Inc., Newbury Park, Calif.
Cole-Hersee Co., S. Boston, Mass.
Cole Instr., Costa Mesa, Cal.
Collectron Corp., New York, N.Y.
Controls Co. of America, Schiller Park, Ill.
Edison Elctrns. Div., Manchester, N.H.
Essex Engrg. Co., Inc., Essex, Conn.
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
General Devices, Inc., Princeton, N.J.
General Elec., Providence, R.I.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Mason Electric Co. Inc., Los Angeles, Cal.
Montgomery Mfg. Co., Inc., Owensville, Ind.
Northern Precision Labs., Inc., Fairfield, N.J.
Sparton Southwest, Inc., Albuquerque, N.M.
Subminiature Instrs. Corp., Riverside, Calif.
Teledyne Kinetics, Solana Beach, Cal.
Tenor Co., Inc., New Berlin, Wisc.
Westinghouse Elec., Elmira, N.Y.

Switches, Motor-Reversing

Alco Elctrn. Prods., Lawrence, Mass.
Allen-Bradley Co., Milwaukee, Wisc.
General Elec. Co., Schenectady, N.Y.
Sealectro Corp., Mamaroneck, N.Y.
Allis-Chalmers, Milwaukee, Wisc.
Ark-Les Switch Corp., Watertown, Mass.
Conectrix, Inc., Wheaton, Ill.
Controls Co. of America, Schiller Park, Ill.
Controls Co. of America, Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Euclid Elec. & Mfg. Div., Madison, Ohio
Furnas Elec. Co., Batavia, Ill.
General Equip. & Mfg., Louisville, Ky.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Square D Co., Park Ridge, Ill.
Stevenson Engrg. & Mfg., Portland, Ore.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Yaskawa Elec. America, Inc., Oak Brook, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Switches, Oil Immersed

Alco Elctrn. Prods., Lawrence, Mass.
Allen-Bradley Co., Milwaukee, Wisc.
Beckman Instrs., Cedar Grove, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Clare, C.P. & Co., Chicago, Ill.
General Elec. Co., Schenectady, N.Y.
Kilovac Corp., Santa Barbara, Cal.
Licon Div., Chicago, Ill. .... p 1935
Ross Engrg. Corp., Campbell, Cal.
Allis-Chalmers, Milwaukee, Wisc.
Cole Instr., Costa Mesa, Cal.
GTE Automatic Elec., Northlake, Ill.
Maxwell Labs., Inc., San Diego, Calif.
Rowan Controller, Westminister, Md.
Square D Co., Park Ridge, Ill.
Subminiature Instrs. Corp., Riverside, Calif.
Texas Instruments, Dallas, Tex.

Switches, Photoelectric—See Cells Photoconductive-Also See Controls, Photoelectric

Switches, Power

Alco Elctrn. Prods., Lawrence, Mass. p 1880
Allen-Bradley Co., Milwaukee, Wisc.
Arra Inc., Bayshore, N.Y.
Centralab, Elctrns., Milwaukee, Wisc. p 1898
Chicago Switch, Chicago, Ill.
CTS Corp, Elkhart, Ind.
Electro Switch Corp., Weymouth, Mass. p 1908
Elgar Corp., San Diego, Cal.
General Elec. Co., Schenectady, N.Y.
Grayhill, Inc., LaGrange, Ill. .... p 1915
International Electro Exchange Corp., Minneapolis, Minn.
ISC Magnetics Div., Huntington, N.Y. p 1921
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Janco Corp., Burbank, Cal. .... p 1931
Licon Div., Chicago, Ill. .... p 1935
Oak Mfg., Crystal Lake, Ill. .... p 1942
Ohmite Mfg. Co., Skokie, Ill.
RDI, Glen Ellyn, Ill.
Ross Engrg. Corp., Campbell, Cal. p 1786
Sealectro Corp., Mamaroneck, N.Y.
Shallcross, Selma, N.C.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
UID Elctrns. Corp., Hollywood, Fla. p 1959
Adams & Westlake, Elkhart, Ind.
Allis-Chalmers, Milwaukee, Wisc.
Allis, Louis Co., Milwaukee, Wisc.
Arcolectric Switch Co., N. Hollywood, Calif.
Arrow-Hart, Inc., Hartford, Conn.
Birnbach Co., Inc., Freeport, N.Y.
Cable Elec. Prods., Inc., Providence, R.I.
C.B.C. Inds., Inc., Ft. Washington, Pa.
Clarostat Mfg. Co., Inc., Dover, N.H.
Controls Co. of America, Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Cyberex Inc., Willoughby, Ohio
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Furnas Elec. Co., Batavia, Ill.
H-B Instr. Co., Phila., Pa.
Hamlin, Inc., Lake Mills, Wisc.
Leach Corp., Los Angeles, Cal.
Mack Elec. Devices, Wyncote, Pa.
Mason Electric Co. Inc., Los Angeles, Cal.
McClintock Matrixes, Inc., Woodbury, Conn.
Micro Switch, Freeport, Ill.
Microwave Assocs., Inc., Burlington, Mass.
Molex Prods. Co., Downers Grove, Ill.
Nucleonic Prods. Co., Canoga Pk, Cal.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Pass & Seymour, Inc., Syracuse, N.Y.
Pioneer Foot Switch Co., Chicago, Ill.
Radio Switch, Marlboro, N.J.
Square D Co., Park Ridge, Ill.
Stacoswitch, Inc., Costa Mesa, Cal.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
TEC, Inc., Eden Prairie, Minn.
Torr Labs., Los Angeles, Cal.
Westinghouse Elec. Corp., Pittsburgh, Pa.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Switches, Pressure

Allen-Bradley Co., Milwaukee, Wisc.
Amphenol Controls Div., Janesville, Wisc. .... p 2906
Amphenol Sales Div., Broadview, Ill. p 2906
Computer Instrs., Hempstead, N.Y. p 2915
Cook Elec. Co., Morton Grove, Ill. p 1903
Cook Electric Co., Morton Grove, Ill. p 1903
General Elec. Co., Schenectady, N.Y.
Kratos Instrument Div., Pasadena, Cal p 511
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Aero Mechanism, Inc., Van Nuys, Calif.
Arrow-Hart, Inc., Hartford, Conn.
Bendix, S. Montrose, Pa.
Betzelt GMBH, Trogerstr. 32, W. Germany
Birnbach Co., Inc., Freeport, N.Y.
Bourns, Inc., Riverside, Calif.
Bristol Div, Waterbury, Conn
Celtic Inds., Inc., Van Nuys, Cal.
CGS/Datametrics, Watertown, Mass.
Cole Instr., Costa Mesa, Cal.
Columbus Elec. Mfg. Co., Columbus, Ohio
Conrac Corp., New York, N.Y.
Controls Co. of America, Schiller Park, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
deHart Mfg. Co., Norristown, Pa.
Dietz, Henry G. Co., Inc., Long Island City, N.Y.
Dynamic Controls Corp., S. Windsor, Conn.
Essex Cryogenics Inds., St. Louis, Mo.
Faria, Thomas G. Corp., Uncasville, Conn.
Fasco Inds., Inc., Rochester, N.Y.
Furnas Elec. Co., Batavia, Ill.
Gagne Assocs., Inc., Binghamton, N.Y.
Gems Div., Farmington, Conn.
Gulton Inds., Costa Mesa, Cal.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Residential Div., Mpls., Minn.
Lear Siegler, Inc., Santa Monica, Calif.
Lear Siegler, Inc., Elyria, Ohio
Maxwell Labs., Inc., San Diego, Calif.
Meletron Corp., Los Angeles, Calif.
Mercoid Corp., Chicago, Ill.
National Acme, Cleveland, Ohio
Pall Corp., Glen Cove, N.Y.
Pall Trinity Micro Corp., Cortland, N.Y.
Pennwalt Corp., Phila., Pa.
Precision Sensors, Inc., Trumbull, Conn
Robinson-Halpern Co., W. Conshohocken, Pa.
Scanivalve, Inc., San Diego, Calif.
Sparton Southwest, Inc., Albuquerque, N.M.
Square D Co., Park Ridge, Ill.
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Technologics Inc, Ormond Beach, Fla.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Trans-Sonics, Inc., Lexington, Mass.
United Elec. Controls Co., Watertown, Mass.
U.O.P. Instrs. Div., Greenwich, Conn.
Wallace & Tiernan Div., Belleville, N.J.
Wintriss Controls, New York, N.Y.

Switches, Program

Airflyte Elctrns. Co., Bayonne, N.J.
Autronics Corp., Pasadena, Calif.
Carter Mfg. Corp., Hudson, Mass.
Chicago Dynamic Inds., Chicago, Ill.
Chicago Switch, Chicago, Ill.
Geo Space Sys., Tampa, Fla.
Grayhill, Inc., LaGrange, Ill.
Haydon, A. W. Co., Waterbury, Conn.
Interswitch, Burlingame, Cal. ...... p 1927
Ledex, Inc., Dayton, Ohio
LVC Ind's., Inc., Corona, N.Y.
Precision Mechanisms, Westbury, N.Y. p 1876
RCL Elctrns., Inc., Irvington, N.J.
Sealectro Corp., Mamaroneck, N.Y. p 2711
Tech Labs., Inc., Palisades Pk., N.J. p 1957
Agastat Div., Elizabeth, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bowmar/TIC, Inc., Newbury Park, Calif.
Cole Instr., Costa Mesa, Cal.
Controls Co. of America, Schiller Park, Ill.
Edison Elctrns. Div., Manchester, N.H.
Essex Int'l., Inc., Decatur, Ill.
General Devices, Inc., Princeton, N.J.
GTE Automatic Elec., Northlake, Ill.
Hyletronics Corp., Littleton, Mass.
Info-Lite Corp., Ft. Lee, N.J.
Lem Instrument Corp., Farmingdale, N.Y.
Micro Switch, Freeport, Ill.
Montgomery Mfg. Co., Inc., Owensville, Ind.
Nucleonic Prods., Canoga Pk, Cal.
Paragon Elec. Co., Two Rivers, Wisc.
Relcom, Mt. View, Calif.
Subminiature Instrs. Corp., Riverside, Calif.
Tenor Co., Inc., New Berlin, Wisc.
Virginia Elctrns. Co., Inc., Falls Church, Va.

Switches, Proximity

Alco Elctrn. Prods., Lawrence, Mass. p 1879
Allen-Bradley Co., Milwaukee, Wisc.
Coto-Coil Co., Inc., Providence, R.I.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Douglas Randall Div., Pawcatuck, Conn.
Elctrn. Instr. & Specialty, Winchester, Mass.
General Elec. Co., Schenectady, N.Y.
Gordos Corp., Bloomfield, N.J.
ISC Magnetics Div., Huntington, N.Y.
Licon Div., Chicago, Ill. .... p 1935
RDI, Glen Ellyn, Ill.
Robertshaw Controls, Columbus, Ohio p 1945
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Adams & Westlake, Elkhart, Ind.
Aladdin Controls, Nashville, Tenn.
Automation Devices, Inc., Fairview, Pa.
Birnbach Co., Inc., Freeport, N.Y.
Burgess Switch Co., Ltd., Scarborough, Ont., Can.
Cole Instr., Costa Mesa, Cal.
Controlcraft Corp., West Chicago, Ill.
Controlotron Corp., Farmingdale, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
De-Tec-Tronic Corp., Chicago, Ill.
Delavan Mfg Co, West Des Moines, Iowa
Denison, R.B., Inc., Bedford, Ohio
Dolan-Jenner Inds., Inc., Melrose, Mass.
EDC (Electro Dev.), Lynnwood, Wash.
Edison Elctrns. Div., Manchester, N.H.
Electro Prods. Labs., Power Supply, Chicago, Ill.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Electro-Sonic Control, Manteca, Calif.
Electronic Control Corp., Detroit, Mich.
Fifth Dimension, Princeton, N.J.
Gems Div., Farmington, Conn.
General Equip. & Mfg., Louisville, Ky.
Gulton Inds., Costa Mesa, Cal.
Indikon Co., Watertown, Mass.
Jo-Bell Prods., Inc., Oak Lawn, Ill.
Kahl Scientific Instr. Corp., El Cajon, Calif.
McClintock Matrixes, Inc., Woodbury, Conn.
MEKontrol Inc., Northboro, Mass.
Micro Switch, Freeport, Ill.
National Acme, Cleveland, Ohio
Photobell Co., Inc., New York, N.Y.
Raymond Engrg., Inc., Middletown, Conn.
Reed Switch Dev., Greenwich, Conn.
Robotron Corp., Detroit, Mich.
Sensor Corp., Greenwich, Conn.
Square D Co., Park Ridge, Ill.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Westinghouse Elec., Buffalo, N. Y.

Switches, Pushbutton (All Types)

ADC Prods., Minneapolis, Minn.
Alco Elctrn. Prods., Lawrence, Mass. p 1879,1880
Allen-Bradley Co., Milwaukee, Wisc.
American Zettler, Costa Mesa, Calif. p 1882,1883
Amphenol Switch Div., Broadview, Ill. p 1888
Bowmar Instr. Corp., Ft. Wayne, Ind.
C & K Components, Watertown, Mass. p 1893
Capitol Machine & Switch Co., Danbury, Conn. .... p 1896
Carling Electric, W. Hartford, Conn. p 1897
Centralab, Elctrns., Milwaukee, Wisc. p 1898
Cherry Electrical Prods., Waukegan, Ill p 1899
Chicago Dynamic Inds., Chicago, Ill. p 1900
Chicago Switch, Chicago, Ill. ...... p 1902
Connector Corp., Chicago, Ill.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Dialight Corp., Brooklyn, N.Y. ...... p 1447
Digitran Co., Pasadena, Cal. .... p 1905
Drake Mfg., Harwood Hgts., Ill.
Durant Digital Instrs., Milwaukee, Wisc. p 1316
Electro-Mech. Comps., S. El Monte, Cal. p 1907
Electro Switch Corp., Weymouth, Mass. p 1908
Elctrn. Meas. Inc., Neptune, N.J.
GC Elctrns., Rockford, Ill.
General Elec. Co., Schenectady, N.Y. p 1911
General Illumination, Inc., St. Paul, Minn
Genisco Technology Corp., Eldema Div., Compton, Cal. ....p 1454,1455
Gordos Corp., Bloomfield, N.J.
Grayhill, Inc., LaGrange, Ill. .... p 1915
Guardian Elec. Mfg. Co., Chicago, Ill.
Ind'l. Devices, Edgewater, N.J.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Electro Exchange Corp., Minneapolis, Minn. .... p 1922-1925
ISC Magnetics Div., Huntington, N.Y. p 1920
J-B-T Instrs., Inc., New Haven, Conn.
Janco Corp., Burbank, Cal. .... p 1930
Licon Div., Chicago, Ill. ....p 1934,1935
Maxi-Switch Co., Minneapolis, Minn.
Oak Mfg., Crystal Lake, Ill. .... p 1942
Raytheon Co., Quincy, Mass.
Robertshaw Controls, Columbus, Ohio p 1944,1945
Seacor, Inc., Norwood, N.J. .... p 1949
Shallcross, Selma, N.C.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., Bklyn., N.Y.
Sorenson Lighted Controls, W. Hartford, Conn.
Standard Grigsby Co., Aurora, Ill. p 1954
T-Bar Inc., Wilton, Conn. .... p 1697
Tapeswitch Corp. Amer., Farmingdale, N.Y.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan
Trimm, Inc., Libertyville, Ill.
UID Elctrns. Corp., Hollywood, Fla. p 1959
Unimax Switch Corp., Wallingford, Conn. .... p 1960
Vemaline Prods. Co., Wyckoff, N.J.
Wild Rover Corp., Closter, N.J.
Adalet Mfg., Cleveland, Ohio
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Airpax Elctrns., So. El Monte, Cal.
Allis-Chalmers, Milwaukee, Wisc.
Arcolectric Switch Co., N. Hollywood, Calif.
Ark-Les Switch Corp., Watertown, Mass.
Arrow-Hart, Inc., Hartford, Conn.
Birnbach Co., Inc., Freeport, N.Y.
Burgess Switch Co., Ltd., Scarborough, Ont., Can.
Cable Elec. Prods., Inc., Providence, R.I.
Circle "F" Industries, Trenton, N.J.
Clare-Pendar Co., Post Falls, Idaho
Cole-Hersee Co., S. Boston, Mass.
Compu-Lite Corp., Irvine, Cal
Conectrix, Inc., Wheaton, Ill.
Control Prods., Inc., E. Hanover, N. J.
Controls Co. of America, Schiller Park, Ill.
Controls Co. of America, Folcroft, Pa.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Culver Stearns Mfg. Co., Worcester, Mass.

Cutler-Hammer, Milwaukee, Wisc.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Edison Elctrns. Div., Manchester, N.H.
Euclid Elec. & Mfg. Div., Madison, Ohio
Furnas Elec. Co., Batavia, Ill.
General Automatic Corp., Bayonne, N.J.
General Control Co., Boston, Mass.
General Elec., Providence, R.I.
General Reed Co., Clark, N.J.
GTE Automatic Elec., Northlake, Ill.
Haydon Switch & Instr., Waterbury, Conn.
Honeywell, Ft. Washington, Pa.
Info-Lite Corp., Ft. Lee, N.J.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Jay-El Prods., Gardena, Calif.
Joy Mfg. Co., New Phila., Ohio
Kahlenberg Bros. Co., Two Rivers, Wisc.
Korry Mfg. Co., Seattle, Wash.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Luminator Div., Plano, Tex.
Mallory Controls, Frankfort, Ind.
Master Specialties, Costa Mesa, Cal.
McGill Mfg. Co., Valparaiso, Ind.
Measurement Sys., Inc., Norwalk, Conn.
MEKontrol Inc., Northboro, Mass.
Methode Elctrns., Inc., Chicago, Ill.
Micro Switch, Freeport, Ill.
Milli-Switch Corp., Gladwyne, Pa.
Molex Prods. Co., Downers Grove, Ill.
Mossman, Donald P., Inc., Brewster, N.Y.
National Acme, Cleveland, Ohio
Nucleonic Prods., Canoga Pk, Cal.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Paul, F.H. & Stein Bros., New York, N.Y.
Philmore Mfg. Co., Richmond Hill, N.Y.
Pioneer Foot Switch Co., Chicago, Ill.
Pollak, Joseph Corp., Boston, Mass.
Rowan Controller, Westminister, Md.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Shigoto Inds., Ltd., New York, N.Y.
Square D Co., Park Ridge, Ill.
Stacoswitch, Inc., Costa Mesa, Cal.
Stettner-Trush Inc., Cazenovia, N.Y.
Superior Switch Co., Richmond, Va.
Switchcraft, Inc., Chicago, Ill.
TEC, Inc., Eden Prairie, Minn.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Tower Mfg. Corp., Providence, R.I.
Truco, Inc., Simsbury, Conn.
Underwriters Safety Device Co., Chicago, Ill.
Universal Relay Corp., New York, N.Y.
Vitramon, Inc., Bridgeport, Conn.
Waldom Elctrns., Inc., Chicago, Ill.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Switches, R-F

Amphenol RF Div., Danbury, Conn. p 1884-1887
Amphenol Sales Div., Broadview, Ill. p 1884-1888
Applied Research Inc., Port Washington, N.Y.
Bendix, Franklin, Ind. .... p 1555
Dalco Inds., Inc., Compton, Cal... p 1556
Dow-Key, Santa Barbara, Cal.
E & M Labs., Westlake Village, Cal.
Elctrn. Instr. & Specialty, Winchester, Mass.
General Elec. Co., Schenectady, N.Y.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Hewlett-Packard, Palo Alto, Cal.
International Electro Exchange Corp., Minneapolis, Minn.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Lorch Elctrns. Corp., Englewood, N.J. p 609
Millen, James Mfg., Malden, Mass. p 1489
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Sierra Sys., Mountain View, Cal.
Transco Prods., Inc., Venice, Cal. p 613
Trompeter Elctrns., Chatsworth, Cal.
UID Elctrns. Corp., Hollywood, Fla.
Vari-L Co., Inc., Denver, Colo.
Adams-Russell Co., Waltham, Mass.
Anaren Microwave, Inc., Syracuse, N.Y.
Andrew Corp., Orland Pk., Ill.
Anzac Elctrns., Waltham, Mass.
Cooke Vacuum Prods., S. Norwalk, Conn.
Denison, R.B., Inc., Bedford, Ohio
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electromagnetic Sci., Inc., Atlanta, Ga.
Elctrn. Resources Div., Los Angeles, Cal.
Engelmann Microwave, Montville, N.J.
Fifth Dimension, Princeton, N.J.
General Microwave Corp., Farmingdale, N.Y.
Hamlin, Inc., Lake Mills, Wisc.
Hughes Aircraft Co, Fullerton, Cal.
Hyletronics Corp., Littleton, Mass.
Javex Elctrns., Cherry Valley, Calif.
Kevlin Mfg. Co., Woburn, Mass.
Matrix Sys. Corp., Chatsworth, Cal.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
Micro Switch, Freeport, Ill.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Div, Nashua, N.H.
Mini-Circuits Lab., Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Olektron Corp., Dudley, Mass.
Radio Switch, Marlboro, N.J.
Reeve Elctrns., Inc., Chicago, Ill.
Sage Labs. Inc., Natick, Mass.
Sanders Assocs., Nashua, N.H.
Torr Labs., Los Angeles, Cal.
Wavecom, Inc., Northridge, Cal.
Whistler Elctrns., Inc., Northridge, Cal.

Switches, Reed

ADC Prods., Minneapolis, Minn.
Allen-Bradley Co., Milwaukee, Wisc.
Amphenol RF Div., Danbury, Conn.
Clare, C.P. & Co., Chicago, Ill.
Coto-Coil Co., Inc., Providence, R.I. p 1682
Douglas Randall Div., Pawcatuck, Conn.
GC Elctrns., Rockford, Ill.
General Elec. Co., Schenectady, N.Y.
Gordos Corp., Bloomfield, N.J. p 1912,1913
Hamlin Elctrns., Inc., Phoenix, Ariz. p 1917
Hathaway Comps., Denver, Colo. p 1918
ITT Jennings, Indl Prods., San Jose, Cal .... p 1739
New Prod. Engrg., Wabash, Ind.
Nippon Electric/NEC America, N.Y., N.Y.
Self-Organizing Sys., Inc., Dallas, Tex.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Transco Prods., Inc., Venice, Cal.
Trompeter Elctrns., Chatsworth, Cal.
Ansley Div. ACI Inc., Perkasie, Pa.
Clare-Pendar Co., Post Falls, Idaho
Cole Instr., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Furnas Elec. Co., Batavia, Ill.
General Reed Co., Clark, N.J.
GTE Automatic Elec., Northlake, Ill.
Hamlin, Inc., Lake Mills, Wisc.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Matrix Sys. Corp., Chatsworth, Cal.
McClintock Matrixes, Inc., Woodbury, Conn.
Narda Microwave Corp., Plainview, N.Y.
National Acme, Cleveland, Ohio
RBM Controls, Logansport, Ind.
RBM Controls, Logansport, Ind.
Revere Elctrn. Div., Wallingford, Conn.
Shigoto Inds., Ltd., New York, N.Y.
Sigma Instrs., Inc., Braintree, Mass.
Torr Labs., Los Angeles, Cal.
Whistler Elctrns., Inc., Northridge, Cal.
Yaskawa Elec. America, Inc., Oak Brook, Ill.

Switches, Rocker

Airpax Elctrns., Inc., Cambridge, Md.
Alco Elctrn. Prods., Lawrence, Mass. p 1879
C & K Components, Watertown, Mass. p 1892,1893
Carling Electric, W. Hartford, Conn. p 1897
Chicago Switch, Chicago, Ill. ...... p 1902
Continental-Wirt Elctrns. Corp., Warminster, Pa. .... p 1895
CTS Corp, Elkhart, Ind.
Licon Div., Chicago, Ill.
Oak Mfg., Crystal Lake, Ill.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Sorenson Lighted Controls, W. Hartford, Conn.
Stackpole Comps. Co., Raleigh, N.C. p 1953
UID Elctrns. Corp., Hollywood, Fla. p 1959
Arcolectric Switch Co., N. Hollywood, Calif.
Cable Elec. Prods., Inc., Providence, R.I.
Circle "F" Industries, Trenton, N.J.
Cole-Hersee Co., S. Boston, Mass.
Cole Instr., Costa Mesa, Cal.
Conectrix, Inc., Wheaton, Ill.
Cutler-Hammer, Milwaukee, Wisc.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Eby Sls. Co., Jamaica, N.Y.
Indak Mfg. Corp., Northbrook, Ill.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Mason Electric Co. Inc., Los Angeles, Cal.
McGill Mfg. Co., Valparaiso, Ind.
Micro Switch, Freeport, Ill.
Molex Prods. Co., Downers Grove, Ill.
Nucleonic Prods., Canoga Pk, Cal.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Pass & Seymour, Inc., Syracuse, N.Y.
Philmore Mfg. Co., Richmond Hill, N.Y.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Shigoto Inds., Ltd., New York, N.Y.
Sierra Elec., Gardena, Calif.
Stettner-Trush Inc., Cazenovia, N.Y.
Superior Switch Co., Richmond, Va.
Switchcraft, Inc., Chicago, Ill.

Switches, Rotary

Airflyte Elctrns. Co., Bayonne, N.J. p 1580
Alco Elctrn. Prods., Lawrence, Mass. p 1879
Amp Inc., Harrisburg, Pa.........p 330,1881
Amphenol RF Div., Danbury, Conn.
Beckman Instrs., Cedar Grove, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Carling Electric, W. Hartford, Conn. p 1897
Carter Mfg. Corp., Hudson, Mass. p 2913
Centralab, Elctrns., Milwaukee, Wisc. p 1898
Chicago Dynamic Inds., Chicago, Ill. p 1900
Chicago Lock Co., Chicago, Ill. .. p 1901
Chicago Switch, Chicago, Ill.
Clare, C.P. & Co., Chicago, Ill.
Computer Instrs., Hempstead, N.Y.
Connector Corp., Chicago, Ill. ..... p 2613
Couch S.H. Div., Boston, Mass... p 1675
CTS Corp, Elkhart, Ind.................. p 1894
Digitran Co., Pasadena, Cal......... p 1905
Eagle-Signal Div., Davenport, Iowa
Electro Switch Corp., Weymouth, Mass. p 1908
Elctrn. Engrg. Co. Cal., Santa Ana, Cal. p 1909
GC Elctrns., Rockford, Ill.
General Elec. Co., Schenectady, N.Y.
Grayhill, Inc., LaGrange, Ill.......... p 1915
Haydon, A. W. Co., Waterbury, Conn.
Ind'l. Devices, Edgewater, N.J.
ISC Magnetics Div., Huntington, N.Y. p 1920
ITT Jennings, Indl Prods., San Jose, Cal .... p 1739
J-B-T Instrs., Inc., New Haven, Conn. p 1929
Janco Corp., Burbank, Cal. ..p 1930,1931
Ledex, Inc., Dayton, Ohio .. p 1936-1939
Licon Div., Chicago, Ill.
New England Instr., Natick, Mass.
Oak Mfg., Crystal Lake, Ill. .... p 1942
Ohmite Mfg. Co., Skokie, Ill.
RCL Elctrns., Inc., Irvington, N.J. p 1946-1948
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Ross Engrg. Corp., Campbell, Cal. p 1786
Seacor, Inc., Norwood, N.J. .... p 1949
Shallco, Inc., Smithfield, N.C. p 1950,1951
Shallcross, Selma, N.C.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Spectrol Elctrns., City of Industry, Cal. p 2924,2925
Stackpole Comps. Co., Raleigh, N.C. p 1953
Standard Grigsby Co., Aurora, Ill. p 1954
Tech Labs., Inc., Palisades Pk., N.J. p 1957
UID Elctrns. Corp., Hollywood, Fla.
Unimax Switch Corp., Wallingford, Conn.
Veeder-Root, Hartford, Conn.
Ace Elctrn. Assocs., Inc., Somerville, Mass.
Allis-Chalmers, Milwaukee, Wisc.
Ansley Div. ACI Inc., Perkasie, Pa.
A.O.I.P., 75/Paris 12eme, France
Arcolectric Switch Co., N. Hollywood, Calif.
Ark-Les Switch Corp., Watertown, Mass.
Arrow-Hart, Inc., Hartford, Conn.
ASM Corp., Smithfield, N.C.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bendix Corp., Sidney, N.Y.
Birnbach Co., Inc., Freeport, N.Y.
Bowmar/TIC, Inc., Newbury Park, Calif.
Burgess Switch Co., Ltd., Scarborough, Ont., Can.
Cable Elec. Prods., Inc., Providence, R.I.
Carson Mfg. Co., Indianapolis, Ind.
Circle "F" Industries, Trenton, N.J.
Clarostat Mfg. Co., Inc., Dover, N.H.
Cole-Hersee Co., S. Boston, Mass.
Cole Instr., Costa Mesa, Cal.
Collectron Corp., New York, N.Y.
Conectrix, Inc., Wheaton, Ill.
Consolidated Resistance Sls., Yonkers, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Durant Mfg. Co., Milwaukee, Wisc.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Eastern Specialty Co., Philadelphia, Pa.
Edison Elctrns. Div., Manchester, N.H.
Essex Cryogenics Inds., St. Louis, Mo.
Eugene Engrg. Co., Inc., Rockland, Mass.
Furnas Elec. Co., Batavia, Ill.
General Devices, Inc., Princeton, N.J.
General Elec., Providence, R.I.
General Microwave Corp., Farmingdale, N.Y.
General Reed Co., Clark, N.J.
Haydon Switch & Instr., Waterbury, Conn.
Honeywell, Ft. Washington, Pa.
Indak Mfg. Corp., Northbrook, Ill.
Javex Elctrns., Cherry Valley, Calif.
Kahlenberg Bros. Co., Two Rivers, Wisc.
Lem Instrument Corp., Farmingdale, N.Y.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Mallory Controls, Frankfort, Ind.
Markite Corp., New York, N.Y.
Mason Electric Co. Inc., Los Angeles, Cal.
Micro Switch, Freeport, Ill.
Microlab/FXR, Livingston, N.J.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Miniature Elctrn. Comps. Corp., Holbrook, Mass.
Mossman, Donald P., Inc., Brewster, N.Y.
Muirhead, Inc., Mountainside, N.J.
National Acme, Cleveland, Ohio
Ney, J.M. Co., Bloomfield, Conn.
Omega Engrg., Inc., Stamford, Conn.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Paul, F.H. & Stein Bros., New York, N.Y.
Philmore Mfg. Co., Richmond Hill, N.Y.
Pollak, Joseph Corp., Boston, Mass.
Poly-Scientific, Blacksburg, Va.
Radio Switch, Marlboro, N.J.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Sealectric Switch & Relay Co., Chicago, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Stacoswitch, Inc., Costa Mesa, Cal.
Subminiature Instrs. Corp., Riverside, Calif.
Superior Switch Co., Richmond, Va.
Switchcraft, Inc., Chicago, Ill.
Tabet Mfg. Co., Norfolk, Va.
Tenor Co., Inc., New Berlin, Wisc.
Texas Instruments, Inc., Attleboro, Mass.
Tower Mfg. Corp., Providence, R.I.
TRG Prods., E. Boston, Mass.

Switches, Rotary Chopper

Airflyte Elctrns. Co., Bayonne, N.J. p 1580
Oak Mfg., Crystal Lake, Ill.
Cole Instr., Costa Mesa, Cal.
Collectron Corp., New York, N.Y.
Metrological Data Corp., Garfield, N.J.
Ney, J.M. Co., Bloomfield, Conn.
Teledyne Gurley, Troy, N.Y.

Switches, Slide

Alco Elctrn. Prods., Lawrence, Mass. p 1879
Amp Inc., Harrisburg, Pa.........p 330,1881
Amphenol RF Div., Danbury, Conn.

Carling Electric, W. Hartford, Conn. p 1897
Centralab, Elctrns., Milwaukee, Wisc. p 1898
Chicago Dynamic Inds., Chicago, Ill.
Chicago Switch, Chicago, Ill. ...... p 1902
Continental-Wirt Elctrns. Corp., Warminster, Pa. .... p 1895
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
GC Elctrns., Rockford, Ill.
General Elec. Co., Schenectady, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill.
International Electro Exchange Corp., Minneapolis, Minn.
ITT Jennings, Indl Prods., San Jose, Cal
Ledex, Inc., Dayton, Ohio
LVC Ind's., Inc., Corona, N.Y.
Oak Mfg., Crystal Lake, Ill.
Rye Inds., Inc., Mamaroneck, N.Y.
Seacor, Inc., Norwood, N.J. .... p 1949
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Stackpole Comps. Co., Raleigh, N.C. p 1953
Standard Grigsby Co., Aurora, Ill.p 1955
UID Elctrns. Corp., Hollywood, Fla. p 1959
Wilbrecht Inc., St. Paul, Minn ...... p 1961
Ansley Div. ACI Inc., Perkasie, Pa.
Arcolectric Switch Co., N. Hollywood, Calif.
Ark-Les Switch Corp., Watertown, Mass.
Arrow-Hart, Inc., Hartford, Conn.
Birnbach Co., Inc., Freeport, N.Y.
Cable Elec. Prods., Inc., Providence, R.I.
Circle "F" Industries, Trenton, N.J.
Cole Instr., Costa Mesa, Cal.
Components Specialties, Inc., Freeport, N.Y.
Conectrix, Inc., Wheaton, Ill.
Consolidated Resistance Sls., Yonkers, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Eby Sls. Co., Jamaica, N.Y.
Essex Cryogenics Inds., St. Louis, Mo.
Indak Mfg. Corp., Northbrook, Ill.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Mason Electric Co. Inc., Los Angeles, Cal.
Micro Switch, Freeport, Ill.
Ney, J.M. Co., Bloomfield, Conn.
Nucleonic Prods., Canoga Pk, Cal.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Pass & Seymour, Inc., Syracuse, N.Y.
Paul, F.H. & Stein Bros., New York, N.Y.
Philmore Mfg. Co., Richmond Hill, N.Y.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Shigoto Inds., Ltd., New York, N.Y.
Stettner-Trush Inc., Cazenovia, N.Y.
Superior Switch Co., Richmond, Va.
Switchcraft, Inc., Chicago, Ill.
Underwriters Safety Device Co., Chicago, Ill.

Switches, Snap-Action (All Types)

Alco Elctrn. Prods., Lawrence, Mass.
Allen-Bradley Co., Milwaukee, Wisc.
Amphenol RF Div., Danbury, Conn.
Cherry Electrical Prods., Waukegan, Ill p 1899
Chicago Lock Co., Chicago, Ill.
Chicago Switch, Chicago, Ill. ...... p 1902
Connector Corp., Chicago, Ill.
Continental-Wirt Elctrns. Corp., Warminster, Pa.
CTS Corp, Elkhart, Ind.
Electro Switch Corp., Weymouth, Mass.
Engelhard Minerals & Chem., Murray Hill, N.J.
General Elec. Co., Schenectady, N.Y.
Grayhill, Inc., LaGrange, Ill.
Guardian Elec. Mfg. Co., Chicago, Ill.
ISC Magnetics Div., Huntington, N.Y. p 1920
J-B-T Instrs., Inc., New Haven, Conn.
Janco Corp., Burbank, Cal.
Licon Div., Chicago, Ill.................. p 1934
Potter & Brumfield, Princeton, Ind.
RCL Elctrns., Inc., Irvington, N.J.
Robertshaw Controls, Columbus, Ohio p 1945
Shallcross, Selma, N.C.
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan
Smith, Herman H., Inc., Bklyn., N.Y.
Stackpole Comps. Co., Raleigh, N.C. p 1953
Standard Grigsby Co., Aurora, Ill.p 1955
UID Elctrns. Corp., Hollywood, Fla.
Unimax Switch Corp., Wallingford, Conn. .... p 1960
Airpax Elctrns., So. El Monte, Cal.
Arcolectric Switch Co., N. Hollywood, Calif.
Ark-Les Switch Corp., Watertown, Mass.
Arrow-Hart, Inc., Hartford, Conn.
Beltone Electronics Corp., Chicago, Ill.
Birnbach Co., Inc., Freeport, N.Y.
Burgess Switch Co., Ltd., Scarborough, Ont., Can.
Carson Mfg. Co., Indianapolis, Ind.
Circle "F" Industries, Trenton, N.J.
Clare-Pendar Co., Post Falls, Idaho
Clarostat Mfg. Co., Inc., Dover, N.H.
Cole Instr., Costa Mesa, Cal.
Columbus Elec. Mfg. Co., Columbus, Ohio
Compu-Lite Corp., Irvine, Cal
Conectrix, Inc., Wheaton, Ill.
Control Prods., Inc., E. Hanover, N. J.
Controls Co. of America, Schiller Park, Ill.
Controls Co. of America, Folcroft, Pa.
Cutler-Hammer, Milwaukee, Wisc.
Denison, R.B., Inc., Bedford, Ohio
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Eby Sls. Co., Jamaica, N.Y.
Furnas Elec. Co., Batavia, Ill.
General Elec., Providence, R.I.
General Equip. & Mfg., Louisville, Ky.
General Reed Co., Clark, N.J.
GTE Sylvania Inc., Danvers, Mass.
Haydon Switch & Instr., Waterbury, Conn.
Hi-Tek Corp., Santa Ana, Calif.
Jaidinger Mfg. Co., Inc., Chicago, Ill.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Mason Electric Co. Inc., Los Angeles, Cal.
Master Specialties, Costa Mesa, Cal.
McClintock Matrixes, Inc., Woodbury, Conn.
McGill Mfg. Co., Valparaiso, Ind.
Micro Switch, Freeport, Ill.
Milli-Switch Corp., Gladwyne, Pa.
National Acme, Cleveland, Ohio
Norwalk Thermostat Co., Norwalk, Ohio
Precision Switch, Port Chester, N.Y.
Price Elec. Co., Frederick, Md.
Reed Switch Dev., Greenwich, Conn.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Sealectric Switch & Relay Co., Chicago, Ill.
Shigoto Inds., Ltd., New York, N.Y.
Stacoswitch, Inc., Costa Mesa, Cal.
Sundstrand Data Control, Redmond, Wash.
Switchcraft, Inc., Chicago, Ill.
TEC, Inc., Eden Prairie, Minn.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Tower Mfg. Corp., Providence, R.I.
Truco, Inc., Simsbury, Conn.
United Elec. Controls Co., Watertown, Mass.
Universal Relay Corp., New York, N.Y.
Vulcan Elec. ITT, Danvers, Mass.

Switches, Solid State

A. D. Data Sys., Inc., Rochester, N.Y.
Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla. p 1308
Alco Elctrn. Prods., Lawrence, Mass.
Allen-Bradley Co., Milwaukee, Wisc.
American Elctrn. Labs., Inc., Lansdale, Pa.
American Nucleonics Corp., Woodland Hills, Cal.. p 307
Amphenol RF Div., Danbury, Conn.
Applied Research Inc., Port Washington, N.Y.
Arra Inc., Bayshore, N.Y. .... p 1553
Autronics Corp., Pasadena, Calif.
Betamite Electronic Devices, Culver City, Calif. .... p 1660
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Daico Inds., Inc., Compton, Cal... p 1556
Digital Equip. Corp., Maynard, Mass.
Dynage, Bloomfield, Conn.
E & M Labs., Westlake Village, Cal.
Elctrn. Instr. & Specialty, Winchester, Mass.
General Electc. Semiconductor, Syracuse,, N.Y.
General Illumination, Inc., St. Paul, Minn
General Magnetics, Bloomfield, N.J.
Genisco Tech. Corp., Genistron Div., Compton, Cal.
Grayhill, Inc., LaGrange, Ill.
Grigsby-Barton, Inc., Rolling Meadows, Ill. .... p 1711
Hamlin Elctrns., Inc., Phoenix, Ariz.
Hewlett-Packard, Palo Alto, Cal.
Hi-G, Windsor Locks, Conn.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Hybrid Sys. Corp., Burlington, Mass.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
International Rectifier, El Segundo, Cal.
ISC Magnetics Div., Huntington, N.Y. p 1920,1921
Ledex, Inc., Dayton, Ohio .... p 1940
Licon Div., Chicago, Ill.................. p 1935
Lorch Elctrns. Corp., Englewood, N.J. p 609
Philadelphia Sci. Controls, Croydon, Pa.
Precision Standards Corp., Santa Ana, Cal.
Solid State Elctrns., Sepulveda, Cal.
Sonex, Inc., Bethayres, Pa.
Sprague Elec. Co., No. Adams, Mass.
Tempo/UTI Div., Chatsworth, Cal.
Transco Prods., Inc., Venice, Cal. p 613
Transmagnetics Inc., Farmingdale, N.Y.
Triac Elctrn. Sys., N.Y., N.Y.
Westinghouse Elec., Youngwood, Pa.
Adams-Russell Co., Waltham, Mass.
Adams & Westlake, Elkhart, Ind.
Aladdin Controls, Nashville, Tenn.
Allis, Louis Co., Milwaukee, Wisc.
Analog Devices, Inc., Norwood, Mass.
Anaren Microwave, Inc., Syracuse, N.Y.
Arbor Sys., Inc., Ann Arbor, Mich.
Arrow-Hart, Inc., Hartford, Conn.
Assembly Elctrns. Ltd., Niagara Falls, Can.
Automatic Switch Co., Florham Park, N.J.
Blake Electronics, Inc., Muskego, Wisc.
Burgess Switch Co., Ltd., Scarborough, Ont., Can.
Burr-Brown Resch. Corp., Tucson, Ariz.
Cal-Power Corp., El Segundo, Calif.
Collins Radio Co., Dallas, Tex.
Compu-Lite Corp., Irvine, Cal
Controlotron Corp., Farmingdale, N.Y.
Cutler-Hammer, Milwaukee, Wisc.
Cyberex Inc., Willoughby, Ohio
Denison, R.B., Inc., Bedford, Ohio
Design Prods. Corp., Troy, Mich.
Dickson Elctrns. Corp., Scottsdale, Ariz
Dynair Elctrns. Inc., San Diego, Calif.
EDC (Electro Dev.), Lynnwood, Wash.
Elctrn. Modules Corp., Timonium, Md.
Elctrn. Resources Div., Los Angeles, Cal.
Engelmann Microwave, Montville, N.J.
Exide Power Sys. Div., Philadelphia, Pa.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
Gems Div., Farmington, Conn.
General Devices, Inc., Princeton, N.J.
General Elec., Providence, R.I.
General Microwave Corp., Farmingdale, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Gulton Inds., Costa Mesa, Cal.
Halmar Elctrns., Inc., Columbus, Ohio
Hoagland Instr., Red Bank, N.J.
Hughes Aircraft Co, Culver City, Cal.
Hyletronics Corp., Littleton, Mass.
Ind'l. Solid State Controls, York, Pa.
Isotech Inc., Westford, Mass.
Jay-El Prods., Gardena, Calif.
Jordan Controls, Milwaukee, Wisc.
Kevlin Mfg. Co., Woburn, Mass.
Lancer Elctrns. Corp., Norristown, Pa.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Lutron Elctrns. Co., Inc., Coopersburg, Pa.
Maytronics, Inc., Colorado Springs, Colo.
MEM Controls, Inc., Wickliffe, Ohio
Micro Switch, Freeport, Ill.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Midland Standard Inc., Elgin, Ill.
Monsanto-Elctrn. Spec. Prods., Cupertino, Cal.
Mullard, Inc., Farmingdale, N.Y.
Neill Engrg. Co., Akron, Ohio
Nucleonic Prods., Canoga Pk, Cal.
Olektron Corp., Dudley, Mass.
Power Control Corp., Pittsburgh, Pa.
Rantec Div., Calabasas, Calif.
Reed Switch Dev., Greenwich, Conn.
Relcom, Mt. View, Calif.
Sanders Assocs., Nashua, N.H.
Servo Dev. Corp., Hicksville, N.Y.
Singer - Tele-Signal, Woodbury, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Square D Co., Park Ridge, Ill.
Stacoswitch, Inc., Costa Mesa, Cal.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
TEC, Inc., Eden Prairie, Minn.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Trepac Corp. America, Englewood, N.J.
Varian Assocs., Palo Alto, Cal.
Wavecom, Inc., Northridge, Cal.
Weltronic Co., Southfield, Mich.
Western Microwave Labs., Los Gatos, Cal.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.
Zenrad Controls Co., Santa Barbara, Cal.
Zeta Labs., Inc., Mountain View, Calif.

Switches, Step Type

A. D. Data Sys., Inc., Rochester, N.Y.
Airflyte Elctrns. Co., Bayonne, N.J.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Chicago Dynamic Inds., Chicago, Ill.
Chicago Switch, Chicago, Ill.
Clare, C.P. & Co., Chicago, Ill. .... p 1671
Eagle-Signal Div., Davenport, Iowa
Electro Switch Corp., Weymouth, Mass.
Guardian Elec. Mfg. Co., Chicago, Ill.
Haydon, A. W. Co., Waterbury, Conn. p 1597
ISC Magnetics Div., Huntington, N.Y.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Janco Corp., Burbank, Cal.
Ledex, Inc., Dayton, Ohio .... p 1940
North Elec. Co., Galion, Ohio
Oak Mfg., Crystal Lake, Ill. .... p 1943
RCL Elctrns., Inc., Irvington, N.J.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Schrack Elec. Sls., New York, N.Y. p 1787
Sealectro Corp., Mamaroneck, N.Y. p 2711
Shallcross, Selma, N.C.
Tech Labs., Inc., Palisades Pk., N.J. p 1957
Agastat Div., Elizabeth, N.J.
Allis-Chalmers, Milwaukee, Wisc.
Bowmar/TIC, Inc., Newbury Park, Calif.
Cole Instr., Costa Mesa, Cal.
Consolidated Resistance Sls., Yonkers, N.Y.
Denison, R.B., Inc., Bedford, Ohio
Dynamic Controls Corp., S. Windsor, Conn.
Edison Elctrns. Div., Manchester, N.H.
Fifth Dimension, Princeton, N.J.
General Devices, Inc., Princeton, N.J.
GTE Automatic Elec., Northlake, Ill.
Imtra Corp., Medford, Mass.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Master Specialties, Costa Mesa, Cal.
Precision Switch, Port Chester, N.Y.
Special Microwave Devices Oper., Waltham, Mass.
Square D Co., Park Ridge, Ill.
Stromberg Carlson Corp., Rochester, N.Y.
Subminiature Instrs. Corp., Riverside, Calif.
Tenor Co., Inc., New Berlin, Wisc.
Universal Relay Corp., New York, N.Y.

Switches, Thermally Actuated

Allen-Bradley Co., Milwaukee, Wisc.
Cox & Co., Inc., New York, N.Y.
Electronic Research Co., Shawnee Mission, Kans.
Elmwood Sensors, Inc., Cranston, R.I. p 1970
Engelhard Minerals & Chem., Murray Hill, N.J.

General Elec. Co., Schenectady, N.Y.
Hamlin Elctrns., Inc., Phoenix, Ariz.
ISC Magnetics Div., Huntington, N.Y.
Philadelphia Sci. Controls, Croydon, Pa.
Aladdin Controls, Nashville, Tenn.
Bimet Corp., Morris, Ill.
Burling Instr. Co., Chatham, N.J.
Cable Elec. Prods., Inc., Providence, R.I.
Chatham Controls Corp., Chatham, N.J.
Control Prods., Inc., E. Hanover, N. J.
Dales, Franklin Co., Akron, Ohio
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Fasco Inds., Inc., Rochester, N.Y.
Fenwal, Inc., Ashland, Mass.
G-V Controls, Livingston, N.J.
GTE Sylvania Inc., Danvers, Mass.
Honeywell, Residential Div., Mpls., Minn.
Instrulab, Inc., Dayton, Ohio
Jaidinger Mfg. Co., Inc., Chicago, Ill.
K West, Westminster, Calif.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kistler Instr. Co., Redmond, Wash.
Networks Elctrn. Corp., Chatsworth, Calif.
Norwalk Thermostat Co., Norwalk, Ohio
Princo Instrs., Southampton, Pa.
Relay Specialties, Inc., Fair Lawn, N.J.
Standard Controls, Seattle, Wash.
Sundstrand Data Control, Redmond, Wash.
Symbolic Displays, Inc., Orange, Calif.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
United Elec. Controls Co., Watertown, Mass.
Valverde Labs., Oakfield, N.Y.
Vulcan Elec. ITT, Danvers, Mass.

Switches, Thumbwheel

Airpax Elctrns., Inc., Cambridge, Md.
Amp Inc., Harrisburg, Pa............... p 1881
Bowmar Instr. Corp., Ft. Wayne, Ind.
Cherry Electrical Prods., Waukegan, Ill p 1899
Chicago Dynamic Inds., Chicago, Ill. p 1900
Digitran Co., Pasadena, Cal. p 1904,1905
Elctrn. Engrg. Co. Cal., Santa Ana, Cal. p 1909
Electrospace Corp., Westbury...... p 323
General Elec. Co., Schenectady, N.Y. p 1911
Haydon, A. W. Co., Waterbury, Conn.
Inter-Market, Inc., Glenview, Ill.. p 1926
Interswitch, Burlingame, Cal. ...... p 1927
ISC Magnetics Div., Huntington, N.Y.
Kessler-Ellis Prods., Atlantic Highlands, N.J.
LVC Ind's., Inc., Corona, N.Y.
Oak Mfg., Crystal Lake, Ill.
Seacor, Inc., Norwood, N.J. .... p 1949
Standard Grigsby Co., Aurora, Ill.p 1955
Tech Labs., Inc., Palisades Pk., N.J. p 1957
Beckman Instrs., Helipot Div., Fullerton, Cal.
Bendix Corp., Sidney, N.Y.
Cole Instr., Costa Mesa, Cal.
Consolidated Resistance Sls., Yonkers, N.Y.
Edison Elctrns. Div., Manchester, N.H.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Shigoto Inds., Ltd., New York, N.Y.
Tower Mfg. Corp., Providence, R.I.

Switches, Time Delay

Allen-Bradley Co., Milwaukee, Wisc.
American Time Products, Woodside, N.Y.
Autronics Corp., Pasadena, Calif.
Betamite Electronic Devices, Culver City, Calif.
Bulova Watch Elctrns. Div. Amer. Time Prods., Woodside, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
Hi-G, Windsor Locks, Conn.
ISC Magnetics Div., Huntington, N.Y.
Magnecraft Elec., Chicago, Ill.
Philadelphia Sci. Controls, Croydon, Pa.
Precision Timer, Westbrook, Conn.
Tempo/UTI Div., Chatsworth, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
Adams & Westlake, Elkhart, Ind.
Arrow-Hart, Inc., Hartford, Conn.
Cutler-Hammer, Milwaukee, Wisc.
Hoagland Instr., Red Bank, N.J.
Ind'l. Solid State Controls, York, Pa.
Norwalk Thermostat Co., Norwalk, Ohio
Square D Co., Park Ridge, Ill.
Tempo Instr., Plainview, N.Y.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Zenith Controls Inc., Chicago, Ill.

Switches, Timing—See Timers

Switches, Toggle

Alco Elctrn. Prods., Lawrence, Mass. p 1878
Allen-Bradley Co., Milwaukee, Wisc.
Amphenol RF Div., Danburry, Conn.
C & K Components, Watertown, Mass. p 1892,1893
Carling Electric, W. Hartford, Conn. p 1897
Chicago Switch, Chicago, Ill.
Electrospace Corp., Westbury
GC Elctrns., Rockford, Ill.
General Elec. Co., Schenectady, N.Y.
ISC Magnetics Div., Huntington, N.Y. p 1920
J-B-T Instrs., Inc., New Haven, Conn. p 1929
Kay Elemetrics, Pine Brook, N.J.
Kulka Elec. Corp., Mt. Vernon, N.Y.
Licon Div., Chicago, Ill................... p 1935
Rye Inds., Inc., Mamaroneck, N.Y. p 2708
Showa Musen Kogyo Co., Ltd., Shinagawa-Ku Tokyo 141, Japan p 2715
Smith, Herman H., Inc., Bklyn., N.Y.
T-Bar Inc., Wilton, Conn. .... p 1697
UID Elctrns. Corp., Hollywood, Fla.
Unimax Switch Corp., Wallingford, Conn.
Airpax Elctrns., So. El Monte, Cal.
Arcolectric Switch Co., N. Hollywood, Calif.
Ark-Les Switch Corp., Watertown, Mass.
Arrow-Hart, Inc., Hartford, Conn.
Automatic Switch Co., Florham Park, N.J.
Birnbach Co., Inc., Freeport, N.Y.
Cable Elec. Prods., Inc., Providence, R.I.
Circle "F" Industries, Trenton, N.J.
Cole-Hersee Co., S. Boston, Mass.
Conectrix, Inc., Wheaton, Ill.
Control Prods., Inc., E. Hanover, N. J.
Controls Co. of America, Folcroft, Pa.
Culver Stearns Mfg. Co., Worcester, Mass.
Cutler-Hammer, Milwaukee, Wisc.
Eagle Elec. Mfg. Co., L. I. C., N.Y.
Edison Elctrns. Div., Manchester, N.H.
Essex Cryogenics Inds., St. Louis, Mo.
General Elec., Providence, R.I.
Haydon Switch & Instr., Waterbury, Conn.
Indak Mfg. Corp., Northbrook, Ill.
Leviton Mfg. Co., Inc., Brooklyn, N.Y.
Mason Electric Co. Inc., Los Angeles, Cal.
Master Specialties, Costa Mesa, Cal.
McGill Mfg. Co., Valparaiso, Ind.
Micro Switch, Freeport, Ill.
Microwave Assocs., Inc., Burlington, Mass.
Milli-Switch Corp., Gladwyne, Pa.
Network Inds., Inc., Bayonne, N.J.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Pass & Seymour, Inc., Syracuse, N.Y.
Philmore Mfg. Co., Richmond Hill, N.Y.
Pollak, Joseph Corp., Boston, Mass.
Rodale Mfg. Co., Inc., Emmaus, Pa.
Rystl Elctrns. Corp., N. Miami Beach, Fla.
Shigoto Inds., Ltd., New York, N.Y.
Sierra Elec., Gardena, Calif.
Superior Switch Co., Richmond, Va.
Switchcraft, Inc., Chicago, Ill.
Texas Instruments, Dallas, Tex.
Texas Instruments, Inc., Attleboro, Mass.
Torsion Balance Co., Clifton, N.J.
Tower Mfg. Corp., Providence, R.I.

Switches, Touch Actuated

Chicago Switch, Chicago, Ill.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Wild Rover Corp., Closter, N.J. .. p 1962
Airpax Elctrns., So. El Monte, Cal.
Burgess Switch Co., Ltd., Scarborough, Ont., Can.
Datanetics Corp., Redondo Beach, Cal
Denison, R.B., Inc., Bedford, Ohio
Relay Service Co., Chicago, Ill.
Rodale Mfg. Co., Inc., Emmaus, Pa.

Switches, Transfer

Allen-Bradley Co., Milwaukee, Wisc.
Amphenol RF Div., Danburry, Conn. p 1885
Amphenol Sales Div., Broadview, Ill. p 1885
Chicago Switch, Chicago, Ill.
Daico Inds., Inc., Compton, Cal... p 1556
Dow-Key, Santa Barbara, Cal.
Electro Switch Corp., Weymouth, Mass. p 1908
General Elec. Co., Schenectady, N.Y.
Janco Corp., Burbank, Cal.
Johnson E. F. Co., Waseca, Minn.
Kilovac Corp., Santa Barbara, Cal.
Ledex, Inc., Dayton, Ohio .... p 1940
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Ross Engrg. Corp., Campbell, Cal. p 1786
Tech Labs., Inc., Palisades Pk., N.J.
Andrew Corp., Orland Pk., Ill.
Arrow-Hart, Inc., Hartford, Conn.
Automatic Switch Co., Florham Park, N.J.
Cole Instr., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Cyberex Inc., Willoughby, Ohio
Fifth Dimension, Princeton, N.J.
Furnas Elec. Co., Batavia, Ill.
General Microwave Corp., Farmingdale, N.Y.
Hyletronics Corp., Littleton, Mass.
Lakeshore Electric Corp., Bedford, Ohio
Matrix Sys. Corp., Chatsworth, Cal.
Maury Microwave Corp., Cucamonga, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Relay Service Co., Chicago, Ill.
Square D Co., Park Ridge, Ill.
Teledyne Kinetics, Solana Beach, Cal.
Texas Instruments, Dallas, Tex.
Torr Labs., Los Angeles, Cal.
Wavecom, Inc., Northridge, Cal.
Zenith Controls Inc., Chicago, Ill.

Switches, Trigger

Carling Electric, W. Hartford, Conn. p 1897
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Guardian Elec. Mfg. Co., Chicago, Ill.
Ross Engrg. Corp., Campbell, Cal.
Signalite, Neptune, N.J.
Triac Elctrn. Sys., N.Y., N.Y.
Arrow-Hart, Inc., Hartford, Conn.
Cole Instr., Costa Mesa, Cal.
Conectrix, Inc., Wheaton, Ill.
Controls Co. of America, Schiller Park, Ill.
Cutler-Hammer, Milwaukee, Wisc.
General Devices, Inc., Princeton, N.J.
General Elec., Providence, R.I.
Mason Electric Co. Inc., Los Angeles, Cal.
Maxwell Labs., Inc., San Diego, Calif.
McGill Mfg. Co., Valparaiso, Ind.
Measurement Sys., Inc., Norwalk, Conn.
Nucleonic Prods., Canoga Pk, Cal.
Pacific Switch Controls, Inc., Van Nuys, Calif.
Stettner-Trush Inc., Cazenovia, N.Y.

Switches, Ultrasonic

Abtronics, Inc., Livermore, Calif.
Cole Instr., Costa Mesa, Cal.
Cutler-Hammer, Milwaukee, Wisc.
Delavan Mfg Co, West Des Moines, Iowa
Linden Labs., Inc., State College, Pa.
National Sonics, Farmingdale, N.Y.

Switches, Vacuum

Computer Instrs., Hempstead, N.Y.
General Elec. Co., Schenectady, N.Y.
ITT Jennings, Div. Int'l. Telephone & Telegraph Corp., San Jose, Cal.
Kilovac Corp., Santa Barbara, Cal.
Kratos Instrument Div., Pasadena, Cal
Ross Engrg. Corp., Campbell, Cal.
Tapeswitch Corp. Amer., Farmingdale, N.Y. .... p 1956
Atocon Co., Lakeview, Ohio
Cole Instr., Costa Mesa, Cal.
Cooke Vacuum Prods., S. Norwalk, Conn.
Cutler-Hammer, Milwaukee, Wisc.
Edwards High Vacuum, Grand Island, N.Y.
Eimac, San Carlos, Calif.
Fredericks Co., Huntingdon Valley, Pa.
Gagne Assocs., Inc., Binghamton, N.Y.
H-B Instr. Co., Phila., Pa.
Hamlin, Inc., Lake Mills, Wisc.
Meletron Corp., Los Angeles, Calif.
Mercoid Corp., Chicago, Ill.
Microwave Assocs., Inc., Burlington, Mass.
Norton Co., Newton, Mass.
Precision Sensors, Inc., Trumbull, Conn
Torr Labs., Los Angeles, Cal.
United Elec. Controls Co., Watertown, Mass.
U.O.P. Instrs. Div., Greenwich, Conn.
Vacuum Equip. Div., Newton, Mass.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Switches, Waveguide

American Elctrn. Labs., Inc., Lansdale, Pa.
Amphenol RF Div., Danburry, Conn.
Arra Inc., Bayshore, N.Y.
E & M Labs., Westlake Village, Cal.
Transco Prods., Inc., Venice, Cal. p 613
Waveline, Inc., W. Caldwell, N.J. p 1567
Adams-Russell Co., Waltham, Mass.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Andrew Corp., Orland Pk., Ill.
Cardwell Condenser, Lindenhurst, N.Y.
Coax Devices Inc., Chelsea, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Electromagnetic Sci., Inc., Atlanta, Ga.
Ferranti Ltd., Hollinwood, Lancs., England
Fifth Dimension, Princeton, N.J.
Filmohm Div., Long Island City, N.Y.
General Microwave Corp., Farmingdale, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Nurad, Inc., Baltimore, Md.
Omega Labs., Inc., Rowley, Mass.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
Sedco Sys., Inc., Farmingdale, N.Y.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Teledyne Microwave, Sunnyvale, Cal.
Torr Labs., Los Angeles, Cal.
TRG Prods., E. Boston, Mass.
Varian Assocs., Palo Alto, Cal.
Wavecom, Inc., Northridge, Cal.

Switchlights—See Switches, Illuminated

Synchro Error Testers—See Testers, Synchro Error—Vol 1

Synchro / Resolver Testers—See Testers, Synchro / Resolver—Vol 1

Synchro Resolvers—See Resolvers, Synchro

Synchro Transmitters, Solid-State

Astrosystems, Lake Success, N.Y. p 333
Bendix Environmtl. Sci., Baltimore, Md. p 336
Control Technology Co., L.I.C., N.Y.
DDC, Hicksville, N.Y........................ p 347
General Magnetics, Bloomfield, N.J. p 1320
Ind'l. Control Co., Farmingdale, N.Y.
Natel Engrg. Co., Canoga Pk., Cal. p 367
North Atlantic Inds., Plainview, N.Y. p 530
Transmagnetics Inc., Farmingdale, N.Y. p 1875
Computer Conversions Corp., East Northport, N.Y.
Dynalex, Inc., Burbank, Cal.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.

Singer-General Precision, Inc., Little Falls, N.J.
Ten Bosch, M., Inc., Pleasantville, N.Y.
Weston-Transicoil, Worcester, Pa.

Synchronizers, Klystron & BWO—See Vol 1

Synchros

Bowmar Instr. Corp., Ft. Wayne, Ind. p 1582
General Elec. Co., Schenectady, N.Y.
Rotating Comps., Bay Shore, N.Y.
Vernitron, Torrance, Cal.
American Elctrns., Inc., Fullerton, Cal.
Bendix, S. Montrose, Pa.
Boehme, H.O., Inc., Plainview, N.Y.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Harowe Servo Controls, W. Chester, Pa.
Henschel Corp., Amesbury, Mass.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
IMC Magnetics Corp., Maywood, Cal.
Singer-General Precision, Inc., Little Falls, N.J.
Tachtronic Instrs., Inc., New Ulm, Minn.
Weston-Transicoil, Worcester, Pa.

Synchroscopes—See Vol 1

Synthesizers, Delay Line—See Delay Line Synthesizers—Vol 3

Synthesizers, Filter—See Filter Synthesizers

Synthesizers, Frequency—See Vol 1

Synthesizers, Waveform—See Vol 1

Systems, Temperature Control—See Controls, Temperature—Vol 3

Tables, Laboratory—See Benches, Consoles, Stools, Tables (Lab and Shop)—Vol 3

Tables, Rate Of Turn—See Vol 1

Tables, X-Y Axis—See Simulators, Motion—Vol 1

Tachometers, Electrical (Non-Generating)

Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla. p 1308
Dixson Inc., Grand Junction, Colo.
Eastern Air Devices, Inc., Dover, N.H.
Hewlett-Packard, Palo Alto, Cal.
ISC Magnetics Div., Huntington, N.Y.
Rotating Comps., Bay Shore, N.Y.
Simpson Elec. Co., Chicago, Ill.
Solid State Elctrns., Sepulveda, Cal.
Sticht, Herman H. Co., Inc., New York, N.Y. .... p 563
Vernitron Corp., Deer Pk., N.Y.
Westinghouse Elec. Corp., Newark, N.J.
AMF Electical Prods., Alexandria, Va.
Bendix, S. Montrose, Pa.
Climatronics Corp., Hauppauge, N.Y.
Controlcraft Corp., West Chicago, Ill.
Dynalco Corp., Ft. Lauderdale, Fla.
Electric Tachometer Corp., Philadelphia, Pa.
Electromatic Equip. Co., Cedarhurst, N.Y.
Epic, Inc., New York, N.Y.
Ideal Precision Meter Co., Inc., Brooklyn, N.Y.
Kelk, George Ltd., Don Mills, Ont., Canada
Kollsman Instr. Corp., Syosset, N.Y.
McNab, Inc., New York, N.Y.
Metron Instrs., Inc., Denver, Colo.
Sensor Corp., Greenwich, Conn.
Singer-General Precision, Inc., Little Falls, N.J.
Stark Elctrn. Instrs., Ltd., Ajax, Ont., Canada
Sun Electric Corp., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Tachtronic Instrs., Inc., New Ulm, Minn.
Teledyne Gurley, Troy, N.Y.
Triple-A Specialty Co., Chicago, Ill.
Westberg Mfg. Co., Sonoma, Cal.
Weston Instruments, Inc., Newark, N.J.
Weston-Transicoil, Worcester, Pa.

Tachometers, Electrical (Self-Generating)

Airpax Elctrns., Inc., Cambridge, Md.
Biddle, James G., Plymouth Meeting, Pa.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Eastern Air Devices, Inc., Dover, N.H.
General Elec. Co., Schenectady, N.Y.
Hewlett-Packard, Palo Alto, Cal.
HICO (Horizons Int'l.), Redwood City, Cal
Magnetic Technology, Canoga Pk., Cal.
Rotating Comps., Bay Shore, N.Y.
Servo-Tek Prods. Co., Hawthorne, N.J. p 1632
Solid State Elctrns., Sepulveda, Cal.
Sticht, Herman H. Co., Inc., New York, N.Y. .... p 563
Vernitron Corp., Deer Pk., N.Y.
Westinghouse Elec. Corp., Newark, N.J.
Aeroflex Labs., Plainview, N.Y.
Allis, Louis Co., Milwaukee, Wisc.
Avtron Mfg., Inc., Cleveland, Ohio
Barger Corp., Sunnyvale, Cal.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Carter Motor Co., Chicago, Ill.
Clifton Div., Clifton Hgts., Pa.
Control Data Corp., Minneapolis, Minn.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electric Indicator Co., Inc., Wilton, Conn.
Electric Tachometer Corp., Philadelphia, Pa.
Electro-Craft Corp, Hopkins, Minn
Electro-Devices, Inc., Paterson, N.J.
Electro-Pacific, Inc., Goleta, Calif.
Electromatic Equip. Co., Cedarhurst, N.Y.
Epic, Inc., New York, N.Y.
Esterline Angus Div., Indianapolis, Ind.
Flow Technology, Inc., Tempe, Ariz.
Harowe Servo Controls, W. Chester, Pa.
Inland Motor Corp. of Va., Radford, Va.
Jones Motrola Corp., Stamford, Conn.
Kollsman Instr. Corp., Syosset, N.Y.
McNab, Inc., New York, N.Y.
Metron Instrs., Inc., Denver, Colo.
Microdot Inc., S. Pasadena, Calif.
MPC Prods. Corp., Chicago, Ill.
Pittman Corp., Sellersville,, Pa.
Reliance Elec. Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Singer Co., Somerville, N.J.
Skurka Engrg. Co., Los Angeles, Calif.
Standard Elec. Time Corp., Springfield, Mass.
Strandberg Engrg. Labs., Inc., Greensboro, N.C.
Sun Electric Corp., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Superior Elec., Bristol, Conn.
Varo, Inc., Santa Barbara, Cal.
Vibrac Corp., Chelmsford, Mass.
Westberg Mfg. Co., Sonoma, Cal.
Western Gear Corp., Pasadena, Cal.
Weston Instruments, Inc., Newark, N.J.
Weston-Transicoil, Worcester, Pa.
Yewtec Corporation, Larchmont, N.Y.
Zero-Max Co., Minneapolis, Minn.

Tachometers, Electronic, Indicating

Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla. p 1308
API Instrs. Co., Waltham,, Mass.
Biddle, James G., Plymouth Meeting, Pa.
Harrel, Inc., E. Norwalk, Conn.
Hewlett-Packard, Palo Alto, Cal.
HICO (Horizons Int'l.), Redwood City, Cal
Monsanto Company, Electronic Instruments, W. Caldwell, N.J.
Norden Div., Norwalk, Conn.
PPM, Inc., Bedford, Ohio
Schauer Mfg. Corp., Cincinnati, Ohio
Servo-Tek Prods. Co., Hawthorne, N.J. p 1632
Simpson Elec. Co., Chicago, Ill.
Solid State Elctrns., Sepulveda, Cal.
Sticht, Herman H. Co., Inc., New York, N.Y. .... p 563
Tempo/UTI Div., Chatsworth, Cal. p 1349
Vernitron Corp., Deer Pk., N.Y.
Advanced Kinetics, Costa Mesa, Calif.
Allis, Louis Co., Milwaukee, Wisc.
AMF Electical Prods., Alexandria, Va.
Amstro Corp., Fairfield, N.J.
Anocut Engrg. Co., Elk Grove Village, Ill.
Baldwin Elctrns., Little Rock, Ark.
Bendix Corp., Sidney, N.Y.
Bendix, S. Montrose, Pa.
Biocom, Inc., Culver City, Cal.
Bristol Div, Waterbury, Conn
Consolidated Ohmic Devices, Carle Pl., N.Y.
Controlcraft Corp., West Chicago, Ill.
Delavan Mfg Co, West Des Moines, Iowa
Dixson, Inc., Grand Junction, Colo.
Dynalco Corp., Ft. Lauderdale, Fla.
Dynamic Precision Controls, Hagerstown, Ind.
Dynapar Corp., Gurnee, Ill.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Edison, T.A., Instr. Div., Ft. Lauderdale, Fla.
Electro Prods. Labs., Power Supply, Chicago, Ill.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Electromatic Equip. Co., Cedarhurst, N.Y.
Electronic Meas. Corp., New York, N.Y.
Engler Instr. Corp., Jersey City, N.J.
Esterline Angus Div., Indianapolis, Ind.
Flow Technology, Inc., Tempe, Ariz.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Heath Co., Benton Harbor, Mich.
Hill, E. Vernon, Inc., San Francisco, Calif.
Kollsman Instr. Corp., Syosset, N.Y.
Metron Instrs., Inc., Denver, Colo.
Midland Standard Inc., Elgin, Ill.
Optomechanisms, Inc., Plainview, N.Y.
Pioneer Elec. & Resch. Corp., Forest Park, Ill.
Power Instrs., Skokie, Ill.
Reliance Elec. Co., Cleveland, Ohio
Shigoto Inds., Ltd., New York, N.Y.
Strandberg Engrg. Labs., Inc., Greensboro, N.C.
Sun Electric Corp., Chicago, Ill.
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
United Aircraft Corp., Norwalk, Conn.
Vibrac Corp., Chelmsford, Mass.
Waters Mfg., Inc., Wayland, Mass.
Westberg Mfg. Co., Sonoma, Cal.
Weston Instruments, Inc., Newark, N.J.
Yewtec Corporation, Larchmont, N.Y.

Tachometers, Stroboscopic

Slaughter Co., Ardmore, Okla. ...... p 559
Sticht, Herman H. Co., Inc., New York, N.Y. .... p 563
Amstro Corp., Fairfield, N.J.
Electromatic Equip. Co., Cedarhurst, N.Y.
General Radio Co., Concord, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Power Instrs., Skokie, Ill.
U.S. Scientific Instrs., Watertown, Mass.

Tape Decks—See Tape Transports—Vol 1

Tape Duplicators—See Duplicators, Magnetic Tape; Perforators,Paper Tape—Vol 1

Tape Editing Equipment—See Editing Equipment—Vol 3

Tape Erasers, Magnetic—See Erasers, Magnetic Tape (Bulk)—Vol 1

Tape Perforators—See Perforators, Paper Tape—Vol 1

Tape-Programmed Testers—See Test Equip., Automatic Checkout;Testers, Integrated Circuit—Vol 1

Tape Recording Accessories—See Vol 1

Tape Recorders—See Recorders, Magnetic Tape; Data Recorders—Vol 1

Tape Search Equipment—See Vol 1

Tape Transports, Computer—See Vol 1

Tapes, Electrical Insulation—See Vol 3

Tapes, Films & Foils, Pressure Sensitive—See Vol 3

Tapes, Heat Shrinkable—See Caps, Forms & Tapes, Heat Shrinkable—Vol 3

Tapes, Paper, Plastic, etc. (For Punching)—See Vol 1

Tapes, Recording, Magnetic (All Types)—See Vol 1

Tape To Film Transfer Equip.

RCA Corp., Camden, N.J.
3M Co., St. Paul, Minn.
Traid Corp., Glendale, Cal.
Video Resch. Corp., Rockville, Md.

Taps—See Dies & Taps—Vol 3

Teaching Machines—See Vol 1

Technical Books—See Vol 3

Tees, Coaxial

Alford Mfg. Co., Winchester, Mass.
Amphenol RF Div., Danburry, Conn. p 2522-2525,2533
Amphenol Sales Div., Broadview, Ill. p 2522-2525,2533
Arra Inc., Bayshore, N.Y.
E & M Labs., Westlake Village, Cal.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Sealectro Corp., Mamaroneck, N.Y.
Trompeter Elctrns., Chatsworth, Cal.
Weinschel Engrg. Co., Gaithersburg, Md. .... p 1571
Airtec, Inc., Roselle, N.J.
Americon Corp., Waltham, Mass.
Anaren Microwave, Inc., Syracuse, N.Y.
Astrolab Inc., Linden, N J
Ava Elctrns., Upper Darby, Pa.
CES Elctrns., Brooklyn, N.Y.
Coax Devices Inc., Chelsea, Mass.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Filmohm Div., Long Island City, N.Y.
General Radio Co., Concord, Mass.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Industrial Microwave, Scotch Plains, N.J.
Kings Elctrns., Tuckahoe, N.Y.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
MI-KRO Connector Div., Long Island City, N.Y.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Labs. America, Brooklyn, N.Y.
Nanosecond Systems, Inc., Fairfield, Conn.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Phelps Dodge Comm., North Haven, Conn.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Sinclair Radio Labs., Maple, Ont., Can.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
Victor Microwave, Inc., Wakefield, Mass.

Tees, Waveguide
Amphenol RF Div., Danburry, Conn.
Arra Inc., Bayshore, N.Y.
E & M Labs., Westlake Village, Cal.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Astrolab Inc., Linden, N J
Cardwell Condenser, Lindenhurst, N.Y.
CES Elctrns., Brooklyn, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Industrial Microwave, Scotch Plains, N.J.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Labs. America, Brooklyn, N.Y.
Miles Reproducer Co., Inc., New York, N.Y.
Omega Labs., Inc., Rowley, Mass.
Premier Microwave, Port Chester, N.Y.
Radiation Sys., Inc., McLean, Va.
Rantec Div., Calabasas, Calif.
RF Systems, Inc., Cohasset, Mass.
Somerset Radiation Lab., Arlington, Va.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
TRG Prods., E. Boston, Mass.
Victor Microwave, Inc., Wakefield, Mass.

Telegraph Keys—See Keys, Telegraph—Vol 1

Telemetering Indicators—See Analyzers, Telemetric Data—Vol 1

Telemetering Systems, Electronic—See Comm. Systems, Telemetering—Vol 1

Telemetering Testers & Calibrators—See Vol 1

Telemetric Data Analyzers—See Analyzers, Telemetric Data—Vol 1

Telemetry Preamplifiers—See Preamplifiers, Telemetry—Vol 1

Telephone Handsets—See Handsets—Vol 1

Telephone Systems—See Comm. Systems, Telephone—Vol 1

Telephones, Sound Powered—See Comm. Systems, Telephone—Vol 1

Teleprinter Error Correction Equipment—See Error Correction Equipment—Vol 1

Teleprinters—See Vol 1

Teletypewriter Testers—See Testers, Teletypewriter—Vol 1

Teletypewriters & Equipment—See Vol 1

Television Equipment—See Antennas; Cameras; Coils; Monitors;Recorders, Video—Vol 1

Television Systems, Closed-Circuit—See Vol 1

Temperature Controls—See Controls, Temperature

Temperature Indicators—See Meters, Temperature—Vol 1

Temperature Sensors—See Transducers, Temperature

Templates, Drafting—See Drafting Equipment—Vol 3

Tempo Regulators—See Regulators, Pitch & Tempo—Vol 1

Tensile Testers—See Testers, Material—Vol 1

Terminal Blocks—See Blocks, Terminal—Vol 3

Terminal Boards—See Boards, Terminal—Vol 3

Terminal Boards, Prepunched—See Vol 3

Terminal Equipment, Digital—See Vol 1

Terminal Strips—See Strips, Terminal—Vol 3

Terminals, Feedthru—See Vol 3

Terminals, Ferrule, Cable-End—See Vol 3

Terminals, Hermetic—See Terminals (As Modified)—Vol 3

Terminals, Lug—See Vol 3

Terminals, Miniature & Subminiature—See Vol 3

Terminals, Printed Circuit Board—See Vol 3

Terminals, Push-On—See Connectors & Terminals, Push-On, Quick Disconnect—Vol 3

Terminals, Solderless—See Vol 3

Terminals, Standoff—See Vol 3

Terminals, Threaded—See Vol 3

Terminals, Turret—See Vol 3

Terminations, Antenna-Also See Dummy Loads—See Vol 1

Terminations, High Voltage—See Vol 3

Terminations, Microwave
Alford Mfg. Co., Winchester, Mass. p 598
Applied Research Inc., Port Washington, N.Y. .... p 1554
Arra Inc., Bayshore, N.Y.
Bendix, Franklin, Ind. .... p 1555
Bird Elctrn., Cleveland, Ohio.......... p 420
E & M Labs., Westlake Village, Cal.
Electro Impulse, Inc., Red Bank, N.J. p 603
Hewlett-Packard, Palo Alto, Cal.
R L C Elctrns., Inc., Mt. Kisco, N.Y. p 1563
Sealectro Corp., Mamaroneck, N.Y.
Texscan Corp., Indianapolis, Ind.
Transco Prods., Inc., Venice, Cal. p 613
Waveline, Inc., W. Caldwell, N.J.
Weinschel Engrg. Co., Gaithersburg, Md. .... p 1571
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
American Pamcor, Inc., Paoli, Pa
Americon Corp., Waltham, Mass.
Astrolab Inc., Linden, N J
Aviel Electronics Inc, Burbank, Calif.
Barth Elctrns., Inc., Cleveland, Ohio
Basic Ceramics Inc., Hawthorne, N.J.
Bell P/A Prods. Corp., Columbus, Ohio
CES Elctrns., Brooklyn, N.Y.
Chemalloy Elctrns., Santee, Cal.
Collins Radio Co., Dallas, Tex.
Core-Tronics, Inc., Orange, N.J.
Custom Comps., Fairfield, N.J.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass.
Dynographic Elctrns. Corp., Hicksville, N.Y.
Elcom Sys., Deer Pk., N.Y.
Elctrn. Specialty, Thomaston, Conn.
EMC Technology Inc, Philadelphia, Pa.
Engelmann Microwave, Montville, N.J.
ESCA, Jupiter, Fla.
Fairchild Electro-Metrics, Amsterdam, N.Y.
Filmohm Div., Long Island City, N.Y.
General Radio Co., Concord, Mass.
GRFF, Port Salerno, Fla.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Insulating Shapes, Inc., Bronx, N.Y.
ITT Telecommunications, Raleigh, N.C.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Merrimac Resch. & Dev., Inc., West Caldwell, N.J.
MI-KRO Connector Div., Long Island City, N.Y.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Div, Nashua, N.H.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Philco-Ford Corp., Washington, D.C.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Radiation Devices Co., Baltimore, Md.
RF Systems, Inc., Cohasset, Mass.
Rohde & Schwarz Sls., Passaic, N.J.
Sage Labs. Inc., Natick, Mass.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Telonic Inds., Inc., Laguna Beach, Calif.
TRG Prods., E. Boston, Mass.
Wheeler Lab. of Hazeltine Corp., Greenlawn, N.Y.

Terminations, VHF, Video, Pulse—See Vol 1

Test Equipment, Color Tv—See Vol 1

Test Equipment, Component Substituting—See Vol 1

Test Equipment, Environmental—See Specific Type Of Equipment—Vol 1

Test Equipment, Mechanical Impedance—See Vol 1

Test Lead Probes—See Probes, Test Lead—Vol 1

Test Leads & Adapters—See Vol 1

Test Sets—See Testers—Vol 1

Test Sets, Multipurpose—See Vol 1

Testers, Accelerometer—See Calibrators, Accelerometer—Vol 1

Testers, Battery—See Vol 1

Testers Burn-In(Aging—See Vol 1

Testers, Cable—See Vol 1

Testers, Capacitor—See Vol 1

Testers, Circuit—See Testers, Signal Tracing—Vol 1

Testers, Coil—See Vol 1

Testers, Component Linearity—See Vol 1

Testers, Computer Memory—See Vol 1

Testers, Corona—See Vol 1

Testers, Crystal—See Analyzers, Crystal—Vol 1

Testers, Diode—See Vol 1

Testers, Electric Power—See Monitors, Power, A-C & D-C—Vol 1

Testers, Encoder—See Vol 1

Testers, Flutter—See Meters, Wow & Flutter—Vol 1

Testers, Ground Resistance—See Meters, OHM—Vol 1

Testers, Gyro—See Vol 1

Testers, Hi-Pot—See Testers, Insulation Breakdown—Vol 1

Testers, Insulation Breadkdown—See Vol 1

Testers, Integrated Circuit (Automatic)—See Vol 1

Testers, Integrated Circuit (Manual)—See Vol 1

Testers, Leakage—See Vol 1

Testers, Life, Component—See Vol 1

Testers, Logarithmic Amplifier—See Vol 1

Testers, Logic Card—See Vol 1

Testers, LSI (Automatic)—See Vol 1

Testers, Magnetic Core—See Vol 1

Testers, Magnetron—See Vol 1

Testers, Material—See Vol 1

Testers, Memory—See Testers, Computer Memory—Vol 1

Testers, Meter—See Vol 1

Testers, Microphone—See Calibrators, Microphone—Vol 1

Testers, Microwave—See Vol 1

Testers, Motor—See Vol 1

Testers, Multipurpose—See Test Sets, Multipurpose—Vol 1

Testers, Potentiometer—See Vol 1

Testers, Power Supply—See Vol 1

Testers, Pulse Jitter—See Vol 1

Testers, Radar—See Vol 1

Testers, Ratio Voltage—See Vol 1

Testers, Relay—See Vol 1

Testers, Resistivity—See Vol 1

Testers, Resistor—See Vol 1

Testers, Servo—See Vol 1

Testers, Shock—See Vol 1

Testers, Short-Turn—See Testers, Coil—Vol 1

Testers, Signal Tracing—See Vol 1

Testers, Solderability—See Machines, Solderability Testing—Vol 1

Testers, Spark—See Vol 1

Testers, Synchro Error—See Vol 1

Testers, Synchro(Resolver—See Vol 1

Testers, Tachometer—See Vol 1

Testers, Telemetering—See Telemetering Testers & Calibrators—Vol 1

Testers, Telephone—See Vol 1

Testers, Teletypewriter—See Vol 1

Testers, Tensile—See Testers, Material—Vol 1

Testers, Torque—See Vol 1

Testers, Tracking & Erosion Resistance (Insulation)—See Vol 1

Testers, Transistor—See Vol 1

Testers, Transmission & Delay—See Vol 1

Testers, Tube—See Vol 1

Testers, Universal—See Vol 1

Testers, Vibration—See Vibration Test Systems—Vol 1

Testers, Voltage Breakdown—See Vol 1

Testing, Environmental—See Services, Environmental Testing—Vol 3

Thermistors

Amperex Elctrn. Corp., Hauppauge, N.Y. p 2818
Balco Capacitors, Orange, N.J. .. p 2821
Cal-R, Inc., Capacitor Div., Santa Monica, Cal. .... p 1963
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal. .... p 1963
Carborundum Co., Niagara Falls, N.Y. p 1964-1967
Elmwood Sensors, Inc., Cranston, R.I.
Fenwal Elctrns., Inc., Framingham, Mass. .... p 1971
GC Elctrns., Rockford, Ill.
Gulton Inds., Inc., Metuchen, N.J. p 1972
Interelectronics Corp., Congers, N.Y.
ISC Magnetics Div., Huntington, N.Y.
Keystone Carbon Co., St. Marys, Pa. p 1974-1979
Murata Corp. of America, Elmsford, N.Y.
Murata Mfg. Co. Ltd., Kyoto, Japan
National Lead Co., Hightstown, N.J. p 1980,1982
Nippon Electric/NEC America, N.Y., N.Y.
RFL Inds., Thermocontrol Div., Boonton, N.J.
Triac Elctrn. Sys., N.Y., N.Y.
Weinschel Engrg. Co., Gaithersburg, Md.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Alpha-Monarch Corp., Dallas, Tex.
Artronix, Inc., St. Louis, Mo.
Bacharach Instr. Co., Pittsburgh, Pa.
Barnes Engrg. Co., Stamford, Conn.
Carbone Corp., Boonton, N.J.
Ceramic Magnetics, Inc., Fairfield, N.J.
Conax Corp., Buffalo, N.Y.
Electro-Flex Heat, Inc., Bloomfield, Conn.
Electro Mats. Corp. Amer., Mamaroneck, N.Y.
Filmohm Div., Long Island City, N.Y.
General Microwave Corp., Farmingdale, N.Y.
Gow-Mac Instr. Co., Madison, N.J.
Honeywell, Apparatus Controls, Mpls., Minn.
Kidde, Walter & Co., Belleville, N.J.
Omega Engrg., Inc., Stamford, Conn.
Palmer Elctrns., Inc., Garfield, N.J.
Pennsylvania Elctrns. Technology, Pittsburgh, Pa.
PRD Elctrns., Inc., Westbury, N.Y.
Rodan Inds., Anaheim, Cal.
Servo Corp. America, Hicksville, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Tanger Elctrns., Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Thermometrics, Inc., Edison, N.J.
United Elec. Controls Co., Watertown, Mass.
United Sys. Corp., Dayton, Ohio
Victory Engrg. Corp., Springfield, N.J.
Workman Elctrn. Prods., Inc., Sarasota, Fla.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio

Thermo Compression Bonding Equipment—See Vol 1

Thermocouple Reference Junctions

Amperex Electronic Corp., Hicksville, N.Y.
General Elec. Co., Schenectady, N.Y.
General Resistance, Mt. Vernon, N.Y.
PPM, Inc., Bedford, Ohio
Acromag, Inc., Wixom, Mich.
Airpax Elctrns., So. El Monte, Cal.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Control Prods. Corp., Chicago, Ill.
Eon Instr., Inc., Van Nuys, Cal.
Gencom Div., Plainview, N.Y.
General Oceanology, Inc., Cambridge, Mass.
Hy-Cal Engrg., Santa Fe Springs, Cal.
K West, Westminster, Calif.
Kaye Instrs., Inc., Cambridge, Mass.
Leico Inds., Inc., New York, N.Y.
Materials Development, Los Angeles, Cal.
Matthey Bishop Inc., Malvern, Pa.
Omega Engrg., Inc., Stamford, Conn.
RDF Corp., Hudson, N.H.
Research, Inc., Minneapolis, Minn.
Richards Arklay S., Newton Highlands, Mass.
Skurka Engrg. Co., Los Angeles, Calif.
Syscon Int'l., Inc., So. Bend, Ind.
Texas Instruments, Dallas, Tex.
West Instr. Div., Schiller Pk., Ill.

Thermocouples, Elements & Accessories

Amphenol Connector Div., Broadview, Ill. .... p 2582
Amphenol Sales Div., Broadview, Ill. p 2582
Austron, Inc., Austin, Tex.
Diversified Elctrns., Evansville, Ind
Engelhard Minerals & Chem., Murray Hill, N.J.
General Elec., Richmond Hgts., Ohio
ITT Cannon Electric, Santa Ana, Cal.
J-B-T Instrs., Inc., New Haven, Conn.
Rustrak Instr. Div., Manchester, N.H.
Simpson Elec. Co., Chicago, Ill.
A. J. Abrams Co., Westport, Conn.
Airpax Elctrns., So. El Monte, Cal.
Alnor Instr. Co., Chicago, Ill.
Alpha-Monarch Corp., Dallas, Tex.
American Standard, Franklin Pk., Ill.
Astro Inds., Santa Barbara, Cal.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Barker Elec. Sls., Ship Bottom, NJ
Beckman Instrs., (AISSD), Fullerton, Cal.
Best Elecs. Div., Seattle, Wash.
Bram Metallurgical-Chem., Phila., Pa.
Bristol Div, Waterbury, Conn
British Insulated Callender's Cables, Ltd., London WC1B 3QN, Eng.
Cam-Lok Div., Cincinnati, Ohio
Conax Corp., Buffalo, N.Y.
Consolidated Controls Corp., El Segundo, Calif.
Consolidated Ohmic Devices, Carle Pl., N.Y.
Control Prods. Corp., Chicago, Ill.
Corning Glass Works, Tech. Prods. Div., Corning, N.Y.
Electro-Flex Heat, Inc., Bloomfield, Conn.
Elctrn. Brazing Co., Hackensack, N.J.
Elctrn. Dev. Labs., Plainview, N.Y.
Exotic Materials, Inc., Costa Mesa, Cal.
Filmohm Div., Long Island City, N.Y.
Foxboro Co., Foxboro, Mass.
General Lab. Assocs., Norwich, N.Y.
General Oceanology, Inc., Cambridge, Mass.
Harco Labs., Inc., Branford, Conn.
High Temperature Instr., W. Conshohocken, Pa.
Honeywell, Ft. Washington, Pa.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Instrulab, Inc., Dayton, Ohio
Ircon Inc., Niles, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
K West, Westminster, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Leico Inds., Inc., New York, N.Y.
Lewis Engrg. Co., Naugatuck, Conn.
Marlin Mfg. Corp., Cleveland, Ohio
Maryland Lava Co., Bel Air, Md.
Materials for Elctrns., Inc., Jamaica, N.Y.
Matthey Bishop Inc., Malvern, Pa.
National Beryllia Corp., Haskell, N.J.
Nuclear Sys., Garland, Tex.
Omega Engrg., Inc., Stamford, Conn.
Pyco, Inc., Penndel, Pa.
Pyrometer Instr. Co., Inc., Northvale, N J
RDF Corp., Hudson, N.H.
Reeder Charles M. & Co., Detroit, Mich.
Revere Elctrn. Div., Wallingford, Conn.
Richards Arklay S., Newton Highlands, Mass.
Sensor Dynamics, Inc., Addison, Ill.
Sigma Instrs., Inc., Braintree, Mass.
Skurka Engrg. Co., Los Angeles, Calif.
Smith, Robert Elec. Co., Hartford, Conn.
Syncor Prods. Co., Inc., Malden, Mass.
Syscon Int'l., Inc., So. Bend, Ind.
Thermal Sys., Los Angeles, Cal.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
Thermotronic Devices, Inc., Conshohocken, Pa.
United Elec. Controls Co., Watertown, Mass.
United Sensor & Control Co., Watertown, Mass.
Vacuum Prods., Inc., Mt. Vernon, N.Y.
West Instr. Div., Schiller Pk., Ill.
Weston Instruments, Inc., Newark, N.J.

Thermocouples, Vacuum-Also See Thermocouples, Elements & Accessories

American Thermo Elec. Co., Los Angeles, Calif.
Barker Elec. Sls., Ship Bottom, NJ
Best Elecs. Div., Seattle, Wash.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Cooke Vacuum Prods., S. Norwalk, Conn.
Denton Vacuum, Inc., Cherry Hill, N.J.
Doric Sci. Corp., San Diego, Calif.
Edwards High Vacuum, Grand Island, N.Y.
Exotic Materials, Inc., Costa Mesa, Cal.
General Lab. Assocs., Norwich, N.Y.
General Oceanology, Inc., Cambridge, Mass.
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Harco Labs., Inc., Branford, Conn.
High Vacuum Equip. Corp., Hingham, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Hy-Cal Engrg., Santa Fe Springs, Cal.
K West, Westminster, Calif.
Leico Inds., Inc., New York, N.Y.
Materials Development, Los Angeles, Cal.
National Beryllia Corp., Haskell, N.J.
Norton Co., Newton, Mass.
Omega Engrg., Inc., Stamford, Conn.
Pyrometer Instr. Co., Inc., Northvale, N J
Reeder Charles M. & Co., Detroit, Mich.
Richards Arklay S., Newton Highlands, Mass.
Sensor Dynamics, Inc., Addison, Ill.
Ultek Div., Palo Alto, Calif.
United Elec. Controls Co., Watertown, Mass.
Vacuum Equip. Div., Newton, Mass.
Vacuum Prods., Inc., Mt. Vernon, N.Y.

Thermocouple Devices & Materials—See Cooling/Heating Modules, Thermoelectric

Thermoelectric Generators—See Generators, Thermoelectric

Thermometers, Medical, Electronic—See Vol 1

Thermometers, Resistance

Beede Electrical Instr. Co., Inc., Penacook, N.H.
Cal-R, Inc., Thermonetics Div., Santa Monica, Cal.
Electro Sci. Inds., Portland, Ore.
Engelhard Minerals & Chem., Murray Hill, N.J.
Harrel, Inc., E. Norwalk, Conn.
Keystone Carbon Co., St. Marys, Pa.
RFL Inds., Thermocontrol Div., Boonton, N.J. .... p 1983
Rustrak Instr. Div., Manchester, N.H.
Simpson Elec. Co., Chicago, Ill.
Weed Instr. Co., Elgin, Tex........... p 1984
Westinghouse Elec. Corp., Newark, N.J.
A. J. Abrams Co., Westport, Conn.
Alpha-Monarch Corp., Dallas, Tex.
American Standard, Franklin Pk., Ill.
Amprobe Instr., Lynbrook, N.Y.
Andonian Assocs., Inc., Waltham, Mass.
Atkins Technical, Inc., Gainesville, Fla.
Bacharach Instr. Co., Pittsburgh, Pa.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bell & Howell Co., Pasadena, Calif.
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., Minneapolis, Minn.
Conax Corp., Buffalo, N.Y.
Control Prods. Corp., Chicago, Ill.
Cryotronics, Inc., High Bridge, N.J.
Dentronics, Inc., Hackensack, N.J.
Device Seals, Inc., Sun Valley, Calif.
Doric Sci. Corp., San Diego, Calif.
Ealing Corp., Cambridge, Mass.
Electronic Design Labs., Inc., Phila., Pa.
Exotic Materials, Inc., Costa Mesa, Cal.
Fenwal, Inc., Ashland, Mass.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., Cambridge, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Ft. Washington, Pa.
Hy-Cal Engrg., Santa Fe Springs, Cal.
K West, Westminster, Calif.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Lewis Engrg. Co., Naugatuck, Conn.
Malaker Corp., High Bridge, N.J.
Marshall Instrs., Inc., Van Nuys, Calif.
Midwest Audio Corp., Chicago, Ill.
Motorola Instr. & Control, Phoenix, Ariz.
Omega Engrg., Inc., Stamford, Conn.
Oxford Instr. Corp., Annapolis, Md.
Pennsylvania Elctrns. Technology, Pittsburgh, Pa.
Pyco, Inc., Penndel, Pa.
RDF Corp., Hudson, N.H.
Relco Prods., Denver, Colo.
Rosemount Engrg. Co., Minneapolis, Minn.
Solitron Devices, Inc., Riviera Bch., Fla.
Sostman H. E., & Co., Cranford, N.J.
T & T Controls Co., Media, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Thermal Sys., Los Angeles, Cal.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
Time-O-Matic, Inc., Danville, Ill.
Tylan Corp., Torrance, Calif.
United Sys. Corp., Dayton, Ohio
U.O.P. Instrs. Div., Greenwich, Conn.
Versitherm, Inc., Farmingdale, N.Y.
VWR Scientific, San Francisco, Cal.
Waters Instrs., Inc., Rochester, Minn
West Coast Resch. Corp., Los Angeles, Calif.
West Instr. Div., Schiller Pk., Ill.

Weston Instruments, Inc., Newark, N.J.

Thermopiles

Bailey Instrs., Inc., Saddle Brook, N.J.
Barnes Engrg. Co., Stamford, Conn.
Ealing Corp., Cambridge, Mass.
Eppley Lab., Inc., Newport, R.I.
General Microwave Corp., Farmingdale, N.Y.
High Temperature Instr., W. Conshohocken, Pa.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Omega Engrg., Inc., Stamford, Conn.
RDF Corp., Hudson, N.H.
Reeder Charles M. & Co., Detroit, Mich.
Santa Barbara Resch. Ctr., Goleta, Calif.
Schoeffel Instr. Corp., Westwood, N.J.
Sensor Dynamics, Inc., Addison, Ill.
Syscon Int'l., Inc., So. Bend, Ind.

Thermostats-Also See Switches, Thermally Actuated; Controls, Temperature

Electronic Research Co., Shawnee Mission, Kans.
Elmwood Sensors, Inc., Cranston, R.I. p 1970
Philadelphia Sci. Controls, Croydon, Pa.
G-V Controls, Livingston, N.J.
Honeywell, Residential Div., Mpls., Minn.
United Elec. Controls Co., Watertown, Mass.

Thin-Film Memory Systems, Planar—See Memory Systems—Vol 1

Thyratrons—See Tubes, Thyratron

Thyristors (Includes Silicon Controlled Rectifiers)

Carter Semiconductor, Amityville, N.Y.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
International Rectifier, El Segundo, Cal. p 1807
Nippon Electric/NEC America, N.Y., N.Y.
Sprague Elec. Co., No. Adams, Mass.
Triac Elctrn. Sys., N.Y., N.Y. .... p 1351
United-Page, Patterson, N.J......... p 1856
Unitrode, Watertown, Mass. p 1850,1851,1853
Unitrode Corp., Watertown, Mass. p 1850,1851,1853
Westinghouse Elec., Youngwood, Pa. p 1860,1861
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Hutson Inds., Dallas, Tex.
ITT Semiconductors, W. Palm Beach, Fla.
M & T Chemicals Inc., Rahway, N.J.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Elctrns., Geneva, Ill.
PIRGO Elctrns., Farmingdale, N.Y.
RCA Solid State Div., Somerville, N.J.
Sarkes Tarzian, Inc., Bloomington, Ind.
Semicon Inc., Burlington, Mass.
State Labs, Inc., New York, N.Y.
Syntron Div., Homer City, Pa.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec. Int'l., New York, N.Y.

Ties, Wire & Cable—See Wire & Cable Ties—Vol 3

Timer Switches—See Switches, Time Delay

Timers, Coin Operated

Deltrol Controls, Milwaukee, Wisc.
Precision Timer, Westbrook, Conn.
Int'l. Register, Chicago, Ill.
Raymond Controls Corp., Middletown, Conn.
Rhodes, M.H., Inc., Avon, Conn.

Timers, Counting

A. D. Data Sys., Inc., Rochester, N.Y.
Anadex Instrs., Inc., Van Nuys, Calif. p 392-395
Autronics Corp., Pasadena, Calif.
Betamite Electronic Devices, Culver City, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
C & K Components, Watertown, Mass.
Chrono-log Corp., Broomall, Pa.
Durant Digital Instrs., Milwaukee, Wisc.
Eagle-Signal Div., Davenport, Iowa p 1317
Eldorado Electrodata, Concord, Cal. p 449
Fork Standards, W. Chicago, Ill.
General Elec. Co., Schenectady, N.Y.
Haydon, A. W. Co., Waterbury, Conn.
Hi-G, Windsor Locks, Conn.
Hickok Elect. Instr., Cleveland, Ohio p 488
HICO (Horizons Int'l.), Redwood City, Cal
Kessler-Ellis Prods., Atlantic Highlands, N.J.
Magnecraft Elec., Chicago, Ill.
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Parabam, Inc., Compton, Cal.
Pennwood Numechron, Pittsburgh, Pa. p 372
Precision Timer, Westbrook, Conn.
Presin Co., Inc., Shelton, Conn.
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sealectro Corp., Mamaroneck, N.Y.
Square D Co., Milwaukee, Wisc. p 1347
Systron-Donner Concord Instr. Div., Concord, Cal.
Tempo/UTI Div., Chatsworth, Cal.
Veeder-Root, Hartford, Conn....... p 1352
A & M Instrument, Inc., Great Neck, N.Y.
Allis, Louis Co., Milwaukee, Wisc.
Artisan Elctrns. Corp., Parsippany, N.J.
Bayside Timers, Inc., Flushing, N.Y.
Bulova Watch Co., Timer Lab., Flushing, N.Y.
CGS/Datametrics, Watertown, Mass.
Conrac Corp., New York, N.Y.
Control Logic, Natick, Mass.
Controlcraft Corp., West Chicago, Ill.
Cooke Engrg. Co., Alexandria, Va.
Data Dynamics Div., Englewood, N.J.
Decor Elctrns. Corp., Austin, Tex.
Di/An Controls, Inc., Boston, Mass.
Digital Displays, Mendham, N.J.
Durant Mfg. Co., Milwaukee, Wisc.
Ealing Corp., Cambridge, Mass.
Engler Instr. Corp., Jersey City, N.J.
ENM Co., Chicago, Ill.
Fedtro, Inc., Rockville Centre, N.Y.
General Oceanology, Inc., Cambridge, Mass.
Gordon Alan Entprs., N. Hollywood, Cal.
Guardian California, Culver City, Cal.
Gulton Inds., Albuquerque, N.M.
Harshaw Chem. Co., Cleveland, Ohio
HLS, Inc., Santa Clara, Cal.
Ind'l. Solid State Controls, York, Pa.
Instrumentation Tech. Corp., Northridge, Calif.
Intercontinental Elctrns., E. Rochester, N.Y.
Japanese Prods. Corp., New Rochelle, N.Y.
MEKontrol Inc., Northboro, Mass.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Precision Sci. Co., Chicago, Ill.
Ragen Precision Inds., Inc., N. Arlington, N.J.
Raymond Controls Corp., Middletown, Conn.
Robotron Corp., Detroit, Mich.
Scientronics, Barrington, N.J.
Servo Dev. Corp., Hicksville, N.Y.
Soltec Corp., No. Hollywood, Cal.
Square D Co., Park Ridge, Ill.
Stoelting Co., Chicago, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Techmetric Co., Redwood City, Calif.
Tempo Instr., Plainview, N.Y.
Time-O-Matic, Inc., Danville, Ill.
Tyco Instr. Div., Waltham, Mass.
USM Corp., Wakefield, Mass.
Weltronic Co., Southfield, Mich.
Zehntel, Inc., Berkeley, Calif.

Timers, Cycle

A. D. Data Sys., Inc., Rochester, N.Y.
Autronics Corp., Pasadena, Calif.
C & K Components, Watertown, Mass.
Deltrol Controls, Milwaukee, Wisc. p 1692
Diversified Elctrns., Evansville, Ind
Eagle-Signal Div., Davenport, Iowa p 1317
Ferwalt, W.H., Inc., Lapwai, Idaho
Fork Standards, W. Chicago, Ill.
General Elec. Co., Schenectady, N.Y.
General Time Corp., Torrington, Conn. p 1321
Haydon, A. W. Co., Waterbury, Conn. p 1597
Hi-G, Windsor Locks, Conn.
Ind'l. Control Co., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Midtex/Aemco, Mankato, Minn.
Parabam, Inc., Compton, Cal.
Pennwood Numechron, Pittsburgh, Pa. p 372
Precision Timer, Westbrook, Conn. p 1341,1343,1344
Sangamo Elec. Co., Pickens, S.C.
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sealectro Corp., Mamaroneck, N.Y.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan .... p 1350
Abrams Instr., Lansing, Mich.
Aemco Div., Mankato, Minn.
Agastat Div., Elizabeth, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bendix, Utica, N.Y.
Bristol Div, Waterbury, Conn
Bulova Watch Co., Timer Lab., Flushing, N.Y.
Conrac Corp., New York, N.Y.
Controlcraft Corp., West Chicago, Ill.
Cramer Div., Old Saybrook, Conn.
Cutler-Hammer, Milwaukee, Wisc.
Durant Mfg. Co., Milwaukee, Wisc.
Dynapar Corp., Gurnee, Ill.
Essex Engrg. Co., Inc., Essex, Conn.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
General Oceanology, Inc., Cambridge, Mass.
Guardian California, Culver City, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Haydon Switch & Instr., Waterbury, Conn.
Heitz, Karl, Inc., New York, N.Y.
HLS, Inc., Santa Clara, Cal.
Hughey & Phillips, Inc., Burbank, Cal.
Ind'l. Solid State Controls, York, Pa.
Industrial Timer Div., Parsippany, N.J.
Int'l. Register, Chicago, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
Kahlenberg Bros. Co., Two Rivers, Wisc.
Liebel-Flarsheim Co., Cincinnati, Ohio
Mallory Timers, Indpls., Ind.
McElroy Elctrns. Corp., Shirley, Mass.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Minarik Elec. Co., Los Angeles, Cal.
Montgomery Mfg. Co., Inc., Owensville, Ind.
National Time & Signal, Oak Pk., Mich.
Raymond Controls Corp., Middletown, Conn.
Relay Specialties, Inc., Fair Lawn, N.J.
Rhodes, M.H., Inc., Avon, Conn.
Robotron Corp., Detroit, Mich.
Scientronics, Barrington, N.J.
Servo Dev. Corp., Hicksville, N.Y.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
Techmetric Co., Redwood City, Calif.
Tempo Instr., Plainview, N.Y.
Trepac Corp. America, Englewood, N.J.
Valcor Engrg. Corp., Kenilworth, N.J.
Walters, W.A., Inc., Chicago, Ill.
Zenith Controls Inc., Chicago, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Timers, Electrolytic Cell

Bissett-Berman, Los Angeles, Cal.p 1314
Curtis Instrs., Inc., Mt. Kisco, N.Y. p 427
Gibbs Mfg. & Resch., Janesville, Wisc. p 1395,1402
HICO (Horizons Int'l.), Redwood City, Cal
Sprague Elec. Co., No. Adams, Mass.
Bergen Labs., Inc., Paterson, N.J.

Timers, Impulse

Allen Avionics, Mineola, N.Y.
Autronics Corp., Pasadena, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
C & K Components, Watertown, Mass.
Chrono-log Corp., Broomall, Pa.
Clare, C.P. & Co., Chicago, Ill.
Durant Digital Instrs., Milwaukee, Wisc.
Eagle-Signal Div., Davenport, Iowa p 1317
Ferwalt, W.H., Inc., Lapwai, Idaho
General Elec. Co., Schenectady, N.Y.
Gibbs Mfg. & Resch., Janesville, Wisc.
Haydon, A. W. Co., Waterbury, Conn.
Hi-G, Windsor Locks, Conn.
Hickok Elect. Instr., Cleveland, Ohio
Janco Corp., Burbank, Cal.
Magnecraft Elec., Chicago, Ill.
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Parabam, Inc., Compton, Cal.
Pennwood Numechron, Pittsburgh, Pa. p 372
Precision Timer, Westbrook, Conn.
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sealectro Corp., Mamaroneck, N.Y.
Syracuse Elctrns. Corp., Syracuse, N.Y. p 1348
Adar Assocs., Cambridge, Mass.
Aemco Div., Mankato, Minn.
Amstro Corp., Fairfield, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Conrac Corp., New York, N.Y.
Control Logic, Natick, Mass.
Controls Co. of America, Schiller Park, Ill.
Cramer Div., Old Saybrook, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Dynapar Corp., Gurnee, Ill.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Guardian California, Culver City, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Heitz, Karl, Inc., New York, York, N.Y.
Ind'l. Solid State Controls, York, Pa.
Liebel-Flarsheim Co., Cincinnati, Ohio
MEKontrol Inc., Northboro, Mass.
Meson Elctrns. Co., Inc., Rochester, N.Y.
National Time & Signal, Oak Pk., Mich.
Raymond Controls Corp., Middletown, Conn.
Relay Specialties, Inc., Fair Lawn, N.J.
Robotron Corp., Detroit, Mich.
Scientronics, Barrington, N.J.
Servo Dev. Corp., Hicksville, N.Y.
Square D Co., Park Ridge, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
Tempo Instr., Plainview, N.Y.
Trepac Corp. America, Englewood, N.J.
Zenith Controls Inc., Chicago, Ill.

Timers, Interval

Allen-Bradley Co., Milwaukee, Wisc.
Anadex Instrs., Inc., Van Nuys, Calif. p 394,395
Atec, Inc., Houston, Tex................ p 411
Austron, Inc., Austin, Tex.
Autronics Corp., Pasadena, Calif.
C & K Components, Watertown, Mass.
Chrono-log Corp., Broomall, Pa.
Curtis Instrs., Inc., Mt. Kisco, N.Y.
Deltrol Controls, Milwaukee, Wisc. p 1692
Diversified Elctrns., Evansville, Ind
Eagle-Signal Div., Davenport, Iowa p 1317
Electronic Research Co., Shawnee Mission, Kans.
Ferwalt, W.H., Inc., Lapwai, Idaho
Fork Standards, W. Chicago, Ill.
General Elec. Co., Schenectady, N.Y.
General Time Corp., Torrington, Conn. p 1321
Gibbs Mfg. & Resch., Janesville, Wisc. p 1395
Haydon, A. W. Co., Waterbury, Conn. p 1597
Hewlett-Packard, Palo Alto, Cal.
Hi-G, Windsor Locks, Conn. p 1322,1323
Hickok Elect. Instr., Cleveland, Ohio p 488

HICO (Horizons Int'l.), Redwood City, Cal
International Electro Exchange Corp., Minneapolis, Minn.
Janco Corp., Burbank, Cal.
Ledex, Inc., Dayton, Ohio .... p 1940
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Meloy Laboratories, Springfield, Va.
Midtex/Aemco, Mankato, Minn.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J..... p 529
(NES) Nationwide Elctrn. Sys., Itasca, Ill.. p 365
Ohmite Mfg. Co., Skokie, Ill.
Parabam, Inc., Compton, Cal.
Pennwood Numechron, Pittsburgh, Pa. p 372
PPM, Inc., Bedford, Ohio
Precision Timer, Westbrook, Conn. p 1341,1343
Sangamo Elec. Co., Pickens, S.C.
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sealectro Corp., Mamaroneck, N.Y.
Syracuse Elctrns. Corp., Syracuse, N.Y. p 1348
Systron-Donner Concord Instr. Div., Concord, Cal.
Tempo/UTI Div., Chatsworth, Cal.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan .... p 1350
Abrams Instr., Lansing, Mich.
Adar Assocs., Cambridge, Mass.
Aemco Div., Mankato, Minn.
Agastat Div., Elizabeth, N.J.
Allis, Louis Co., Milwaukee, Wisc.
Amstro Corp., Fairfield, N.J.
Applied Control Co., Fairfield, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bayside Timers, Inc., Flushing, N.Y.
Bendix, Utica, N.Y.
Bulova Watch Co., Timer Lab., Flushing, N.Y.
Burke & James, Inc., Chicago, Ill.
Central Scientific Co., Chicago, Ill.
Conductron Corp., St. Charles, Mo.
Conrac Corp., New York, N.Y.
Control Logic, Natick, Mass.
Controlcraft Corp., West Chicago, Ill.
Controlotron Corp., Farmingdale, N.Y.
Controls Co. of America, Schiller Park, Ill.
Corning Glass Works, Fluidic Products Dept., Corning, N.Y.
Cramer Div., Old Saybrook, Conn.
Cutler-Hammer, Milwaukee, Wisc.
Data Dynamics Div., Englewood, N.J.
Datum, Inc., Anaheim, Calif.
De-Tec-Tronic Corp., Chicago, Ill.
Di/An Controls, Inc., Boston, Mass.
Dimco-Gray Co., Dayton, Ohio
Dri-Clave Corp., Westbury, N.Y.
Durant Mfg. Co., Milwaukee, Wisc.
Dynamic Controls Corp., S. Windsor, Conn.
Dynapar Corp., Gurnee, Ill.
EDC (Electro Dev.), Lynnwood, Wash.
Elctrn. Resources Div., Los Angeles, Cal.
Essex Engrg. Co., Inc., Essex, Conn.
Fairchild Space & Defense Sys., Syosset, N.Y.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Furnas Elec. Co., Batavia, Ill.
General Oceanology, Inc., Cambridge, Mass.
General Radio Co., Concord, Mass.
Gordon Alan Entprs., N. Hollywood, Cal.
Guardian California, Culver City, Cal.
Harshaw Chem. Co., Cleveland, Ohio
Heitz, Karl, Inc., New York, N.Y.
HLS, Inc., Santa Clara, Cal.
Honeywell Information Systems, Wellesley Hills, Mass
Ind'l. Solid State Controls, York, Pa.
Industrial Timer Div., Parsippany, N.J.
Instrumentation Tech. Corp., Northridge, Calif.
Intercontinental Elctrns., E. Rochester, N.Y.
Int'l. Register, Chicago, Ill.
Lehigh Valley Elctrn., Inc., Fogelsville, Pa.
Lektra Labs., Inc., College Point, N.Y.
Liebel-Flarsheim Co., Cincinnati, Ohio
Lisk, G.W. Co., Clifton Springs, N.Y.
Mallory Timers, Indpls., Ind.
McElroy Elctrns. Corp., Shirley, Mass.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Nano Fast, Inc., Chicago, Ill.
National Time & Signal, Oak Pk., Mich.
Northeast Elctrns. Corp., Concord, N.H.
Nuclear-Chicago, Des Plaines, Ill.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Paragon Elec. Co., Two Rivers, Wisc.
Raymond Controls Corp., Middletown, Conn.
Relay Specialties, Inc., Fair Lawn, N.J.
Rhodes, M.H., Inc., Avon, Conn.
Robotron Corp., Detroit, Mich.
Scientronics, Barrington, N.J.
Servo Dev. Corp., Hicksville, N.Y.
Soltec Corp., No. Hollywood, Cal.
Square D Co., Park Ridge, Ill.
Stock Drive Prods., New Hyde Pk., N.Y.
Stoelting Co., Chicago, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
Sunshine Sci. Instrs., Inc., Philadelphia, Pa.
Symbolic Displays, Inc., Orange, Calif.
Taylor Instr. Process Control Div., Rochester, N.Y.
Techmetric Co., Redwood City, Calif.
Technic, Inc., Providence, R.I.
Tempo Instr., Plainview, N.Y.
Transystems Elctrn. Co., Fort Lee, N.J.
Trepac Corp. America, Englewood, N.J.
Universal Resch. Labs., Elk Grove Village, Ill
USM Corp., Wakefield, Mass.
VWR Scientific, San Francisco, Cal.
Walters, W.A., Inc., Chicago, Ill.
Zenith Controls Inc., Chicago, Ill.

Timers, Programmed

Autronics Corp., Pasadena, Calif.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
California Elctrn. Mfg. Co., Alamo, Calif.
Deltrol Controls, Milwaukee, Wisc.
Eagle-Signal Div., Davenport, Iowa p 1317
Elctrn. Meas. Inc., Neptune, N.J.
Fork Standards, W. Chicago, Ill.
General Time Corp., Torrington, Conn.
Haydon, A. W. Co., Waterbury, Conn.
Hi-G, Windsor Locks, Conn.
Ind'l. Control Co., Farmingdale, N.Y.
Ledex, Inc., Dayton, Ohio
Logitek, Inc., Farmingdale, N.Y.
LVC Ind's., Inc., Corona, N.Y.
Magnecraft Elec., Chicago, Ill.
Metric Sys., Ft. Walton Beach, Fla. p 358
Midtex/Aemco, Mankato, Minn.
Monsanto Company, Electronic Instruments, W. Caldwell, N.J..... p 529
(NES) Nationwide Elctrn. Sys., Itasca, Ill.. p 365
Parabam, Inc., Compton, Cal......... p 371
Pennwood Numechron, Pittsburgh, Pa. p 372
PPM, Inc., Bedford, Ohio .... p 535
Precision Mechanisms, Westbury, N.Y.
Precision Timer, Westbrook, Conn. p 1341,1343
Triac Elctrn. Sys., N.Y., N.Y.
Adar Assocs., Cambridge, Mass.
Aemco Div., Mankato, Minn.
Aerospace Resch. Inc., Boston, Mass.
Agastat Div., Elizabeth, N.J.
Allied Elctrns. Corp., Chicago, Ill.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bayside Timers, Inc., Flushing, N.Y.
Bulova Watch Co., Timer Lab., Flushing, N.Y.
CGS/Datametrics, Watertown, Mass.
Conrac Corp., New York, N.Y.
Control Logic, Natick, Mass.
Controlotron Corp., Farmingdale, N.Y.
Cooke Engrg. Co., Alexandria, Va.
Cramer Div., Old Saybrook, Conn.
Dantronics, St. Paul, Minn.
Datatron, Inc., Santa Ana, Cal
Di/An Controls, Inc., Boston, Mass.
Durant Mfg. Co., Milwaukee, Wisc.
Dynapar Corp., Gurnee, Ill.
Electro-Pacific, Inc., Goleta, Calif.
Elctrn. Resources Div., Los Angeles, Cal.
General Oceanology, Inc., Cambridge, Mass.
General Radio Co., Concord, Mass.
Guardian California, Culver City, Cal.
Guide Inds., Inc., Sun Valley, Calif.
Harshaw Chem. Co., Cleveland, Ohio
Hird Brown America, Livingston, N.J.
HLS, Inc., Santa Clara, Cal.
Honeywell, Ft. Washington, Pa.
Ind'l. Solid State Controls, York, Pa.
Industrial Timer Div., Parsippany, N.J.
Instrumentation Tech. Corp., Northridge, Calif.
Intercontinental Elctrns., E. Rochester, N.Y.
Int'l. Register, Chicago, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
Kahlenberg Bros. Co., Two Rivers, Wisc.
Mallory Timers, Indpls., Ind.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Minarik Elec. Co., Los Angeles, Cal.
Montgomery Mfg. Co., Inc., Owensville, Ind.
Noble Elctrns., Inc., Carpinteria, Calif.
Relay Specialties, Inc., Fair Lawn, N.J.
Rhodes, M.H., Inc., Avon, Conn.
Servo Dev. Corp., Hicksville, N.Y.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Stoelting Co., Chicago, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
Taft Electrosystems, Inc., Metuchen, N. J.
Tempo Instr., Plainview, N.Y.
Tenor Co., Inc., New Berlin, Wisc.
Zehntel, Inc., Berkeley, Calif.
Zenith Controls Inc., Chicago, Ill.
Zenrad Controls Co., Santa Barbara, Cal.

Timers, Reset

A. D. Data Sys., Inc., Rochester, N.Y.
Alco Elctrn. Prods., Lawrence, Mass.
Autronics Corp., Pasadena, Calif.
C & K Components, Watertown, Mass.
Deltrol Controls, Milwaukee, Wisc. p 1692
Eagle-Signal Div., Davenport, Iowa p 1317
Fork Standards, W. Chicago, Ill.
General Elec. Co., Schenectady, N.Y.
General Time Corp., Torrington, Conn. p 1321
Haydon, A. W. Co., Waterbury, Conn. p 1597
Hi-G, Windsor Locks, Conn.
HICO (Horizons Int'l.), Redwood City, Cal
International Electro Exchange Corp., Minneapolis, Minn.
Magnecraft Elec., Chicago, Ill.
Midtex/Aemco, Mankato, Minn.
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Ohmite Mfg. Co., Skokie, Ill.
Parabam, Inc., Compton, Cal......... p 371
Precision Timer, Westbrook, Conn. p 1341,1343
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sealectro Corp., Mamaroneck, N.Y.
Syracuse Elctrns. Corp., Syracuse, N.Y. p 1348
Tempo/UTI Div., Chatsworth, Cal.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan .... p 1350
Triac Elctrn. Sys., N.Y., N.Y.
Aemco Div., Mankato, Minn.
Applied Control Co., Fairfield, N.J.
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bayside Timers, Inc., Flushing, N.Y.
B.H. Inds., Los Angeles, Cal.
Conrac Corp., New York, N.Y.
Controlcraft Corp., West Chicago, Ill.
Cramer Div., Old Saybrook, Conn.
Cutler-Hammer, Milwaukee, Wisc.
Di/An Controls, Inc., Boston, Mass.
Dynapar Corp., Gurnee, Ill.
ENM Co., Chicago, Ill.
Essex Engrg. Co., Inc., Essex, Conn.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
General Oceanology, Inc., Cambridge, Mass.
Guardian California, Culver City, Cal.
Harshaw Chem. Co., Cleveland, Ohio
HLS, Inc., Santa Clara, Cal.
Ind'l. Solid State Controls, York, Pa.
Industrial Timer Div., Parsippany, N.J.
Instrumentation Tech. Corp., Northridge, Calif.
Intercontinental Elctrns., E. Rochester, N.Y.
Japanese Prods. Corp., New Rochelle, N.Y.
Kahlenberg Bros. Co., Two Rivers, Wisc.
Lab-Line Instrs., Inc., Melrose Park, Ill.
Liebel-Flarsheim Co., Cincinnati, Ohio
Mallory Timers, Indpls., Ind.
McKee-Pedersen Instrs., Danville, Calif.
MEKontrol Inc., Northboro, Mass.
Meson Elctrns. Co., Inc., Rochester, N.Y.
National Time & Signal, Oak Pk., Mich.
Nuclear-Chicago, Des Plaines, Ill.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Paragon Elec. Co., Two Rivers, Wisc.
Precision Sci. Co., Chicago, Ill.
Raymond Controls Corp., Middletown, Conn.
Robotron Corp., Detroit, Mich.
Scientronics, Barrington, N.J.
Servo Dev. Corp., Hicksville, N.Y.
Square D Co., Park Ridge, Ill.
Stoelting Co., Chicago, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
Taylor Instr. Process Control Div., Rochester, N.Y.
Techmetric Co., Redwood City, Calif.
Tempo Instr., Plainview, N.Y.
Tenor Co., Inc., New Berlin, Wisc.
Zenith Controls Inc., Chicago, Ill.

Timers, Sequence

A. D. Data Sys., Inc., Rochester, N.Y.
Autronics Corp., Pasadena, Calif.
Bowmar Instr. Corp., Ft. Wayne, Ind.
C & K Components, Watertown, Mass.
California Elctrn. Mfg. Co., Alamo, Calif.
Chicago Dynamic Inds., Chicago, Ill.
Clare, C.P. & Co., Chicago, Ill.
Deltrol Controls, Milwaukee, Wisc.
Eagle-Signal Div., Davenport, Iowa p 1317
Elctrn. Meas. Inc., Neptune, N.J.
Fork Standards, W. Chicago, Ill.
General Elec. Co., Schenectady, N.Y.
General Time Corp., Torrington, Conn. p 1321
Haydon, A. W. Co., Waterbury, Conn. p 1597
Hi-G, Windsor Locks, Conn.
Ind'l. Control Co., Farmingdale, N.Y.
Ledex, Inc., Dayton, Ohio .... p 1940
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Midtex/Aemco, Mankato, Minn.
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Parabam, Inc., Compton, Cal.
PPM, Inc., Bedford, Ohio
Precision Mechanisms, Westbury, N.Y.
Precision Timer, Westbrook, Conn. p 1341,1344
Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Sealectro Corp., Mamaroneck, N.Y.
Syracuse Elctrns. Corp., Syracuse, N.Y. p 1348
Tempo/UTI Div., Chatsworth, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
Abrams Instr., Lansing, Mich.
Aemco Div., Mankato, Minn.
Agastat Div., Elizabeth, N.J.
Applied Materials Tech., Inc., Santa Clara, Cal
Artisan Elctrns. Corp., Parsippany, N.J.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Autotron, Inc., Danville, Ill.
Bayside Timers, Inc., Flushing, N.Y.
Bendix, Utica, N.Y.
Bowmar/Ali, Inc., Acton, Mass.
Bristol Div, Waterbury, Conn
Bulova Watch Co., Timer Lab., Flushing, N.Y.
CGS/Datametrics, Watertown, Mass.
Controlcraft Corp., West Chicago, Ill.
Controlotron Corp., Farmingdale, N.Y.
Controls Co. of America, Schiller Park, Ill.
Cramer Div., Old Saybrook, Conn.
Data Dynamics Div., Englewood, N.J.
Davidson Elctrn. Dev. Co., Erie, Pa.
De-Tec-Tronic Corp., Chicago, Ill.
Durant Mfg. Co., Milwaukee, Wisc.
Dynapar Corp., Gurnee, Ill.
Fairchild Space & Defense Sys., Syosset, N.Y.
Furnas Elec. Co., Batavia, Ill.

General Oceanology, Inc., Cambridge, Mass.
Gordon Alan Entprs., N. Hollywood, Cal.
Guardian California, Culver City, Cal.
Gulton Inds., Albuquerque, N.M.
Harshaw Chem. Co., Cleveland, Ohio
Heitz, Karl, Inc., New York, N.Y.
Hird Brown America, Livingston, N.J.
HLS, Inc., Santa Clara, Cal.
Industrial Timer Div., Parsippany, N.J.
Instrumentation Tech. Corp., Northridge, Calif.
Intercontinental Elctrns., E. Rochester, N.Y.
Japanese Prods. Corp., New Rochelle, N.Y.
Mallory Timers, Indpls., Ind.
McElroy Elctrns. Corp., Shirley, Mass.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Miller Elec. Mfg. Co., Appleton, Wisc.
Montgomery Mfg. Co., Inc., Owensville, Ind.
National Time & Signal, Oak Pk., Mich.
Nuclear-Chicago, Des Plaines, Ill.
Paragon Elec. Co., Two Rivers, Wisc.
Raymond Controls Corp., Middletown, Conn.
Reach Elctrns., Inc., Lexington, Neb.
Relay Specialties, Inc., Fair Lawn, N.J.
Rhodes, M.H., Inc., Avon, Conn.
Robotron Corp., Detroit, Mich.
Scientronics, Barrington, N.J.
Servo Dev. Corp., Hicksville, N.Y.
Square D Co., Park Ridge, Ill.
Stoelting Co., Chicago, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
Taylor Instr. Process Control Div., Rochester, N.Y.
Tempo Instr., Plainview, N.Y.
Tenor Co., Inc., New Berlin, Wisc.
Transystems Elctrn. Co., Fort Lee, N.J.
Trepac Corp. America, Englewood, N.J.
Walters, W.A., Inc., Chicago, Ill.
Weltronic Co., Southfield, Mich.
Zenith Controls Inc., Chicago, Ill.

Timers, Solid State

A. D. Data Sys., Inc., Rochester, N.Y.
Alco Elctrn. Prods., Lawrence, Mass.
Allen-Bradley Co., Milwaukee, Wisc.
American Time Products, Woodside, N.Y.
Austron, Inc., Austin, Tex.
Autronics Corp., Pasadena, Calif.
Betamite Electronic Devices, Culver City, Calif.
Bulova Watch Elctrns. Div. Amer. Time Prods., Woodside, N.Y.
Bulova Watch Co., Freq. Control Prods., Elctrns. Div., Woodside, N.Y.
Bulova Watch Co., Servo Prods. Elctrns. Div., Woodside, N.Y.
California Elctrn. Mfg. Co., Alamo, Calif.
Digital Equip. Corp., Maynard, Mass.
Eagle-Signal Div., Davenport, Iowa p 1317
Elctrn. Meas. Inc., Neptune, N.J.
General Elec. Co., Schenectady, N.Y.
Gibbs Mfg. & Resch., Janesville, Wisc. p 1395
Haydon, A. W. Co., Waterbury, Conn.
Hi-G, Windsor Locks, Conn.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Ledex, Inc., Dayton, Ohio
Logitek, Inc., Farmingdale, N.Y.
Magnecraft Elec., Chicago, Ill.
Midtex/Aemco, Mankato, Minn.
(NES) Nationwide Elctrn. Sys., Itasca, Ill.
Parabam, Inc., Compton, Cal.
Precision Timer, Westbrook, Conn.
Solid State Elctrns., Sepulveda, Cal.
Tempo/UTI Div., Chatsworth, Cal.
Tokyo Elec. Co., Ltd., Chiyoda-ku, Tokyo, Japan .... p 1350
Triac Elctrn. Sys., N.Y., N.Y.
Abrams Instr., Lansing, Mich.
Adar Assocs., Cambridge, Mass.
Air-O-Tronics Prods., Morrisville, N.Y.
Arrow-Hart, Inc., Hartford, Conn.
Artisan Elctrns. Corp., Parsippany, N.J.
Bayside Timers, Inc., Flushing, N.Y.
Bendix, Utica, N.Y.
B.H. Inds., Los Angeles, Cal.
Coil Co. of Amer., Northvale, N.J.
Control Logic, Natick, Mass.
Controlcraft Corp., West Chicago, Ill.
Fairchild Semiconductor, Mountain View, Calif.
Farmer Elec. Prods. Co., Inc., Natick, Mass.
Furnas Elec. Co., Batavia, Ill.
General Oceanology, Inc., Cambridge, Mass.
General Radio Co., Concord, Mass.
Guardian California, Culver City, Cal.
Gulton Inds., Albuquerque, N.M.
HLS, Inc., Santa Clara, Cal.
Hoagland Instr., Red Bank, N.J.
Ind'l. Solid State Controls, York, Pa.
Intercontinental Elctrns., E. Rochester, N.Y.
Int'l. Register, Chicago, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
Jordan Controls, Milwaukee, Wisc.
Lear Siegler, Inc., Santa Monica, Calif.
Mallory Timers, Indpls., Ind.
Meson Elctrns. Co., Inc., Rochester, N.Y.
Midland Standard Inc., Elgin, Ill.
Mullard, Inc., Farmingdale, N.Y.
Neill Engrg. Co., Akron, Ohio
Ney, J.M. Co., Bloomfield, Conn.
Raymond Controls Corp., Middletown, Conn.
Relay Specialties, Inc., Fair Lawn, N.J.
Robotron Corp., Detroit, Mich.
Rowan Controller, Westminister, Md.
Servo Dev. Corp., Hicksville, N.Y.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Square D Co., Park Ridge, Ill.
Stoelting Co., Chicago, Ill.
Struthers-Dunn, Inc., Bettendorf, Iowa
Taft Electrosystems, Inc., Metuchen, N. J.
Tempo Instr., Plainview, N.Y.
Time-O-Matic, Inc., Danville, Ill.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Valcor Engrg. Corp., Kenilworth, N.J.
Vanguard Relay Corp., Lindenhurst, N.Y.
Zehntel, Inc., Berkeley, Calif.
Zenrad Controls Co., Santa Barbara, Cal.

Timers, Thermal

Sankyo Seiki Mfg. Co., Ltd., Tokyo, Japan
Tempo/UTI Div., Chatsworth, Cal.
E-T-A Prods. Co. America, Chicago, Ill.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
G-V Controls, Livingston, N.J.
Hoagland Instr., Red Bank, N.J.
Industrial Timer Div., Parsippany, N.J.
Japanese Prods. Corp., New Rochelle, N.Y.
Raymond Controls Corp., Middletown, Conn.
Relay Specialties, Inc., Fair Lawn, N.J.
Struthers-Dunn, Inc., Bettendorf, Iowa

Timers, Welding (Electronic)—See Vol 1

Timing Switches—See Timers

Tinsel—See Wire, Tinsel—Vol 3

Tonometers—See Vol 1

Tool Kits & Sets—See Vol 3

Tools, Alignment & Tuning—See Vol 3

Tools, Crimping—See Vol 3

Tools, Hand Or Mechanical—See Cutters; Screwdrivers; Wrenches; etc.—Vol 3

Tools, Heat Sealing—See Vol 1

Tools, Microelectronic Handling—See Vol 3

Tools, Parts-Handling, Vacuum Operated—See Vol 3

Tools, Relay Servicing—See Vol 3

Tools, Resistance Soldering—See Soldering Equip., Resistance—Vol 3

Tools, Soldering—See Specific Types—Vol 3

Tools, Swaging—See Vol 3

Toroids—See Coils, Toroidal—Vol 3

Torque Indicators—See Indicators, Torque—Vol 1

Torque Meters—See Indicators, Torque—Vol 1

Torque Testers—See Testers, Torque—Vol 1

Torquers, Gyro—See Motors, Gyro

Totalizers, Digital—See Vol 1

Tote Boxes—See Boxes, Component / Subassembly Handling—Vol 3

Tower Erection & Maintenance Services—See Services, Tower Erection & Maintenance—Vol 1

Towers, Antenna—See Antenna Towers—Vol 1

Tracers, Curve, Tube & Transistor—See Vol 1

Tracers, Signal—See Testers, Signal Tracing—Vol 1

Tracers, Voltage Curve—See Vol 1

Tracking Systems—See Vol 1

Trailers, Instrumentation—See Laboratories, Mobile & Field—Vol 1

Trainers—See Simulators & Trainors—Vol 1

Transceivers, Airborne—See Vol 1

Transceivers, Facsimile—See Vol 1

Transceivers, Infrared

Electro/Data, Inc., Garland, Tex.
Hughes Aircraft Co, Culver City, Cal.
Infrared Inds., Inc., Santa Barbara, Cal.
Loral Elctrn. Sys., Bronx, N.Y.
Raytheon Co., Lexington, Mass.

Transceivers, Single-Sideband—See Vol 1

Transcription Arms—See Phonograph Arms, Transcription—Vol 1

Transducers, Acceleration—See Accelerometers

Transducers, Displacement

American Aerospace Controls, Farmingdale, N.Y.
Carter Mfg. Corp., Hudson, Mass.
Computer Instrs., Hempstead, N.Y.
Del Elctrns. Corp., Mt. Vernon, N.Y.
Dytronics Co., Columbus, Ohio
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Magnedyne Inc., Carlsbad, Calif.
Norden Div., Norwalk, Conn.
Ohio Semitronics, Columbus, Ohio p 1986
Schaevitz Engrg., Pennsauken, N.J. p 948,1346,1988,1989
SRC Div., Newport Bch., Cal. ...... p 1992
Tektronix, Inc., Beaverton, Ore.
Ade Corp., Watertown, Mass.
Allis, Louis Co., Milwaukee, Wisc.
Ametek/Instrs. & Controls, Feasterville, Pa.
Applied Control Co., Fairfield, N.J.
Automatic Control Elctrns. Co., San Antonio, Tex.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bell & Howell Co., Pasadena, Calif.
Bendix, S. Montrose, Pa.
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Bourns, Inc., Riverside, Calif.
Bowmar/TIC, Inc., Newbury Park, Calif.
Bristol Div, Waterbury, Conn
Celtic Inds., Inc., Van Nuys, Cal.
Clifton Div., Clifton Hgts., Pa.
Collins, G.L. Corp., Long Beach, Calif.
Columbia Resch. Labs., Woodlyn, Pa.
Computer Conversions Corp., East Northport, N.Y.
Davidson Elctrn. Dev. Co., Erie, Pa.
Decker Corp., Bala-Cynwyd, Pa.
Dynamic Data Corp., Columbus, Ohio
Dynamic Precision Controls, Hagerstown, Ind.
Dynapar Corp., Gurnee, Ill.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Electro-Sonic Control, Manteca, Calif.
Foxboro Co., Foxboro, Mass.
Gould Labs., Cleveland, Ohio
Gulton Inds., Costa Mesa, Cal.
Hamlin, Inc., Lake Mills, Wisc.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Houston Scientific Inds., Inc., Houston, Tex
Humphrey, Inc., San Diego, Calif.
IKL, Inc., Newport Beach, Calif.
Jordan Controls, Milwaukee, Wisc.
Kaman Nuclear, Colorado Springs, Colo.
Kavlico Elctrns., Chatsworth, Cal.
Kistler Instr. Co., Redmond, Wash.
Larson Aero Dev., Concord, Calif.
Ling Elctrns., Anaheim, Calif.
Lion Precision Div., Newton, Mass.
Litton Inds., Mt. Vernon, N.Y.
Mark Prods., Inc., Houston, Tex.
Mechanical Technology, Inc., Latham, N.Y.
Minnetech Labs., Inc., Minneapolis, Minn.
Mullard, Inc., Farmingdale, N.Y.
Optron Corp., Woodbridge, Conn.
Pickering & Co., Plainview, N.Y.
Rank Precision Inds., W. Nyack, N.Y.
Research, Inc., Minneapolis, Minn.
Robinson-Halpern Co., W. Conshohocken, Pa.
Sanders Assocs., Inc., Manchester, N.H.
Servotronics, Inc., Buffalo, N.Y.
Singer-General Precision, Inc., Little Falls, N.J.
Sostman H. E., & Co., Cranford, N.J.
Sparton Southwest, Inc., Albuquerque, N.M.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Statham Instrs., Inc., Oxnard, Cal.
Systems Resch. Labs., Dayton, Ohio
Task Corp., Anaheim, Calif.
Teledyne Gurley, Troy, N.Y.
Tensitron, Inc., Harvard, Mass.
Theta Instr. Corp., Fairfield, N.J.
Transducer Controls Corp., Covina, Calif.
Transducer Systems, Inc., Willow Grove, Pa.
Transidyne-General Corp., Ann Arbor, Mich.
United Aircraft Corp., Norwalk, Conn.
West Coast Resch. Corp., Los Angeles, Calif.
Wintriss Controls, New York, N.Y.

Transducers, Flow

Computer Instrs., Hempstead, N.Y.
Honeywell, Denver, Colo.
Schaevitz Engrg., Pennsauken, N.J. p 1990
Ametek/Instrs. & Controls, Feasterville, Pa.
Autocon Inds., Inc., St. Paul, Minn.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Bell & Howell Co., Pasadena, Calif.
Bendix Corp., Davenport, Iowa
BLH Elctrns., Inc., Waltham, Mass.
Bristol Div, Waterbury, Conn
Carolina Medical Elctrns., Inc., King, N.C.
CGS/Datametrics, Watertown, Mass.
Decker Corp., Bala-Cynwyd, Pa.
Dynamic Precision Controls, Hagerstown, Ind.

Electro-Sonic Control, Manteca, Calif.
Fischer & Porter Co., Warminster, Pa.
Flow Technology, Inc., Tempe, Ariz.
Foxboro Co., Foxboro, Mass.
Hughes Aircraft Co, Malibu, Cal.
K West, Westminster, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Micro-Strain, Inc., Spring City, Pa.
Moore Inds., Van Nuys, Cal.
Motorola Instr. & Control, Phoenix, Ariz.
Robertshaw Controls Co., Anaheim, Cal.
Rosemount Engrg. Co., Minneapolis, Minn.
Sanders Assocs., Inc., Manchester, N.H.
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Taylor Instr. Process Control Div., Rochester, N.Y.
Technology/Versatronics, Yellow Springs, Ohio
Trans-Sonics, Inc., Lexington, Mass.
Tylan Corp., Torrance, Calif.
West Coast Resch. Corp., Los Angeles, Calif.

Transducers, Force

Beckman Instruments, Shiller Pk., Ill.
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Schaevitz Engrg., Pennsauken, N.J. p 1989
SRC Div., Newport Bch., Cal. ...... p 1993
Tektronix, Inc., Beaverton, Ore.
Ade Corp., Watertown, Mass.
Bendix Corp., Davenport, Iowa
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Bristol Div, Waterbury, Conn
Celtic Inds., Inc., Van Nuys, Cal.
Coil Co. of Amer., Northvale, N.J.
Columbia Resch. Labs., Woodlyn, Pa.
Decker Corp., Bala-Cynwyd, Pa.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Dynamic Precision Controls, Hagerstown, Ind.
Dynisco Div., Westwood, Mass.
Electronic Design Labs., Inc., Phila., Pa.
Endevco, Pasadena, Calif.
Engdahl Enterprises, Costa Mesa, Cal.
Foxboro Co., Foxboro, Mass.
Gentran Inc., Sunnyvale, Cal
Houston Scientific Inds., Inc., Houston, Tex
Instron Corp., Canton, Mass.
Interface, Inc., Scottsdale, Ariz.
Kavlico Elctrns., Chatsworth, Cal.
Kelk, George Ltd., Don Mills, Ont., Canada
Kenney Engrg. Corp., Monrovia, Cal.
Kistler Instr. Co., Redmond, Wash.
Kulite Semiconductor Prod., Ridgefield, N.J.
Larson Aero Dev., Concord, Calif.
Lebow Assocs., Inc., Troy, Mich.
Ling Elctrns., Anaheim, Calif.
MB Elctrns/Textron Co., New Haven, Conn.
Measurement Sys., Inc., Norwalk, Conn.
Micro-Strain, Inc., Spring City, Pa.
Minnetech Labs., Inc., Minneapolis, Minn.
PCB Piezotronics, Inc., Depew, N.Y.
Revere Elctrn. Div., Wallingford, Conn.
Sanders Assocs., Inc., Manchester, N.H.
Sensotec, Inc., Columbus, Ohio
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Strainsert Co., Bryn Mawr, Pa.
Task Corp., Anaheim, Calif.
Taylor Instr. Process Control Div., Rochester, N.Y.
Tensitron, Inc., Harvard, Mass.
Thwing-Albert Instr. Co., Philadelphia, Pa.
Transducer Controls Corp., Covina, Calif.
Transducer Systems, Inc., Willow Grove, Pa.
Transducers, Inc., Santa Fe Springs, Calif.
Tyco Instr. Div., Waltham, Mass.
West Coast Resch. Corp., Los Angeles, Calif.
Wood, C.N. Mfg. Co., Newtown, Pa.
Zonic Tech. Labs., Cincinnati, Ohio

Transducers, Impedance

Dranetz Engrg. Labs., Plainfield, N.J.
Hewlett-Packard, Palo Alto, Cal.
Biocom, Inc., Culver City, Cal.
Clifton Div., Clifton Hgts., Pa.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Endevco, Pasadena, Calif.
Kaman Nuclear, Colorado Springs, Colo.
Linden Labs., Inc., State College, Pa.
Transducer Controls Corp., Covina, Calif.
Transducer Systems, Inc., Willow Grove, Pa.

Transducers, Incremental Digital Position, Rotary

Astrosystems, Lake Success, N.Y.
Norden Div., Norwalk, Conn.
PPM, Inc., Bedford, Ohio
Remex Elctrns., Santa Ana, Cal.
SRC Div., Newport Bch., Cal. ...... p 1993
Ade Corp., Watertown, Mass.
Computer Conversions Corp., East Northport, N.Y.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dynamics Resch. Corp., Wilmington, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Hughes Aircraft Co, Culver City, Cal.
Singer-General Precision, Inc., Little Falls, N.J.
Theta Instr. Corp., Fairfield, N.J.
Trump-Ross Ind'l. Controls, Inc., Billerica, Mass.
United Aircraft Corp., Norwalk, Conn.
Weston-Transicoil, Worcester, Pa.

Transducers, Magnetic Pickup

Airpax Elctrns., Inc., Cambridge, Md.
Airpax Elctrns., Ft. Lauderdale, Fla. p 1308
American Aerospace Controls, Farmingdale, N.Y.
Arvin Magnetics, Eden Prairie, Minn.
Astrosystems, Lake Success, N.Y.
Beckman Instruments, Shiller Pk., Ill.
Int'l. Electro-Magnetics, Palatine, Ill.
ISC Magnetics Div., Huntington, N.Y. p 1334,1335
Norden Div., Norwalk, Conn.
Ohio Semitronics, Columbus, Ohio p 1986
RFL Inds., Instr. Div., Boonton, N.J.
Rye Inds., Inc., Mamaroneck, N.Y.
Schaevitz Engrg., Pennsauken, N.J. p 1988
Solid State Elctrns., Sepulveda, Cal.
SRC Div., Newport Bch., Cal. ...... p 1992
Tempo/UTI Div., Chatsworth, Cal. p 1349
Advanced Kinetics, Costa Mesa, Calif.
Airpax Elctrns., So. El Monte, Calif.
Allis, Louis Co., Milwaukee, Wisc.
B & K Instrs., Inc., Cleveland, Ohio
Barger Corp., Sunnyvale, Cal.
Bourns Pacific Magnetic Corp., Romoland, Calif.
Celtic Inds., Inc., Van Nuys, Cal.
Controlcraft Corp., West Chicago, Ill.
Dolan-Jenner Inds., Inc., Melrose, Mass.
Dynalco Corp., Ft. Lauderdale, Fla.
Dynapar Corp., Gurnee, Ill.
Electro Prods. Labs., Power Supply, Chicago, Ill.
Electro Prods. Labs., Transducer Div., Chgo., Ill.
Fischer & Porter Co., Warminster, Pa.
Flow Technology, Inc., Tempe, Ariz.
General Instr. Corp., Westwood, Mass.
Grado Labs., Inc., Brooklyn, N.Y.
Halmar Elctrns., Inc., Columbus, Ohio
Kavlico Elctrns., Chatsworth, Cal.
Mullard, Inc., Farmingdale, N.Y.
PECO, Milpitas, Cal.
Pickering & Co., Plainview, N.Y.
Power Instrs., Skokie, Ill.
Sensor Corp., Greenwich, Conn.
Skurka Engrg. Co., Los Angeles, Calif.
Statham Instrs., Inc., Oxnard, Cal.
Telex Comm. Div., Minneapolis, Minn.
Transducer Systems, Inc., Willow Grove, Pa.
United Aircraft Corp., Norwalk, Conn.

Transducers, Power—See Transducers, Volt, Watt, Currents, etc.

Transducers, Pressure

Amphenol Controls Div., Janesville, Wisc. .... p 2907
Amphenol Sales Div., Broadview, Ill.p 2907
Bendix Environmtl. Sci., Baltimore, Md.
Computer Instrs., Hempstead, N.Y. p 2915
Harrel, Inc., E. Norwalk, Conn.
Hewlett-Packard, Palo Alto, Cal.
Honeywell, Denver, Colo.
Kratos Instrument Div., Pasadena, Cal p 511
Metrix Instr. Co., Houston, Tex.
Microdot Inc., City of Industry, Cal.
Schaevitz Engrg., Pennsauken, N.J. p 1990
Solid State Elctrns., Sepulveda, Cal.
SRC Div., Newport Bch., Cal. ...... p 1992
Tektronix, Inc., Beaverton, Ore.
A & M Instrument, Inc., Great Neck, N.Y.
Advanced Kinetics, Costa Mesa, Calif.
Aero Mechanism, Inc., Van Nuys, Calif.
Alnor Instr. Co., Chicago, Ill.
Ametek/Instrs. & Controls, Feasterville, Pa.
A.R.F. Products, Inc., Raton, N.M.
Autocon Inds., Inc., St. Paul, Minn.
Automatic Timing & Controls, Inc., King of Prussia, Pa.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Bendix, S. Montrose, Pa.
Bendix Corp., Davenport, Iowa
Betzelt GMBH, Trogerstr. 32, W. Germany
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Bourns, Inc., Riverside, Calif.
Bristol Div, Waterbury, Conn
Celtic Inds., Inc., Van Nuys, Cal.
CGS/Datametrics, Watertown, Mass.
Channel Inds., Santa Barbara, Cal.
Columbia Resch. Labs., Woodlyn, Pa.
Conrac Corp., New York, N.Y.
Crystal Resch., Inc., Cambridge, Mass.
Decker Corp., Bala-Cynwyd, Pa.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Dynamic Precision Controls, Hagerstown, Ind.
Dynisco Div., Westwood, Mass.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Edo Western Corp., Salt Lake City, Utah
Endevco, Pasadena, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Foxboro Co., Foxboro, Mass.
Furnas Elec. Co., Batavia, Ill.
General Oceanology, Inc., Cambridge, Mass.
Genisco Tech. Corp., Instr. Div., Compton, Cal.
Gentran Inc., Sunnyvale, Cal
Gulton Inds., Costa Mesa, Cal.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Ft. Washington, Pa.
Honeywell, Residential Div., Mpls., Minn.
Japanese Prods. Corp., New Rochelle, N.Y.
K West, Westminster, Calif.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kaman Nuclear, Colorado Springs, Colo.
Kavlico Elctrns., Chatsworth, Cal.
Kistler Instr. Co., Redmond, Wash.
Kollsman Instr. Corp., Syosset, N.Y.
Kulite Semiconductor Prod., Ridgefield, N.J.
Lear Siegler, Inc., Santa Monica, Calif.
Leeds & Northrup Corp., No. Wales, Pa.
Linden Labs., Inc., State College, Pa.
Lion Precision Div., Newton, Mass.
Marathon Instrs. Div., Pico Rivera, Calif.
MB Elctrns/Textron Co., New Haven, Conn.
Mechanical Technology, Inc., Latham, N.Y.
Medistor Instr. Co., Seattle, Wash.
Micro-Strain, Inc., Spring City, Pa.
Minnetech Labs., Inc., Minneapolis, Minn.
MKS Instrs., Inc., Burlington, Mass.
Moore Inds., Van Nuys, Cal.
Motorola Instr. & Control, Phoenix, Ariz.
Non-Linear Sys., Inc., Del Mar, Cal.
PCB Piezotronics, Inc., Depew, N.Y.
Penn Engrg. & Mfg. Corp., Doylestown, Pa.
Ramsay Engrg. Co., Anaheim, Calif.
Robertshaw Controls Co., Anaheim, Cal.
Robinson-Halpern Co., W. Conshohocken, Pa.
Rosemount Engrg. Co., Minneapolis, Minn.
Scanivalve, Inc., San Diego, Calif.
Sensotec, Inc., Columbus, Ohio
Sostman H. E., & Co., Cranford, N.J.
Sparton Southwest, Inc., Albuquerque, N.M.
Standard Controls, Seattle, Wash.
Statham Instrs., Inc., Oxnard, Cal.
Stow Labs., Inc., Hudson, Mass.
Strainsert Co., Bryn Mawr, Pa.
Sundstrand Data Control, Redmond, Wash.
Taylor Instr. Process Control Div., Rochester, N.Y.
Teledyne Taber, No. Tonawanda, N.Y.
Texas Instruments, Inc., Houston, Tex.
Transducer Controls Corp., Covina, Calif.
Transducer Systems, Inc., Willow Grove, Pa.
Transducers, Inc., Santa Fe Springs, Calif.
Transidyne-General Corp., Ann Arbor, Mich.
Tyco Instr. Div., Waltham, Mass.
Vacco Electronics, S. El Monte, Calif.
Validyne Engrg. Corp., Northridge, Cal.
Viatran Corp., Buffalo, N.Y.
Waters Instrs., Inc., Rochester, Minn
West Coast Resch. Corp., Los Angeles, Calif.
West Instr. Div., Schiller Pk., Ill.
Wintriss Controls, New York, N.Y.

Transducers, Sonar

Electronic Resch. Assocs., Cedar Grove, N.J.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
AMBAC Inds., Garden City, N.Y.
Channel Inds., Santa Barbara, Cal.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Edo Western Corp., Salt Lake City, Utah
Empire Sci., Ind'l. Instr., Garden City, N.Y.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Hughes Aircraft Co, Fullerton, Cal.
Inspection Systems, Hawthorne, Calif
Int'l. Transducer, Goleta, Cal.
InterOcean Systems, San Diego, Cal.
Massa Div., Hingham, Mass.
Raytheon Co., Lexington, Mass.
Sanders Assocs., Ocean Sys., So. Nashua, N.H.
Sparton Corp., Jackson, Mich.
Straza Inds., El Cajon, Calif.
TDK Elctrns. Corp., Long Island City, N.Y.
Westinghouse Elec. Corp., Pittsburgh, Pa.

Transducers, Sound Velocity

James Elctrns., Inc., Chicago, Ill.
SRC Div., Newport Bch., Cal.
AMBAC Inds., Garden City, N.Y.
Aperco Co., East Meadow, N.Y.
Bludworth Marine Div., Linden, N.J.
Channel Inds., Santa Barbara, Cal.
Chesapeake Instr. Corp., Shadyside, Md.
Collins, G.L. Corp., Long Beach, Calif.
Conrac Corp., Cedar Rapids, Iowa
Edo Western Corp., Salt Lake City, Utah
Geo Space, Houston, Tex.
Gulton Inds., Costa Mesa, Cal.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Inspection Systems, Hawthorne, Calif
Kaman Nuclear, Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Linden Labs., Inc., State College, Pa.
Ling Elctrns., Anaheim, Calif.
Mark Prods., Inc., Houston, Tex.
Massa Div., Hingham, Mass.
Ramsay Engrg. Co., Anaheim, Calif.
Telex Comm. Div., Minneapolis, Minn.

Transducers, Strain Gauge

Honeywell, Denver, Colo. .... p 590
Microdot Inc., City of Industry, Cal.
Precision Monolithics, Santa Clara, Cal.
Techni-Rite Elctrns., E. Greenwich, R.I.
Tektronix, Inc., Beaverton, Ore.
A.O.I.P., 75/Paris 12eme, France
Bell & Howell Co., Pasadena, Calif.
Biocom, Inc., Culver City, Cal.
Columbia Resch. Labs., Woodlyn, Pa.
Dillon, W.C. & Co., Van Nuys 340, Calif.
Doric Sci. Corp., San Diego, Calif.
Dynisco Div., Westwood, Mass.
Endevco, Pasadena, Calif.
Fairchild Controls, Mountain View, Calif.

General Oceanology, Inc., Cambridge, Mass.
Gentran Inc., Sunnyvale, Cal
Gulton Inds., Costa Mesa, Cal.
Houston Scientific Inds., Inc., Houston, Tex
Hughes Aircraft Co, Culver City, Cal.
Interface, Inc., Scottsdale, Ariz.
Japanese Prods. Corp., New Rochelle, N.Y.
Kelk, George Ltd., Don Mills, Ont., Canada
Kenney Engrg. Corp., Monrovia, Cal.
Kulite Semiconductor Prod., Ridgefield, N.J.
Lebow Assocs., Inc., Troy, Mich.
Magnaflux Corp., Chicago, Ill.
MB Elctrns/Textron Co., New Haven, Conn.
Measurement Sys., Inc., Norwalk, Conn.
Micro-Strain, Inc., Spring City, Pa.
Minnetech Labs., Inc., Minneapolis, Minn.
Revere Elctrn. Div., Wallingford, Conn.
Sensotec, Inc., Columbus, Ohio
Statham Instrs., Inc., Oxnard, Cal.
Strainsert Co., Bryn Mawr, Pa.
Teledyne Taber, No. Tonawanda, N.Y.
Thwing-Albert Instr. Co., Philadelphia, Pa.
Toledo Scale, Toledo, Ohio
Transducer Controls Corp., Covina, Calif.
Transducers, Inc., Santa Fe Springs, Calif.
Tyco Instr. Div., Waltham, Mass.
Viatran Corp., Buffalo, N.Y.
West Coast Resch. Corp., Los Angeles, Calif.
Wood, C.N. Mfg. Co., Newtown, Pa.

Transducers, Temperature

Airpax Elctrns., Inc., Cambridge, Md.
Astro-Space Labs., Huntsville, Ala
Beckman Instruments, Shiller Pk., Ill.
Cox & Co., Inc., New York, N.Y... p 1968
Elmwood Sensors, Inc., Cranston, R.I.
Fenwal Elctrns., Inc., Framingham, Mass. .... p 1971
Harrel, Inc., E. Norwalk, Conn.
Hewlett-Packard, Palo Alto, Cal.
Keystone Carbon Co., St. Marys, Pa. p 1979
RFL Inds., Thermocontrol Div., Boonton, N.J.
Simpson Elec. Co., Chicago, Ill.
Tektronix, Inc., Beaverton, Ore.
Teledyne Geotech, Dallas, Tex.
Triac Elctrn. Sys., N.Y., N.Y.
Weed Instr. Co., Elgin, Tex.......... p 1984
Westinghouse Elec. Corp., Newark, N.J.
A & M Instrument, Inc., Great Neck, N.Y.
Acromag, Inc., Wixom, Mich.
Addison Div., Mountainside, N.J.
Airpax Elctrns., So. El Monte, Cal.
Alpha-Monarch Corp., Dallas, Tex.
American Standard, Franklin Pk., Ill.
Ametek/Instrs. & Controls, Feasterville, Pa.
Amprobe Instr., Lynbrook, N.Y.
Andonian Assocs., Inc., Waltham, Mass.
A.R.F. Products, Inc., Raton, N.M.
Artronix, Inc., St. Louis, Mo.
Atkins Technical, Inc., Gainesville, Fla.
Bailey Meter Co., Wickliffe, Ohio
Barber-Colman Co., Industrial Instrs. Div., Rockford, Ill.
Beckman Instrs., Process Instrs., Fullerton, Cal.
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Bendix Corp., Davenport, Iowa
Biocom, Inc., Culver City, Cal.
BLH Elctrns., Inc., Waltham, Mass.
Bristol Div, Waterbury, Conn
Burns Engrg., Inc., Minneapolis, Minn.
Conax Corp., Buffalo, N.Y.
Control Prods. Corp., Chicago, Ill.
Dentronics, Inc., Hackensack, N.J.
Dynamic Precision Controls, Hagerstown, Ind.
Edison, Thomas A. Instr. Div., W. Orange, N.J.
Electro-Flex Heat, Inc., Bloomfield, Conn.
Eon Instr., Inc., Van Nuys, Cal.
Exotic Materials, Inc., Costa Mesa, Cal.
Fischer & Porter Co., Warminster, Pa.
Foxboro Co., Foxboro, Mass.
General Oceanology, Inc., Cambridge, Mass.
Genisco Tech. Corp., Instr. Div., Compton, Cal.
Gentran Inc., Sunnyvale, Cal
High Temperature Instr., W. Conshohocken, Pa.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Residential Div., Mpls., Minn.
Hy-Cal Engrg., Santa Fe Springs, Cal.
Infrared Inds., Inc., Santa Barbara, Cal.
Ircon Inc., Niles, Ill.
Japanese Prods. Corp., New Rochelle, N.Y.
K West, Westminster, Calif.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Kaman Nuclear, Colorado Springs, Colo.
Kulite Semiconductor Prod., Ridgefield, N.J.
Leeds & Northrup Corp., No. Wales, Pa.
Lewis Engrg. Co., Naugatuck, Conn.
Mag-Con Engrg. Co., St. Paul, Minn.
Marlin Mfg. Corp., Cleveland, Ohio
Meteorology Research, Inc., Altadena, Calif.
Micro-Strain, Inc., Spring City, Pa.
Motorola Instr. & Control, Phoenix, Ariz.
Nold, Walter, Co., Natick, Mass.
Omega Engrg., Inc., Stamford, Conn.
Pennsylvania Elctrns. Technology, Pittsburgh, Pa.
Ramsay Engrg. Co., Anaheim, Calif.
RDF Corp., Hudson, N.H.
Relco Prods., Denver, Colo.
Riverbank Labs., Geneva, Ill.
Robinson-Halpern Co., W. Conshohocken, Pa.
Rosemount Engrg. Co., Minneapolis, Minn.
Sensotec, Inc., Columbus, Ohio
Skurka Engrg. Co., Los Angeles, Calif.
Smith, Robert Elec. Co., Hartford, Conn.
Sostman H. E., & Co., Cranford, N.J.
Sparton Corp., Jackson, Mich.
Sparton Southwest, Inc., Albuquerque, N.M.
Sundstrand Data Control, Redmond, Wash.
Syscon Int'l., Inc., So. Bend, Ind.
T & T Controls Co., Media, Pa.
Taylor Instr. Process Control Div., Rochester, N.Y.
Technology/Versatronics, Yellow Springs, Ohio
Thermal Sys., Los Angeles, Cal.
Thermo Elec. Co., Inc., Saddle Brook, N.J.
Thermometrics, Inc., Edison, N.J.
Trans-Met Engrg., La Habra, Cal.
Trans-Sonics, Inc., Lexington, Mass.
Tylan Corp., Torrance, Calif.
Versitherm, Inc., Farmingdale, N.Y.
Waters Instrs., Inc., Rochester, Minn
West Coast Resch. Corp., Los Angeles, Calif.
West Instr. Div., Schiller Pk., Ill.
Williamson Corp., Concord, Mass.
Yellow Springs Instr. Co., Inc., Yellow Springs, Ohio
Zonic Tech. Labs., Cincinnati, Ohio

Transducers, Thermoelectric —See Transducers, Temperature

Transducers, Torque

Beckman Instruments, Shiller Pk., Ill.
SRC Div., Newport Bch., Cal. ...... p 1993
Ade Corp., Watertown, Mass.
Aero Mechanism, Inc., Van Nuys, Calif.
Ametek/Instrs. & Controls, Feasterville, Pa.
Bendix, S. Montrose, Pa.
BLH Elctrns., Inc., Waltham, Mass.
Decker Corp., Bala-Cynwyd, Pa.
Dynamic Precision Controls, Hagerstown, Ind.
Falcon Div., Wilmington, Mass.
Gentran Inc., Sunnyvale, Cal
Himmelstein, S. & Co., Elk Grove Village, Ill.
Honeywell, Aerospace & Def., Minneapolis, Minn.
Honeywell, Apparatus Controls, Mpls., Minn.
Interface, Inc., Scottsdale, Ariz.
Kavlico Elctrns., Chatsworth, Cal.
Kenney Engrg. Corp., Monrovia, Cal.
Kistler Instr. Co., Redmond, Wash.
Larson Aero Dev., Concord, Calif.
Lebow Assocs., Inc., Troy, Mich.
Measurement Sys., Inc., Norwalk, Conn.
Micro-Strain, Inc., Spring City, Pa.
Minnetech Labs., Inc., Minneapolis, Minn.
Servotronics, Inc., Buffalo, N.Y.
Statham Instrs., Inc., Oxnard, Cal.
Strainsert Co., Bryn Mawr, Pa.
Tensitron, Inc., Harvard, Mass.
Transducer Controls Corp., Covina, Calif.
Transducer Systems, Inc., Willow Grove, Pa.
Tyco Instr. Div., Waltham, Mass.
Vibrac Corp., Chelmsford, Mass.
West Coast Resch. Corp., Los Angeles, Calif.
Wood, C.N. Mfg. Co., Newtown, Pa.
Zonic Tech. Labs., Cincinnati, Ohio

Transducers, Ultrasonic

Electronic Resch. Assocs., Cedar Grove, N.J.
Erie Technological Prods. (EEM), Erie, Pa.
James Elctrns., Inc., Chicago, Ill.
Tohoku Metal Inds., Ltd., Tokyo, Japan
Alden Elctrn. & Impulse Record. Equip., Westboro, Mass.
AMBAC Inds., Garden City, N.Y.
Automation Inds., Los Angeles, Cal.
Automation Inds., Danbury, Conn.
Bendix Corp., Davenport, Iowa
Bourns Security Sys., Smithtown, N.Y.
Branson Sonic Power, Danbury, Conn
California Avionics Labs., Inc., Palo Alto, Calif.
Channel Inds., Santa Barbara, Cal.
Commander Labs., Inc., Escondido, Calif.
E.B.L. Co, East Hartford, Conn.
Edo Western Corp., Salt Lake City, Utah
Gulton Inds., Costa Mesa, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Inspection Systems, Hawthorne, Calif
Int'l. Transducer, Goleta, Cal.
InterOcean Systems, San Diego, Cal.
Lewis Corp., Woodbury, Conn.
Linden Labs., Inc., State College, Pa.
Listening, Inc., Arlington, Mass.
Massa Div., Hingham, Mass.
Mechanical Technology, Inc., Latham, N.Y.
National Sonics, Farmingdale, N.Y.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Straza Inds., El Cajon, Calif.
TDK Elctrns. Corp., Long Island City, N.Y.
Union Ultra-Sonics Corp., Lowell, Mass.
Vernitron Piezoelectric Div., Bedford, Ohio
Wheelabrator Corp., Mishawaka, Ind.

Transducers, Velocity

Schaevitz Engrg., Pennsauken, N.J. p 1990
SRC Div., Newport Bch., Cal. ...... p 1992
Airpax Elctrns., So. El Monte, Cal.
Collins, G.L. Corp., Long Beach, Calif.
Gulton Inds., Costa Mesa, Cal.
Humphrey, Inc., San Diego, Calif.
Kistler Instr. Co., Redmond, Wash.
Optron Corp., Woodbridge, Conn.
Pickering & Co., Plainview, N.Y.
Robinson-Halpern Co., W. Conshohocken, Pa.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Thermo Sys., Inc., St. Paul, Minn.
Transducer Controls Corp., Covina, Calif.
Weston-Transicoil, Worcester, Pa.

Transducers, Vibration

Beckman Instruments, Shiller Pk., Ill.
Dytronics Co., Columbus, Ohio .... p 441
Honeywell, Denver, Colo.
Metrix Instr. Co., Houston, Tex..... p 518
Tektronix, Inc., Beaverton, Ore.
Teledyne Geotech, Dallas, Tex.
Tohoku Metal Inds., Ltd., Tokyo, Japan
AGAC-Derritron, Inc., Alexandria, Va.
Amstro Corp., Fairfield, N.J.
Aperco Co., East Meadow, N.Y.
B & K Instrs., Inc., Cleveland, Ohio
Bell & Howell Co., Pasadena, Calif.
Bell & Howell Co., Monrovia, Calif.
Biocom, Inc., Culver City, Cal.
Channel Inds., Santa Barbara, Cal.
Columbia Resch. Labs., Woodlyn, Pa.
Decker Corp., Bala-Cynwyd, Pa.
Dyna Magnetic Devices, Inc., Hicksville, N.Y.
Dynamic Data Corp., Columbus, Ohio
Dynamic Precision Controls, Hagerstown, Ind.
E.B.L. Co, East Hartford, Conn.
Edo Western Corp., Salt Lake City, Utah
Electro-Sonic Control, Manteca, Calif.
Endevco, Pasadena, Calif.
General Radio Co., Concord, Mass.
Geo Space, Houston, Tex.
Gulton Inds., Costa Mesa, Cal.
H H Controls Co., Arlington, Mass.
Indikon Co., Watertown, Mass.
IRD Mechanalysis, Inc., Columbus, Ohio
Kaman Nuclear, Colorado Springs, Colo.
Kistler Instr. Co., Redmond, Wash.
Larson Aero Dev., Concord, Calif.
Linden Labs., Inc., State College, Pa.
Ling Elctrns., Anaheim, Calif.
Marathon Instrs. Div., Pico Rivera, Calif.
Mark Prods., Inc., Houston, Tex.
Massa Div., Hingham, Mass.
MB Elctrns/Textron Co., New Haven, Conn.
Mechanical Technology, Inc., Latham, N.Y.
Micro-Strain, Inc., Spring City, Pa.
Optron Corp., Woodbridge, Conn.
PCB Piezotronics, Inc., Depew, N.Y.
Robinson-Halpern Co., W. Conshohocken, Pa.
Shure Bros., Inc., Evanston, Ill.
Sonotone Corp., Elmsford, N.Y.
Sprengnether, W.F. Instr. Co., Inc., St. Louis, Mo.
Statham Instrs., Inc., Oxnard, Cal.
Transducer Systems, Inc., Willow Grove, Pa.
Unholtz-Dickie Corp., Hamden, Conn.
Wintriss Controls, New York, N.Y.
Zonic Tech. Labs., Cincinnati, Ohio

Transducers Volt, Watt, Current, Var, Power Factor, Frequency

American Aerospace Controls, Farmingdale, N.Y. ....p 1306,1307
Bell, F.W., Inc., Columbus, Ohio.. p 1985
Flight Sys., Inc., Mechanicsburg, Pa.
General Elec. Co., Schenectady, N.Y.
ISC Magnetics Div., Huntington, N.Y.
Kratos Instrument Div., Pasadena, Cal p 511
Ohio Semitronics, Columbus, Ohio p 533,1986
Rustrak Instr. Div., Manchester, N.H.
Scientific Columbus, Columbus, Ohio p 1987
Triac Elctrn. Sys., N.Y., N.Y.
Westinghouse Elec. Corp., Newark, N.J. p 582
A & M Instrument, Inc., Great Neck, N.Y.
Acromag, Inc., Wixom, Mich.
Active Control Instrumentation, E. Northport, NY
Bristol Div, Waterbury, Conn
Electro Windings & Comps., Kenilworth, N.J.
Evans Assocs., Berkeley, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Hallmark Standards, Inc., Mt. Vernon, N.Y.
Halmar Elctrns., Inc., Columbus, Ohio
Hammond Mfg. Co., Ltd., Guelph, Ont., Can.
Honeywell, Ft. Washington, Pa.
Isotech Inc., Westford, Mass.
Japanese Prods. Corp., New Rochelle, N.Y.
Phaostron Instr. & Elctrn. Co., So. Pasadena, Cal.
RFL Inds., Comms. Div., Boonton, N.J.
Rochester Instr. Sys., Rochester, N.Y.
Weston Instruments, Inc., Newark, N.J.

Transformers, Audio— See Vol 3

Transformers, Autotransformer—See Vol 3

Transformers, Bias—See Vol 3

Transformers, Bridging— See Vol 3

Transformers, Chopper— See Vol 3

Transformers, Constant Voltage—See Vol 3

Transformers, Control— See Vol 3

Transformers, Converter, D-C To D-C—See Vol 3

Transformers, Current—See Transformers, Instrument—Vol 3

Transformers, Decade—See Vol 3

Transformers, Differential—See Vol 3

Transformers, Discriminator—See Vol 3

Transformers, Donut—See Transformers, Toroidal—Vol 3

Transformers, Driver—See Vol 3

Transformers, Filament—See Vol 3

Transformers, 400 CPS—See Vol 3

Transformers, Flyback—See Vol 3

Transformers, HV—See Vol 3

Transformers, I-F—See Vol 3

Transformers, Input—See Vol 3

Transformers, Instrument—See Vol 3

Transformers, Interstage—See Vol 3

Transformers, Isolation—See Vol 3

Transformers, Line—See Vol 3

Transformers, Magnetic Amplifier—See Transformers, Saturable—Vol 3

Transformers, Matching—See Vol 3

Transformers, Matrix—See Vol 3

Transformers, Mercury Vapor—See Vol 3

Transformers, Metered—See Vol 3

Transformers, Microphone—See Vol 3

Transformers, Miniature, Subminiature & Microminiature—See Vol 3

Transformers, Mixing—See Vol 3

Transformers, Modulation—See Vol 3

Transformers, Output—See Vol 3

Transformers, Phase Conversion—See Vol 3

Transformers, Photoflash Power—See Vol 3

Transformers, Plate—See Vol 3

Transformers, Power—See Vol 3

Transformers, Printed Circuit Mounting—See Vol 3

Transformers, Pulse—See Vol 3

Transformers, Rectifier—See Vol 3

Transformers, Reference—See Vol 3

Transformers, R-F—See Vol 3

Transformers, Rotary—See Vol 3

Transformers, Saturable—See Vol 3

Transformers, Servo—See Vol 3

Transformers, Step-Down, Step-Up—See Vol 3

Transformers, Toroidal—See Vol 3

Transformers, Transistor—See Vol 3

Transformers, Ultrasonic—See Vol 3

Transformers, Variable—See Vol 3

Transformers, Vibrator—See Vol 3

Transformers, Voltage-Dividing—See Vol 1

Transformers, Voltage-Regulating-Also See Regulators & Stabilizers, Voltage—See Vol 3

Transformers, Welding—See Vol 3

Transformers, Wide Band—See Vol 3

Transistor & Diode Heat Dissipators

American Lava Corp., Chattanooga, Tenn.
Astrodyne, Inc., Wilmington, Mass. p 1794
Augat Inc., Attleboro, Mass.
Daburn Elctrns. & Cable Corp., Bronx, N.Y.
Delco Elctrns. Div., Kokomo, Ind.
General Electc. Semiconductor, Syracuse,, N.Y.
HICO (Horizons Int'l.), Redwood City, Cal
International Rectifier, El Segundo, Cal.
Mauratron, Inc., Dallas, Tex. .... p 815
Vemaline Prods. Co., Wyckoff, N.J. p 1857
AAVID Engrg., Inc., Laconia, N.H.
Accel Ind'l. Heat Sink, Los Angeles, Cal.
Alpha Comps. Corp., Venice, Calif.
Argent Inds., Inc., Dayton, Ohio
Asheville-Schoonmaker Mica, Newport News, Va.
Beckman Instrs., Helipot Div., Fullerton, Cal.
Birnbach Co., Inc., Freeport, N.Y.
Birtcher Corp., Monterey Park, Cal.
Brush Beryllium Co., Cleveland, Ohio
Chem Aero, Inc., Wilmington, Cal.
Cinch-Monadnock, City of Industry, Cal.
Consolidated Ceramics & Metalizing, Flemington, N.J.
Cordover, Carl & Co., Mineola, N.Y.
Delbert Blinn. Co., Pomona, Calif.
E-Tronics, Van Nuys, Cal.
Eastern Inds. Div., Hamden, Conn.
Eltee, Inc., W. Caldwell, N.J.
Extrudonics Co., New Brunswick, N.J.
Fansteel Inc., N Chicago, Ill.
Fischer Special Mfg. Co., Cincinnati, Ohio
Gibson Elec., Delmont, Pa.
Golding Mfg. Co., N. Arlington, N.J.
Hobson Bros., Inc., Chicago, Ill.
Horex Elctrns., Inc., Santa Monica, Calif.
Hunter Tools, El Monte, Calif
Int'l. Elctrn. Resch., Burbank, Cal.
Lochart Inds., Inc., Paramount, Cal.
Modular Devices, Inc., Gardena, Calif.
Precision Extrusions, Bensenville, Ill.
SKG Assocs., Inc., Boston, Mass.
Space Prods., Inc., Long Beach, Calif.
Stauffer-Wacker Silicone Corp., Adrian, Mich.
Staver Co., Inc., Bay Shore, N.Y.
Tekna Prods. Co., Rochester, N.Y.
Thermalloy Co., Dallas, Tex.
Wakefield Engrg., Inc., Wakefield, Mass.
Waterbury Pressed Metal Co., Waterbury, Conn.
Westinghouse Elec. Int'l., New York, N.Y.
Xcelite, Inc., Orchard Park, N.Y.

Transistor Mounting Pads—See Pads, Transistor Mounting

Transistor Testers—See Testers, Transistor—Vol 1

Transistors, Chip, Unpackaged

Centralab Semiconductor, El Monte, Cal.
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
Solid State Devices, Santa Fe Springs, Cal.
Sprague Elec. Co., No. Adams, Mass.
Amperex Elctrn., Slatersville, R.I.
Computer Components Int'l, Palm Beach Gardens, Fla.
Dionics, Inc., Westbury, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
General Instr. Corp., Hicksville, N.Y.
Intersil, Inc., Cupertino, Calif.
Kertron, Inc., Riviera Beach, Fla
Micro Elctrns., Ltd., Kwun Tong, Hong Kong
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Calif.
PIRGO Elctrns., Farmingdale, N.Y.
Power Physics Corp., Eatontown, N.J.
Qualidyne Corp., Santa Clara, Cal.
Raytheon Co., Mt. View, Calif.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, Tappan, N.Y.
Solitron Devices, Inc., Riviera Bch., Fla.
Teledyne Semiconductor, Hawthorne, Cal.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Transistors, Dual

Carter Semiconductor, Amityville, N.Y. p 1795
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
Precision Monolithics, Santa Clara, Cal.
Solid State Devices, Santa Fe Springs, Cal. .... p 1839
Sprague Elec. Co., No. Adams, Mass.
United-Page, Patterson, N.J.
Computer Components Int'l, Palm Beach Gardens, Fla.
Crystalonics Div., Cambridge, Mass.
Dionics, Inc., Westbury, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
Intersil, Inc., Cupertino, Calif.
ITT Semiconductors, W. Palm Beach, Fla.
Micro Elctrns., Ltd., Kwun Tong, Hong Kong
Motorola Semiconductor Prods., Phoenix, Ariz.
National Semiconductor, Santa Clara, Calif.
Power Physics Corp., Eatontown, N.J.
Qualidyne Corp., Santa Clara, Cal.
Raytheon Co., Mt. View, Calif.
Semicoa, City of Industry, Calif.
Solitron Devices, Tappan, N.Y.
Solitron Devices, Inc., Riviera Bch., Fla.
State Labs, Inc., New York, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.
Transitron Elctrn. Corp., Wakefield, Mass.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Transistors, Field-Effect

Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
Precision Monolithics, Santa Clara, Cal.
Solid State Devices, Santa Fe Springs, Cal.
Unisem, Philadelphia, Pa. .... p 1847
United-Page, Patterson, N.J.
American Micro-Sys., Inc., Santa Clara, Cal.
Computer Components Int'l, Palm Beach Gardens, Fla.
Crystalonics Div., Cambridge, Mass.
Dionics, Inc., Westbury, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Instr. of Can., Waterloo, Ont., Can.
General Instr. Corp., Hicksville, N.Y.
Intersil, Inc., Cupertino, Calif.
Micro Elctrns., Ltd., Kwun Tong, Hong Kong
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Calif.
Nucleonic Prods., Canoga Pk, Cal.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, Tappan, N.Y.
Solitron Devices, Inc., Riviera Bch., Fla.
State Labs, Inc., New York, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China

Transistors, Germanium, Photo

General Electc. Semiconductor, Syracuse,, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J.
Corvair Diode, New York, N.Y.
Infrared Inds., Inc., Santa Barbara, Cal.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
State Labs, Inc., New York, N.Y.
Vidaire Electronics Mfg. Corp., Freeport, N.Y.

Transistors, Germanium, Power

Delco Elctrns. Div., Kokomo, Ind. p 1800
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y. .... p 1799
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Silicon Transistor Corp., Garden City, N.Y. .... p 1830-1835
Solid State Devices, Santa Fe Springs, Cal.
United-Page, Patterson, N.J. .... p 1856
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Corvair Diode, New York, N.Y.
Corvair Elctrns, New York, N.Y.
Electronic Transistors, Flushing, N.Y.
Franel Corp., So. River, N.J.

Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Kertron, Inc., Riviera Beach, Fla
KSC Semiconductor Corp., Chelmsford, Mass.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Power Physics Corp., Eatontown, N.J.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
Solitron Devices, Inc., Riviera Bch., Fla.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Transistors, Germanium, R-F

General Elec. Co., Schenectady, N.Y.
Lansdale Transistor & Elctrns., Inc., Lansdale, Pa. .... p 1808
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Solid State Devices, Santa Fe Springs, Cal.
Sprague Elec. Co., No. Adams, Mass.
United-Page, Patterson, N.J. .... p 1856
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Corvair Diode, New York, N.Y.
Corvair Elctrns, New York, N.Y.
Electronic Transistors, Flushing, N.Y.
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.

Transistors, Germanium, Switching

Delco Elctrns. Div., Kokomo, Ind. p 1800
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Lansdale Transistor & Elctrns., Inc., Lansdale, Pa. .... p 1808
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Solid State Devices, Santa Fe Springs, Cal.
Sprague Elec. Co., No. Adams, Mass. p 2474
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Corvair Diode, New York, N.Y.
Corvair Elctrns, New York, N.Y.
Electronic Transistors, Flushing, N.Y.
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Solitron Devices, Tappan, N.Y.
Solitron Devices, Inc., Riviera Bch., Fla.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

Transistors, Pressure Sensitive

General Electc. Semiconductor, Syracuse,, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
United-Page, Patterson, N.J.
Stow Labs., Inc., Hudson, Mass.

Transistors, Silicon, Photo

Clairex Elctrns., Mt. Vernon, N.Y. p 1636
General Electc. Semiconductor, Syracuse,, N.Y. .... p 1799
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nat'l. Semiconductors, Plattsburgh, N.Y. p 1814
Nippon Electric/NEC America, N.Y., N.Y.
Sensor Tech., Van Nuys, Cal. .... p 1638
Solid State Devices, Santa Fe Springs, Cal. .... p 1839
United-Page, Patterson, N.J.
Unitrode, Watertown, Mass. .... p 1851
Unitrode Corp., Watertown, Mass. p 1851
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Corvair Diode, New York, N.Y.
Corvair Elctrns, New York, N.Y.
Crystalonics Div., Cambridge, Mass.
EG & G, Inc., Salem, Mass.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
General Sensors, Inc., Athens, Tex.
HEI, Inc., Chaska, Minn.
Int'l. Elctrns., Melville, N.Y.
Micro Elctrns., Ltd., Kwun Tong, Hong Kong
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
Nucleonic Prods., Canoga Pk, Cal.
Quantum Sensing, Inc., Bohemia, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Siliconix, Inc., Santa Clara, Cal.
State Labs, Inc., New York, N.Y.
Transitron Elctrn. Corp., Wakefield, Mass.

Transistors, Silicon, Power

Delco Elctrns. Div., Kokomo, Ind. p 1800
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y. .... p 1799
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Lansdale Transistor & Elctrns., Inc., Lansdale, Pa. .... p 1808
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
Silicon Transistor Corp., Garden City, N.Y. .... p 1822-1829
Solid State Devices, Santa Fe Springs, Cal. .... p 1838,1840
Sprague Elec. Co., No. Adams, Mass.
Unisem, Philadelphia, Pa. .... p 1846
United-Page, Patterson, N.J.
Unitrode, Watertown, Mass. .... p 1849
Unitrode Corp., Watertown, Mass. p 1849
Westinghouse Elec., Youngwood, Pa. p 1862-1864
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Avantek, Inc., Santa Clara, Cal.
Cordover, Carl & Co., Mineola, N.Y.
Corvair Diode, New York, N.Y.
Corvair Elctrns, New York, N.Y.
Crystalonics Div., Cambridge, Mass.
Electronic Transistors, Flushing, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Semiconductor Corp., Tempe, Ariz.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
Isofilm Int'l., Chatsworth, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
Kertron, Inc., Riviera Beach, Fla
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Calif.
PIRGO Elctrns., Farmingdale, N.Y.
Power Physics Corp., Eatontown, N.J.
Raytheon Co., Mt. View, Calif.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Semicoa, City of Industry, Calif.
Siemens Corp., Comps. Div., Iselin, N.J.
Solid Power Corp., Farmingdale, N.Y.
Solitron Devices, Tappan, N.Y.
Solitron Devices, Inc., Riviera Bch., Fla.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Varian Assocs., Palo Alto, Cal.
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Transistors, Silicon, R-F

Carter Semiconductor, Amityville, N.Y. p 1795
General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y. .... p 1799
Hewlett-Packard, Palo Alto, Cal.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Lansdale Transistor & Elctrns., Inc., Lansdale, Pa. .... p 1808
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
Solid State Devices, Santa Fe Springs, Cal. .... p 1839
Sprague Elec. Co., No. Adams, Mass. p 2474
Unisem, Philadelphia, Pa. .... p 1846
United-Page, Patterson, N.J. .... p 1856
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Avantek, Inc., Santa Clara, Cal.
Calvert Elctrns., Inc., New York, N.Y.
Communications Transistor Corp., San Carlos, Cal.
Corvair Diode, New York, N.Y.
Corvair Elctrns, New York, N.Y.
Crystalonics Div., Cambridge, Mass.
Electronic Transistors, Flushing, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Instr. Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Intersil, Inc., Cupertino, Calif.
Kertron, Inc., Riviera Beach, Fla
Micro Elctrns., Ltd., Kwun Tong, Hong Kong
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Calif.
PIRGO Elctrns., Farmingdale, N.Y.
Power Physics Corp., Eatontown, N.J.
Raytheon Co., Mt. View, Calif.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Semicoa, City of Industry, Calif.
Siemens Corp., Comps. Div., Iselin, N.J.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, Tappan, N.Y.
Solitron Devices, Inc., Riviera Bch., Fla.
State Labs, Inc., New York, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Varian Assocs., Palo Alto, Cal.

Transistors, Silicon, Switching

Carter Semiconductor, Amityville, N.Y. p 1795
Delco Elctrns. Div., Kokomo, Ind. p 1800
General Elec. Co., Schenectady, N.Y.
Hughes Aircraft Co., Mos Div., Newport Beach, Cal.
Lansdale Transistor & Elctrns., Inc., Lansdale, Pa. .... p 1808
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
Silicon Transistor Corp., Garden City, N.Y.
Solid State Devices, Santa Fe Springs, Cal. .... p 1838
Sprague Elec. Co., No. Adams, Mass.
United-Page, Patterson, N.J. .... p 1856
Unitrode, Watertown, Mass. .... p 1851
Unitrode Corp., Watertown, Mass. p 1851
Westinghouse Elec., Youngwood, Pa. p 1862-1864
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Avantek, Inc., Santa Clara, Cal.
Computer Components Int'l, Palm Beach Gardens, Fla.
Corvair Diode, New York, N.Y.
Corvair Elctrns, New York, N.Y.
Crystalonics Div., Cambridge, Mass.
Dionics, Inc., Westbury, N.Y.
Electronic Transistors, Flushing, N.Y.
Fairchild Semiconductor, Mountain View, Calif.
Ferranti Ltd., Hollinwood, Lancs., England
Franel Corp., So. River, N.J.
General Instr. of Can., Waterloo, Ont., Can.
General Instr. Corp., Hicksville, N.Y.
International Diode Corp., Jersey City, N.J.
Int'l. Elctrns., Melville, N.Y.
Intersil, Inc., Cupertino, Calif.
Isofilm Int'l., Chatsworth, Cal.
ITT Semiconductors, W. Palm Beach, Fla.
JSH Elctrns, Inc., Culver City, Calif.
Kertron, Inc., Riviera Beach, Fla
Micro Elctrns., Ltd., Kwun Tong, Hong Kong
Motorola Semiconductor Prods., Phoenix, Ariz.
Mullard, Inc., Farmingdale, N.Y.
National Semiconductor, Santa Clara, Calif.
Nucleonic Prods., Canoga Pk, Cal.
PIRGO Elctrns., Farmingdale, N.Y.
Power Physics Corp., Eatontown, N.J.
Raytheon Co., Mt. View, Calif.
RCA Solid State Div., Somerville, N.J.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Semicoa, City of Industry, Calif.
Siemens Corp., Comps. Div., Iselin, N.J.
Siliconix, Inc., Santa Clara, Cal.
Solitron Devices, Tappan, N.Y.
Solitron Devices, Inc., Riviera Bch., Fla.
State Labs, Inc., New York, N.Y.
Teledyne Semiconductor, Hawthorne, Cal.
Texas Instruments, Dallas, Tex.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Transitron Elctrn. Corp., Wakefield, Mass.
TRW Semiconductor Div. TRW Inc., Lawndale, Cal.
Unitron Inds. Corp., Taipei, Taiwan, Republic of China
Workman Elctrn. Prods., Inc., Sarasota, Fla.

Transistors, Unijunction

General Elec. Co., Schenectady, N.Y.
General Electc. Semiconductor, Syracuse,, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 1809
Nippon Electric/NEC America, N.Y., N.Y.
Solid State Devices, Santa Fe Springs, Cal.
Triac Elctrn. Sys., N.Y., N.Y.
United-Page, Patterson, N.J.
Unitrode, Watertown, Mass. .... p 1851
Unitrode Corp., Watertown, Mass. p 1851
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Franel Corp., So. River, N.J.
Motorola Semiconductor Prods., Phoenix, Ariz.
Nucleonic Prods., Canoga Pk, Cal.
State Labs, Inc., New York, N.Y.
Texas Instruments, Dallas, Tex.
Thor Elctrns. Corp., Elizabeth, N.J.

Transit Cases-Also See Containers, Shipping—See Vol 3

Transitions—See Couplings—Vol 3

Translators, Data—See Vol 1

Translators, TV—See Transmitters, UHF; Transmitters, VHF—Vol 1

Transmission Line, Wire & Cable—See Cable, Transmission Line—Vol 3

Transmission Systems, Data—See Vol 1

Transmitters, Broadcast, A-M, F-M & TV—See Vol 1

Transmitters, Digital Data—See Transmission Systems, Data—Vol 1

Transmitters, Diplexer—See Vol 1

Transmitters, Direction Finding—See Vol 1

Transmitters, Duplexer—See Vol 1

Transmitters, Facsimile—See Vol 1

Transmitters, Fixed Frequency—See Vol 1

Transmitters, Fixed Station Comm.—See Vol 1

Transmitters, Infrared

Electro/Data, Inc., Garland, Tex.
Collins Radio Co., Dallas, Tex.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Infrared Inds., Inc., Santa Barbara, Cal.
Raytheon Co., Lexington, Mass.
Santa Barbara Resch. Ctr., Goleta, Calif.

Transmitters, Interrogation—See Vol 1

Transmitters, Microwave—See Vol 1

Transmitters, Multiplex—See Vol 1

Transmitters, Pulse Code Modulation—See Vol 1

Transmitters, Pulse Phase Modulation—See Vol 1

Transmitters, Pulse Time Modulation—See Vol 1

Transmitters, Radar—See Radar Systems—Vol 1

Transmitters, Radio-Control—See Vol 1

Transmitters, Radio Range—See Vol 1

Transmitters, Railroad—See Vol 1

Transmitters, Single-Sideband—See Vol 1

Transmitters, Telemetry—See Vol 1

Transmitters, Tropospheric Scatter—See Vol 1

Transmitters, UHF—See Vol 1

Transmitters, ULF—See Vol 1

Transmitters, VHF—See Vol 1

Transmitters, VLF—See Vol 1

Transponders

ESC Elctrns. Corp., Palisades Pk., N.J.
Microwave Cavity Labs., La Grange, Ill.
RCA Elctrns. Comps., Harrison, N.J.
Vega Precision Labs., Vienna, Va. p 614
Aerocom, Miami, Fla.
Aeronautical Comm. Equip. Inc., Miami, Fla.
AMF Electical Prods., Alexandria, Va.
A.R.F. Products, Inc., Boulder, Colo.
A.R.F. Products, Inc., Raton, N.M.
ASC Sys. Corp., Chicago, Ill.
Beukers Labs., Inc., Hauppauge, N.Y.
Collins Radio Co., Cedar Rapids, Iowa
Collins Radio Co., Dallas, Tex.
ComGeneral Corp., Dayton, Ohio
Conductron Corp., St. Charles, Mo.
Control Sci. Corp., Alexandria, Va.
Dorsett Elctrns., Tulsa, Okla.
General Dynamics, San Diego, Cal.
General Instr. Corp., Hicksville, N.Y.
GTE Sylvania Inc., Elctrn. Sys. Gp., Waltham, Mass.
Hermes Elctrns., Dartmouth N.S., Can.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Instru-Lec Corp., Mt. Vernon, N.Y.
Int'l. Transducer, Goleta, Cal.
ITT Avionics Div, Nutley, N.J.
King Radio Corp., Olathe, Kans.
Massa Div., Hingham, Mass.
Microwave Div, Nashua, N.H.
Motorola, Scottsdale, Ariz.
Narco Avionics, Ft. Washington, Pa.
Philco-Ford Corp., Washington, D.C.
Prodelin, Inc., Hightstown, N.J.
RCA Govt. & Comm. Sys., Moorestown, N.J.
Rodale Elctrns., Inc., Garden City, N.Y.
Southern Avionics Co., Beaumont, Tex.
Straza Inds., El Cajon, Calif.
United Telecontrol Elctrns., Asbury Park, N.J.
Western Microwave Labs., Los Gatos, Cal.

Traps, Ion—See Ion Traps—Vol 1

Triacs—See Thyristors

Triggers, SCR—See Controls, SCR

Trimmer Potentiometers—See Potentiometers, Trimmer—Vol 3

Tripods (For Instruments)—See Vol 1

Tube Heat Dissipators

Birtcher Corp., Monterey Park, Cal.
Hobson Bros., Inc., Chicago, Ill.
Int'l. Elctrn. Resch., Burbank, Cal.
Pall Corp., Glen Cove, N.Y.
Wakefield Engrg., Inc., Wakefield, Mass.
Waterbury Pressed Metal Co., Waterbury, Conn.

Tube Parts

Amphenol Ind'l. Div., Chicago, Ill. p 2542
Amphenol Sales Div., Broadview, Ill. p 2542
Art Wire & Stamping Co., Cedar Knolls, N.J.
Elctrn. Enterprises, Newark, N.J.
General Elec. Co., Schenectady, N.Y.
General Elec., Richmond Hgts., Ohio
RCA Elctrns. Comps., Harrison, N.J.
Asheville-Schoonmaker Mica, Newport News, Va.
Auto-Swage Products, Inc., Shelton, Conn.
Basic Ceramics Inc., Hawthorne, N.J.
Buckbee-Mears Co., St. Paul, Minn.
Cleveland Refractory Metals Div., Solon, Ohio
Coleman Instrs., Maywood, Ill.
Corning Glass Works, Television Prods. Div., Corning, N.Y.
Du-Co Ceramics Co., Saxonburg, Pa.
Eby Sls. Co., Jamaica, N.Y.
Eimac, San Carlos, Calif.
Electron Technology, Inc., Kearny, N.J.
Gencom Div., Plainview, N.Y.
General Elec. Co., Cleveland, Ohio
GTE Sylvania Inc., Warren, Pa.
Haydu Prods., Inc., Opa Locka, Fla.
Johnson & Hoffman Mfg. Co., Carle Place, N.Y.
King Laboratories, Inc., Syracuse, N.Y.
Kirchberger, M & Co., Inc., Englewood, N.J.
Lancaster Glass Corp., Lancaster, Ohio
Maryland Lava Co., Bel Air, Md.
Micacraft Prods., Newark, N.J.
National Elctrns., Geneva, Ill.
Norelcom Inds., Inc., Farmingdale, N.Y.
Owens-Illinois, Consumer & Tech. Prods., Toledo, Ohio
Philips Metalonics, Mt. Vernon, N.Y.
R. I. Metpro, Inc., Warwick, R.I.
Richland Glass Co., Inc., Richland, N.J.
Ronson Metals Corp., Newark, N.J.
S & S Optical Co., Inc., Ft. Wayne, Ind.
Semicon Assoc., Inc., Lexington, Ky.
Staver Co., Inc., Bay Shore, N.Y.
Superior Tube Co., Norristown, Pa.
Westinghouse Elec., Bloomfield, N. J.

Tube Pullers—See Pullers, Tube—Vol 3

Tube Testers—See Testers, Tube—Vol 1

Tubes, Backward Wave

Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
United-Page, Patterson, N.J.
Watkins Johnson Co., Palo Alto, Cal.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Hughes Aircraft Co., Torrance, Cal.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
Litton Inds., San Carlos, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Mullard, Inc., Farmingdale, N.Y.
Raytheon Co., Waltham, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Tripp Research Corp., Redwood City, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.

Tubes, Ballast

Elctrn. Enterprises, Newark, N.J. p 1996
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
United-Page, Patterson, N.J.
Amperite Co., Inc., Union City, N.J.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
Jefferson Elec., Bellwood, Ill.
JSH Elctrns, Inc., Culver City, Calif.
Soderberg Mfg. Co., Inc., Alhambra, Cal.
State Labs, Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.

Tubes, Battery Charger

Gordos Corp., Bloomfield, N.J.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y.
United-Page, Patterson, N.J.
Cetron Elctrn. Corp., Geneva, Ill.
Dutrex Inds., Inc., New York, N.Y.
Electro-Standards Labs., Inc., Miami, Fla.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Thor Elctrns. Corp., Elizabeth, N.J.

Tubes, Cathode-Ray, Data-Storage

Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2001
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Gencom Div., Plainview, N.Y.
General Electrodynamics Corp., Garland, Tex.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Honeywell Information Systems, Wellesley Hills, Mass
Hughes Aircraft Co., Ind'l. Prods. Div., Oceanside, Cal.
Hughes Aircraft Co., Storage Tubes Ind'l. Prods. Div., Oceanside, Calif.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Litton Inds., San Carlos, Calif.
Mullard, Inc., Farmingdale, N.Y.
Nat'l. Union Elec. Corp., Bloomington, Ill.
Rauland, Melrose Pk., Ill.
State Labs, Inc., New York, N.Y.
Thomas Elctrns., Inc., Wayne, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.
Westinghouse Elec. Int'l., New York, N.Y.

Tubes, Cathode-Ray, Instrument Use

General Elec. Co., Schenectady, N.Y.
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y. .... p 1998
Int'l. Elctrns., Melville, N.Y.
Legi Elctrns. Corp., Los Angeles, Cal. p 1486
Metropolitan Supply Corp., New York, N.Y. .... p 2001
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon Co., Quincy, Mass. ...... p 2005
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Coleman Instrs., Maywood, Ill.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Ferranti Elec., Inc., Plainview, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Gencom Div., Plainview, N.Y.
General Atronics, Elctrn. Tube, Phila., Pa.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co., Storage Tubes Ind'l. Prods. Div., Oceanside, Calif.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Kentucky Elctrns., Owensboro, Ky.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Litton Inds., San Carlos, Calif.
Nat'l. Union Elec. Corp., Bloomington, Ill.
Rauland, Melrose Pk., Ill.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
Thomas Elctrns., Inc., Wayne, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Multiple Gun

Ind'l Elctrn. Engrs., Van Nuys, Cal.
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y. .... p 1998
Int'l. Elctrns., Melville, N.Y.
Legi Elctrns. Corp., Los Angeles, Cal. p 1486
Metropolitan Supply Corp., New York, N.Y. .... p 2001
Raytheon Co., Quincy, Mass.
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Ferranti Elec., Inc., Plainview, N.Y.
General Atronics, Elctrn. Tube, Phila., Pa.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hughes Aircraft Co., Storage Tubes Ind'l. Prods. Div., Oceanside, Calif.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Litton Inds., San Carlos, Calif.

Rank Precision Inds., W. Nyack, N.Y.
Rauland, Melrose Pk., Ill.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Projection

General Elec. Co., Schenectady, N.Y.
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2001
Raytheon Co., Quincy, Mass. ...... p 2005
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Amperex Elctrn., Slatersville, R.I.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Gencom Div., Plainview, N.Y.
General Atronics, Elctrn. Tube, Phila., Pa.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hughes Aircraft Co., Ind'l. Prods. Div., Oceanside, Cal.
Hughes Aircraft Co., Storage Tubes Ind'l. Prods. Div., Oceanside, Calif.
Int'l. Elctrns., Melville, N.Y.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Litton Inds., San Carlos, Calif.
Rank Precision Inds., W. Nyack, N.Y.
Thomas Elctrns., Inc., Wayne, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Scan Conversion

Metropolitan Supply Corp., New York, N.Y. .... p 2001
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
DuMont Electron Tubes, Clifton, N.J.
Ferranti Ltd., Hollinwood, Lancs., England
General Electrodynamics Corp., Garland, Tex.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
Hughes Aircraft Co., Ind'l. Prods. Div., Oceanside, Cal.
Rauland, Melrose Pk., Ill.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Shaped-Beam

Ind'l Elctrn. Engrs., Van Nuys, Cal.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2001
Raytheon Co., Quincy, Mass. ...... p 2005
United-Page, Patterson, N.J.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
General Atronics, Elctrn. Tube, Phila., Pa.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co., Storage Tubes Ind'l. Prods. Div., Oceanside, Calif.
Int'l. Elctrns., Melville, N.Y.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Litton Inds., San Carlos, Calif.
Rank Precision Inds., W. Nyack, N.Y.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, Studio or Theatre

Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y. .... p 1998
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2001
Raytheon Co., Quincy, Mass. ...... p 2005
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Amperex Elctrn., Slatersville, R.I.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Elctrns., Melville, N.Y.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Rank Precision Inds., W. Nyack, N.Y.
State Labs, Inc., New York, N.Y.
Westinghouse Elec., Elmira, N.Y.

Tubes, Cathode-Ray, TV Picture & Color

Amperex Elctrn. Corp., Hauppauge, N.Y.
General Elec. Co., Schenectady, N.Y.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Elctrns., Melville, N.Y.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Mullard, Inc., Farmingdale, N.Y.
Philco-Ford Corp., Washington, D.C.
Rauland, Melrose Pk., Ill.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Thomas Elctrns., Inc., Wayne, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Ceramic (Electron)

Amperex Electronic Corp., Hicksville, N.Y.
Elctrn. Enterprises, Newark, N.J. p 1996
General Elec. Co., Schenectady, N.Y. p 1997
General Elec., Richmond Hgts., Ohio p 2811
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Watkins Johnson Co., Palo Alto, Cal.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Coleman Instrs., Maywood, Ill.
Du-Co Ceramics Co., Saxonburg, Pa.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
General Lab. Assocs., Norwich, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
Machlett Labs., Inc., Stamford, Conn.
Maryland Lava Co., Bel Air, Md.
Mictron Div. KMS, Inc., Sarasota, Fla.
Rank Precision Inds., W. Nyack, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Counting

Ind'l Elctrn. Engrs., Van Nuys, Cal.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Pinlites, Fairfield, N.J.
Raytheon Co., Quincy, Mass.
United-Page, Patterson, N.J.
Amperex Elctrn., Slatersville, R.I.
Burroughs Corp., Plainfield, N.J.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
State Labs, Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.

Tubes, Diode, Temperature Limited

Metropolitan Supply Corp., New York, N.Y. .... p 2000
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co, Malibu, Cal.
Thermosen, Inc., Stamford, Conn.
Westinghouse Elec., Elmira, N.Y.

Tubes, Electrometer

Int'l. Elctrns., Melville, N.Y.
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon Co., Quincy, Mass.
United-Page, Patterson, N.J.
Victoreen Instr., Cleveland, Ohio
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
Mullard, Inc., Farmingdale, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.

Tubes, Electron Multiplier

Amperex Electronic Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Coleman Instrs., Maywood, Ill.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
EMR Div., Princeton, N.J.
Gencom Div., Plainview, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Johnston Labs., Inc., Cockeysville, Md.
JSH Elctrns, Inc., Culver City, Calif.
Mullard, Inc., Farmingdale, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Flash

Amglo Inds., Inc., Rosemont, Ill. p 1641
Illumination Inds., Inc., Sunnyvale, Cal. p 1644
Int'l. Elctrns., Melville, N.Y.
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Dutrex Inds., Inc., New York, N.Y.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Ferranti Elec., Inc., Plainview, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Heintz & Kaufman, Ltd., Culver City, Calif.
ILC, Inc., Sunnyvale, Calif.
Int'l. Elctrns., Melville, N.Y.
Kemlite Labs., Inc., Chicago, Ill.
Pek, Inc., Sunnyvale, Calif.
Siemens Corp., Comps. Div., Iselin, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
U.S. Scientific Instrs., Watertown, Mass.
Xenon Corp., Medford, Mass.

Tubes, Forward Wave

Int'l. Elctrns., Melville, N.Y.
United-Page, Patterson, N.J.
Dutrex Inds., Inc., New York, N.Y.
Hughes Aircraft Co., Torrance, Cal.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Mullard, Inc., Farmingdale, N.Y.
Raytheon Co., Waltham, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Teledyne MEC, Palo Alto, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Tripp Research Corp., Redwood City, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.

Tubes, Gamma Ray

Amperex Electronic Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
United-Page, Patterson, N.J.
Dutrex Inds., Inc., New York, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
Int'l. Elctrns., Melville, N.Y.
Mullard, Inc., Farmingdale, N.Y.
Nuclear Corp. Amer., Denville, N.J.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Soltec Corp., No. Hollywood, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Wood, N. Counter Lab., Inc., Chicago, Ill.

Tubes, Gas

Amperex Electronic Corp., Hicksville, N.Y. .... p 1995
Elctrn. Enterprises, Newark, N.J. p 1996
Electrons Co., Fairfield, N.J. .... p 1451
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Black Light Corp. Amer., San Gabriel, Cal.
Burroughs Corp., Plainfield, N.J.
Cetron Elctrn. Corp., Geneva, Ill.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
General Lab. Assocs., Norwich, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Harshaw Chem. Co., Cleveland, Ohio
Heintz & Kaufman, Ltd., Culver City, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
Kemlite Labs., Inc., Chicago, Ill.
Mullard, Inc., Farmingdale, N.Y.
Nat'l. Union Elec. Corp., Bloomington, Ill.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Varian Assocs., Palo Alto, Cal.

Tubes, Geiger-Mueller

Amperex Electronic Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Raytheon Co., Quincy, Mass.
United-Page, Patterson, N.J.
Victoreen Instr., Cleveland, Ohio
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Dutrex Inds., Inc., New York, N.Y.
Eberline Instr. Corp., Santa Fe, N.M.
Gencom Div., Plainview, N.Y.
Harshaw Chem. Co., Cleveland, Ohio
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
Kahl Scientific Instr. Corp., El Cajon, Calif.
Mullard, Inc., Farmingdale, N.Y.
Nuclear-Chicago, Des Plaines, Ill.
Nuclear Corp. Amer., Denville, N.J.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Nuclear Resch. Corp., Southampton, Pa.
Siemens Corp., Comps. Div., Iselin, N.J.
Soltec Corp., No. Hollywood, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Wood, N. Counter Lab., Inc., Chicago, Ill.

Tubes, Glow Or Discharge—See Tubes, Gas

Tubes, Hollow Cathode, Spectroscopic

Metropolitan Supply Corp., New York, N.Y. .... p 2000
United-Page, Patterson, N.J.
Coleman Instrs., Maywood, Ill.
Dutrex Inds., Inc., New York, N.Y.
Gencom Div., Plainview, N.Y.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Rank Precision Inds., W. Nyack, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Ignitron

Amperex Electronic Corp., Hicksville, N.Y.
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
International Rectifier, El Segundo, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
LM Ericsson, New York, N Y
National Elctrns., Geneva, Ill.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Image Converter

Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2001
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Abtronics, Inc., Livermore, Calif.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Bendix, Ann Arbor, Mich.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Electro-Optical Systems, Pasadena, Cal.
Electrophysics Corp., Nutley, N.J.
EMR Div., Princeton, N.J.
Gencom Div., Plainview, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
LM Ericsson, New York, N Y
Machlett Labs., Inc., Stamford, Conn.
Mullard, Inc., Farmingdale, N.Y.
Rauland, Melrose Pk., Ill.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Varo, Inc., Electron Devices Div., Garland, Tex.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Indicator

General Illumination, Inc., St. Paul, Minn
Ind'l Elctrn. Engrs., Van Nuys, Cal.
Int'l. Elctrns., Melville, N.Y.
Nippon Electric/NEC America, N.Y., N.Y.
Pinlites, Fairfield, N.J.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Amperex Elctrn., Slatersville, R.I.
Burroughs Corp., Plainfield, N.J.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Mullard, Inc., Farmingdale, N.Y.
National Elctrns., Geneva, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
TEC, Inc., Eden Prairie, Minn.
Thomas Elctrns., Inc., Wayne, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.

Tubes, Industrial Power

Amperex Electronic Corp., Hicksville, N.Y. .... p 1995
Elctrn. Enterprises, Newark, N.J. p 1996
Electrons Co., Fairfield, N.J. .... p 1451
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Cetron Elctrn. Corp., Geneva, Ill.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
General Elctrns., Inc., Newark, N.J.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
Machlett Labs., Inc., Stamford, Conn.
Mullard, Inc., Farmingdale, N.Y.
National Elctrns., Geneva, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
United Elctrns. Co., Newark, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Infrared

Int'l. Elctrns., Melville, N.Y.
United-Page, Patterson, N.J.
Abtronics, Inc., Livermore, Calif.
Amperex Elctrn., Slatersville, R.I.
Cetron Elctrn. Corp., Geneva, Ill.
Dell Optics Co., Inc., N. Bergen, N.J.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
EMR Div., Princeton, N.J.
Epic, Inc., New York, N.Y.
Gencom Div., Plainview, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Merco Prods. Co., Inc., Eugene, Ore.
Mullard, Inc., Farmingdale, N.Y.
Raytheon Co., Waltham, Mass.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varo, Inc., Electron Devices Div., Garland, Tex.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.
Westinghouse Elec., Elmira, N.Y.

Tubes, Ionization

Amperex Electronic Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Raytheon Co., Quincy, Mass.
United-Page, Patterson, N.J.
Aremco Prods., Inc., Briarcliff Manor, N.Y.
Cooke Vacuum Prods., S. Norwalk, Conn.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Electron Technology, Inc., Kearny, N.J.
Granville-Phillips Co., Boulder, Colo.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co, Malibu, Cal.
Int'l. Elctrns., Melville, N.Y.
Norton Co., Newton, Mass.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Soltec Corp., No. Hollywood, Cal.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Vacuum Inds., Inc., Somerville, Mass.
Veeco Instrs., Inc., Plainview, N.Y.
Westinghouse Elec., Elmira, N.Y.

Tubes, Klystron

Amperex Electronic Corp., Hicksville, N.Y.
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
Polarad Elctrn. Instrs., Lake Success, N.Y.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Gencom Div., Plainview, N.Y.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co., Torrance, Cal.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Litton Inds., San Carlos, Calif.
Microwave Assocs., Inc., Burlington, Mass.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Raytheon Co., Waltham, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Beverly, Mass.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.

Tubes, Laser

Int'l. Elctrns., Melville, N.Y.
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Coleman Instrs., Maywood, Ill.
Dutrex Inds., Inc., New York, N.Y.
Edmund Scientific Co., Barrington, N.J.
EG & G, Inc., Salem, Mass.
Eimac, San Carlos, Calif.
Electro Optics Assocs., Palo Alto, Calif.
Hughes Aircraft Co., Torrance, Cal.
Int'l. Elctrns., Melville, N.Y.
Kemlite Labs., Inc., Chicago, Ill.
Optics Technology, Palo Alto, Calif.
Raytheon Co., Waltham, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Syncor Prods. Co., Inc., Malden, Mass.
Thermal Amer. Fused Quartz, Montville, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Torr Labs., Los Angeles, Cal.

Tubes, Magnetron

Amperex Electronic Corp., Hicksville, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Bowmar/TIC, Inc., Newbury Park, Calif.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Edmund Scientific Co., Barrington, N.J.
Ferranti Ltd., Hollinwood, Lancs., England
Gencom Div., Plainview, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Kriss Elctrns., Inc., Upper Saddle River, N.J.
Litton Inds., San Carlos, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Mictron Div. KMS, Inc., Sarasota, Fla.
Mullard, Inc., Farmingdale, N.Y.
Raytheon Co., Waltham, Mass.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Beverly, Mass.

Tubes, Microwave

Amperex Electronic Corp., Hicksville, N.Y.
Bowmar Instr. Corp., Ft. Wayne, Ind.
Elctrn. Enterprises, Newark, N.J. p 1996
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Watkins Johnson Co., Palo Alto, Cal.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co., Torrance, Cal.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
Litton Inds., San Carlos, Calif.
Machlett Labs., Inc., Stamford, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Mullard, Inc., Farmingdale, N.Y.
OKI Elctrns. America, Ft. Lauderdale, Fla.
Raytheon Co., Waltham, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
State Labs, Inc., New York, N.Y.
Teledyne MEC, Palo Alto, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Tripp Research Corp., Redwood City, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Beverly, Mass.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Varian Assocs., Travel Wave Tube, Palo Alto, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.

Tubes, Noise Source

Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
Signalite, Neptune, N.J. .... p 1952
United-Page, Patterson, N.J.
Waveline, Inc., W. Caldwell, N.J.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
General Microwave Corp., Farmingdale, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
Sperry Elctrn. Tube, Gainesville, Fla.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.

Tubes, Pencil

Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
RCA Elctrns. Comps., Harrison, N.J.

United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Black Light Corp. Amer., San Gabriel, Cal.
Calvert Elctrns., Inc., New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Siemens Corp., Comps. Div., Iselin, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Ultra-Violet Prods., Inc., San Gabriel, Cal.

Tubes, Photomultiplier

Amperex Electronic Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Abtronics, Inc., Livermore, Calif.
Bailey Instrs., Inc., Saddle Brook, N.J.
Bendix, Ann Arbor, Mich.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
EMR Div., Princeton, N.J.
Gamma Sci., San Diego, Cal.
Gencom Div., Plainview, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Mullard, Inc., Farmingdale, N.Y.
Rank Precision Inds., W. Nyack, N.Y.
Schoeffel Instr. Corp., Westwood, N.J.
State Labs, Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.

Tubes, Pirani—See Gauges, Pirani—Vol 1

Tubes, Printer

Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Raytheon Co., Quincy, Mass.
Amperex Elctrn., Slatersville, R.I.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Int'l. Elctrns., Melville, N.Y.
Kemlite Labs., Inc., Chicago, Ill.
Litton Inds., San Carlos, Calif.
Rank Precision Inds., W. Nyack, N.Y.

Tubes, Radiation Detection

Amperex Electronic Corp., Hicksville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Raytheon Co., Quincy, Mass.
United-Page, Patterson, N.J.
Victoreen Instr., Cleveland, Ohio
Abtronics, Inc., Livermore, Calif.
Bailey Instrs., Inc., Saddle Brook, N.J.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Mullard, Inc., Farmingdale, N.Y.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Packard Instrument Co., Inc., Downers Grove, Ill.
Soltec Corp., No. Hollywood, Cal.
Westinghouse Elec., Elmira, N.Y.
Wood, N. Counter Lab., Inc., Chicago, Ill.

Tubes, Readout-(CRT, Cold-Cathode, Vacuum Flurescent, Etc.)

Alco Elctrn. Prods., Lawrence, Mass.
Ind'l Elctrn. Engrs., Van Nuys, Cal. p 1476
Inter-Tech. Grp., Inc., Irvington-on-Hudson, N.Y. .... p 1998
Int'l. Elctrns., Melville, N.Y.
Legi Elctrns. Corp., Los Angeles, Cal. p 1483-1485
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y. .... p 1487
Pinlites, Fairfield, N.J.
Raytheon Co., Quincy, Mass. .... p 2005
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J. p 1502
Amperex Elctrn., Slatersville, R.I.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Burroughs Corp., Plainfield, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Ferranti Ltd., Hollinwood, Lancs., England
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Integrated Circuit Elctrns., Inc., Waltham, Mass.
Int'l. Elctrns., Melville, N.Y.
JSH Elctrns, Inc., Culver City, Calif.
Litton Inds., San Carlos, Calif.
Mullard, Inc., Farmingdale, N.Y.
National Elctrns., Geneva, Ill.
Nat'l. Union Elec. Corp., Bloomington, Ill.
State Labs, Inc., New York, N.Y.
TEC, Inc., Eden Prairie, Minn.
Thomas Elctrns., Inc., Wayne, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Receiving

Amperex Elctrn. Corp., Hauppauge, N.Y.
Amperex Electronic Corp., Hicksville, N.Y. .... p 1995
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Watkins Johnson Co., Palo Alto, Cal.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Allied Elctrns. Corp., Chicago, Ill.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
GTE Sylvania Inc., Elctrn. Comps. Grp., Waltham, Mass.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co, Culver City, Cal.
Int'l. Elctrns., Melville, N.Y.
LM Ericsson, New York, N Y
Mullard, Inc., Farmingdale, N.Y.
Sampson Elctrns. Prods. Div., Chicago, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Rectifying, Gas-Filled

Amperex Electronic Corp., Hicksville, N.Y. .... p 1995
Elctrn. Enterprises, Newark, N.J. p 1996
Electrons Co., Fairfield, N.J. .... p 1451
Gordos Corp., Bloomfield, N.J.
Int'l. Elctrns., Melville, N.Y.
International Rectifier, El Segundo, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Schauer Mfg. Corp., Cincinnati, Ohio
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
General Elctrns., Inc., Newark, N.J.
General Lab. Assocs., Norwich, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
Mullard, Inc., Farmingdale, N.Y.
National Elctrns., Geneva, Ill.
Nat'l. Union Elec. Corp., Bloomington, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
United Elctrns. Co., Newark, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Rectifying, Vacuum

Amperex Electronic Corp., Hicksville, N.Y.
Elctrn. Enterprises, Newark, N.J. p 1996
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
International Rectifier, El Segundo, Cal.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Victoreen Instr., Cleveland, Ohio
Wagner Elec. Corp., Livingston, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
Coleman Instrs., Maywood, Ill.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
Eureka X-Ray Tube Corp., Chicago, Ill.
Ferranti Ltd., Hollinwood, Lancs., England
General Elctrns., Inc., Newark, N.J.
General Lab. Assocs., Norwich, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
Machlett Labs., Inc., Stamford, Conn.
Moore Inds., Van Nuys, Cal.
Mullard, Inc., Farmingdale, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
United Elctrns. Co., Newark, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Scintillation

Amperex Electronic Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
United-Page, Patterson, N.J.
Dutrex Inds., Inc., New York, N.Y.
EMR Div., Princeton, N.J.
Gencom Div., Plainview, N.Y.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Nuclear Equip. Chem. Corp., Farmingdale, N.Y.
Packard Instrument Co., Inc., Downers Grove, Ill.

Tubes, Strobe—See Lights, Stroboscopic

Tubes, Switching

Elctrn. Enterprises, Newark, N.J. p 1996
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
United-Page, Patterson, N.J.
Burroughs Corp., Plainfield, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
General Lab. Assocs., Norwich, N.Y.
GTE Sylvania Inc., Seneca Falls, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
Litton Inds., San Carlos, Calif.
Machlett Labs., Inc., Stamford, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.
Weltronic Co., Southfield, Mich.
Westinghouse Elec., Elmira, N.Y.

Tubes, Tv Camera Pickup

General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2001
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Amperex Elctrn., Slatersville, R.I.
ATV Research, Dakota City, Neb.
Calvert Elctrns., Inc., New York, N.Y.
Cohu Elctrns., Inc., San Diego, Calif.
Denson Elctrns. Corp., Rockville, Conn.
Dutrex Inds., Inc., New York, N.Y.
EMR Div., Princeton, N.J.
GBC Closed Circuit TV Corp., New York, N.Y.
Gencom Div., Plainview, N.Y.
General Electrodynamics Corp., Garland, Tex.
GTE Sylvania Inc., Seneca Falls, N.Y.
Hamamatsu TV Co., Ltd., Hamamatsu City, Shizuoka Pref., Japan
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
LM Ericsson, New York, N Y
Multi Media Engrg., Inc., Rockville, Md.
RCA Corp., Camden, N.J.
Shibaden Corp. Amer., Woodside, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Westinghouse Elec., Elmira, N.Y.

Tubes, Thyratron

Amperex Electronic Corp., Hicksville, N.Y. .... p 1995
Elctrn. Enterprises, Newark, N.J. p 1996
Electrons Co., Fairfield, N.J. .... p 1451
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
EG & G, Inc., Salem, Mass.
EG&G, Inc., Electro-Optics Div., Salem, Mass.
Elctrn. Resources-Counter Prod. Group, L.A., Cal.
Ferranti Ltd., Hollinwood, Lancs., England
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
LM Ericsson, New York, N Y
Mullard, Inc., Farmingdale, N.Y.
National Elctrns., Geneva, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Transmit-Receive (TR)

Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
United-Page, Patterson, N.J.
Calvert Elctrns., Inc., New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co, Culver City, Cal.
Int'l. Elctrns., Melville, N.Y.
Microwave Assocs., Inc., Burlington, Mass.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Ferranti Ltd., Hollinwood, Lancs., England

Tubes, Transmitting

Amperex Electronic Corp., Hicksville, N.Y.
Elctrn. Enterprises, Newark, N.J. p 1996
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
Penta Labs., Santa Barbara, Cal.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Wagner Elec. Corp., Livingston, N.J.
Watkins Johnson Co., Palo Alto, Cal.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Apollo Corp., Shinagawa-Ku, Tokyo, Japan
Calvert Elctrns., Inc., New York, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
Corvair Elctrns, New York, N.Y.
DuMont Electron Tubes, Clifton, N.J.
Dutrex Inds., Inc., New York, N.Y.
Eimac, San Carlos, Calif.
General Elctrns., Inc., Newark, N.J.
Heintz & Kaufman, Ltd., Culver City, Calif.
Hughes Aircraft Co, Culver City, Cal.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
JSH Elctrns, Inc., Culver City, Calif.
Litton Inds., San Carlos, Calif.
LM Ericsson, New York, N Y
Machlett Labs., Inc., Stamford, Conn.
Microwave Assocs., Inc., Burlington, Mass.
Mullard, Inc., Farmingdale, N.Y.
RCA Corp., Camden, N.J.
Siemens Corp., Comps. Div., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
State Labs, Inc., New York, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Thor Elctrns. Corp., Elizabeth, N.J.
Torr Labs., Los Angeles, Cal.
United Elctrns. Co., Newark, N.J.
Varian Assocs., Palo Alto, Cal.
Varian Assocs., Beverly, Mass.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Varian Assocs., Travel Wave Tube, Palo Alto, Cal.
Westinghouse Elec., Elmira, N.Y.

Tubes, Traveling Wave Amp.

Amperex Electronic Corp., Hicksville, N.Y.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
RCA Elctrns. Comps., Harrison, N.J.
United-Page, Patterson, N.J.
Watkins Johnson Co., Palo Alto, Cal.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
Hughes Aircraft Co., Torrance, Cal.
Int'l. Elctrns., Melville, N.Y.
ITT Electron Tube, Easton, Pa.
Litton Inds., San Carlos, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Mullard, Inc., Farmingdale, N.Y.
Raytheon Co., Waltham, Mass.
Siemens Corp., Comps. Div., Iselin, N.J.
Sperry Elctrn. Tube, Gainesville, Fla.
Teledyne MEC, Palo Alto, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Thomson-CSF Inc., New York, N.Y.
Tripp Research Corp., Redwood City, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Varian Assocs., Travel Wave Tube, Palo Alto, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.

Tubes, Ultraviolet

Amersil, Inc., Hillside, N.J.
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
United-Page, Patterson, N.J.
Abtronics, Inc., Livermore, Calif.
American Ultraviolet Co., Chatham, N.J.
Amperex Elctrn., Slatersville, R.I.
Atlantic Ultraviolet Corp., Long Island City, N.Y.
Black Light Corp. Amer., San Gabriel, Cal.
Black Light Eastern, Westbury, N.Y.
Cetron Elctrn. Corp., Geneva, Ill.
Dell Optics Co., Inc., N. Bergen, N.J.
Dutrex Inds., Inc., New York, N.Y.
EMR Div., Princeton, N.J.
Gencom Div., Plainview, N.Y.
GTE Sylvania Inc., Danvers, Mass.
Honeywell, Apparatus Controls, Mpls., Minn.
Int'l. Elctrns., Melville, N.Y.
International Light, Newburyport, Mass.
Kemlite Labs., Inc., Chicago, Ill.
Mullard, Inc., Farmingdale, N.Y.
Shannon Luminous Mat'ls., Hollywood, Cal.
Siemens Corp., Comps. Div., Iselin, N.J.
Ultra-Violet Prods., Inc., San Gabriel, Cal.
Westinghouse Elec., Elmira, N.Y.
Xenon Corp., Medford, Mass.

Tubes, Vidicon—See Tubes, TV Camera Pickup

Tubes, Voltage Reference Or Regulating

Amperex Electronic Corp., Hicksville, N.Y.
General Elec. Co., Schenectady, N.Y. p 1997
Int'l. Elctrns., Melville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
Nippon Electric/NEC America, N.Y., N.Y.
Raytheon Co., Quincy, Mass.
RCA Elctrns. Comps., Harrison, N.J.
Signalite, Neptune, N.J.
United-Page, Patterson, N.J.
Victoreen Instr., Cleveland, Ohio
Wagner Elec. Corp., Livingston, N.J.
Aeg-Telefunken Corp., Englewood Cliffs, N.J.
Amperex Elctrn., Slatersville, R.I.
Calvert Elctrns., Inc., New York, N.Y.
Corvair Elctrns, New York, N.Y.
Dutrex Inds., Inc., New York, N.Y.
Ferranti Ltd., Hollinwood, Lancs., England
General Lab. Assocs., Norwich, N.Y.
Heintz & Kaufman, Ltd., Culver City, Calif.
Int'l. Elctrns., Melville, N.Y.
Mullard, Inc., Farmingdale, N.Y.
Nat'l. Union Elec. Corp., Bloomington, Ill.
Siemens Corp., Comps. Div., Iselin, N.J.
Thor Elctrns. Corp., Elizabeth, N.J.
Varian Assocs., Beverly, Mass.
Westinghouse Elec., Elmira, N.Y.

Tubes, X-Ray

Amperex Electronic Corp., Hicksville, N.Y.
Metropolitan Supply Corp., New York, N.Y. .... p 2000
United-Page, Patterson, N.J.
Abtronics, Inc., Livermore, Calif.
Eureka X-Ray Tube Corp., Chicago, Ill.
Ferranti Ltd., Hollinwood, Lancs., England
Gencom Div., Plainview, N.Y.
Machlett Labs., Inc., Stamford, Conn.
Mullard, Inc., Farmingdale, N.Y.
Siemens Corp., Comps. Div., Iselin, N.J.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.
Varian Assocs.Electron Tube & Device Grp., Palo Alto, Cal.
Warnecke Electron Tubes, Inc., Des Plaines, Ill.

Tubing, Aluminum—See Vol 3

Tubing, Asbestos—See Vol 3

Tubing, Brass—See Vol 3

Tubing, Ceramic—See Vol 3

Tubing, Columbium—See Vol 3

Tubing, Copper—See Vol 3

Tubing, Fabric-Also See Tubing, Spaghetti—See Vol 3

Tubing, Fiber—See Vol 3

Tubing, Fluorocarbon, Flexible—See Vol 3

Tubing, Fused Quartz—See Vol 3

Tubing, Glass Fiber Insulation—See Vol 3

Tubing, Glass, Precision—See Vol 3

Tubing, Heat Shrinkable-Also See Caps, Forms & Tapes, Heat Shrinkable—See Vol 3

Tubing, Magnesium—See Vol 3

Tubing, Metal—See Tubing, Brass; Tubing, Copper, etc.—Vol 3

Tubing, Metal Alloy—See Vol 3

Tubing, Metal Hose, Flexible—See Vol 3

Tubing, Mica—See Vol 3

Tubing, Molybdenum—See Vol 3

Tubing, Monel—See Vol 3

Tubing, Mylar—See Vol 3

Tubing, Nickel—See Vol 3

Tubing, Nylon-Also See Tubing, Spaghetti—See Vol 3

Tubing, Paper—See Vol 3

Tubing, Phenolic—See Vol 3

Tubing, Plastic-Also See Tubing, Spaghetti—See Vol 3

Tubing, Platinum—See Vol 3

Tubing, Porcelain—See Vol 3

Tubing, Precious Metal—See Vol 3

Tubing, Refractory Metal—See Vol 3

Tubing, Rubber, Natural & Synthetic—See Vol 3

Tubing, Shrinkable—See Tubing, Heat Shrinkable—Vol 3

Tubing, Spaghetti—See Vol 3

Tubing, Spiral Wrap—See Vol 3

Tubing, Tantalum—See Vol 3

Tubing, TFE-Also See Tubing, Spaghetti—See Vol 3

Tubing, Titanium—See Vol 3

Tubing, Tungsten—See Vol 3

Tubing, Varnished Cambric Insulation-Also See Tubing, Spaghetti—See Vol 3

Tubing, Waveguide

Engelhard Minerals & Chem., Murray Hill, N.J.
Uniform Tubes, Collegeville, Pa.
Waveline, Inc., W. Caldwell, N.J. p 1567
Airtec, Inc., Roselle, N.J.
Aluminum Co. America, Pittsburgh, Pa.
American Radar Comps., Inc., Denville, N.J.
Anaconda American Brass Co., Waterbury, Conn.
Chase Metal Service Div., Cleveland, Ohio
Co-Operative Inds., Inc., Chester, N.J.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Icore Electro-Plastics, Inc., Santa Clara, Cal.
Icore, Inc., Santa Clara, Cal.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave, Port Chester, N.Y.
Revere Copper & Brass, Inc., New York, N.Y.
Superior Tube Co., Norristown, Pa.
Systron-Donner Microwave Div., Van Nuys, Cal.

Tubing, Zipper—See Vol 3

Tuners, Microwave—See Vol 1

Tuners, TV & FM—See Vol 1

Tuning Forks—See Vol 1

Turntables, Recording & Transcription—See Vol 1

Tweezers, Hand & Vacuum—See Vol 3

Twisters, Wire—See Wire Twisters—Vol 3

Twists, Waveguide—See Bends & Twists, Microwave—Vol 1

Typewriters, Input-Output (All Types)—See Vol 1

Ultrasonic Bonding Machines—See Machines, Ultrasonic Bonding—Vol 1

Ultrasonic Cleaners—See Cleaners, Ultrasonic—Vol 1

Ultrasonic Equip.—See Amplifiers; Analyzers; Controls, Indicators; Soldering Equip., etc.—Vol 1

Ultrasonic Guns—See Vol 1

Ultraviolet Inspection Lighting-Also See Microscopes, Ultraviolet—See Vol 1

Ultraviolet Spectrophotometers—See Spectrophotometers—Vol 1

Underwater Communication, Detection, Navigation, etc. Equipment—See Vol 1

Urea Formaldehyde—See Plastic Raw Materials—Vol 3

Vacuum Equip., Deposition—See Depositiion Equip., Vacuum—Vol 1

Vacuum Fluorescent Readout Tubes—See Tubes, Readout

Vacuum Indicators—See Indicators, Vacuum—Vol 1

Vacuum Parts-Handling Tools—See Tools, Parts-Handling, Vacuum Operated—Vol 3

Vacuum-Tube Voltmeters—See Meters, Vacuum-Tube Volt—Vol 1

Valves, Cryogenic—See Vol 1

Valves, Epitaxial Reactor—See Vol 1

Valves, Nonmetallic—See Vol 3

Valves, Servo

Automation Dev., Culver City, Cal. p 1310
Adel Div., Burbank, Calif.
Bendix, Utica, N.Y.
Consolidated Controls Corp., El Segundo, Calif.
Glar-Ban Corp., Buffalo, N.Y.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
LTV Electrosystems, Dallas, Tex.
Moog, Inc., East Aurora, N.Y.
O'Brien, D. G., Inc., Framingham, Mass.
Sanders Assocs., Inc., Manchester, N.H.
Servotronics, Inc., Buffalo, N.Y.
Standard-Thomson Corp., Waltham, Mass.

Valves, Solenoid

Adel Div., Burbank, Calif.
Aeronautical Div, Bryan, Ohio
Atkomatic Valve Co., Indianapolis, Ind.
Automatic Switch Co., Florham Park, N.J.
Bendix, Utica, N.Y.
Circle Seal Corp., Anaheim, Cal.
Consolidated Controls Corp., El Segundo, Calif.
Dynamic Controls Corp., S. Windsor, Conn.
Edwards High Vacuum, Grand Island, N.Y.
Fluorocarbon Co., Anaheim, Cal.
Fox Valve Dev. Co., Inc., Hanover, N.J.
Foxboro Co., Foxboro, Mass.
Hartman Sys. Div. A-T-O, Inc., Huntington Sta., N.Y.
Honeywell, Apparatus Controls, Mpls., Minn.
Honeywell, Residential Div., Mpls., Minn.
Hydro-Aire Div., Burbank, Calif.
IMC Magnetics Corp., Tempe, Ariz.
Johnson Corp., Three Rivers, Mich.
Koontz-Wagner Elec., South Bend, Ind.
Laketown Mfg. Corp., Waconia, Minn.
Magnetec Corp., Van Nuys, Calif.
Marotta Sci. Controls, Inc., Boonton, N.J.
Scanivalve, Inc., San Diego, Calif.
Skinner Elec. Valve Div., New Britain, Conn.
Square D Co., Park Ridge, Ill.
Taylor Instr. Process Control Div., Rochester, N.Y.
Taylor-Winfield Corp., Warren, Ohio
U.O.P. Instrs. Div., Greenwich, Conn.
Vactronic Lab. Equip., Inc., E. Northport, N.Y.
Valcor Engrg. Corp., Kenilworth, N.J.
Veeco Instrs., Inc., Plainview, N.Y.
Weston Hydraulics, Div., Van Nuys, Calif.
Wright Comps., Inc., Clifton Springs, N.Y.

Valves, Vacuum—See Vol 1

Vapor Cooling Systems, Vacuum Tube

Astro Dynamics, Inc., Burlington, Mass.
Eimac, San Carlos, Calif.
Torr Labs., Los Angeles, Cal.
Varian Assocs., Palo Alto, Cal.

Vapor Degreasers—See Machines, Vapor-Degreasing —Vol 1

Varactors—See Diodes, Varactor

Varistors—See Resistors, Voltage Sensitive—Vol 3

Varnish—See Insulating Compounds, Varnish—Vol 3

Vehicle Guidance Systems (Industrial)—See Machines, Material Handling (Electronic Control)—Vol 1

Verification Systems, Tape—See Vol 1

VHF Equipment—See Generators; Receivers; etc.—Vol 1

Vibration Analyzers—See Analyzers, Vibration—Vol 1

Vibration Measurement Instruments—See Meters, Vibration—Vol 1

Vibration Mounts—See Mounts, Shock & Vibration—Vol 3

Vibration Test Systems-Also See Services, Environmental Test—See Vol 1

Vibrating Capacitors

Stevens-Arnold, Inc., So. Boston, Mass. p 2007
Tel-Instr. Elctrns. Corp., Carlstadt, N.J.

Vibrators (Frequency Converting)

ATR Elctrns., Inc., St. Paul, Minn. p 652
Oak Mfg., Crystal Lake, Ill.
Channel Inds., Santa Barbara, Cal.
Cleveland Vibrator Co., Cleveland, Ohio
Cornell-Dubilier Elctrns., Newark, N.J.
Mallory Timers, Indpls., Ind.
Terado Corp., St. Paul, Minn.
Vokar Prods., Inc., Ann Arbor, Mich.

Video Analyzers—See Analyzers, Video—Vol 1

Vidicon Tubes—See Tubes, TV Camera Pickup

Viewing Hoods, Cathode Ray Tube—See Vol 3

Vinyl Compounds—See Plastic Raw Materials—Vol 3

Viscosity Indicators—See Indicators, Viscosity

Visual Control Boards, Charts & Graphs—See Boards, Graphic,Visual Control—Vol 1

VLF Equipment—See Receivers; Transmitters; etc. —Vol 1

Voltage Comparators—See Comparators, Voltage—Vol 1

Voltage Regulators—See Regulators & Stabilizers, Voltage—Vol 1

Voltage Source—See Vol 1

Voltmeters—See Meters, Volt —Vol 1

Wafer Fabrication, Semiconductor—See Semiconductor Wafer Fabrication

Washers—See Fasteners—Vol 3

Water Coils, Tube Cooling

Lapp Insulator Div., Interpace Corp., LeRoy, N.Y.
Sentry Equip. Corp., Oconomowoc, Wisc.
Wakefield Engrg., Inc., Wakefield, Mass.

Wave Soldering Equipment—See Soldering Equip, Printed Circuit—Vol 3

Waveform Analyzers—See Analyzers, Waveform—Vol 1

Waveguide-Coax Adapters

Arra Inc., Bayshore, N.Y.
Bendix, Franklin, Ind.
E & M Labs., Westlake Village, Cal.
Hewlett-Packard, Palo Alto, Cal.
R L C Elctrns., Inc., Mt. Kisco, N.Y.
Waveline, Inc., W. Caldwell, N.J.
Ainslie Corp., S. Braintree, Mass.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Americon Corp., Waltham, Mass.
Andrew Corp., Orland Pk., Ill.
Astrolab Inc., Linden, N J
Cardwell Condenser, Lindenhurst, N.Y.
CES Elctrns., Brooklyn, N.Y.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
General Microwave Corp., Farmingdale, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Industrial Microwave, Scotch Plains, N.J.
Kevlin Mfg. Co., Woburn, Mass.
Kings Elctrns., Tuckahoe, N.Y.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Meca Elctrns., Inc., Denville, N.J.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Microwave Filter Co., Inc., East Syracuse, N.Y.
Microwave Labs. America, Brooklyn, N.Y.
N-H Microwave, Inc., Red Bank, N.J.
Narda Microwave Corp., Plainview, N.Y.
Nurad, Inc., Baltimore, Md.
Omega Labs., Inc., Rowley, Mass.
OMNI Spectra, Farmington, Mich.
Pabst Engineering Equipment Co., Inc., Elizabeth, N.J.
Pem Mach. Tool Co., Inc., Cranford, N.J.
Phelps Dodge Comm., North Haven, Conn.
PRD Elctrns., Inc., Westbury, N.Y.
Premier Microwave, Port Chester, N.Y.
Prodelin, Inc., Hightstown, N.J.
Reeve Elctrns., Inc., Chicago, Ill.
RF Systems, Inc., Cohasset, Mass.
Sage Labs. Inc., Natick, Mass.
Schutter Microwave, Lindenhurst, N.Y.
Scientific-Atlanta, Inc., Atlanta, Ga.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
Tru-Connector Corp., Peabody, Mass.
Victor Microwave, Inc., Wakefield, Mass.

Waveguides, Circular

Ainslie Corp., S. Braintree, Mass.
Aircom, Inc., Union, N.H.
Andrew Corp., Orland Pk., Ill.
Co-Operative Inds., Inc., Chester, N.J.
Connolly & Co., Inc., Mt. View, Calif.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Gabriel Elctrns. Corp., Saco, Me.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Schutter Microwave, Lindenhurst, N.Y.
Servometer Corp., Clifton, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.

Waveguides, Flexible

Waveline, Inc., W. Caldwell, N.J. p 1567
Ainslie Corp., S. Braintree, Mass.
Airtec, Inc., Roselle, N.J.
Andrew Corp., Orland Pk., Ill.
Cardwell Condenser, Lindenhurst, N.Y.
Co-Operative Inds., Inc., Chester, N.J.
Elctrn. Specialty, Thomaston, Conn.
Gabriel Elctrns. Corp., Saco, Me.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Hughes Aircraft Co, Fullerton, Cal.
Lieco, Inc., Lindenhurst, N.Y.
Pem Mach. Tool Co., Inc., Cranford, N.J.
Premier Microwave, Port Chester, N.Y.
Prodelin, Inc., Hightstown, N.J.
RF Systems, Inc., Cohasset, Mass.
Schutter Microwave, Lindenhurst, N.Y.
Servometer Corp., Clifton, N.J.
Surface Conduction, Inc., New York, N.Y.

Waveguides, Rectangular

Ainslie Corp., S. Braintree, Mass.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Andrew Corp., Orland Pk., Ill.
Connolly & Co., Inc., Mt. View, Calif.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Ferranti Ltd., Hollinwood, Lancs., England
Gabriel Elctrns. Corp., Saco, Me.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Industrial Microwave, Scotch Plains, N.J.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
Schutter Microwave, Lindenhurst, N.Y.
Servometer Corp., Clifton, N.J.
Systron-Donner Microwave Div., Van Nuys, Cal.
Thomson-CSF Electron Tubes, N.Y., N.Y.
Varian Assoc., Beverly, Mass

Waveguides, Rigid

Amphenol RF Div., Danburry, Conn.
Arra Inc., Bayshore, N.Y.
Uniform Tubes, Collegeville, Pa.
Waveline, Inc., W. Caldwell, N.J. p 1567
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Andrew Corp., Orland Pk., Ill.
Astrolab Inc., Linden, N J
Cardwell Condenser, Lindenhurst, N.Y.
Chemalloy Elctrns., Santee, Cal.
Connolly & Co., Inc., Mt. View, Calif.
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Ferranti Ltd., Hollinwood, Lancs., England
Gabriel Elctrns. Corp., Saco, Me.
GAF Corp., New York, N.Y.
Granite State Machine Co., Inc., Manchester, N.H.
GTE Lenkurt Inc., San Carlos, Calif.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Hughes-Treitler Mfg. Corp., Garden City, N.Y.
Industrial Microwave, Scotch Plains, N.J.
Laminair, Inc., Los Angeles, Calif.
Lieco, Inc., Lindenhurst, N.Y.
Maury Microwave Corp., Cucamonga, Calif.
MCS Corp., Monrovia, Calif.
Microlab/FXR, Livingston, N.J.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
Narda Microwave Corp., Plainview, N.Y.
Omega Labs., Inc., Rowley, Mass.
Pabst Engineering Equipment Co., Inc., Elizabeth, N.J.
Pem Mach. Tool Co., Inc., Cranford, N.J.
Premier Microwave, Port Chester, N.Y.
Prodelin, Inc., Hightstown, N.J.
RF Systems, Inc., Cohasset, Mass.
Schutter Microwave, Lindenhurst, N.Y.
Servometer Corp., Clifton, N.J.
Struthers Elctrns. Corp., Mamaroneck, N.Y.
Surface Conduction, Inc., New York, N.Y.
Systron-Donner Microwave Div., Van Nuys, Cal.
TACO Div., Sherburne, N.Y.
Thomson-CSF Electron Tubes, N.Y., N.Y.
TRG Prods., E. Boston, Mass.
Victor Microwave, Inc., Wakefield, Mass.

Wave Traps—See Filters, Antenna; Filters, Microwave; etc.

Wax—See Insulating Compounds, Wax—Vol 3

Weatherstrip, Electronic—See Vol 3

Welding Equip. & Access.-Also See Controls, Welding; Timers,Welding—See Vol 1

Welding Equip., Semiconductor Devices—See Vol 1

Welding & Refining Equip., Electron Beam—See Vol 1

Whip Antennas—See Antennas, Mobile—Vol 1

Whiteprint Machines—See Vol 3

Wind Direction Indicators—See Indicators, Wind Direction—Vol 1

Wind Speed Indicators—See Indicators, Wind Speed—Vol 1

Windings, Transformer—See Vol 3

Windows, Infrared—See Vol 1

Windows, Pressure Type—See Vol 1

Windows, Shieled—See Vol 3

Windows, Waveguide

American Elctrn. Labs., Inc., Lansdale, Pa.
Severna Operation, East Orange, N.J.
Ainslie Corp., S. Braintree, Mass.
Aircom, Inc., Union, N.H.
Airtec, Inc., Roselle, N.J.
Alberox Corp., New Bedford, Mass.
Ceramaseal, Inc., New Lebanon Center, N.Y.
Dell Optics Co., Inc., N. Bergen, N.J.
Filmohm Div., Long Island City, N.Y.
Guide Inds., Inc., Sun Valley, Calif.
Herley Inds., Inc., Syosset, N.Y.
Hughes Aircraft Co, Culver City, Cal.
Jones, A.D. Optical Works, Burlington, Mass.
Latronics Corp., Latrobe, Pa.
Microwave Assocs., Inc., Burlington, Mass.
Microwave Development Labs., Inc., Needham Hgts., Mass.
O & S Research, Inc., Riverton, N.J.
Pacific Universal Prods. Corp., Pasadena, Calif.
Premier Microwave, Port Chester, N.Y.
RF Systems, Inc., Cohasset, Mass.
Richland Glass Co., Inc., Richland, N.J.
Rogers Corp., Rogers, Conn.
Systron-Donner Microwave Div., Van Nuys, Cal.
3M Co., St. Paul, Minn.
Varian Assocs., Palo Alto, Cal.

Wire, Antenna (All Types)—See Vol 3

Wire, Asbestos Insulated—See Vol 3

Wire, Bare, Aluminum—See Vol 3

Wire, Bare, Beryllium Copper—See Vol 3

Wire, Bare, Brass—See Vol 3

Wire, Bare, Columbium—See Vol 3

Wire, Bare, Composite Metals—See Vol 3

Wire, Bare, Copper—See Vol 3

Wire, Bare, Copper-Clad—See Vol 3

Wire, Bare, Fine, Specialties—See Vol 3

Wire, Bare, Gold & Gold-Plated—See Vol 3

Wire, Bare, Molybdenum—See Vol 3

Wire, Bare, Nickel—See Vol 3

Wire, Bare, Nickel-Chrome—See Vol 3

Wire, Bare, Nickel-Clad Copper—See Vol 3

Wire, Bare, Phosphor Bronze—See Vol 3

Wire, Bare, Platinum—See Vol 3

Wire, Bare, Silver-Plated—See Vol 3

Wire, Bare, Stainless-Steel—See Vol 3

Wire, Bare, Steel (Excluding Guy Wire)—See Vol 3

Wire, Bare, Tantalum—See Vol 3

Wire, Bare, Titanium—See Vol 3

Wire, Bare, Tungsten—See Vol 3

Wire, Bare, Zirconium—See Vol 3

Wire, Braid (Excluding Shielding)—See Vol 3

Wire, Braid (Shielding)—See Braid, Cable & Wire Shielding—Vol 3

Wire, Bridge—See Vol 3

Wire, Ceramic Insulated—See Vol 3

Wire, Enamel Insulated—See Wire, Hookup, Pushback (All Types)—Vol 3

Wire, Fiberglass Insulated—See Wire, Glass Insulated—Vol 3

Wire, Fine, Bare Or Insulated—See Wire, Bare, Fine, Specialties—Vol 3

Wire, Flat Strip—See Cable, Flat—Vol 3

Wire, Floor, Insulated—See Vol 3

Wire, Fuse—See Vol 3

Wire, Gear Measuring—See Gear Measuring Wire—Vol 3

Wire, Glass Insulated—See Vol 3

Wire, Guy—See Vol 3

Wire, Heater—See Cable, Heater—Vol 3

Wire, High Temperature—See Vol 3

Wire, High Voltage—See Vol 3

Wire, Hookup-Pushback (All Types)—See Vol 3

Wire, Irradiated—See Vol 3

Wire, Lead-In & Ground—See Vol 3

Wire, Litz—See Vol 3

Wire, Magnet—See Vol 3

Wire, Mesh—See Vol 3

Wire, Multiconductor—See Cable, Multiconductor—Vol 3

Wire, Plastic Insulated—See Wire, Hookup-Pushback—Vol 3

Wire, Potentiometer Winding—See Vol 3

Wire, Radiation-Resistant—See Vol 3

Wire, Recording—See Vol 3

Wire, Refractory Metal—See Vol 3

Wire, Resistance & Filament—See Vol 3

Wire, Resistance Thermometer—See Vol 3

Wire, Resistor Winding—See Vol 3

Wire, Ribbon—See Vol 3

Wire, Semiconductor Lead—See Vol 3

Wire, Shielded—See Vol 3

Wire, Strain Gauge—See Vol 3

Wire, TFE Insulated—See Vol 3

Wire, Test Lead—See Vol 3

Wire, Thermocouple—See Vol 3

Wire, Tinsel—See Vol 3

Wire, Transmission—See Cable, Transmission Line—Vol 3

Wire, Tungsten—See Vol 3

Wire & Cable Ties—See Vol 3

Wire Cutters, Automatic—See Vol 1

Wire Cutters, Hand Operated—See Vol 3

Wire Cutting & Stripping Services—See Services, Wire Cutting & Stripping—Vol 3

Wire Forms—See Forms, Wire—Vol 3

Wire Markers (All Types)-Also See Strips, Marker & Fanning—See Vol 3

Wire-Marking Machines, Automatic—See Vol 1

Wire-Marking Machines, Hand Operated—See Vol 1

Wire Measuring & Cutting Machines—See Vol 1

Wire-Measuring Gauges—See Vol 3

Wire Shielding—See Vol 3

Wire Strippers, Automatic—See Vol 1

Wire Strippers, Hand Operated—See Vol 3

Wire Strippers, Thermal—See Vol 3

Wire Stripping Chemicals—See Chemicals, Wire Stripping—Vol 3

Wire Twisters, Automatic—See Vol 1

Wire Twisters, Hand Operated—See Vol 3

Wire Wrapping Services—See Services, Wire Wrapping—Vol 3

Wire Wrapping Tools & Accessories-Also See Machines, Wire Wrapping—See Vol 3

Wiring Panels & Boards, Computer—See Boards, Programming—Vol 1

Work Positioners, Circuit Board & Chassis—See Holders & Jigs—Vol 3

Work Stations, Clean, Dust Free—See Vol 1

Wrenches—See Vol 3

X-Ray Inspection Equipment—See Vol 1

X-Ray Intensity Meters—See Meters, X-Ray Intensity—Vol 1

X-Y Axis Tables—See Simulators, Motion—Vol 1

Xenon Lamp Power Supplies—See Power Supplies, ARC Lamp—Vol 1

YIG Crystals—See Crystals, YIG—Vol 1

Yokes, Deflection, Oscilloscope—See Vol 3

Yokes, Deflection, Radar PPI—See Vol 3

Yokes, Deflection, Cathode-Ray Tube—See Vol 3

Yokes, Deflection, TV Camera—See Vol 3

Yokes, Rotating Coil—See Vol 3

Zener Diodes—See Diodes, Zener

Zipper Tubing—See Tubing, Zipper—Vol 3

Zone Boxes, Thermocouple—See Thermocouples, Elements & Acessories

This is the Last Page of the Product Index/Directory — Volume 2.

Next page is 301

1971-72 eem

55
PRODUCT SECTIONS
IN 3
VOLUMES

TEST INSTRUMENTS EQUIPMENT & SYSTEMS	Vol. 1
ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES	Vol. 2
PASSIVE COMPONENTS MATERIALS / HARDWARE	Vol. 3

eem — Electronic Engineers Master saves you engineering, specifying and purchasing time. Manufacturers' catalogs are grouped under easy-to-remember headings.

The 55 Product Sections categorize related electronics components, equipment, materials, instruments and systems, and fabrication services, enabling you to quickly compare and evaluate similar items.

To find a specific manufacturer's catalog pages refer to the Index of Manufacturers which precedes each Catalog Section (white pages).

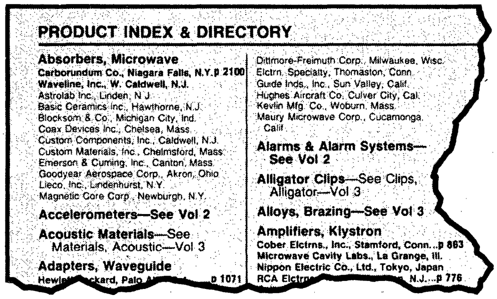
These are the 55 eem Product Sections grouped in 3 volumes

Volume Number	Product Section	Page Number	Products
2	1100	1278	Amplifiers, Audio, Operational, etc.
1	1200	307	Antennas & Accessories
1	1300	308	Audio Equipment & Accessories
3	1400	2314	Cabinets, Chassis, Containers, Racks, Boxes, etc.
3	1500	2330	Capacitors (All Types)
3	1600	2478	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
2	1700	1296	Circuit Assemblies, Circuit Boards & Breadboarding Kits
3	1800	2481	Coils (Inductors, Chokes), Assemblies, Forms
1	1900	322	Communications Equipment (Facsimile, Telephone, Television)
1	2000	328	Computing, Data Handling Equipment & Accessories
3	2100	2510	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2	2200	1304	Controls, Control Components & Systems
2	2300	1353	Crystals & Mechanical Tuning Devices; Oscillators
3	2350	2728	Delay Lines (All Types)
2	2400	1435	Panel Components (Including Lighting & Readouts)
3	2500	2754	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
1	2550	388	Environmental Test Equipment
3	2600	2776	Fans, Blowers & Cooling Equipment
2	2700	1506	Filters
3	2800	2809	Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
1	2900	391	Instruments, Measuring & Test
1	3000	587	Instruments, Graphic Recording
3	3100	2810	Insulators, Insulating Materials & Parts
2	3130	1535	Integrated Circuits & Hybrid Microcircuits
3	3150	2814	Manufacturing, Subcontracting, Custom Fabrication
3	3200	2816	Materials, Raw (Metals, Plastics, Glass, Rubber, Cloth, etc.)
1	3300		Medical Electronic Equipment
1	3400	598	Microwave, Laser & Radar (Systems & Subsystems)
2	3450	1552	Microwave, Laser & Radar (Components/Accessories)
2	3500	1572	Motors, Rotating Components & Accessories
1	3600		Nuclear & Radiation Equipment
2	3700	1636	Photoelectric Equipment & Components
2	3800	1641	Optical Equipment & Accessories
1	4000	616	Power Supplies, Converters, Inverters, Batteries, etc.
1	4100	947	Production Machinery & Automation Equipment
3	4200		Engineering Aids (Books, Drafting Equipment, Whiteprinters)
1	4300	950	Recording Equipment (Non-Audio Types)
2	4500	1645	Relays
3	4600		Research, Development, Engineering Services
3	4700	2818	Resistors, Fixed
3	4750	2902	Resistors, Variable (Potentiometers & Rheostats)
2	4800	1794	Semiconductors & Devices, Rectifiers (Non-Tube Types)
2	4900	1865	Servomechanisms & Components
1	5000	951	Studio Equipment
2	5100	1877	Switches, Circuit Breakers, Fuses, Protective Devices
1	5200	953	Telemetering Equipment
2	5300	1963	Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.
3	5400	2933	Tools (Hand & Power); Soldering Supplies
2	5500	1985	Transducers & Associated Equipment
3	5600	2948	Transformers
2	5700	1995	Tubes, Tube Parts, Shields, Inserts, etc.
1	5800		Ultrasonic, Sonic, Subsonic Equipment
1	5850		Vacuum Equipment & Accessories
2	5900	2006	Vibrators, Choppers, etc.
3	6000	2994	Wire, Cable, Harnesses & Accessories

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y. p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N.J.
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass.
Emerson & Cuming, Inc., Canton, Mass.
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.

Accelerometers—See Vol 2

Acoustic Materials—See Materials, Acoustic—Vol 3

Adapters, Waveguide
Hewl ckard, Palo p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.

Alarms & Alarm Systems— See Vol 2

Alligator Clips—See Clips, Alligator—Vol 3

Alloys, Brazing—See Vol 3

Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. ..p 863
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctrn N.J. ...p 776

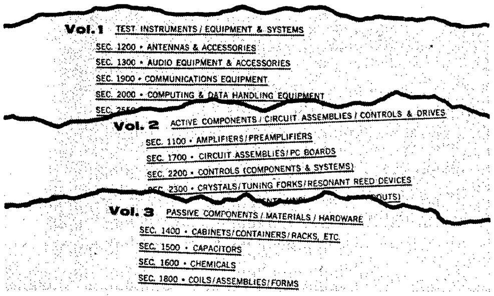
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT

Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES

Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

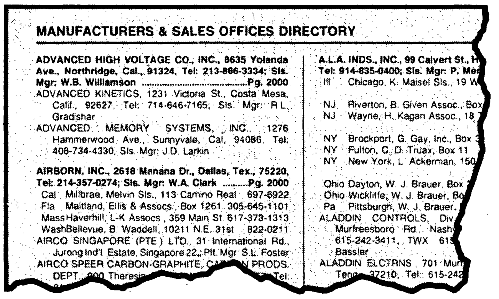
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal, 94086, Tel: 408-734-4330, Sls. Mgr: J.D. Larkin

AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs, 359 Main St. 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE) LTD., 31 International Rd., Jurong Ind'l Estate, Singapore 22,; Plt. Mgr S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C N PRODS. DEPT., 800 Theresia Tel:

A.L.A. INDS., INC., 99 Calvert St.,
Tel: 914-835-0400; Sls. Mgr: P. Me
Ill Chicago, K. Maisel Sls., 19 W

NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18

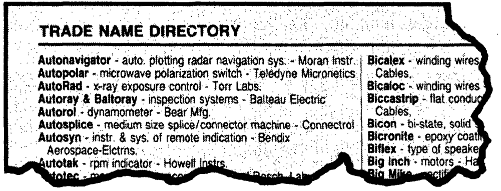
NY Brockport, G. Gay, Inc., Box
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150

Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer, Bo
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-3411, TWX 61 Bassler
ALADDIN ELCTRNS, 701 Mur Tenn 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires Cables,
Bicaloc - winding wires
Biccastrip - flat condu Cables,
Bicon - bi-state, solid
Bicronite - epoxy coati
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

eem
CATALOG SECTION

Volume 2

active components circuit assemblies controls and drives

This volume contains:

Section	Product	Starting Page
1100	Amplifiers (Audio, Operational, etc.)	1278
1700	Circuit Assemblies, Circuit Boards & Breadboarding Kits	1296
2200	Controls, Control Components & Systems	1304
2300	Crystals & Mechanical Tuning Devices; Oscillators	1353
2400	Panel Components (Including Lighting & Readouts)	1435
2700	Filters	1506
3130	Integrated Circuits & Hybrid Microcircuits	1535
3450	Microwave, Laser & Radar (Components/Accessories)	1552
3500	Motors, Rotating Components & Accessories	1572
3700	Photoelectric Equipment & Components	1636
3800	Optical Equipment & Accessories	1641
4500	Relays	1645
4800	Semiconductors & Devices; Rectifiers (Non-Tube Types)	1794
4900	Servomechanisms & Components	1865
5100	Switches, Circuit Breakers, Fuses, Protective Devices	1877
5300	Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.	1963
5500	Transducers & Associated Equipment	1985
5700	Tubes, Tube Parts, Shields, Inserts, etc.	1995
5900	Vibrators, Choppers, etc.	2006

eem consists of 3 volumes. The contents of Volumes 1 and 3 are shown at right.

Volume 1

test instruments equipment and systems

Pages 1-988

Power Supplies

Communications

Microwave Systems

Telemetering

Audio

Test, Measuring and Recording

Environmental Test

Production Machinery

Computing, Data Handling and Accessories

Volume 3

passive components materials/hardware

Pages 2009-3072

Capacitors
Delay Lines
Connectors
Transformers
Coils
Insulators
Hand Tools
Resistors, Fixed and Variable
Fans and Blowers
Materials and Chemicals
Wire, Cable and Accessories
Cabinets, Fabricated Parts and Hardware
Manufacturing Services

INDEX OF MANUFACTURERS' CATALOG PAGES

note: This same index appears in all three volumes of **eem**

eem
electronic engineers master
1971-72

Mfr. Page

A

Aaron-Davis 616
Abbott Transistor
  Labs 618-632, 2948, 2949
Accutronics Inc. 1353-1360
ACDC Electronics Inc. 634-639
Acopian Corp. 640, 641
AD Data Systems 328
ADC Products 2510-2515
Advanced High Voltage Co. 617
Aero Devices 2994
Aerovox Corp. 2330
AirBorn, Inc. 2517
Airflyte Electronics Co. 1580
Airpax Electronics 1308, 1877
A.L.A. Industries Inc. 1645
Alco Electronic Products, Inc.
  Knobs 1440
  Lamps 1439
  Readouts 1438
  Relays 1646
  Switches 1878-1880
  Terminal Strips 1646
Alford Manufacturing Co. 598
All-Tronics, Inc. 1506-1508
Allard Instrument Corp. 1435
Allen Avionics, Inc. 1510, 2729-2731
Allen-Bradley 1511, 1535, 2331, 2822, 2823, 2908, 2909
Allen Electronics 2481
Almond Instruments Co. 329
Alpha, Div. of Loral Corp. 2995
American Aerospace
  Controls 1304-1307
American Astrionics, Inc. 335
American Electronic Labs 1552
American Lava Corp., Sub. of 3M..2810
American Nucleonics Corp. 307
American Precision Industries,
  Delevan Div. 1585, 2490
American Technical
  Ceramics 2332, 2333
American Zettler,
  Inc. 1309, 1647-1653, 1882, 1883
Amersil Inc. 2816
Ametek/Lamb
  Electric 1572, 1573, 2776, 2777
Amglo Industries, Inc. 1641
AMP Inc., Capitron
  Div. 642, 643, 2338, 2518, 2519
  Syscom Div. 330, 331, 1881

Mfr. Page

Amperex Electronic Corp.
  Audio Equipment & Accessories ..308
  Capacitors 2334-2337
  Resistors 2818, 2819
  Tubes 1995
  Yokes 2482
Amphenol Corp.
  Bunker-Ramo ....Back Cover, Vol. 3
  Cadre Div. 2814
  Connector Div. 2560-2590
  Controls Div...1436, 1437, 2902-2907
  Industrial Div. 2538-2557
  R.F. Div. 1884-1887, 2520-2537
  Sams Div. 2558, 2559
  Switch Div. 1888
Anadex Instruments, Inc. 391-400
Analog Digital Data Systems 328
Andersen Labs., Inc. 2728
A.P. Circuit Corp. 1509
API Instruments,
  Sub. of LFE Corp. 402, 403
Applied Microwave Lab. Inc. 599
Applied Research Inc. 1554
Arco Electronics, Inc.,
  PFC Mfg. Div. 2339-2345
Arnold Engineering Co. 2754, 2755
Arnold Magnetics Corp. 644-651
ARRA Inc. (Antenna & Radome
  Research Assocs.) 1553
Art Wire & Stamping Co. 2815
Artronic Instrument Co. 2732
Arvee Engineering Co. 1278
Arvin Frequency Devices 1361
Arvin Magnetics 309
Ashland Electric
  Products 1574-1579, 2778-2781
Associated Research, Inc. 404, 405
Associated Testing Labs 388
Astro-Space Laboratories, Inc. 633
Astrodyne, Inc. 1794
Astrosystems Inc. 332-334, 406-409
Atec, Inc. 410, 411
Atomichron, Inc. 469
ATR Electronics, Inc. 652
Augat Inc. 1536
Austron Inc. 653
Automatic Coil 2483
Automatic Controls
  (see Cook Electric)
Automation Development Co. 1310
Autronics Corp. 1311
Avtel Corp. 654-659
AVX Aerovox 2330

Mfr. Page

B

Babcock Electronics Corp. 1654-1659
BAFCO, Inc. 412
Balco Electronics, Inc.
  Balco/Marstan 1296, 2346, 2347, 2820, 2821
Barnes Corp. 2591
Beau Products 2720, 2721
Beckman Instruments Inc.
  Cedar Grove Operations 414, 415
  Electronic Instruments Div. 413
Beede Electrical Instr. Co. 416, 417
Behlman Div.
  (see California Instruments)
Bel Fuse Inc. 2734-2738
Bell Inc., F.W. 418, 1985
Bendix Corp.
  Environmental Science Div. 336
  Microwave Devices 1555, 2597, 2756
Berg Electronics, Inc. 2592-2595
Beta Instrument Corp. 337
Betamite Electronic Devices 1660
Biddle Co., James G. 419
Bird Electronic Corp. 420, 421
Bissett-Berman Corp. 1314
Bivar, Inc. 2809
Bloc-Lite 1441
Bliley Electric Co. 1367-1372, 2733
Blue M Engineering 389
Bodine Electric Co. 1581
Bolt Beranek and Newman Inc. 587
Boonton Electronics Corp. 422, 423
Bowmar Instrument
  Corp. 1312, 1313, 1442, 1582
Bramco Controls Div.,
  Ledex Inc. 1406, 1523
Brush Div., Gould Inc. 588, 589
Buchanan Electrical Products
  Corp. 2598, 2599
Bulova Watch Co.
  American Time
    Products 660, 1366, 1642
  Frequency Control
    Products 1362-1365, 1512
  Servo Products 1865-1867
Bunker-Ramo/Amphenol
  (see Amphenol)
Burroughs 338
Burton-Rogers (Hoyt) 494, 495
Bussmann Mfg. Div.,
  McGraw-Edison 1890, 1891

Mfr. Page

C

C-Cor Electronics, Inc. 1280, 1281
C & K Components, Inc. 1892, 1893
Cabtron Corporation 2314
Caddell-Burns Mfg. Co. 2484, 2485
Caddock Electronics 2824-2828
Cal-R Inc. 1537, 1963, 2349-2351, 2830, 2831
Calif. Electronic Mfg. Co. 1315
California Instruments Corp.
  Behlman Div. 670, 671
  Calico Div. 424
  Elin Div. 671
Capitol Machine & Switch 1896
Carborundum
  Co. 1964-1967, 2832-2834
Carling Electric, Inc. 1897
Carter Mfg. Corp. 2912, 2913
Carter Semiconductor Inc. 1795
CEA, Div. of Berkleonics, Inc...672, 673
CELCO (Constantine
  Engineering Labs, Co.) 339
Centralab Electronics Div. of
  Globe-Union Inc. 1898, 2348, 2918
Centralab Semiconductor 1796-1798
Centron Engrg. 1299
Cherry Electrical Products Corp...1899
Chester Cable Operations,
  Cities Service Co. 2997
Chicago Dynamic Industries 1900
Chicago Lock Co. 1901
Chicago Miniature Lamp Works 1443
Chicago Switch, Inc. 1902
Christie Electric Corp. 674, 675
Chrono-log Corp. 340
Chronetics 425
Cimco Wire & Cable Co. 2996
Cinch-Graphik, Div. of TRW 1297
Cinch Mfg., Div. of TRW 2600-2609
Cinch-Nuline, Div. of TRW 2610
Circon Corp. 2937
Circuit Power Inc. 676, 677
Circuit-Stik Inc. 1298, 1299
Clairex Electronics, Inc. 1636, 1637
Clare & Co., C.P. 1662-1674
Clarke-Hess Communication
  Research Corp. 426
Clauss Cutlery Co. 2933-2936
CML MaCarr, Inc. 661-668
Coast Coil Co. 2487

UNITED TECHNICAL PUBLICATIONS
Division of Cox Broadcasting Corp.
645 Stewart Avenue, Garden City, New York 11530

SALES OFFICES: • **East** (516) 248-9700 • **Midwest** (312) 679-1100 • **West** (714) 558-0911

INDEX OF MANUFACTURERS' CATALOG PAGES

Mfr.	Page
Cober Electronics, Inc.	600, 601
Columbia Components Corp.	2742
Columbia Electronic Cables	2998-3005
Columbia Technical Corp., Humiseal Div.	2478, 2479
Comar Electric Co.	1676-1681
Component Research Co.	2352-2373
Computer Components Inc.	1661
Computer Devices Corp.	2739-2741
Computer Devices (of Calif.)	1583
Computer Instruments Corp.	2914, 2915
Computer Labs	342, 343, 1279
Computer Power Systems, Inc.	669
Computer Products	341
Concord Electronics Corp.	2611
Connector Corp.	2612, 2613
Connor-Winfield Corp.	1376, 1377
Consolidated Reactive Metals	3014
Consolidated Wire & Associated Corporations	3006-3013
Constantine Engineerings Labs. Co. (Celco)	339
Continental Conector Corp.	2614, 2615
Continental-Wirt Electronics (see CW Industries)	
Control Electronics Co.	2743
Control Technology Co.	1868, 1869
Co-Ord Switch	2617
Cook Electric	
Automatic Controls	1903
Lectrohm, Inc.	1760, 2854-2856
Corning Electronics	2374, 2375, 2836, 2837
Cosmicar Optical Co., Ltd.	1643
Coto-Coil Co.	1682, 1683
Couch Div., S.H., ESB Inc.	1675
Cox & Company, Inc.	1968
CPS (see Computer Power Systems)	
Croven Limited	1378
Crown International	951
CTS Corp.	1538, 1894, 2829, 2910, 2911
CTS Knights, Inc.	1373-1375
Cunningham Corp.	322
Curtis Instruments Inc.	427
CW Industries (Continental-Wirt)	1895

D

Mfr.	Page
Daburn Electronics & Cable Corp.	3032, 3033
Daco Instrument Co., Inc.	1444, 2783
Daico Industries, Inc.	1556
Dale Electronics, Inc.	
Coils, Chokes, Inductors	2488, 2489
Connectors	2618, 2619
Resistors	2838-2849
Packaged Networks	1539
Potentiometers	2916, 2917
Motors, Relays	1584
Surge Arrestors	1906
Damon Corp.	1379
Data-Control Systems, Inc.	345
Data Delay Devices	2744, 2745
Data Devices (see DDC)	
Data Graphics Corp.	346
Data Technology Corp.	429
Datacom, Inc.	344
Datak Corp.	1445
Datapulse (see Systron Donner)	
Datascan, Inc.	428
Datron Systems (see Electronic Specialty)	
DDC	347, 1282
Dearborn Wire & Cable Co.	3015-3031
Del Electronics Corp.	678-680, 2377
Delco Electronics	1800, 1801
Delevan	1585, 2490
Deltrol Controls	1692
Deltron Inc.	682-685

Mfr.	Page
Designatronics Inc.	
Automatic Coil	2483
United Products Co.	2508
Dialight Corp.	1446, 1447
Digital Equipment Corp.	348
Digitran Co.	1904, 1905
Digitron Corp.	349
Display Devices, Inc.	1450
Diversified Electronics	1684, 1685
Dixson Inc.	430, 431
Dohrmann, Div. of Envirotech Corp.	592-594, 1969
Douglas Electronics, Inc.	1300-1303
Douglas Randall, Div. Walter Kidde	1381, 1686, 1687
Dow Key	1688-1691
Drake Manufacturing Co.	1448, 1449
Dranetz Engineering Labs	433-438, 1870, 1871
Dressen-Barnes Electronics	686-690
Durant Digital Instruments	1316
Dynage Inc.	692-700
Dynamic Instrument Corp.	681, 1586
Dynarad Inc.	439
Dynamics Instrumentation (see Multitech)	
Dytro Corp.	440
Dytronics Co., Inc.	441

E

Mfr.	Page
E-H Research Labs	442-447
E & M Laboratories	1557
E-Z Hook Test Products	2621-2623
Eagle Signal, Div. of Gulf & Western	1317, 1693
Eastern Air Devices, Inc.	1588, 1589
Eby Co., Hugh H.	2620
Ectron Corp.	1283
Edsyn, Inc.	2938
EEMCO Div., of Datron Systems	1590, 1591
EAI	2381
EIP Inc.	448
Elco Corp.	2624, 2625
Elcor Products	701
Eldema	1452-1455
Eldorado Electrodata Corp.	449
Electro Cube, Inc.	2378, 2379, 2950
Electro/Data Inc.	1558, 1559
Electro Impulse, Inc.	450, 603, 2784
Electro-Mech	1907
Electro-Mechanical Instr. Co.	451
Electro-Mechanics Co.	452
Electro Motive Mfg. Co.	2380
Electro-Numerics Corp.	453
Electro Scientific Industries	454, 455, 2919
Electro Switch Corp.	1908
Electronic Applications Co.	1694-1696
Electronic Associates, Inc. (see EAI)	
Electronic Controls, Inc. (see T-Bar)	
Electronic Development Corp.	456, 457
Electronic Devices, Inc.	1802-1805
Electronic Enclosures	2315
Electronic Engineering Co. of Calif.	1909
Electronic Enterprises Inc.	1996
Electronic Hardware Corp.	1456
Electronic Instrument & Specialty Corp.	1706
Electronic Measurements Inc.	702
Electronic Molding Corp.	2626
Electronic Research Co.	458, 1384
Electronic Specialty Co.	1698-1705
Electrons Co.	1451
Electrospace Corp.	323

Mfr.	Page
Elexon Inc.	706
Elfab Corp.	2627
Elgar Corp.	703-705
Elgenco Inc.	460-465
Elin Div. (see California Instruments)	
Elmwood Sensors, Inc.	1970
Empro Manufacturing Co.	459
Engelhard Industries, H.A. Wilson	2817
Envirotech Corp. (see Dohrmann)	
Equipto Enclosure Systems	2316
ERA Transpac Corp.	707-709
Erie Frequency Control	1382, 1383
ESC Electronics Corp.	1513, 2747
ETC, Inc.	2628
Evans Corp., George	2785
Eveready (see Union Carbide)	
Exact Electronics, Inc.	466
Executone, Printact Relay Div.	1784

F

Mfr.	Page
F-Dyne Electronics Co.	2382, 2383
Fabricast, Inc.	1592, 1593
Fae Instrument Corp.	1587
Faratron Corp.	467, 711-713
Faria Meter Corp.	468
Fenwal Electronics, Inc.	1971
Ferrodyne Corp.	2951
Ferronics Inc.	2757
Ferrotran Electronics	715-717, 2954
Ferwalt, Inc., W.H.	1385
Flight Systems, Inc.	1707, 1910
Flite-Tronics Co., Inc.	714
Fluke Mfg. Co., John	470-479
Fork Standards, Inc.	718, 1387-1390
Formica Metal Products Co.	2317
Freed Transformer Co.	480-483, 2952, 2953
Frequency Control, Inc.	1386
Frequency Electronics, Inc.	469, 1391
Frequency Engineering Labs	604, 605
Frequency Sources Inc.	1560, 1561

G

Mfr.	Page
Gamble Industries, Charles T.	2852
Gates Electronics Co.	720, 721
GC Electronics	2629
General Electric Co.	
Batteries	719
Capacitors	2384, 2385
Indicating Lights	1462
Instruments, Measuring & Test	484, 485
Lamp Glass Dept.	2811
Miniature Lamp Dept.	1463
Motors	1595
Permanent Magnets	2758
Relays	1708, 1709
Semiconductors	1799
Soldering Irons	2939
Switches	1911
Terminal Boards	2630
Tubes, Microwave Devices	1997
General Electro-Mechanical Corp.	1594
General Illumination Inc.	1457-1461
General Instrument Corp.	2386, 2387
General Magnetics, Inc.	1318-1320

Mfr.	Page
General Resistance, Inc.	2850, 2851
General Time, Industrial Controls Div.	1321
Genisco Technology Corp.	
Eldema	1452-1455
RFI/EMI	1514, 1515
Geo Space Systems	350, 486, 608
Georator Corp.	722, 723
Geotech (see Teledyne Geotech)	
Gibbs Mfg. & Research	1395-1402
Accutronics Inc.	1353-1360
Glass Technology Div., Gulton	2632
Globe Industries, Div. of TRW	1598-1607, 2787
Gordos Corp.	1912-1914
Gorn Connector Div. (see Positronic Industries)	
Gould Inc., Brush Div.	588, 589
Graphite Metallizing Corp.	1596
Grayhill Inc.	1915
Greenray Industries, Inc.	606, 607, 1392, 1393
Oven Industries	1394
Griffith Plastics Corp., Nobex Div.	1466-1471
Grigsby-Barton, Inc.	1710, 1711
GTE Sylvania	1464, 1465
Guardian Electric	1712-1714, 1916
Gudeman Div., Gulton Inds.	2388-2409
Gulton Industries, Inc.	
Glass Technology Div.	2632
Gudeman Div.	2388-2409
Microceramics Div.	1972, 2410-2413
Rustrak Instrument	595

H

Mfr.	Page
Hamlin Electronics,	
Hamlin Electronics	1724, 1725, 1917
Harrel, Inc.	1973
Hart Advance, Relay Div.	1723
Hathaway Components	1715-1722, 1918
Haydon Co., A.W.	1597
Hecon Corp.	1332
Heinemann Electric Co.	1919
Hertz Filter Corp.	1516
Hewlett-Packard, N.J. Div.	729-732
Hexacon Electric Co.	2940
Hi-G, Inc.	
Power Supplies	724, 725
Relays	1726-1738
Solenoids	1330, 1331
Timing & Sensing	1322-1329
Hickok Electrical Instr.	351, 487-489
HICO	1616
Hipotronics, Inc.	490-493, 726-728, 2415, 2955
Hiram Jones	2634, 2635
Hisonic Inc.	1517, 2491
Honeywell, Inc.	
Test Instruments Div.	590
Wabash Div.	2318
Hopkins Engineering Co.	1519
Horizons International (HICO)	1616
Houston Instrument	591
Howard Industries	1617
Hoyt Electrical Instr. Works (Burton-Rogers)	494, 495
Hudson Lamp Co.	1472

Continued on next page

INDEX OF MANUFACTURERS' CATALOG PAGES

Mfr. Page

- Hughes Aircraft Co.
  - Connecting Devices 2633
  - Indust. Products Div., Fact Systems 496
  - Microelectronic Prod. Div. 1403
  - MOS Div. 1540, 1541
- Humiseal Div., Columbia Technical Corp. 2478, 2479
- Hurst Mfg. Corp. 1608-1615
- Hybrid Systems Corp. 352, 353, 1284

I

- Icon Corp. 1333
- Illumination Industries Inc. 1644
- Industrial Control Co. 1872, 1873
- Industrial Devices, Inc. 1474, 1475
- Industrial Electronic Engineers 1476-1478
- Industrial Test Equipment Co. 497, 733
- Infodex, Inc. 498
- Infotronics Instruments (see Dohrmann)
- Instrument Specialties Co. ..2760, 2761
- Instruments for Industry 1285
- Inter-Computer Electronics 354-356
- Inter-Market Inc. 1473, 1926
- Inter-Technical Group 1998, 2759
- Interelectronics Corp. 735
- International Crystal Mfg. Co. 1404, 1405
- International Electro Exchange 1922-1925
- International Electro-Magnetics 310, 311
- International Electronics Corp. 2418
- International Rectifier 1807
- Interstate Electronics 499
- Interswitch 1927
- Intronics, Inc. 734, 1288
- IRC (see TRW)
- ISC Magnetics 500, 1334, 1335, 1806, 1920, 1921
- Ithaco 1286, 1287
- ITT Cannon 2637-2641
- ITT Jennings 501, 1740, 1741, 1928, 2416, 2417
- ITT Jennings Industrial Products 1618, 1739
- ITT Thermotech 2766-2773

J

- J-B-T Instruments, Inc. 1929
- Jackson Bros. (London) Ltd. 2419
- James Electronics Inc. 1742, 1743
- Janco Corp. 1930, 1931
- JFD Electronics Corp. 2420
- Johanson Manufacturing Corp. 2421
- Johnson Co., E.F. 2422, 2423, 2642-2644
- Jonard Industries Corp. 2941
- Joslyn Electronic Systems 1933
- Julie Research Labs. 502, 503, 2853

K

- Kahle Engineering 947
- Kappa Networks 1520, 1521, 2748, 2749
- Kay Elementrics Corp. 504-509
- KCC Shokai Ltd. 1479
- Kemet (Union Carbide) 2424-2427
- Kepco, Inc. 737-771, Back Cover, Vol. 1
- Kessler-Ellis Products 1336
- Keystone Carbon Co. 1974-1979
- KGS Electronics 2956, 2957
- Kilovac Corp.
  - Dow Key 1688-1691
  - Penta Labs 1744, 1745, 2428
- Kilovolt Corp. 772, 773
- K M S Industries, Inc.
  - Quan-Tech Div. 545-548
  - Microwave Cavity Labs 610, 611
- Kratos Instrument Div. 510, 511
- Kratos Precision Products 1783
- Krohn-Hite Corp. 512, 1522
- Kulka Electric Corp. 2645

L

- La Marche 774, 775
- Lambda Electronics Corp. 777-806
- Lamps, Inc. 1480, 1481
- Landis & Gyr 1337
- Lansdale Transistor & Electronics 1808
- Larson Instrument Co. 513
- Lectrohm, Inc., Sub. of Cook Electric 1760, 2854-2856
- Ledex, Inc.
  - Bramco Controls Div. 1406, 1523
  - Ledex Div. 1542, 1619-1621, 1940
  - Wilmington Controls Div. ..1936-1939
- Leecraft Manufacturing Co. 1482
- Legi Electronics Corp. 1483-1486
- Liberty Controls 1746-1749
- Licon, Div. Illinois Tool Works 357, 1934, 1935
- Light Electric Corp. 808, 809
- LogiMetrics, Inc. 514, 515
- Logitek, Inc. 1338, 1750-1759
- London Co. 516
- Loral Corp.
  - Alpha Div. 2995
  - PFC Div. of Arco 2339-2345
- Lorch-Adret Corp. 517
- Lorch Electronics Corp. 609
- LTV Electrosystems Memcor Div. 2857, 2922
- LVC Industries Inc.
  - Bloc-Lite 1441
  - Co-Ord Switch 2617

M

- MAC-IRIS, Sub. of Dynarad 439
- Magnecraft Electric 1762-1768
- Magnedyne Inc. 1622
- Magnetic Tech Div., Vernitron 386, 387, 1503, 1634, 1635
- Magnetic Windings Co. 2964
- Manhattan Electric Cable Corp. 3034
- Marathon Battery Co. 810, 811
- Marconi Instruments 519-521
- Markel & Sons, L. Frank 2812, 3035
- Matrix Corp. 361
- Mauratron, Inc. 815
- Maxi-Switch Co. 1941
- McCoy Electronics Co. 1408-1411
- McLean Engineering Labs ..1623, 2788
- Melcor Electronics Corp. 1290
- Meloy Labs 1407
- Memcor Components 2857, 2922
- Mepco, Inc. 2864
- Metric Systems Corp. 358-360
- Metrix Instrument Co. 518
- Metropolitan Supply Co. 1809, 2000, 2001
- MF Electronics Corp. 1412, 1413
- Micro-Circuits Co. 2480
- Micro Electronics Corp. 2646-2648
- Microdot Inc. 522
- Microsemiconductor Corp. ..1810-1813
- Microtran Co. 2958-2963
- Microwave Cavity Labs, Div. of KMS Industries, Inc. 610, 611
- Microwave Devices, Div. of Bendix Corp. 1555, 2597, 2756
- Mid-Eastern Industries, ...812-814
- Midtex Inc., Aemco Div. 1761
- Midwec Corp. 2430, 2431
- Millen Mfg. Co., James
  - Capacitors 2429
  - Components, Dials, etc. ..1488, 1489
  - Inductors, Coils 2497
  - Oscilloscopes 523
  - Tube Shields 2762, 2763
  - Tube Sockets, Hardware, etc. ..1999
- Miller Co., J.W. 2492-2496
- Milwaukee Resistor Corp. 2858-2863
- MM Electronic Enclosures 2319
- Modutec, Inc. 524-527
- Monitor Labs 364
- Monitor Products Co., Inc. ..1414-1416
- Monolithic Dielectrics 2432, 2433
- Monsanto Electronic Instruments 528, 529
- Motorola Communications & Electronics 1417
- Motronics Corp. 1624
- Mueller Electric Co. 2649
- Multicore Sales Corp. 2942
- Multimetrics, Inc. 1524
- Multitech, Co.
  - Automation Products 362
  - Communications 324
  - Data Products 363
  - Dynamics Instrumentation 432
  - Microelectronics 1543
  - Power Systems 816
- Murata Mfg. Co., Ltd. 1418

N

- Natel Engineering Co. 366, 367
- National Lead Co., (see NL Industries)
- National Semiconductors 1814
- National Tel-Tronics 2650
- National Wire & Cable 3036-3045
- Nationwide Electronic Systems 365
- NEC America (see Nippon Elec.)
- Neff Instrument Corp. 1291
- Nelson Ross Electronics 536, 537
- Neshaminy Transformer Co. 2965
- New England Instrument 2920, 2921
- New Product Engineering 1792, 1793
- Nippon Electric/NEC America 1487
- NJE Corp. 818-825
- NL Industries 1980-1982
- Norden, Div. of United Aircraft 370
- Norman Industries 532
- North Atlantic Industries 368, 369, 530, 531
- North Electric Co., Electronetics Div. 826, 827, 2651
- North Hills Electronics 817, 1339, 2967
- Northern Engineering Labs 1419
- Northfield Precision Instrument Corp. 1625
- Norton Associates, Inc. 312-315
- Nortronics Co. 316-319
- Nova Electric Mfg. Co. 828
- NWL Transformers 2966
- Nytronics, Inc. 2434, 2498
  - Capacitor Div. 2434
  - Essex Electronics Div. 2498

O

- Oak Mfg. Co. 1942, 1943
- Ogallala Electronics 2754, 2755
- Ohio Semitronics 533, 1986
- Ohmite Mfg. Co.
  - Relays 1769
  - Resistors 2869
  - Rheostats 2923
  - Variable Transformers 2968
- Omtronics Mfg., Inc. 2865-2868
- Opad Electric Co. 829
- Opamp Labs 1292
- Optima Enclosures (see Scientific-Atlanta)
- Oven Industries (Greenray) 1394
- Ovenaire Inc. 1420-1423

P

- Pacific Technology Inc. 830
- Pamotor, Inc. 2789
- Panduit Corp. 3047
- Parabam, Inc. 371
- Penn Airborne Products 534
- Pennwood Numechron Co. (Tymeter) 372
- Penta Labs 1744, 1745, 2428
- Perfection Mica Co. 2002, 2003, 2321, 2764, 2765
- Perkin-Elmer Corp. 2969
- PFC Mfg. Div./Arco 2339-2345
- Philadelphia Scientific Controls ..1770
- Philbrick (see Teledyne Philbrick)
- Philamon Inc. 1424
- Pico Electronics 2970
- Piezo Technology Inc. 1425
- Pinlites Inc. 1490
- Planet Instruments 1340, 1626
- Polarad Electronic Instruments 536-540
- Pomona Electronics 2652-2704

INDEX OF MANUFACTURERS' CATALOG PAGES

Mfr. **Page**

Positronic Industries 2631
Potter & Brumfield 1771-1782
Power Inc. 831
Power Designs 832-835
Power/Mate Corp. 836-859
Powertec 860-864
PPM Inc. 535
Precision Mechanisms Corp. 1876
Precision Metal Products 2705
Precision Monolithics 1545-1547
Precision Standards Corp. 541-544
Precision Timer Co. 1341-1344
Premier Metal Products 2322, 2323
Presin Co. 1345
Preston Scientific 373, 549, 1293
Primo Co., Ltd. 320
Printact Relay Div. of Executone ..1784
Program Data Co. 2706

Q

Quan-Tech 545-548
Quindar Electronics 953

R

Radio Materials Co.,
  Div. of P.R. Mallory 2435
Raytheon Co.
  Industrial Components Oper. 2005
  Sorensen Power Supplies 878, 879
Raytheon Computer 374-376
RCA Electronics 550-552
RCL Electronics 1946-1948, 2750, 2751, 2870-2873
RDI Reed Devices Inc. 1785
Re-el Circuits 326, 327
Rectifier Components Corp. 1815
Reeves-Hoffman 1426, 1427
REMEX 377
Renco Corp. 378
Republic Electronics 2436
Resistance Products Co. 2874, 2875
Resistors, Inc. 2876
RF Communications 553
RF Interonics 1528
RFL Industries
  Instrument Div. 554
  Thermocontrol Div. 1983
RHG Electronics Laboratory ..612, 1562
Ripley Co. 2791
RLC Electronics 1563
RO Associates 865-869
Robertshaw Controls 1944, 1945
Rockland Systems Corp. 1526, 1527
Rogan Brothers 1491
Rosemount Plug-in 870
Ross Engineering 1786
Rotating Components 1627-1629, 2792, 2793
Rotron Inc. 2794-2807
Rowe Industries 2707
Rustrak Instrument Div. 595
Rye Industries 2708
Ryka 1564

S

S & EI Manufacturing 2438, 2439
Sae Advanced Packaging 2712, 2713
Sage Electronics 2878, 2879
San Fernando Electric 2437
Sangamo Electric
  Capacitor Div. 2440
  Data Systems Div. 379
Sankyo Seiki Mfg. Co. 1630

Mfr. **Page**

Sawyer Industries 1631
Saxton Products 3048-3053
Scanbe Mfg. 2324
Schauer Mfg. Corp. 1821
Schaevitz Engineering 390, 948, 1346, 1988-1991
Schrack Electrical Sales 1787
Scientific-Atlanta, Optima Div. 2320
Scientific Columbus 1987
Seacor Inc. 1949, 2441
Sealectro Corp.
  Circuit Hardware 2709
  R.F. Components 2710
  Programming Devices 380, 2711
SEG Electronics Corp. 1525
Self-Organizing Systems 1790
Semtech Corp. 1816-1820
Sennheiser Electronic Corp. 321
Sensor Technology 1638
Servo-Tek Products 1632
SGL Industries 2774
Shallco 1950, 1951
Shallcross 555, 2880, 2881
Showa Musen Kogyo Co., Ltd. 2715
Sierra Systems 872
Signal Transformer Co. 2971-2982
Signalite 1492, 1952
Silicon Transistor Corp. 1822-1835
Simpson Electric Co. 556, 557
Singer Instrumentation 562
Slaughter Co. 558, 559
Sloan Co. 1494-1499
Smith, Herman H. 2716, 2717
Snelgrove Co. Ltd., C.R. 1428
Solid State Devices 1836-1840
Solid State Electronics 954, 2006
Sonex Inc. 955
Sorensen Power Supplies,
  Div. Raytheon 878, 879
Sorenson Lighted Controls 1493
Soshin Electric Co., Ltd. 2442
Southern Electronics Corp. 1548, 1549, 2444-2473
Specific Products 325
Spectra-Strip Corp. 3054-3056
Spectrol Electronics Corp. ..2924, 2925
Spectrum Technology Inc. 1429
Spellman High-Voltage
  Electronics Corp. 873-877
Sprague Electric Co. 2474
Square D Co. 1347
SRC Division/Moxon 560, 561, 871, 1992-1994
Stackpole Carbon Co. 2877
Stackpole Components 1953
Staco, Inc. 2983
Standard Condenser Corp. 2475
Standard Grigsby Co. 1954, 1955
Standard Pneumatic Motor Co. 2943
Standard Wire & Cable Co. 3057
Stantron Div.,
  Wyco Metal Products 2325
Stevens-Arnold 2007
Sticht Co., Herman H. 563
Summit Engineering 1565
Sylvania (GTE) 1464, 1465
Syntronic Instruments 2499
Syracuse Electronics Corp. 1348
Systron Donner 564, 565
Systron Donner
  Alpha Div. 565
  Concord Instrument 564, 565
  Datapulse 564
  Kruse 565
  Trygon Electronics 564, 933

Mfr. **Page**

T

T-Bar Inc. 1697
Tapeswitch Corp. of Amer. 1956
Taurus Corp. 381
Tech Labs 1957
Techmar Corp. 2327
Techni-Rite Electronics 596, 597
Technipower Inc. 905-928
Techno Components Corp. 2926, 2927
Tecnetics 880-885
Tektronix, Inc. 566
TEL Labs 2882, 2883
Teledyne Geotech 950
Teledyne Philbrick 1294
Teledyne Relays 1788, 1789
Telequipment, Ltd. (see Tektronix)
Tempo/UTI 384, 1349
Tensolite 3059
Texscan Corp. 578
Thermotech, Div. of ITT 2766-2773
Thunder International Corp. 886-895
T.M.C. Systems (Ariz.) 1430, 1431
Tobe Deutschmann Labs 2476
Todd Products Corp. 929-931
Tohoku Metal Industries, Ltd. 2501
Tokyo Electric Co., Ltd. 1350
Topaz Electronics 896-904
Torotel Inc.
  Crystals 1432
  Filters 1529
  Inductors 2502-2505
  Transformers 2984, 2985
Torwico Electronics ..2506, 2507, 2987
Transco Products 613
Transcon Mfg. Co. 1844, 1845, 3060-3067
Transmagnetics ..382, 383, 1874, 1875
Triac Electronic Systems 1351
Trimm Inc. 2718
Trio Labs 932
Triplett Corp. 567-577
Trompeter Electronics 1958, 2719
TRW Inc.
  Boone Div. 2889-2895
  Burlington Div. 2885-2888
  Cinch-Graphic Div. 1297
  Cinch Mfg. Div. 2600-2609
  Cinch Nu-Line 2610
  Globe Industries 1598-1607, 2787
  Phila. Div. 2896
  St. Petersburg Div. 2928-2931
  UTC Div. 1533, 2988, 2989
Trygon Electronics 564, 933
TT Electronics 1530, 1531
Tung-Sol Div. Wagner
  Electric 1500-1502, 1841-1843

U

UID Electronics Corp. 1959
Uniform Tubes, Inc. 3068
Unimax Switch Corp. 1960
Union Carbide Corp.
  Eveready Div. 710
  Material Systems 2424-2427
UNISEM (see United Aircraft)
United Aircraft Corp.
  Norden Div. 370
  Unisem Div. ....1550, 1551, 1846, 1847, Back Cover, Vol. 2
United Detector Technology 1639
United-Page, Inc. 1856
United Products Co. 2508
United Transformer Div.,
  TRW (UTC) 1533, 2988, 2989
Unitrode Corp. 1566, 1848-1855
Unitron 935-937
Universal Ad-Yu Electronics ..579, 2752

Mfr. **Page**

Universal Electronics Co. 938, 939
Universal Voltronics 940, 941
USCC/Centralab 1532, 2477

V

Vaco Products 2944
Vactec Inc. 1640
Varadyne, Inc.
  Varadyne Power Systems 934
  Varadyne Systems 385
Varflex Corp. 2813
Vari-L Co. 1534, 1568-1570, 2509, 2990, 2991
Vector Electronic Co. 2722
Vector Engineering 942, 943
Vectron Laboratories 1433
Veeder-Root Co. 1352
Vega Precision Labs 614, 615
Vemaline Products Co., Inc.
  Control Knobs 1504
  Heat Sinks 1857
  Indicator Panels & Lights 1505
  Planetary Drives 2775
  Rack Handles 2328
Venus Scientific 944, 945
Vernitron Corp. 1503, 1634, 1635
  Beau Products Div. 2720, 2721
  Magnetic Tech Div. 386, 387, 1503, 1634, 1635
  Motor Products Div. 386, 387
Vero Electronics 2329
Victor Wire & Cable 3069
Victoreen Instrument 2897
Virginia Panel Corp. 2723
Vishay Resistor Products 2898, 2899, 2932

W

Wabash
  (see New Product Engineering)
Wagner Electric (see Tung-Sol)
Wall Mfg. Co. 2945
Wanlass 946
Watkins-Johnson Co. 949, 1295
Waveline 1567
Wavetek 583-585
Weed Instrument Co. 1984
Weinschel Engineering 1571
Weller 2946
Welwyn International 2900
Western Reserve Electronics ..580, 581
Westinghouse Electric Corp.
  Panel Instruments 582
  Semiconductors 1858-1864
Wheelock Signals 1791
Whitmor Wire & Cable 3070
Wilbrecht Electronics 1961
Wild Rover Corp. 1962
Winchester Electronics 2724, 2725
Wiremold Co. 2726, 2727
Wyco Metal Products
  (see Stantron Div.)

X

X-Tron Electronics 1434

Y

Yamashina Seiki Co., Ltd. 1633

Z

Zaring Industries 2992, 2993

ARVEE AMPLIFIERS for dependable service

Wideband and Video Amplifiers use type BNC connectors others on request.

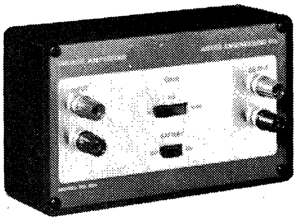
Response flatness typically ±.5 DB.

Supply voltage usually single ended plus 15 volts.

Additional RFI shielding available for critical environments.

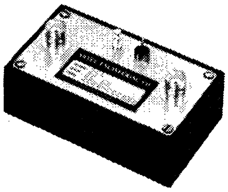
Output capability refers to 1 DB compression of gain.

FIGURE 1



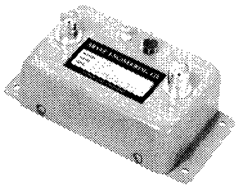
Laboratory instrument case with internal battery and shield.
3¾ x 6¼ x 2

FIGURE 2



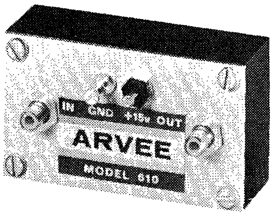
Machined aluminum case for maximum strength and RFI protection. 3¼ x 2 x 1

FIGURE 3



Rugged drawn aluminum case for economical commercial use.
4 x 2⅛ x 1 1/16

FIGURE 4



Miniature machined aluminum case.
1.75 x 1.0 x .6

WIDEBAND AMPLIFIERS

Model Number	Frequency Response	Gain	Input Impedance	Load Impedance	Output Capability	Equivalent Input Noise (microvolts)	Case Style	Price
610	1 MHz - 100MHz	20 DB±.5	50	50	1 Vp-p	15	Fig. 4	$150
521	20 Hz - 200 MHz	20 DB	50	50	1 Vp-p	40	Fig. 2	$250
520	20 Hz - 120 MHz	20 DB	50	50	1 Vp-p	35	Fig. 2	200
508	.2 MHz - 200 MHz	20 DB	50	50	1 Vp-p	30	Fig. 2	190
507	.2 MHz - 150 MHz	20 DB	50	50	1 Vp-p	25	Fig. 2	175
506	.1 MHz - 100 MHz	20 DB	50	50	1.2 Vp-p	20	Fig. 2	170
505	.1 MHz - 50 MHz	20 DB	50	50	1.5 Vp-p	18	Fig. 2	150
504	1 MHz - 35 MHz	20 DB±.5	50	50	2 Vp-p	12	Fig. 2	140
301	.5 MHz - 10 MHz	40 DB	50	50	2 Vp-p	12	Fig. 3	75
311	20 Hz - 150 MHz	20 DB	50	50	1 Vp-p	45	Fig. 3	140
310	20 Hz - 100 MHz	20 DB	50	50	1 Vp-p	40	Fig. 3	120
308	.25 MHz - 200 MHz	20 DB	50	50	1 Vp-p	50	Fig. 3	120
307	.25 MHz - 150 MHz	20 DB	50	50	1 Vp-p	40	Fig. 3	100
306	.25 MHz - 100 MHz	20 DB	50	50	1.2 Vp-p	30	Fig. 3	90
305	.25 MHz - 50 MHz	20 DB	50	50	1.4 Vp-p	25	Fig. 3	75
304	2 MHz - 32 MHz	20 DB±.5	50	50	2 Vp-p	15	Fig. 3	75

AUDIO & VIDEO AMPLIFIERS

Model Number	Frequency Response	Gain	Input Impedance	Load Impedance	Output Capability	Distortion	Equivalent Input Noise (microvolts)	Case Style	Price
502	20 Hz - 10 MHz	X 10	93	93	4 Vp-p	5%	20	Fig. 2	$150
501	20 Hz - 5 MHz	X 100	93	93	5 Vp-p	5%	20	Fig. 2	140
302	20 Hz - 10 MHz	X 10	93	93	4 Vp-p	5%	25	Fig. 3	85
201	20 Hz - 50 KHz	X 100	50 K	8	1 Watt	1%	10	not shown	80
202	10 Hz - 30 KHz	X 100	50 K	8	10 Watt	1%	10	not shown	150
203	20 Hz - 30 KHz	X 100	50 K	8	50 Watt	1%	15	not shown	290

DC AMPLIFIERS

Model Number	Frequency Response	Gain	Input Impedance	Load Impedance	Output Capability	Drift	Equivalent Input Noise (microvolts)	Case Style	Price
701	DC - 100 KHz	X 1000 Adj.	10 K	1 K	±5v	10 uv/°C	10	not shown	$150
702	DC - 1 MHz	X 100 Adj.	1 K	1 K	±3v	10 uv/°C	15	not shown	125

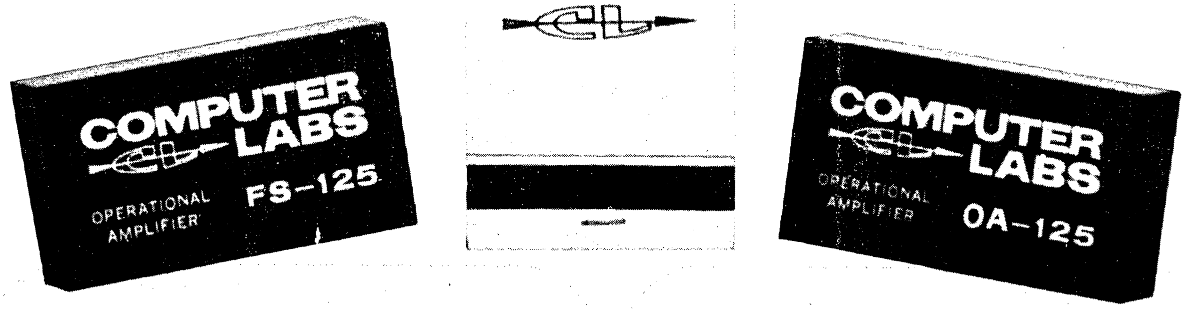
DECADE AMPLIFIERS

Model Number	Frequency Response	Gain	Input Impedance	Load Impedance	Output Capability	Distortion	Equivalent Input Noise (microvolts)	Case Style	Price
851 B	5 Hz - 1 MHz	X1 X10 X100	100 K	10 K	10 Vp-p	1%	5	Fig. 1	$ 79.50
852	20 Hz - 5 MHz	X1 X10 X100	600	600	5 Vp-p	5%	20	Fig. 1	150.00

In addition to the standard items shown special designs can often be supplied with very reasonable lead time.

ARVEE ENGINEERING CO. • **P. O. BOX 3759** • **TORRANCE, CALIFORNIA 90510** • **(213) 373-1324**

Operational Amplifiers with Matchless Performance



If settling time is important, specify FS-125

The Model FS-125 is designed for fast settling **(maximum 80 ns to 0.1% final value)** on step function signals but does not sacrifice low drift operation. It can be calibrated with dc and remain within 0.1% up to 12 MHz. This makes it an ideal choice for sample-and-holds, A/D's, D/A's, comparators, and similar "time domain" applications.

If gain bandwidth is important, specify OA-125

The Model OA-125 has a 6 dB/octave roll-off which gives it the widest bandwidth of any unconditionally stable amplifier available. **No compensating networks are required.** This makes it an ideal choice for active filters, video amplifiers, and similar "frequency domain" applications.

	FS-125	OA-125	
INPUT: Single ended	√	√	
VOLTAGE GAIN (Open loop)	100,000	100,000	
INPUT IMPEDANCE	10	5	K ohms
INPUT OFFSET VOLTAGE	3.5	3.0	mV
SLEW RATE	250	180	V/us
SMALL SIGNAL BANDWIDTH (Gain=1)	30	100	MHz
RISETIME (Gain=1)	15	17	ns
OUTPUT VOLTAGE (100-ohm load)	+2.4 −2.2	+2.4 −2.2	volts
SUPPLY REQUIREMENTS: ±15V ±3%	√	√	
PRICE (small lot)	$97.00	$135.00	

Analog Multiplexers / Analog-to-Digital Converters / Digital-to-Analog Converters / Operational Amplifiers

COMPUTER LABS
for tomorrow's technology today
1109 South Chapman St. / Greensboro, N. C. 27403 / (919) 292-6427 / TWX 510 922-7954

C-COR AMPLIFIERS

C-COR ELECTRONICS, INC.
60 DECIBEL ROAD • STATE COLLEGE, PENNSYLVANIA 16801 • PHONE 814-238-2461

GENERAL PURPOSE WIDEBAND AMPLIFIERS

C-COR Models	Passband* 3 dB Min.	OUTPUT CAPABILITY @ 1 dB Comp. dBm Min.	Typical	Test Spec. (1) Vp-p	@ Ohms	Gain Min. dB	NOISE Broadband (rms) Input (µV)	NF Typical dB	Z In : Out Ohms	Power Required Vdc	mA	Dimensions H x W x L Inches	Remarks
3203	0.2-1GHz	+8	+10	1.4	50	20	—	5	50 : 50	+28	60	1½ 2 3	Dimensions include cooling fins where applicable
*3370	.002-700MHz	+20	+24	6.3	50	20	40	8	50 : 50	+28	300	3 3 5	
3371	0.02-550MHz	+20	+23	6.0	50	20	60	15	50 : 50	+28	420	3 3 5	Dual output, inverting and non-inverting
*3311	.002-550MHz	+24	+26	10.0	50	26	30	9	50 : 50	+28	380	3 3 5	VSWR < 1.5:1
*3312	.002-550MHz	+26	+31	12.5	50	30	30	9	50 : 50	+28	380	3 3 5	Unmatched output
3374-A	0.02-500MHz	+17	+20	12.0	100	20	60	9	1M : 50	+28	300	3 3 5	Cin < 5pF
*4313	0.1-500MHz	+27	+28	14.0	50	40, 20	30	9	50 : 50	115 Vac 50-60 Hz		5¼ 16½ 11	Selectable gain; lab type amplifier
3393	dc-300MHz	+8	+10	1.6	50	20	25	9	50 : 50	±10	30	1½ 2 3	
*4375-A	0.1-270MHz	+30 @ 50MHz +27 @ 250MHz		25.0	75	60, 40, 20	25	10	50 : 50 75 : 75	115 Vac 50-60 Hz		5¼ 16½ 11	Selectable gain and impedance; lab type amplifier
3362-E	.001-200MHz	+20	+22	6.3	50	20	35	—	50 : 50	+32	230	1¾ 3½ 6	
3364-E	.001-200MHz	+20	+22	6.3	50	40	35	—	50 : 50	+32	300	1¾ 3½ 9	
3366-E	.001-200MHz	+20	+22	6.3	50	60	35	—	50 : 50	+32	300	1¾ 3½ 12	
4376	10Hz-200MHz	+13	+14	1.4	50	40, 20	60	—	1M : 50	115 Vac 50-400 Hz		5¼ 6 10	Cin < 12pF; 5% distortion; selectable gain; lab type amp
3329-E	5Hz-130MHz	+24	+25	10.0	50	20	40	—	50 : 50	+34	315	1¾ 3½ 7½	
3368-E	5Hz-130MHz	+24	+25	10.0	50	40	35	—	50 : 50	+34	330	1¾ 3½ 10½	
3388-E	5Hz-130MHz	+24	+25	10.0	50	60	35	—	50 : 50	+34	340	1¾ 3½ 13½	

MIN-ECON — MINIATURE LOW-COST AMPLIFIER MODULES

3596	6-300MHz	+4	—	1.0	50	20	30	—	50 : 50	+15	50	1¼ 2¼ 3¼	General purpose wideband
3502	1-300MHz	+20	+23	6.3	50	6	—	—	50 : 50	+22	200	**Dimensions for All Min-Econs**	Linear power post-amplifier
3580	25kHz-175MHz	+4	+8	1.0	50	20	35	—	50 : 50	+15	40		Flat aligned for CW or pulse
3528	100Hz-100MHz	+12	+13	2.5	50	20	25	—	50 : 50	+15	150		Wide dynamic range
3581-E	10Hz-60MHz	+4	+10	1.0	50	20	20	—	50 : 50	+10	25		Very low frequency response
3579	Fc Range 100-250MHz	−2	+1	0.5	50	25	—	3	50 : 50	+15	12	Min-Econ prices range from only $79 to $189 and are normally available from stock.	VHF bandpass preamp (specify Fc)
3578	Fc Range 250-500MHz	−4	+2	0.4	50	20	—	4	50 : 50	+15	12		UHF bandpass preamp (specify Fc)
3583	1.5-50MHz	+3	+4	1.0	50	20	—	4	50 : 50	+10	30		Wideband HF preamp; 5% distortion
3518	5 ns RT; 2% droop @ 20 µs	—	—	±1.5Vp	50	20	20	—	50 : 50	+15	150		Inverting pulse amplifier; wide dynamic range
3596-A	2 ns RT; 10% droop @ 1 µs	—	—	±0.5Vp	50	20	30	—	50 : 50	+15	50		Fast risetime pulse amplifier
3592	5Hz-30MHz	+12	+13	2.0	50	X1	100	—	70k : 75	+15	20		Impedance Transformation amplifier; video
3567	dc-20MHz	+13	—	1.5	50	20	25	—	1k : 50	±10	60		Direct-coupled video; 5% distortion
3577	20Hz-12MHz	+18	+21	4.0	50	X20	20	—	1M : 50	+25	80		Very low distortion video 1% @ 2Vp-p, 5% 4Vp-p dc
PS-22B Power Supply for Min-Econ Amplifiers. Specify voltage and current rating desired. Available: 10 Vdc @ 90 mA, 12 Vdc @ 90 mA, 15 Vdc @ 90 mA, 22 Vdc @ 90 mA, 24 Vdc @ 30 mA, 6.3 Vdc @ 150 mA, 24 Vdc @ 85 mA, 28 Vdc @ 80 mA and 36 Vdc @ 40 mA.										115 Vac 60 Hz		4¼ 2⅜ 3¼	dc output may be positive or negative. Ripple 10 mV max. @ maximum load

FAST RISE TIME PULSE AMPLIFIERS

C-COR Models	RISETIME nanosec. Typical	Max.	Droop %	@ PW	LINEAR OUTPUT Min. Vp	@ Ohms	Typical Vp	@ Ohms	Gain Min. dB	NOISE Broadband (rms) Input (µV)	Z In : Out Ohms	Power Required Vdc	mA	Dimensions H x W x L Inches	Remarks
3371-P	0.8	1.0	10	0.5µs	±2	50	±3	50	20	25	50 : 50	+28	420	2 3 9	
*3310	0.95	1.0	<1	1.0µs	±8	50	±9	50	30	30	50 : 50	+28	380	3 3 5	Output unmatched
*4313-P	1.0	1.2	10	350ns	±6	50	±6.5	50	40, 20	30	50 : 50	115 Vac 50-60 Hz		5¼ 16½ 11	Selectable gain; lab type amplifier
3374-P	1.1	1.3	10	1.0µs	±2	50	±3	50	20	60	1M : 50	+28	300	3 3 5	Cin < 5pF
*4375-B	1.9	2.0	10	100ns	±8	75	±10	75	60, 40, 20	25	50 : 50 75 : 75	115 Vac 50-60 Hz		5¼ 16½ 11	Selectable gain and impedance; lab type amplifier
3362-F	2.0	3.0	10	3.0µs	±3	50	—	—	20	30	50 : 50	+32	230	1¾ 3½ 6	-G Model available with -6Vp output capability into 50 ohms
3364-F	2.0	3.0	10	3.0µs	±3	50	—	—	40	35	50 : 50	+32	300	1¾ 3½ 9	
3366-F	2.0	3.0	10	1.0µs	±3	50	—	—	60	35	50 : 50	+32	300	1¾ 3½ 12	
3329-F	3.0	5.0	2	2.0ms	+4, −8	50	—	—	20	40	50 : 50	+34	315	1¾ 3½ 7½	
3368-F	3.5	5.0	2	1.0ms	+4, −8	50	—	—	40	35	50 : 50	+34	330	1¾ 3½ 10⅝	-G Model available with -12Vp output capability into 50 ohms
3388-F	4.0	5.0	2	1.0ms	+4, −8	50	—	—	60	20	50 : 50	+34	340	1¾ 3½ 13⅝	

*NEW PRODUCTS

(1) Output capability Test Spec is the test limit for a given percent distortion: listed in the Remarks column where applicable, or typically 10% if unspecified.

THE COMPLETE LINE OF LOW COST "OFF THE SHELF" AMPLIFIERS

C-COR ELECTRONICS, INC.
60 DECIBEL ROAD • STATE COLLEGE, PENNSYLVANIA 16801 • PHONE 814-238-2461

C-COR
AMPLIFIERS

LOW NOISE PREAMPLIFIERS

C-COR Models	Center Freq. Range MHz	Passband 3 dB Min. MHz	OUTPUT CAPABILITY @ 1 dB Comp. dBm Min.	dBm Saturation	Gain Min. dB	NF Typical dB	Z In : Out Ohms	Power Required Vdc mA	Dimensions H x W x L Inches	Remarks
*2207	400-1000	15-60	+5	—	30-20	3-4	50 : 50	+15 18	3 1½ 3	Silicon low noise preamp; gain inverse to Fc & passband
2202	250-750	20	+1	—	20	3-6	50 : 50	+15 12	2½ 3⅝ 6½	UHF TV preamp
*2208	50-300	6-30	+10	—	20	3-4	50 : 50	+15 20	3 1½ 3	FET preamp
3206	—	30-300	—	—	20	4	50 : 50	+20 50	1¼ 2½ 6	

MEDIUM POWER BANDPASS AMPLIFIERS—SOLID-STATE LINEAR

*3229	30-90	3-9	+36	+37	30	—	50 : 50	+28 750	3 3 6	Dimensions include cooling fins where applicable
3230	90-175	9-18	+36	+37	30	—	50 : 50	+28 750	3 3 6	
3231	175-325	17-33	+33	+34	27	—	50 : 50	+28 650	3 3 7	Class C versions available with up to 4 times the output power of Class A models described. Bandwidths of up to 30% avail. on special order
3232	325-500	32-50	+30	+31	22	—	50 : 50	+28 550	3 3 9	
*3233	500-750	50-75	+30	+31	20	—	50 : 50	+28 550	3 3 9	

WIDEBAND POWER AMPLIFIERS

C-COR Models	Passband 3 dB Minimum	POWER OUTPUT @ 1 dB Comp. dBm Minimum	dBm Maximum	Gain Minimum dB	Z In : Out Ohms	Power Required Vdc mA	Dimensions H x W x L Inches	Remarks
1029-A	0.1-250MHz	+44	+47	10	50 : 93	115 Vac 50-60Hz	21 19 17	Total power requirements 3 kVA
1029-B	1-160MHz	+48	+49	16	75 : 50	115 Vac 50-60Hz	21 19 17	Total power requirement 3 kVA
1012	0.001-185MHz	+41	+40	7.5	50 : 93	115 Vac 50-60Hz	8¾ 19 12½	Total power requirement 275 watts — applies to Models 1012-A and 1028 also
1012-A	0.1-60MHz	+44	+41	12	75 : 50	115 Vac 50-60Hz	8¾ 19 12½	
1028	30-300MHz	+35	+37	30	50 : 50	115 Vac 50-60Hz		
3008	1-40MHz	+35	+38.5	20	50 : 50	+37 2A	3½ 4½ 12	Solid-state
3314	0.1-500MHz	+27	+30	30	50 : 50	+28 600	3 3 6	Push-pull

VIDEO AMPLIFIERS

C-COR Models	Passband 3 dB Min.	OUTPUT CAPABILITY @ 1 dB Comp. dBm Min.	Typical	Test Spec. (1) Vp-p	@ Ohms	Gain Min. dB	NOISE Broadband (rms) Input (µV)	NF Typical dB	Z In : Out Ohms	Power Required Vdc mA	Dimensions H x W x L Inches	Remarks
3407	100Hz-60MHz	—	+20	5.5	50	5.5	100	—	50 : 50	+25 1.4A	2 4 10	Eight (8) outputs
1319-F	2Hz-20MHz	+20	+23	8.0	75	0-40	10	—	75 : 75	115 Vac 50-400Hz		Gain continuously adjustable; 2% distortion
4333-C	DC-20MHz	+22	+24	10.0	50	20, 26	25	—	1k : 50	115 Vac 50-400Hz	3½ 8 12	Gain, single ended: diff. output; 5% dis.; diff. input and output
3453	5Hz-20MHz	+10	+16	4.0	75	0-8	125	—	40k : 75	115 Vac 50-400Hz	3½ 2½ 9	Four (4) outputs; gain continuously adjustable; 5% distortion
1392	DC-10MHz	+30	+32	20.0	50	20	50	—	75 : 75	115 Vac 50-400Hz	5 19 10	5% distortion @ 1 MHz
4454	5Hz-3MHz	+24	—	10.0	75	0-6	100	—	2k : 75	115 Vac 50-400Hz	3½ 4 9	Four (4) outputs; gain continuously adjustable; 2% distortion

SPECIAL PURPOSE AMPLIFIERS

*3693-A 3693-P	10kHz-500MHz	+3	+10	—	—	X1	50	—	1M : 50	+28 30	1¼ 2 3	High impedance probe amp; -A CW version. -P pulse version
2306	50-220MHz	+21	+23	Cross Mod.-63 dB at +53 dBmVout for 12 channel test condition		44	—	10	75 : 75	115 Vac 50-60Hz	11 15¾ 10	TV distribution amp.; channels 1-12; dual output
3378	18kHz-100MHz	+32	—	40	150	34	20	—	50 : <50	±40, — ±10	3¼ 4 8	Amplifier to drive CRT deflection plates
*4630	DC-100kHz	—	—	1	1K	20, 40	5	—	10k : 1k	±5 10	1½ 2 3	Low noise display amplifier
3603	Fc- 30 or 60MHz 1 or 10MHz BW	—	+20	—	—	60 or 70	—	8	50 : 50		1⅝ 2½ 11	IF amplifier
3611	Fc- 30, 60, or 120MHz 10% or 30% BW	Five Standard Models Available. Gain Adjustable.										Wideband IF amplifier; options include video output and AGC

MULTICOUPLERS

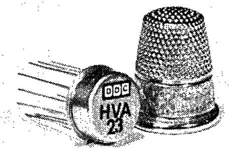
3828	2kHz-500MHz	+20	+23	8	50	0, 10, 20	35	9	50 : 50	+28 2A	3¼ 19 12	Five (5) outputs, 60 dB isolation; gain selectable
*1882	DC-20MHz	—	—	±5Vp	50	X2	—	—	10k : 50	115 Vac 50-400Hz	3¼ 19 12	Five (5) outputs, > 60 dB isolation
1884	DC-5MHz	+20	+21	±7Vp	1K	X1, 2, 3, 4	—	—	10k : 50	115 Vac 50-400Hz	3¼ 8 12	Six (6) outputs, > 60 dB isolation; gain selectable

Inquiries for your specific multicoupler requirements invited. C-COR's modular approach will provide an economic answer for your application.

C-COR AMPLIFIERS RATED FIRST WHERE PERFORMANCE IS RATED FIRST

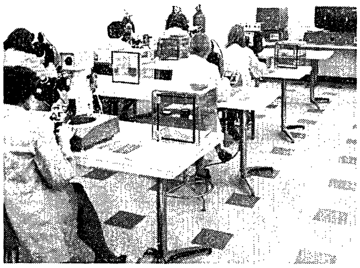
DATA DEVICES from DDC

THESE ARE SOME OF OUR SIGNAL CONDITIONING MODULES:



DDC
FAST SETTLING AMPLIFIER
FS-23

DDC
DATA DEVICE CORPORATION



WIDEBAND AMPLIFIERS:

Ideal for radar and display systems, as video summing and subtracting amplifiers, in data conversion and pulse amplification, sample and hold circuits, driving coax lines and in other high frequency applications.

- 1,000 V/μs slew rates
- 150 nS settling times to 0.1%
- 150 MHz gain-bandwidth products
- ±10 V at ±100 mA outputs
- Models for differential as well as inverting applications
- Short-circuit protected versions
- Hybrid models, including 150 MHz unity gain amplifiers

SYNCHRO LOAD DRIVERS:

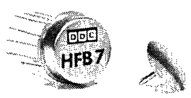
A wide range of output currents and voltages, including ±140 V peak at ±250 mA. Ideal for driving synchro loads, and in other applications requiring high power and small size.

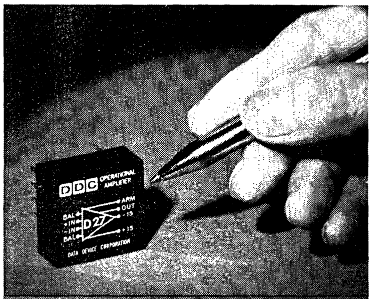
OP AMPS:

- Hybrid and discrete
- FET and bipolar
- Low voltage drift
- High CMRR
- High CMV

POWER SUPPLIES; OTHER MODULES:

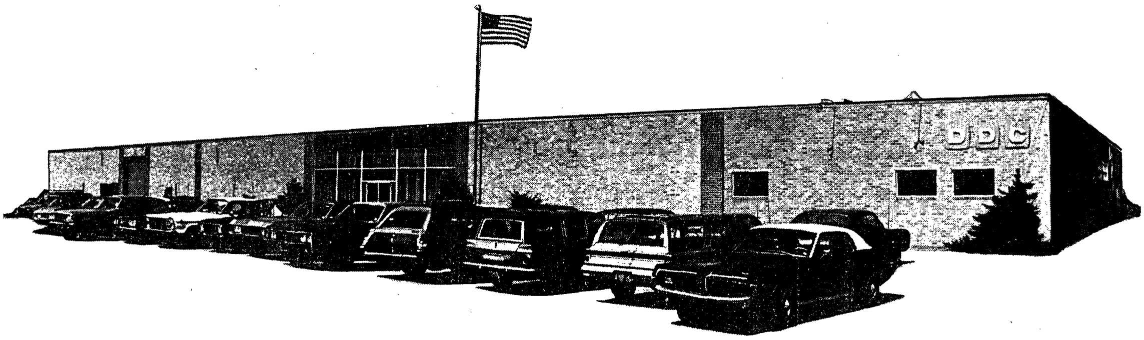
- Matched logarithmic elements
- Sensitive analog comparator/ relays
- Single, dual, and multi-output power supplies to satisfy most requirements. Encapsulated modules, card-mounted models, and other form factors are available. ALSO SEE VOLUME I, SECTION 2000




DDC
OPERATIONAL AMPLIFIER
D27
DATA DEVICE CORPORATION

DDC
DUAL OUTPUT POWER SUPPLY
MODEL P.2.15.40
DATA DEVICE CORPORATION

ALL DDC PRODUCTS ARE AVAILABLE TO MEET MILITARY SPECIFICATIONS



DDC 100 Tec Street, Hicksville, N.Y. 11801 • TWX 510-221-1874 • PHONE 516-433-5330

Ectron DC AMPLIFIERS

With complete signal conditioning options • Data Acquisition • Process Control • Airborne and Vehicular Testing • Mil Spec Environments • RFI Protection • High Common Mode Rating • Small Package Sizes

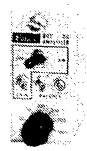
MODEL ➤

The following class selection guide lists simplified specifications. For complete specifications or experienced applications assistance, contact Ectron.

Model 414

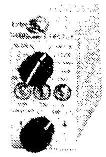
AIRBORNE
- Environmental
- 100 G Shock
- 100°C, 100% RH

Model 418



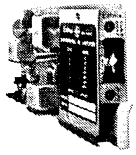
VEHICLE TESTING
- Environmental
- Bridge Excitation & Conditioning

Model 521



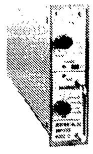
THERMOCOUPLE
- Direct Reading
- Linearization
- Ref. Junctions

Model 616



PROCESS CONTROL
- Data Acquisition
- 300 V CMV Rating
- .2µV/°C, Low Cost

Model 751

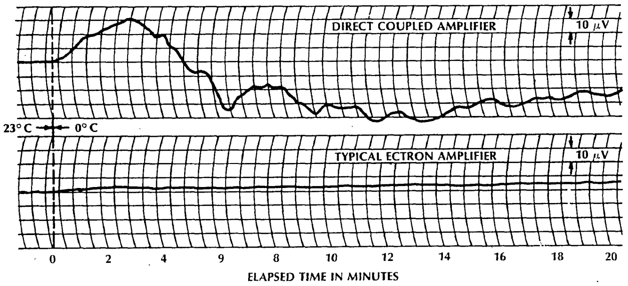


VERSATILE
- Wideband
- 300 V CMV Rating
- Gains 1 to 2500
- Bandwidth Control

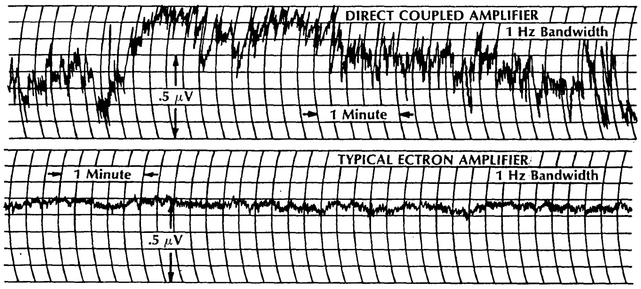
SPECIFICATIONS ➤

SPECIFICATIONS	Model 414	Model 418	Model 521	Model 616	Model 751
Operating Temperature	−55°C to +100°C	−25°C to +71°C	−25°C to +71°C	−25°C to +71°C	0°C to +60°C
Acceleration & Shock	100 G	50 G	50 G	5 G	5 G
Zero Stability/°C	.5 µV	.5 µV	.5 µV	.2 µV	1 µV
Gains	10 to 1000	10 to 2500	(in degrees)	10 to 2500	1 to 2500
Gain Stability/°C	.005%	.005%	.005%	.005%	.003%
Bandwidth, dc to	3 KHz	3 KHz	10 Hz to 3 KHz	2 KHz	100 KHz
Variable Bandwidth	No	No	No	No	Optional
Common Mode Voltage	100 V	100 V	100 V	300 V	50 or 300 V
CMR, 60Hz	120 dB	120 dB	120 dB	130 dB	130 dB
Dual Output	No	No	No	No	Yes
Output	10V @ 5 ma	10V @ 5 ma	10V @ 5 ma	10V @ 5 ma	10V @ 100 ma
Bridge Power Supply	Optional	Optional	(CJS supply)	Optional	Optional
Bridge Bal & Completion	Optional	Optional	No	Optional	Optional
Peak Noise (10Hz)	1µV RTI	1µV RTI	1µV RTI	.2µV RTI	1µV RTI
Direct Thermocouple Input	No	Optional	Yes	Optional	Optional
Integral Cold Junction	No	Optional	Yes	Optional	Optional
Thermocouple Linearization	No	No	Yes	No	No
RTI Zero Suppression	Optional	Optional	Yes	No	No

PERFORMANCE CURVES BELOW SHOW SUPERIOR CHARACTERISTICS OF ECTRON DC AMPLIFIERS



These recordings show the effect of an abrupt temperature change on Ectron and conventional amplifiers.



These recordings compare Ectron Amplifiers low noise with conventional amplifiers.

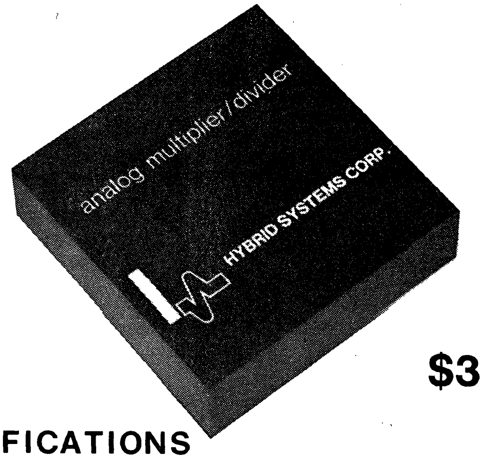
8133 Engineer Road, San Diego, California 92111
Phone (714) 278-0600
(See EEM listing for Ectron Representatives)
"Try Ectron's Special Products Department for difficult or unique problems."

Ectron CORPORATION

ANALOG MULTIPLIER/ DIVIDERS

TRANSCONDUCTANCE UNITS

The Model 107C and Model 107C-MIL, based upon the transconductance principle, are 4 quadrant multipliers (+XY/10). In addition to multiplying they can divide (10Z/Y), and square root ($\sqrt{10Z}$). Selection of the function is done through pin interconnection. The units are factory trimmed to 1% accuracy. No external components are required. The 107C and 107C-MIL are identical except that the Model 107C-MIL will operate over the range of -55°C to +125°C and contains all hermetically sealed active components.



$39

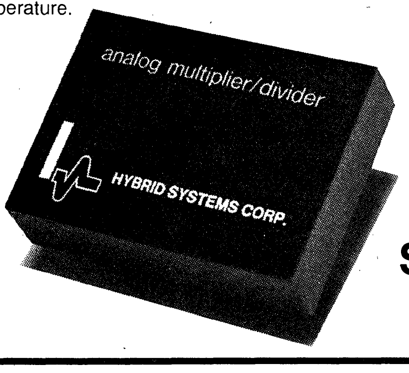
NEW

WIDEBAND MULTIPLIERS

Also available are wider bandwidth versions of the 107C.

PULSE MODULATION UNITS

The Models 101/103 are both 4 quadrant multiplier/dividers. They differ only in static accuracy. Both multiply (XY/10), divide (10Z/Y), square $X^2/10$) and square root ($\sqrt{10Z}$) through pin interconnection. The Model 106A Analog Divider is a "divide only" version of the Model 103 and has the same accuracy (.1%). The 108 is a 2 quadrant "multiply only" version of the 106A. Lastly, the 109 computes XY/5Z. These units are all exceptionally stable with temperature.



$120

SPECIFICATIONS

	TRANSCON-DUCTANCE	PULSE MODULATION				
	4 QUADRANT	ANALOG DIVIDER	2 QUADRANT MULTIPLIER	2 QUADRANT XY/5Z	4 QUADRANT MULTIPLIER/DIVIDER	
MODEL	107C	106A	108	109	101	103
Accuracy[1] (Mult.) max.	1%	N/A	±0.1%	±0.3%	±0.2%	+0.1%
Accuracy[2] (Divide) max.	1%	±0.1%	N/A	±0.3%	±0.2%	±0.1%
Output	XY/10	+10 Z/Y	YZ/10	XY/5Z	+XY/10 and +10Z/Y	
X Input Range	±10V	N/A	N/A	0 to -10 V	±10 volts	±10 volts
Y Input Range	±10V	0 to -10 V	0 to -10 V	±10 V	±10 volts	±10 volts
Z Input Range	±10V	±10 volts	±10 volts	+2 to +10 V	±10 volts	±10 volts
Denominator Dynamic Range	20:1	200:1	N/A	5:1	200:1	200:1
Bandwidth (3dB)	400kHz	All: 100 Hz				
Gain Vs. Temp.	.03%/°C	.005%/°C	.005%/°C	.005%/°C	.01%/°C	.01%/°C
Offset Stability	2mV/°C	50μV/°C	50μV/°C	50μV/°C	100μV/°C	100μV/°C
Operating Temperature	All units: 0°C to +70°C					
Dimensions	1.75"x1.75"x.5"	All: 3.5" x 2.5" x 0.825"				
Price (1-9)	**$39**	**$120**	**$120**	**$140**	**$195**	**$225**

[1] Maximum for 4 quadrants % of full scale, includes offset, gain, and linearity. [2] Denominator = -10 VDC.

HYBRID SYSTEMS CORP., 95 Terrace Hall Ave., Burlington, Mass. 01803 • Tel: 617-272-1524 • TWX: 702-332-7584

BROADBAND POWER AMPLIFIERS

(INSTANTANEOUS BANDWIDTH — no tuning, no plug in's, no bandswitching)

FOR RFI SUSCEPTIBILITY TESTING

Amplifiers and leveled swept systems for driving antennas for MIL-STD-461, 462 radiated susceptibility testing from 10 MHz to 220 MHz.

Typical Models	Output Power	Typical Fields
M5000L	10 watts	5 volts/meter
M402L	100 watts	10/20 v/m
M404L	400 watts	more than 20 v/m

FOR NUCLEAR MAGNETIC RESONANCE RESEARCH

To produce pulsed or continuous high-intensity hf and vhf fields in confined sample space.

Typical Models	Output Power	Frequency Range
M5000	10 watts	0.2 to 220 MHz
M404A	400 watts	0.2 to 220 MHz
M404CW/P	400 watts cw 2 kw pulse	1 to 250 MHz

FOR DRIVING ELECTRO-OPTICAL LASER MODULATORS

To impress high-voltage wideband signals across capacitive electro-optical and acousto-optical modulators in video or bandpass applications.

Typical Models	Output Voltage	Frequency Range
PVA-200	200 volts p-p	10 Hz to 10 MHz
M5000	62 volts p-p	0.2 to 220 MHz
M411	200 volts p-p	2 MHz to 30 MHz
M411T	400 volts p-p	2 MHz to 30 MHz

FOR COMMUNICATIONS AND ELECTRONIC COUNTERMEASURES

For amplifying and/or transmitting wideband signals or fast frequency changes without tuning or bandswitching.

Typical Models	Output Power	Frequency Range
M411	100 watts	2 MHz to 30 MHz
M408	1 kw	2 MHz to 30 MHz
M406	1 kw	0.2 to 200 MHz
M466	4 kw	0.1 to 100 MHz

FOR COMPONENT TESTING — All models

FOR FILTER, ATTENUATOR AND SCREEN ROOM EVALUATION — All models

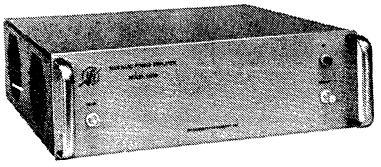
FOR ANTENNA RESEARCH — All models

FOR GENERAL LAB USE TO RAISE LEVEL OF RF SIGNAL GENERATORS AND SWEEPERS

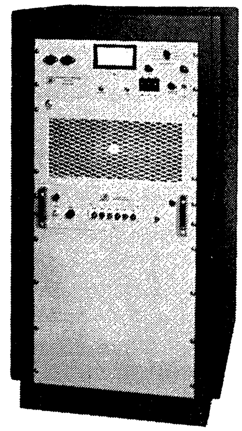
FOR ANY APPLICATION REQUIRING HIGH POWER AND VERY WIDE INSTANTANEOUS BANDWIDTH

Instruments for Industry offers a complete line of high gain, high power very wideband amplifiers, literally from "milliwatts to kilowatts" and from Hertz to Gigahertz. Those listed above are but a few of our many standard systems, available on short delivery. We do specials, too. A phone call will put us at your disposal to discuss and/or solve your broadband power problem.

TYPICAL I.F.I. INSTRUMENTS



Where cost and reliability are important, the hybrid M2500 solves many problems. Combining the best features of tubes and transistors, it produces a solid 5 watts with excellent linearity and 30 db gain from 10 kHz to 220 MHz.



The M404A is the most versatile and powerful off-the-shelf broadband amplifier on the market. Most lab signal generators, sweepers and synthesizers can drive it to 400 watts output from 200 kHz to 220 MHz without tuning or bandswitching.

516-694-1414

INSTRUMENTS FOR INDUSTRY, INC.

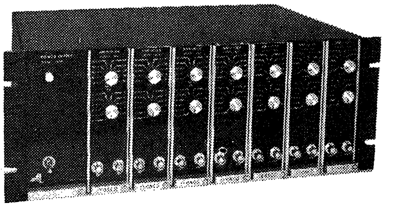
151 Toledo St., Farmingdale, L.I., N.Y. 11735 Cable: ELECTRONIC, Hicksville, N.Y.

ITHACO

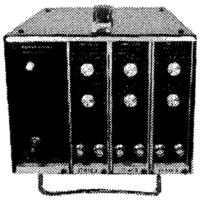
735 W. CLINTON ST., ITHACA, N.Y. 14850
(607) 272-7640 TWX: 510-255-9307

ITHACO

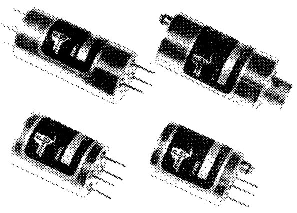
INSTRUMENTATION for DYNAMIC DATA ACQUISITION & SIGNAL CONDITIONING



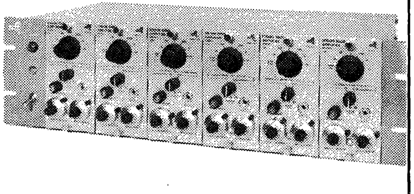
450 SERIES AMPLIFIERS



MODEL 450S2 PORTABLE CASE



MODELS 143/144 PREAMPLIFIERS



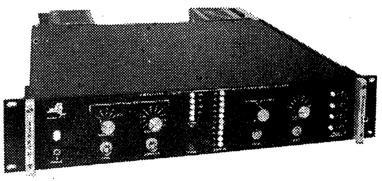
MODEL 241 DYNAMIC STRAIN GAGE AMPLIFIERS

ITHACO dynamic data acquisition amplifiers and preamplifiers generally operate in the 1 Hz to 200 KHz range, and are used in a wide variety of applications requiring:

- Shaping of frequency and phase response
- Voltage or change inputs; single-ended or differential
- State-of-the-art noise performance at any impedance level
- Fully automatic (ITHACO's AUTO-GAIN® Amplifiers) computer oriented, data acquisition systems
- All products provide stable and precise gain; as low as −20 db and as high as 100 db

ITHACO manufactures high and low impedance, single-ended or differential, voltage or charge preamplifiers in various packages. The 250, 450 and 430 Series are general purpose amplifiers for dynamic data, available with a choice of electrical configurations — including single-ended or differential front ends. Model 241 is specifically designed for acquisition of dynamic strain data over a 60 KHz bandwidth.

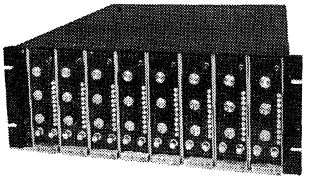
FULLY AUTOMATIC DYNAMIC DATA ACQUISITION AND RECOVERY SYSTEMS



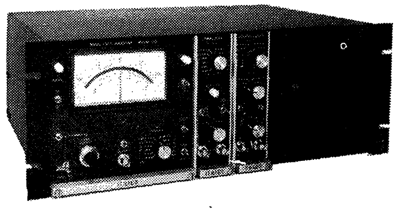
MODEL 541
AMPLIFIER STATUS MULTIPLEXER-DEMULTIPLEXER

AUTOMATIC GAIN RANGING, 32 CHANNEL STATUS RECOVERY

ITHACO's fully automatic data acquisition and recovery systems condition wide-dynamic range signals to amplitudes suitable for recording processing and display. They prevent loss of costly data due to operator error and manual response time. Model 441 Amplifiers automatically condition the amplitude of signals in the range of 1 Hz to 100 KHz to a level within the limited dynamic range of the tape recorder (or A/D converter, real-time analyzer, etc.). Gain is automatically switched in the precise steps as required to hold output signal amplitude in the range 0.2 to 1.0 volts. The Model 541 multiplexes the amplifier status signals and supplies the data processing equipment with amplifier status for each data channel.



MODEL 441 AUTO-GAIN® AMPLIFIERS



MODEL 353

LOCK-IN AMPLIFIER

Model 353 Lock-In Amplifier measures amplitude and phase of repetitive signals in the presence of high noise levels. The 353 design represents a significant departure from that of conventional lock-in amplifiers. Synchronization with an external reference signal is substantially automatic, and the instrument will track this reference signal over a 10:1 frequency range without affecting accuracy of phase calibration. Set-up time is minimum and no frequency tuning is required. The instrument will accommodate peak to peak coherent signals or noise of 1,000 times the full scale signal setting without saturating. Standard sensitivity of 1 microvolt can be increased to 10 nanovolts with remote preamplifiers in the 1 Hz to 200 KHz frequency range.

Modular in construction, the 353 can be adapted to a wide variety of specialized applications by adding any of several currently available plug-in functional units. Models such as the L1 Voltage Controlled Amplifier, 411 Filter, H1 Oscillator, E1 Post Amplifier and G1 Preamplifier may be plugged into the 353 mounting frame and interconnected to provide in-phase and quadrature component measurements, ratio measurements of two signals of the same or different frequencies, dual channel lock-in operation, logarithmic lock-in operation, etc.

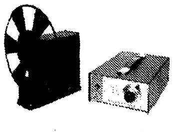
WIDEBAND, OMNIDIRECTIONAL, SENSITIVE HYDROPHONE

MODEL 601-1

30 Hz TO 150 KHz RESPONSE,
INTERNAL 20 db PREAMPLIFIERS

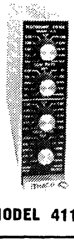
Model 601-1 is a sensitive, wideband, omnidirectional hydrophone incorporating a low noise ITHACO preamplifier within its molded structure to provide optimum noise performance. Midband sensitivity is −69 dbv/μbar at preamplifier output (−89 db at amplifier input). Frequency response is ±3 db from 30 Hz to 100 KHz with usable response to 150 KHz. Spectral noise, 1.0 Hz bandwidth, at preamplifier output is less than Sea State Zero at frequencies below 10 KHz.

MODEL 382



LIGHT BEAM CHOPPER

Model 382 Light Beam Chopper provides an accurate, highly stable means of modulating a light beam for photometric and radiometric applications in conjunction with the 353 Lock-In Amplifier. Covering the 0.5 Hz to 3 KHz frequency range, it features direct drive, quick disconnect single and dual frequency blades, dual reference outputs, and all solid state construction. Setting accuracy and stability of the chopping frequency are better than 1% over the above frequency range.



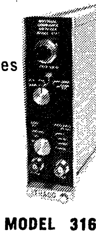
MODEL 411

VARIABLE ELECTRONIC FILTER

- Low Pass, High Pass, Bandpass, Band Reject Operation
- Independent High Pass and Low Pass Sections, 1 Hz to 100 KHz
- Phase Match Between 2 Filters 5° at the same Filter Setting
- Four Pole Butterworth Characteristic (Chebishev and Bessel also available)
- Accuracy ±2% of setting
- Compatible with Model 350 and 450 mounting frames

LOGARITHMIC AMPLIFIER

- Manual, Voltage Controlled, Logarithmic, Compression Gain Modes
- Signal Acquisition and Recovery with a Single Unit
- 0.25 db Gain Accuracy over an 80 db range
- ±3 db 5 Hz to 200 KHz
- Low Noise, 5.5 μv rms Broadband Referred to Input
- ±2° Phase match between amplifiers 30 Hz to 20 KHz
- Compatible with 350 and 450 Series mounting frames



MODEL 3161

ITHACO LOW NOISE VOLTAGE PREAMPLIFIERS, CHARGE PREAMPLIFIERS, VELOCITY PREAMPLIFIERS AND SEISMIC PREAMPLIFIERS

MODEL NO.	DESCRIPTION	FREQUENCY RESPONSE	GAIN	NOISE		OUTPUT RATED LOAD AND OUTPUT Z	MAXIMUM INPUT	DC POWER	CAN SIZE
				1Hz BW	BROADBAND				
123K 123L	1000 meg Input Z. Unity Gain, Utility Preamplifiers	—1 db @ 0.1Hz, 200KHz	0.0 ±0.1db	—158dbv @10KHz	8µv rms	5v rms into 10K. 100 ohms in series with 100µf	5v rms, ±75v abs. max.	—12v to —24v 2.5 to 5ma	1.13″ dia. 2.25″ long
125K 125L								+12v to +24v 2.5 to 5ma	
137	100K Input Z 60db gain	—3db at 0.1Hz, 10KHz	60 ±0.1db	Not Specified	0.8µv rms	5v rms into 5K. 50 ohms dc coupled	5mv rms; ±1v abs. max.	+20v to +30v —20v to —30v	3″x2.05″ x .55″
138					0.5µv rms				
143E 143F	1000 meg Input Z, Premium Noise, 20 and 40db Preamplifiers	—3db @ 0.5Hz, 200KHz	20 ±0.2db	—164dbv @10KHz	2.5µv rms	5v rms into 5K. 50 ohms dc coupled	0.5v rms, ±75v abs. max.	+12 to +25v 4 to 8ma	1.13″ dia. 1.57″ long
143L 143N						5v rms into 1K. 50 ohms, 40µf		+20 to +28v 15 to 20ma	1.13″ dia. 2.25″ long
144E 144F			40 ±0.2db			5v rms into 5K. 50 ohms dc coupled	50mv rms, ±75v abs. max.	+12 to +25v 4 to 8ma	1.13″ dia. 1.57″ long
144L 144N						5v rms into 1K. 50 ohms, 40µf		+20 to +28v 15 to 20ma	1.13″ dia. 2.25″ long
146	Gain selected by connections at socket	—2db@0.5Hz, 100KHz	20/30/40db			5v rms into 5K. 50 ohms dc coupled	.5v rms @20db, ±75v abs. max.	+12 to +25v 4 to 8 ma	1.13″ dia. 2.25″ long
150	100 meg Input Z, high pressure package	—1db @ 5Hz, 75KHz	14 ±0.5db		2µv rms	3v rms into 50 ohms. 50 ohms dc coupled	.6v rms, ±75v abs. max.	26 ±2v, 60ma	1.5″ dia. 4.5″ long
155L 155N	1000 meg Input Z. Remotely switched gain	—3db max @ 0.5Hz 200KHz	20 ±0.5db		2.5µv rms	5v rms into 1K. 50 ohms, 40µf	.56v rms, ±75v abs. max.	+20 to +28v 12 to 18ma	1.13″ dia. 2.25″ long
161	1000 meg Z in flat, miniature package	—3db @ 0.2Hz, 200KHz	10 to 40db			5v rms into 5K. 50 ohms	1.2v rms, ±75v abs. max.	+12 to +28v 7 to 10ma	2.25″ x 1″ x .38″
901D	1000 meg, Adjustable Gain	0.1Hz to 200KHz	0db to —10db	Not Specified	8µv rms	5 rms into 10K. 100 ohms	5v rms, ±75v abs max.	+12 to +28v 15 to 20ma	1.13″ dia. 2.25″ long
1391	Low Cost Charge Converters	—1% @5Hz, 20KHz	1mv/pc		25µv rms	5v rms into 1K. 50 ohms, 40µf	±5000pc	+28±5v, 15ma regulated	1.13″ dia. 2.25″ long
1392		—1% @15Hz, 20KHz	10mv/pc		200µv rms		±500pc		
1395	Charge Converters 85°C flight rated	—1% @5Hz, 20KHz	1mv/pc		25µv rms	±5v into 5K. 50 ohms, 16µf	±5000pc	+28v, 15ma unregulated	1.13″ dia. 3.00″ long
1396		—1% @15Hz, 20KHz	10mv/pc		200µv rms		±500pc		
1451	High Z preamps w/both ACCELERATION and VELOCITY outputs for Vibration Measurements	acc (2%@5Hz,20KHz) vel(10%@5Hz,10KHz)	acc(gain x 1.0) vel(x1.00@61.4Hz)		7µv rms	±5v into 5K, both outputs. 100 ohms, 40µf	±5v peak, ±75v abs. max.	+28 ±5v 8ma	1.13″ dia. 2.25″ long
1452			acc(gain x 1.0) vel(x3.0 to 12 adj. @100KHz)		8µv rms ±10mv pk				
1474	Charge Converters, 85°C flight rated w/ both ACCELERATION & VELOCITY outputs for Vibration Measurement	acc(—1%5Hz, 20KHz) vel(±2%5Hz, 5KHz)	acc(1mv/pc) vel(1mv/pc @61.4Hz)		acc(25µv rms) vel(200µv rms)	±5v into 5K load @ midband acc(50 ohms, 16µf) vel(50 ohms, 160µf)	±5000pc	+28v, unregulated 15ma	1.75″ dia. 3.6″ long
1475		acc(—1%5Hz, 20KHz) vel(—1%5Hz, 5KHz)			acc(25µv rms) vel(±10mv pk)				
1476		acc(—1%5Hz, 20KHz) vel(—1%50Hz, 5KHz)	acc(1mv/pc) vel(10mv/pc @61.4Hz)		acc(25µv rms) vel(±3mv pk)				
1541	Very low Frequency, premium noise, diff. 5 meg .01µf Input Z.	—3db @ .001Hz, 100Hz. High/Low pass filters available	60-100db externally adjustable	—156db in passband	.16µv rms	14 volts pk to pk into 30K ohm load	determined by gain setting	±20vdc, 10 ma each	3.938″x 4.625″x 3.938″

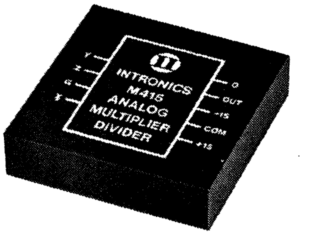
ITHACO RACK-MOUNTED VOLTAGE, CHARGE, STRAIN GAGE AND VIBRATION AMPLIFIERS FOR DYNAMIC DATA ACQUISITION AND SIGNAL CONDITIONING

MODEL No.	DESCRIPTION	FREQUENCY RESPONSE —3 db Points	GAIN			NOISE	OUTPUT, RATED LOAD	MAX. LIN. INPUT	POWER SUPPLY AND MOUNTING
			RANGE	COARSE	FINE				
431	1 meg input Z, Selectable LF Rolloff	LF 1, 10, 100, 1K, 10KHz HF 100KHz	—10 to +90db	10±0.1 db steps	1.0db steps (10db vernier available)	3µv rms	Output Z is 20 ohms dc coupled. Max. offset ±10mv. 5v rms sinewave output into 500 ohm load. 1v rms into 100 ohm load	5v rms sinewave	INDIVIDUAL ISOLATED ±15v DC POWER SUPPLY IN EACH CHANNEL. Primary Power 95v to 130v, 50Hz to 400Hz Model 430S1—rack adapter holds up to 8 channels, 7″ high
432	500 meg input Z, General Purpose	1Hz to 100KHz				4µv rms			
433	500 meg input Z, Selectable LF Rolloff	LF 1, 10, 100, 1K, 10KHz HF 100KHz							
434	1 meg input Z, Post Amplifier	1Hz to 100KHz				3µv rms			
435	20 meg Z differential input, 100db CMR	LF 1, 10, 100, 1K, 10KHz HF 100KHz				10µv rms			
436		1Hz to 100KHz							
441 442	Automatic gain ranging Post Amplifiers	LF 1, 10, 100, 1K, 10KHz HF 100KHz	—10 to +80db		Special order only	3µv rms			Similar to 430 Series. Uses 440S1 rack adapter
451	1 meg input Z, Selectable LF Rolloff	LF 1, 10, 100, 1K, 10KHz HF 100KHz	—10 to +90db		1.0db steps (10db vernier available)				COMMON ±15 VDC POWER SUPPLY FOR UP TO 7 CHANNELS, ±50 ma/channel Additional—55v for Models 455/456 Model 450S1—rack adapter holds up to 7 channels, 7″ high Model 450S2—portable case holds 3 channels plus 450R power supply Models 450S1 and 450S2—takes plug-in power supplies: Model 450P1—AC type Model 450P2—AC type with preamp power
452	500 meg input Z, General Purpose	1Hz to 100KHz				4µv rms			
453	500 meg input Z, Selectable LF Rolloff	LF 1, 10, 100, 1K, 10KHz HF 100KHz							
454	1 meg input Z, Post Amplifier	1Hz to 100KHz				3µv rms			
455	20 meg Z differential input, 100db CMR	LF 1, 10, 100, 1K, 10KHz HF 100KHz				10.0 µv rms			
456		1Hz to 100KHz							
491	4 meg input Z, Remote Control of Gain	LF 1, 10, 100, 1K, 10KHz HF 100KHz ³	0 to +80db	20±Odb steps in response to static BCD commands		3µv rms			Similar to 430 Series. Uses 490S1 rack adapter
461	Charge Amplifier with Demountable Charge Preamp	±5% 2Hz to 50KHz ±10% 1Hz to 100KHz	.03 to 3000g, psi, lb		10-turn dial sets accelerometer sensitivity, pC/g, psi, lb	.004 pC +.002pC/1000pf RTI or 200µv RTO	1, 1.414, 2.5 or 5v peak direct coupled from 15 ohms max. Optional galvo driver, servo output and meter	±10,000pC	Model 460P1—power supply with cal oscillator Model 460S1—rack adapter Model 460S2—portable case
241	Dynamic Strain Gage Amplifier complete with Constant Current Source. Very High Gain.	0.5Hz to 60KHz (±3% 2Hz to 10KHz)	1 volt out for 10 to 30,000µ strain		2 normalizing dials set GF (1 to 4) and gage R (100 to 1000 ohm)	0.25µ strain rms w/120 ohm gage	Output Z is 100 ohms, 100µf. 5v pk output into a 10K load (full scale is 1v pk)	30,000 strain for 1v out	105 to 125v, 60-400 Hz Model 240T—6 channel rack adapter w/power, 5¼″ high Model 240P A & B—one channel system
3151	Differential Input Voltage Controlled Amplifier	10Hz to 200KHz	0 to 80 db	10-turn dial for manual control		10µv rms	Balanced output 6v peak to peak from 100 ohms, 40µv into 10K ohms	1v rms	Similar to 450 Series

intronics

Analog Function Modules

MULTIPLIER/DIVIDERS



The new line of Intronics second generation design analog multipliers offer the best price/performance combination in the industry. These units are designed to meet the widest range of bandwidth, accuracy, stability, and price requirements. All are capable of multiplication, division, squaring, and square-rooting operation.

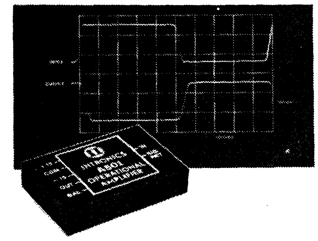
M505, M506 WIDEBAND SERIES Featuring 5MHz bandwidth and 150 V/usec slew rate these models offer both 1% and 0.5% accuracies with .02%/C worst case temperature stability. No external adjustments required. Prices $98 and $130.

M310, M311 PRECISION SERIES These units operate on the pulse height-width principle to give the ultimate in accuracy and temperature stability. Accuracy of 0.1% and temperature stabilities of .005%/°C for scale factor, and 50µV/°C for offset are featured. No adjustments required. Prices $115 and $145.

M415, M416 GENERAL PURPOSE SERIES. Low cost high performance series featuring 1% and 0.5% accuracies with exceptionally good linearity. These multipliers in a compact low profile package also have 750 kHz bandwidth and excellent temperature stability with no adjustments required. Prices $49. and $65.

M425 LOWEST COST MULTIPLIER/DIVIDER Features performance equal to that of many higher priced units, with 1% accuracy, 500kHz bandwidth, good temperature stability and supply rejection. Requires only two external adjustments, for zero and scale factor. Price $29.75.

OPERATIONAL AMPLIFIERS



The Intronics line of fast operational amplifiers provide the ideal solution to requirements where large gain-bandwidth product, fast slewing rate, and fast settling time are needed. Output currents up to 50mA and input temperature drift down to 5µV/°C are available.

A501, A502 VERY FAST INVERTING AMPLIFIERS. Provide output currents of 50 mA, gain bandwidth of 100MHz, 1000V/usec slewing, and 60 nsec settling to 0.1%. These amplifiers are ideal for fast A/D and D/A conversion, video summing amplifiers, and high speed integrators. Prices $105 and $125.

A520, A521 FAST INVERTING AMPLIFIER A low cost version of the A501/A502 design featuring 20mA output current, 100 MHz gain bandwidth, 300 V/usec slew rate, and less than 1 usec settling time to .01%. These units also feature low temperature drift to 5uV/°C. $49 & $59.

FA530, FA531 FAST FET DIFFERENTIAL AMPLIFIER These units feature FET differential input with fast settling of 1 usec to .01% in either inverting or non-inverting operation. Also featured are 10MHz gain bandwidth, 50V/usec slew rate, CMRR of 40,000, and temperature drift to 10 uV/°C. Economy priced.

FA501 FAST FET FOLLOWER A FET input buffer amplifier featuring a gain of +1 ±0.5% from DC to 2.5MHz. Bandwidth is 50 MHz min. with a rise time of 10 nsec max. Output voltage is ±5 volts at 100 mA making this unit ideal for driving coaxial lines with fast pulses. Price $175.

SPECIAL FUNCTIONS

intronics
C100
CRT GEOMETRY/FOCUS
CORRECTION MODULE

These modules develop non-linear analog functions which are more complex than just amplification or multiplication. They result in both price and space savings due to unique designs which simplify the required operation.

C100, C101 CRT GEOMETRY/FOCUS CORRECTION MODULES These unique modules synthesize corrected horizontal and vertical deflection signals to produce an extremely linear display on a flat-face CRT. Correction is accomplished for deflection angles up to 70°. The modules are easy to use since they connect directly between the deflection signals and the deflection amplifiers. External adjustments also correct for CRT and yoke alignment errors. Prices $565 and $348.

VM101 VECTOR OPERATOR. A wideband module which computes $\sqrt{X^2 + Y^2}$ to 1% accuracy for rectangular to polar conversion. In addition it can average this function or average either of the inputs separately. Price $95.

R101 RMS OPERATOR A module which accurately computes true RMS of any type waveform from DC to 0.5MHz. The module is simple to use requiring only an offset and scale factor adjustment to achieve 0.1% accuracy. This unit will replace more costly heater-thermocouple type RMS elements. Price $85.

FS201, FS202 SAMPLE-HOLD MODULES Provide accurate track and hold operation to .01% accuracy at moderate speeds. Acquisition time is 30 usec and bandwidth is 100KHz. Hold mode voltage decay is 50 mV/sec and 10 mV/sec. Precision operation at low cost. Prices $55.00 and $80.00.

Intronics specializes in the manufacture of high quality, advance design analog function modules. Pioneers in the development of analog multiplier modules, we now offer a wide variety of analog functions, both off the shelf and custom designed for your requirements. In addition we specialize in developing custom analog subsystems. Call our Applications Engineering Department to discuss your requirements. Write for new 1971-72 Catalog.

See Modular Power Supply line in section 4000.

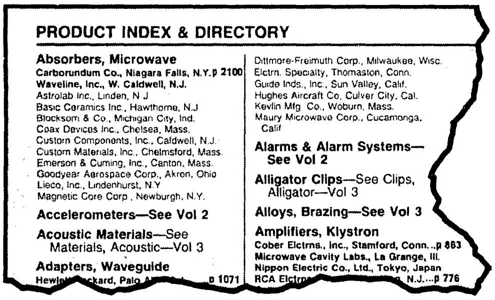
intronics

INTRONICS, INCORPORATED / 57 CHAPEL STREET / NEWTON, MASSACHUSETTS 02158 / 617-332-7350 / TWX 710-335-6835

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y.p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N J
Basic Ceramics Inc., Hawthorne, N.J
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass.
Emerson & Cuming, Inc., Canton, Mass.
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y
Magnetic Core Corp , Newburgh, N.Y.
Accelerometers—See Vol 2
Acoustic Materials—See Materials, Acoustic—Vol 3
Adapters, Waveguide
Hewl ckard, Palo A p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Kevlin Mfg Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif
Alarms & Alarm Systems—See Vol 2
Alligator Clips—See Clips, Alligator—Vol 3
Alloys, Brazing—See Vol 3
Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. ..p 883
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctr N.J....p 776

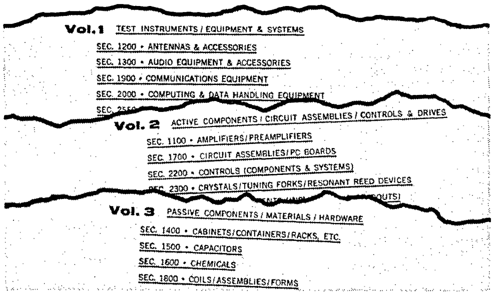
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT
Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
SEC. 2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES
Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

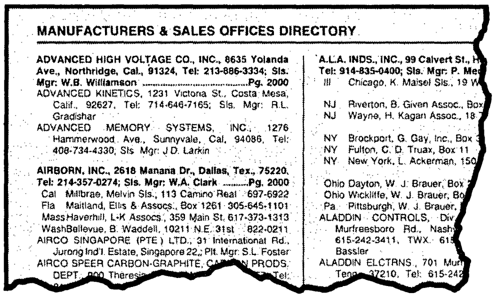
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



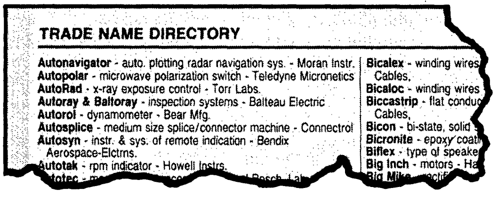
MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal. 94086, Tel: 408-734-4330; Sls Mgr: J.D. Larkin
AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220. Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St. 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE) LTD., 31 International Rd., Jurong Ind'l. Estate, Singapore 22.; Plt. Mgr: S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C N PRODS. DEPT. 00 Theresi Tel:
A.L.A. INDS., INC., 99 Calvert St.,
Tel: 914-835-0400; Sls. Mgr: P. Me
Ill Chicago, K. Maisel Sls., 19 W
NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18
NY Brockport, G. Gay, Inc., Box
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150
Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer, Bo
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div Murfreesboro Rd., Nash 615-242-3411, TWX 61 Bassler
ALADDIN ELCTRNS., 701 Mur Ten 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires Cables.
Bicaloc - winding wires
Biccastrip - flat condu Cables,
Bicon - bi-state, solid
Bicronite - epoxy coat
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

REPRESENTATIVE DATA CONVERSION PRODUCTS

from

melcor electronics corporation

1750 NEW HIGHWAY
FARMINGDALE, LONG ISLAND, N.Y. 11735

WIDEBAND OPERATIONAL AMPLIFIERS

TRUE DIFFERENTIAL—2119 and 1941 ... INVERTING ONLY—2108 and 2151

	2119*	1941	2108	2151
Rated Output	±10V 20 ma	±10V 20 ma	±10V 50 ma	±10V 100 ma
Open Loop DC Gain	100 db	88 db	100 db	92 db
Unity Gain Bandwidth	20 MHz	75 MHz	100 MHz	100 MHz
Full Power Frequency	2.5 MHz	10 MHz	10 MHz	12 MHz
Slew Rate	150V/usec	1000V/usec	1000V/usec	1000V/usec
Settling Time	1 usec to .01%	—	.4 usec to .01%	.4 usec to .01%
Voltage Drift/Temp.	10 uV/°C	50 uV/°C	25 uV/°C	25 uV/°C

***Model 2119 is also available with drift coefficients of 25 uV/°C (Model 2118) and 50 uV/°C (Model 2117). The above listing is representative of Melcor's complete line of operational amplifiers.**

WIDEBAND DEFLECTION PREAMPLIFIER MODEL 2043

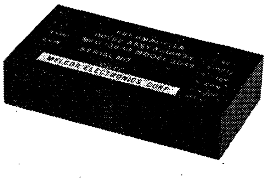
Rated Output	±25V at 30 ma
Open Loop Gain	88 db
Gain X Bandwidth at 5 MHz	1000 MHz
Full Power Frequency	.67 MHz
Slew Rate	100V/usec
Overload Recovery	1.0 usec

Model 2043 is representative of the deflection preamplifiers currently in production. In addition to the preamplifiers, Melcor has a line of complete deflection amplifiers. Additional information available on request.

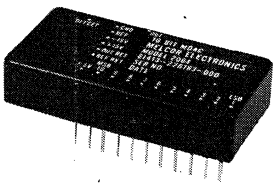
MULTIPLYING D/A CONVERTER MODEL 2064

Resolution	10 Bits
Accuracy	¼ LSB at 25°C Temperature Coefficient of .001%/°C
Reference Input	±10V (DC to 13 KHz)
Input Code	10 Bits of Straight Binary
Input Compatibility	DTL or TTL
Settling Time	2.5 usec to .01%
Output	±10V at 10 ma

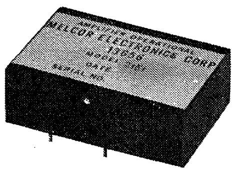
The above unit is available as a Hi-Rel or commercial grade unit. Additional information is available on request.



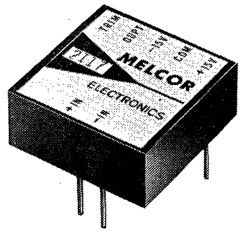
MODEL 2043



MODEL 2064



MODEL 2151



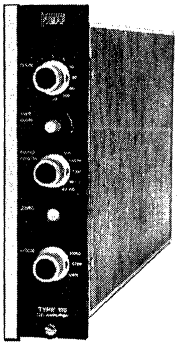
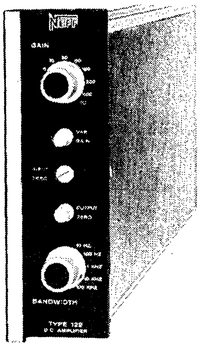
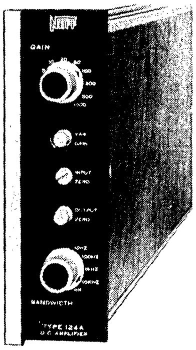
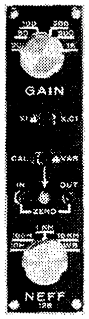
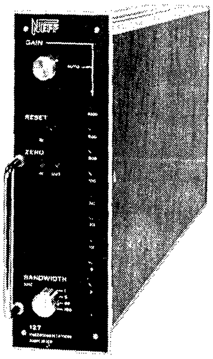
MODEL 2117

For more information on Melcor's complete line of operational amplifiers, deflection amplifiers and D/A converters, contact the Data Conversion Sales Manager, Melcor Electronics Corporation.

NEFF
INSTRUMENT CORPORATION

INSTRUMENTATION FOR MEASUREMENT & CONTROL

Neff Instrument Corporation offers a complete line of instrumentation amplifiers for laboratory, industrial, and aerospace applications with prices ranging from $100 to $3000. If your requirements are not met by one of the listed models, please contact our sales office listed below. Chances are they can suggest a model for your exact application.

Model	**119**	**122**	**124 A**	**126**	**127**
					
Many Neff Amplifiers include the following standard features. Integral Power Supply; Full Scale Offset; Multiplexed Output; Galvanometer Matching; Simultaneous Wideband and Narrow Band Outputs; Input and Output Zero Control; 8 or 16 Channel Rack Enclosures; Single Channel Case. Products available on **GSA.** Please request Federal Supply Catalog.	20kHz Wideband Differential, Chopper Stabilized. For high accuracy applications demanding extreme stability.	100kHz Wideband differential. General purpose low noise amplifier for use with tape recorders, oscillographs, and data systems.	100kHz Wideband differential, 300 volt operating CMV. For industrial and data systems where high voltage is present.	50kHz Wideband, differential, high performance—low cost. For multi-channel data systems where minimum size is important.	Automatic/Programmable Gain, 100kHz Wideband differential. High Speed FET, gain selection. Twelve programmable gain steps.
GAIN	1 to 3000	1 to 2500	1 to 2500	0.2 to 2500	1 to 1000
Switch Steps	1, 2, 5,...1000	1, 2, 5,...1000	1, 2, 5,...1000	0.2, 0.5, 1,...1000	
Accuracy	0.1% and 0.01%	0.1% and 0.01%	0.1% and 0.01%	0.1%	0.1% and 0.01%
Variable Gain	1 to 3 Multiplier	1 to 2.5 Multiplier	1 to 2.5 Multiplier	1 to 2.5 Multiplier	
Input Impedance	100 Megohms	100 Megohms	100 Megohms	10 Megohms	100 Megohms
Bandwidth	20kHz Filter Switch Selectable 12db/Octave	100kHz Filter Switch Selectable 12db/Octave	100kHz Filter Switch Selectable 12db/Octave	50kHz Filter Switch Selectable 12db/Octave	100kHz Filter Switch Selectable 12db/Octave
Output	±10 volts, ±100 MA Wideband or Narrow Band	±10 volts, ±100 MA Wideband and Narrow Band	±10 volts, ±100 MA Wideband and Narrow Band	±10 volts, ±10 MA Direct and Multiplexed	±10 volts, ±100 MA Wideband and Narrow Band
Common Mode	120db ±50 volts	120db ±25 volts	120db ±300 volts	120db ±10 volts	120db ±10 volts
Zero Stability	±1 microvolt $\pm 0.2\mu v/°C$	±5 microvolts $\pm 0.5\mu v/°C$	±5 microvolts $\pm 0.5\mu v/°C$	±5 microvolts $\pm 1\mu v/°C$	±5 microvolts $\pm 1\mu v/°C$
Noise					
10KHz	$3\mu v$ RMS	$2\mu v$ RMS	$2\mu v$ RMS	$2\mu v$ RMS	$2\mu v$ RMS
10Hz	$3\mu v$ peak-to-peak	$0.5\mu v$ peak-to-peak	$0.5\mu v$ peak-to-peak	$1\mu v$ peak-to-peak	$1.5\mu v$ peak-to-peak

SALES OFFICES Albuquerque (505) 299-7658 • **Boston** (617) 275-8310 • **Chicago** (312) 585-5485 • **Cleveland** (216) 261-5440 • **Dallas** (214) 231-2573 • **Dayton** (513) 426-5551 • **Denver** (303) 934-5505 • **Detroit** (313) 526-8800 • **Greensboro** (919) 273-1918 • **Houston** (713) 621-0040 • **Huntsville** (205) 881-6220 • **Indianapolis** (317) 293-0696 • **Kansas City** (913) 381-5852 • **Los Angeles** (213) 245-9404 • **Milwaukee** (414) 464-5555 • **Minneapolis** (612) 544-9393 • **Montreal** (514) 670-1212 • **Newark** (201) 687-8737 • **New York** (914) 769-1811 • **Orlando** (305) 843-1510 • **Ottawa** (613) 725-3354 • **Philadelphia** (215) 887-9610 • **Phoenix** (602) 263-1250 • **Pittsburgh** (412) 371-9449 • **Portland** (213) 357-2281 • **Rochester** (716) 266-1400 • **San Diego** (714) 232-2017 • **San Francisco** (408) 244-1505 • **Seattle** (213) 357-2281 • **St. Louis** (314) 524-6900 • **Toronto** (416) 678-1500 • **Vancouver, BC** (604) 253-7136 • **Washington, DC** (215) 887-9610 • **Waterbury** (203) 775-0055.

NEFF INSTRUMENT CORP., 1088 EAST HAMILTON ROAD, DUARTE, CALIFORNIA 91010 • (213) 357-2281 • TWX 910-585-1833

OPAMP LABS

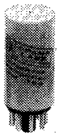
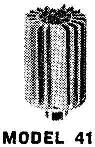
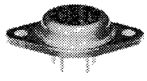
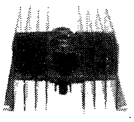
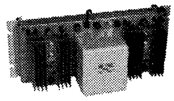
172 S. Alta Vista Blvd., Los Angeles, Calif. 90036
Telephone: (213) 934-3566

AMPLIFIERS

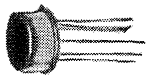
—SEND FOR CATALOG—

We manufacture over 50 products

FREE — 50 Industrial & Audio Operational Amplifier Applications

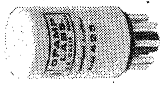






	MODEL 360M Microphone Preamplifier	MODEL 416 D.C. Thru Audio Operational Power Amplifier	MODEL 435 Medium Voltage D.C. Operational Amplifier	MODEL 440 D.C. Thru Audio Operational Power Amplifier	MODEL S-50K Dual Channel 50 W RMS Power Amplifier Kit
POWER REQUIREMENTS	±12v to ±24v @ 30ma or +12v to +50v @ 30ma or −12v to −50v @ 30ma	±12v to ±24v ±12 ma to ±30 ma plus load current	+12v to ±25v ±8 ma to ±15 ma plus load current	±12v to ±36v ±12ma to ±30ma plus load current	115v - 60 Cy. - 1 Phase @ 2.0 Amps
OPERATING TEMPERATURE RANGE (Case)	−20°C to +85°C	−20° to +85°C	−55°C to +85°C	−55°C to +85°C	−20°C to +70°C
INPUT					Per Channel
Impedance (Open Loop)	50 to 600 Ohms	20K	20K	20K	100K
Offset Voltage (R_S = 10K)		±100 mv	±20 mv	±100mv	
Bias Current		0.2 µa	0.5 µa	0.2 µa	
Common Mode Voltage Range		Up to ±30v	Up to ±20v	Up to ±30v	
Equivalent Drift (R_S = 10K)		±0.5 mv/°C	±20 µv/°C	±0.5 mv/°C	
Equivalent Noise	−125 DBM	20 µv	2 µv (−115 dbm)	20 µv	20 µv
Common Mode Rejection Ratio		80 DB	80 DB	80 DB	
	Has internal input isolation transformer				
TRANSFER					
Voltage Gain		650	20,000	650	10 (20 DB)
Unity — Gain BandWidth	20 cy to 25 kc (−3 DB)	2 mc	2 mc	2 mc	May be changed via Feed Back Resistor
OUTPUT					
Impedance (open loop)	10 ohms	0.5 Ohm	50 Ohms	0.1 Ohm	0.1 Ohm
Voltage Swing/Load		Up to ±20v/8 Ohms	±20v/50 Ohms	±24v/4 Ohms	±28v/8 Ohms
Slewing Rate		5v/µsec	5v/µsec	5v/µs	
Full Power		D.C. to 25 kc	D.C. to 25 kc	D.C. to 25 kc	D.C. to 20 kc
Maximum Current		2 Amps	±400 ma	15 Amps	10 Amps
Peak Power		40w music		100 Watts	100 Watts
RMS Power		10w	2 w	50 Watts	50 Watts
Level	+14 DBM with B± = ±24v	+40 dbm	+33 dbm		
Total Harmonic distortion at full power.		0.5%	0.05% @ +24 dbm	< 0.5% any supply voltage & power level	0.5%
SIZE	1" Dia. x 2" Seated Height	2" dia. x 3" Seated height	5-Pin Modified TO-3 Case Mates with 9-Pin Noval Tube Socket	4¾" x 5½" x 2⅝" Seated Height	7" H x 19" w Panel—Chassis Plug-in Ampl. and Power Supply
PRICE	$30.00/1 to 99 $27.00/100 to 999	$30.00/1 to 99 $25.00/100 to 999	$30.00/1-99 $25.00/100-999	$60.00 Model 440 $35.00 Model 440K Kit	Kit $170.00/ea. Wired $230.00/ea.



MODEL 4009 Medium Voltage D.C. Operational Amplifier

POWER REQUIREMENTS			
Power Supply Voltage	±12v	±24v	±36v
Power Supply Current	±2.5 ma	±5 ma	±8 ma
OPERATING TEMPERATURE RANGE (Case)	−55°C to +125°C	−55°C to +125°C	−55°C to +70°C
INPUT			
Input Offset Voltage	< 100 mv	< 100 mv	< 100 mv
Input Bias Current	0.2 µa	0.2 µa	0.2 µa
Input Impedance	20 K	20K	20K
Input Common Mode Voltage Range	±10v	±20v	±30v
Equivalent Input Drift	< 0.5 mv/°C	< 0.5 mv/°C	< 0.5 mv/°C
Equivalent Input Noise	10 µv	10 µv	10 µv
TRANSFER			
Internal Power Dissipation	60 mw	240 mw	600 mw
Open Loop Voltage Gain	500	650	800
Unity-Gain Bandwidth	30 mc	30 mc	30 mc
Common Mode Rejection Ratio	60 DB	80 DB	80 DB
OUTPUT			
Output Impedance	2.5K	2.5K	2.5K
Output Voltage Swing/Load	±10v/50K ± 8v/10K ± 3v/ 2K	±20v/50K ±15v/10K ± 8v/ 2K	±30v/50K ±20v/10K ±10v/ 2K
Output Capacitance Loading	0.1 µf	0.1 µf	0.1 µf
Output Slewing Rate	10v/µs	10v/µs	10v/µs
Overload Recovery	5 µs	5 µs	5 µs
SIZE	Low Silhouette Modified TO-5 Can	Low Silhouette Modified TO-5 Can	Low Silhouette Modified TO-5 Can
PRICE	$10.00/1 to 999 $8.00/1K to 10K		

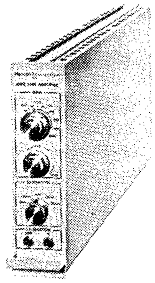


MODEL 425 Medium Voltage D.C. Operational Amplifier

POWER REQUIREMENTS		
Power Supply Voltage	±12v	±25v
Power Supply Current (Standby)	±8 ma	±15 ma
OPERATING TEMPERATURE RANGE (Case)	−20°C to +85°C	−20°C to +85°C
INPUT		
Input Offset Voltage	±20 mv	±20 mv
Input Bias Current	0.5 µa	0.5 µa
Input Impedance (Open Loop)	20K	20K
Input Common Mode Voltage Range	±10v	±20v
Equivalent Input Drift (R_S = 10K)	±20 µv/°C	±20 µv/°C
Equivalent Input Noise (R_S = 1K)	2 µv (−115 dbm)	2 µv (−115 dbm)
TRANSFER		
Internal Power Dissipation	200 mw	750 mw
Open Loop Voltage Gain	5,000	20,000
Unity-Gain Bandwidth	2 mc	2 mc
Common Mode Rejection Ratio	80 DB	80 DB
OUTPUT		
Output Impedance (Open Loop)	100 Ohms	100 Ohms
Output Voltage Swing/Load	±10v/1K ±8v/600 Ohms (+16 dbm) ±3v/50 Ohms	±20v/1K ±18v/600 Ohms (+24 dbm) ±7v/50 Ohms
Output Slewing Rate	5v/µs	5v/µs
Full Power Output	D.C. to 25 kc	D.C. to 25 kc
SIZE	1" Dia. x 1⅝" Seated Height	1" Dia. x 1⅝" Seated Height
PRICE	$25.00/1 to 99 $22.00/100 to 999	

PRESTON
SCIENTIFIC INCORPORATED
805 East Cerritos Ave., Anaheim, Calif. 92805
Tel. (714) 776-6400

INSTRUMENTATION AMPLIFIERS



8300XWB AMPLIFIER

Preston Scientific's outstanding Model XWB Series Floating Differential AMPLIFIER has been designed for use in a variety of modern high speed data acquisition and process control systems applications requiring very low noise and drift, fast over-load recovery and settling times, high accuracy, wide dynamic CMR and CMV.

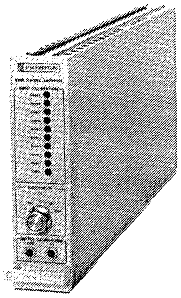
Specifications include:

- 0.005% Linearity
- 150 db Common Mode Rejection
- 30 Microsecond Settling Time
- Switchable Filtering
- 0.2 Microvolt per °C Drift
- 350 Volt Common Mode Voltage
- 100 kHz Bandwidth
- 0 to +50°C Temperature Range

SPECIFICATIONS, MODEL 8300 XWB

Description	Gain	Bandwidth (−3 DB)	Lin.	Common Mode	
				Reject	Volt
Floating Differential Amplifier	10-position 1, 2, 5 seq. K = 1 to 1000	100 kHz	±0.005% ±3 μv RTI	120 db	300 Volts Peak

RMS Noise RTI (P-P)	Drift	Input Z	Output Capability	Options	Size**	Price
7 μV	0.2 μV/°C	100 Megohms	±10 Volts at ±100 MA	Dual Output	B	$645.

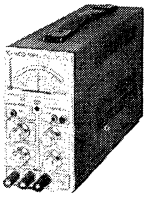


8300XWBRC AMPLIFIER

SPECIFICATIONS, MODEL 8300 XWBRC

Description	Gain	Bandwidth (−3 DB)	Lin.	Common Mode	
				Reject	Volt
Programmable Gain Amplifier	10-position 1, 2, 5 seq. K = 1 to 1000	100 kHz	±0.005% ±3 μv RTI	120 db	300 Volts Peak

RMS Noise RTI (P-P)	Drift	Input Z	Output Capability	Options	Size**	Price
7 μV	0.2 μV/°C	100 Megohms	±10 Volts at ±100 MA	Switch, Sel. Bandwidth	B	$1575.



X-MOD706 NULL-METER/ AMPLIFIER

SPECIFICATIONS, MODEL 706

Description	Gain	Bandwidth (−3 DB)	Lin.	Common Mode	
				Reject	Volt
DC Amplifier/Null Meter	$10\text{-}10^7$	Selectable 10-1-0.1 Hz	±0.1%	140 db	300 Volts Peak

RMS Noise RTI (P-P)	Drift	Input Z	Output Capability	Options	Size**	Price
0.3 μV	0.1 μV/°C	200K-ohms	±10 Volts at ±10 MA	100 Hz Bandwidth	S	$445

**(B) 8.75H, 2.12W, 20.38L (S) 6.70H, 3.45W, 12.22L

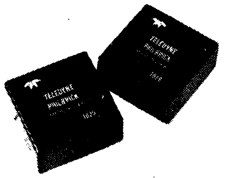
PRESTON SCIENTIFIC also manufactures Digital Volt Meters and Digital Panel Meters EEM Section 2900 Page 549 and A/D Converters EEM Section 2000 Page 373. For the location of your nearest PRESTON representative refer to Yellow Section.

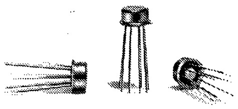
TELEDYNE PHILBRICK CIRCUIT MODULES

Teledyne Philbrick supplies the most comprehensive assemblage of circuit modules—both discrete and microcircuit—and the related instrumentation and power available from a single source. This total capability permits an ease of product selection and offers the most thoroughly experienced applications support available.

LINEAR FUNCTION MODULES

Teledyne Philbrick produces a wide variety of operational amplifiers (both discrete and microcircuit) to fill virtually any applications requirement. Comprising differential, chopper stabilized, parametric, or FET input, these amplifiers are available in hybrid, discrete component, or monolithic packages for military, industrial or commercial requirements.

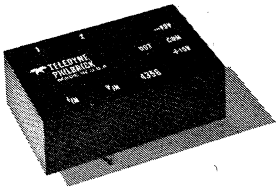




NONLINEAR FUNCTION MODULES

To the systems engineer faced with solving nonlinear applications, Teledyne Philbrick offers a wide variety of circuit modules to generate intentional, predetermined, accurate and stable distortion, the slope of which can be described by a single and useful mathematical expression.

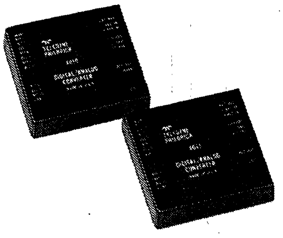
- **Log Amplifiers**
- **Multiplier/Dividers**
- **Sine & Cosine Elements**
- **Square Law Elements**
- **Track & Hold Modules**
- **Variable Function Elements**
- **Vector Operation**
- **Three-mode Integrator**



DATA CONVERSION MODULES

Teledyne Philbrick manufactures a comprehensive selection of self-contained D/A and A/D Converter modules offering an outstanding range of performance characteristics. Reinforced by the reliability, quality, and experienced applications support you can expect from Teledyne Philbrick, these data conversion "building blocks" are ideally suited to the design of a wide variety of high performance real time, on-line data conversion systems.

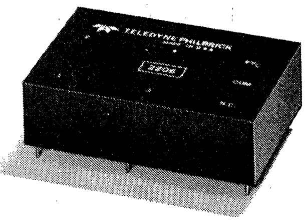
- **Test Equipment**
- **Display Systems**
- **Computer Interfacing**
- **Instrumentation**
- **Process Control**
- **Data Acquisition**



POWER MODULES

Teledyne Philbrick reliable power supply modules and regulators for op amps and related circuitry and modular supplies for micrologic circuitry are designed to convert unregulated energy to productive, regulated voltage at low power levels. Power supply features assure:

- **Protection against overloads and short circuiting**
- **Low temperature coefficient**
- **Low ripple, minimum noise**
- **Fast response time**



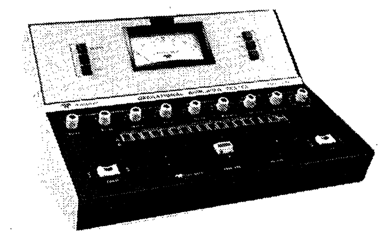
TESTERS

Teledyne Philbrick manufactures quality instrumentation designed to offer you versatility and simplicity in op amp testing and system simulation. Op amp testers feature:

- **Automatic and semi-automatic test**
- **Manual, internal or remote programming**
- **Tests IC, Hybrid and Discrete op amps and comparators**

The Teledyne Philbrick Operational Manifold offers the engineer:

- **Reduced breadboarding time**
- **Plug-in function boards for linear and nonlinear modules**
- **Easy-to-follow circuit displayed for teaching purposes**



TELEDYNE PHILBRICK

TOLL FREE READY DATA: 800-225-7883

DEPT. EEM-71 / ALLIED DRIVE AT ROUTE 128 / DEDHAM, MASSACHUSETTS 02026 / (617) 329-1600 / TWX (710) 348-6726 / TELEX: 92-4439 / CABLE: TELEPHIL

Low-Noise Transistor Amplifiers (Partial List)

Type	Freq. Range (GHz)	Noise Figure (dB)	Gain (dB)	Gain Flatness (dB)	Power Output For 1 dB Comp. (dBm)	Typical Intercept Point For IM Products (dBm)	VSWR In/Out	Power Requirement
WJ-5030-5	.05– .50	2.5	25	±1.0	+7	+15	2.5/2.0	+15 VDC
WJ-5030	.05– .50	3.5	30	±1.0	−3	+7	2.5/2.0	+15 VDC
WJ-5057	.05– .50	3.5	30	±1.0	−3	+7	2.5/2.0	115 VAC
WJ-5106	.50–1.0	7.0	20	±0.75	+23	+36	1.35/1.35	+24 VDC
*WJ-736	.50–1.0	4.0	25	±1.0	−3	+10	2.0/2.0	−15 VDC
*WJ-738	.50–1.0	4.0	25	±1.0	−3	+7	2.0/2.0	115 VAC
WJ-740	.5 –1.0	4.0	25	±1.0	−3	+7	2.0/2.0	115 VAC
WJ-736-27	.6 – .8	4.0	28	±1.0	+10	+20	2.0/2.0	−15 VDC
WJ-765	1.2 –1.4	5.0	18.5	±0.5	+10	+18	2.0/2.0	−15 VDC
WJ-737	1.0 –2.0	6.0	25	±1.0	0	+13	2.0/2.0	−15 VDC
WJ-737-31	1.0 –2.0	5.0	25	±2.0	0	+10	2.0/2.0	−15 VDC
WJ-739	1.0 –2.0	6.0	25	±1.0	0	+13	2.0/2.0	115 VAC
WJ-5201	1.0 –2.0	–	14	±2.0	+30	+42	1.5/1.5	+15 VDC
WJ-739-13	1.0 –2.0	6.5	28	±1.5	+10	+20	2.0/2.0	115 VAC
WJ-739-50	1.0 –2.0	6.0	20	±1.0	+15	+25	1.7/1.7	115 VAC
WJ-739-14	1.0 –2.0	5.0	28	±1.0	0	+13	2.0/2.0	115 VAC
WJ-739-15	1.0 –2.0	10.0	35	±1.5	+10	+20	2.5/2.5	115 VAC
WJ-739-24	1.0 –2.0	8.0	45	±1.5	+10 (SAT)	–	2.5/2.5	115 VAC
WJ-741	1.0 –2.0	6.0	25	±1.0	0	+13	2.0/2.0	115 VAC
WJ-757	1.0 –2.0	6.0	16	±1.0	−3	+7	2.0/2.0	−15 VDC
WJ-5200	1.25–1.35	10.0	40	±1.0	+30	+42	2.0/2.0	+28 VDC
**WJ-780	1.0 –2.6	7.0	27	±1.5	+5	+20	2.5/2.5	115 VAC
WJ-780-3	1.43–2.3	6.5	25	±1.0	+5	+20	2.0/2.0	115 VAC
WJ-5014	1.3 –2.0	8.0	25	±1.0	+5	+20	1.5/1.5	+25 VDC
WJ-772	2.2 –2.3	6.0	25	±1.0	+5	+20	2.0/2.0	−15 VDC
WJ-772-8	2.2 –2.3	6.0	30	±1.0	+5	+18	2.0/2.0	−15 VDC
WJ-6007	1.0 –4.0	7.5	25	±1.5	+5	+17	2.0/2.0	115 VAC
**WJ-5004	2.0 –4.0	10.0	30	±1.5	+10	+20	2.0/2.0	115 VAC
WJ-5004-2	2.0 –4.0	8.5	30	±1.5	+10	+20	2.5/2.5	115 VAC
WJ-5004-4	2.0 –4.0	7.0	25	±1.5	+5	+13	2.0/2.0	115 VAC
WJ-5004-7	2.0 –4.0	9.0	45	±1.5	+10 (SAT)	+15	2.5/2.5	115 VAC
WJ-5004-13	2.1 –4.2	10.0	31.5	±1.5	+10	+20	2.0/2.0	−15 VDC
**WJ-5005	2.0 –4.0	12.0	36	±1.5	+10	+22	2.5/2.5	115 VAC
WJ-5096	2.0 –4.0	8.5	25	–	+5	+12	2.5/2.5	115 VAC
WJ-5004-22	3.7 –4.2	9.0	15	±0.75	+3	+14	1.2/1.2	−24 VDC
WJ-5004-37	3.7 –4.2	9.0	28	±0.35	+5	+20	1.2/1.2	115 VAC
WJ-5004-61	3.4 –4.2	7.5	28	±0.5	+12	+23	1.3/1.3	115 VAC
WJ-5090	2.0 –4.5	8.5	28	±1.5	+7	+17	2.0/2.0	115 VAC
WJ-5090-4	2.0 –4.5	7.5	25	±1.5	+5	+15	2.0/2.0	115 VAC

**Qualified to MIL-E-16400F Class II.
*Units available with power outputs of +10 dBm and +20 dBm and noise figures of 3.5 dB and 4.0 dB.

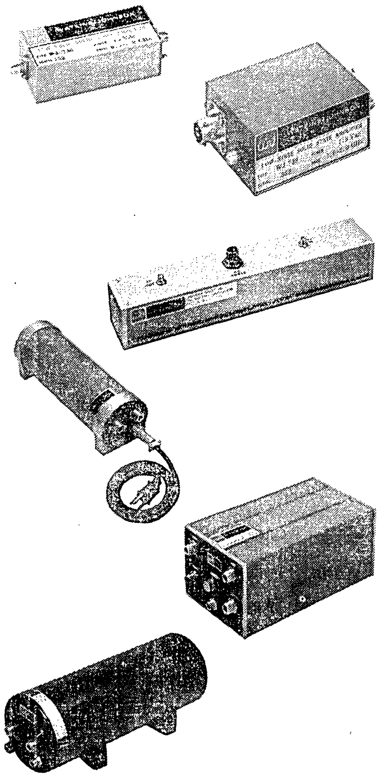
Low-Noise Traveling-Wave Amplifiers (Partial List)

Type	Freq. Range (GHz)	NF (db)	S.S. Gain (db)	Sat. Power Output (dBm)	Wgt. (lbs)
WJ-278	0.5-1.0	4.5	25	—10	17
WJ-293	0.5-1.0	8.0	25	+5	6
WJ-404	0.5-1.0	8.5	25	+5	14.5
WJ-397	0.5-2.0	7.0	25	+3	18
WJ-278-9	0.6-0.8	3.2	25	—10	17
WJ-268	1.0-2.0	5.0	25	—10	17
WJ-294	1.0-2.0	8.0	25	+7	6
WJ-294-5	1.0-2.0	8.0	28	+7	6
WJ-328-1	1.0-2.0	12.0	35	+10	17
WJ-374	1.0-2.0	5.5	25	0	17
WJ-405	1.0-2.0	8.5	25	+7	14.5
WJ-457	1.0-2.0	8.0	25	+7	6
WJ-280	1.0-2.6	8.0	35	—10	17
WJ-294-2	1.0-2.6	8.5	25	+7	6
WJ-442	1.0-4.0	7.0	25	0	18
WJ-370-3	1.4-2.3	4.5	20	—13	38
WJ-268-20	1.435-1.535	4.0	25	—10	17
WJ-268-24	1.435-2.3	5.0	25	—10	17
WJ-374-1	1.435-2.3	5.0	25	0	17
WJ-269	2.0-4.0	5.5	25	—10	17
WJ-295	2.0-4.0	8.5	25	+7	6
WJ-295-3	2.0-4.0	10.0	31	+10	6
WJ-295-5	2.0-4.0	8.5	28	+7	6
WJ-329-1	2.0-4.0	12.0	35	+10	17
WJ-375	2.0-4.0	6.5	25	0	17
WJ-406	2.0-4.0	8.5	25	+7	14.5
WJ-422	2.0-4.0	7.5	25	+10	6.5
WJ-458	2.0-4.0	8.5	25	+7	6
WJ-462	2.0-4.0	10.0	40	+10	4
WJ-477	2.0-4.0	12.0	25	+20	7
WJ-486	2.0-4.0	15.0	40	+13	3.5
WJ-3003	2.0-4.0	10.0	30	+20	18
WJ-281	2.0-4.5	8.0	35	—10	17
WJ-343	2.0-8.0	7.0	25	0	18
WJ-355	2.2-2.3	3.7	25	—10	17
WJ-375-7	2.2-2.3	4.5	13	Note	17
WJ-295-2	2.3-4.5	9.0	25	+7	6
WJ-494	2.5-10.0	10.0	25	0	18
WJ-381	2.6-5.2	9.5	25	+7	6
WJ-482	2.6-5.2	7.5	25	+10	7.5
WJ-3001	2.6-5.2	10.0	40	+10	3.5
WJ-3031	2.6-5.2	15.0	40	+13	3.5
WJ-375-1	2.7-3.1	4.5/5.0	23	0	17
WJ-295-34	2.9-3.1	5.0	24	—3	6
WJ-375-4	3.4-3.6	4.5	25	0	19.5
WJ-269-58	3.7-4.2	5.0	25	—10	17
WJ-381-11	3.7-4.2	8.0	28	+7	6
WJ-439	3.7-4.2	8.0	25	+7	17
WJ-481	3.7-4.2	6.5	28	+10	7.5
WJ-3025	3.7-4.2	10.0	40	+20	18
WJ-3034	3.7-4.2	10.0	30	+20	7.5
WJ-271	4.0-8.0	6.5	25	—5	17
WJ-286	4.0-8.0	8.0	35	—5	17
WJ-296	4.0-8.0	9.0	25	+7	6
WJ-296-5	4.0-8.0	9.0	28	+7	6
WJ-331-1	4.0-8.0	12.0	35	+10	17
WJ-407	4.0-8.0	9.0	25	+7	14.5
WJ-376	4.0-8.0	7.0	25	0	17
WJ-423	4.0-8.0	7.5	25	+10	6.5
WJ-459	4.0-8.0	9.0	25	+7	6
WJ-463	4.0-8.0	10.0	40	+10	4
WJ-476	4.0-8.0	12.0	25	+20	7
WJ-485	4.0-8.0	15.0	35	+12	3.5
WJ-3004	4.0-8.0	10.0	30	+20	18
WJ-3043	4.0-8.0	10.0	25	+7	12.5
WJ-3033	4.0-12.0	8.5	25	0	18
WJ-296-2	4.3-7.35	9.0	25	+7	6
WJ-349	4.5-6.5	5.0	25	—10	17
WJ-382	4.8-6.2	6.0	25	+13	18
WJ-382-5	4.8-6.2	6.0	25	+13	38
WJ-3002	5.2-10.4	10.0	40	+10	3.5
WJ-3032	5.2-10.4	15.0	35	+12	3.5
WJ-297-2	7.0-11.0	9.5	25	+7	6
WJ-396	7.0-11.0	6.0	25	—3	8.5
WJ-424-14	7.0-11.0	8.0	30	+10	6.5
WJ-464-1	7.0-11.0	10.0	40	+10	3.5
WJ-484	7.0-11.0	13.0	38	+13	3.5
WJ-484-3	7.0-11.0	15.0	38	+13	5.0
WJ-484-10	7.0-11.0	12.0	37	+13	5.0
WJ-363-15	7.25-7.75	7.0	30	+13	17
WJ-3005-5	7.25-7.75	9.0	30	+20	18
WJ-363-3	8.0-10.0	7.0	30	+13	18
WJ-377	8.0-12.0	9.0	25	0	17
WJ-276	8.0-12.0	8.5	25	—5	17
WJ-287	8.0-12.0	10.0	35	—5	17
WJ-297	8.0-12.0	10.0	25	+7	6
WJ-297-5	8.0-12.0	10.0	28	+7	6
WJ-332-1	8.0-12.0	12.0	35	+10	17
WJ-363	8.0-12.0	8.0	30	+13	18
WJ-345	8.0-12.0	7.0	25	—3	18
WJ-384	8.0-12.0	8.5	25	+10	18
WJ-408	8.0-12.0	9.5	25	+7	14.5
WJ-424	8.0-12.0	7.5	25	+10	6.5
WJ-424-16	8.0-12.0	9.0	28	+13	6.5
WJ-460	8.0-12.0	10.0	25	+7	6
WJ-464	8.0-12.0	10.0	40	+10	4
WJ-472	8.0-12.0	12.0	25	+20	7
WJ-484-12	8.0-12.0	13.0	38	+13	3.5
WJ-491	8.0-12.0	8.0	27	+10	17
WJ-3005	8.0-12.0	10.0	30	+20	18
WJ-3044	8.0-12.0	10.0	25	+7	12.5
WJ-437	8.0-18.0	9.5	25	+3	18
WJ-424-6	8.5-9.5	6.5	25	+10	6.5
WJ-345-11	8.5-9.6	6.0	25	—3	18
WJ-363-4	10.0-12.0	7.5	30	+13	18
WJ-307-5	10.0-16.0	10.0	25	+7	18
WJ-307-15	10.7-18.0	11.0	25	+7	18
WJ-342-2	10.7-18.0	13.0	30	+7	6.5
WJ-307-24	12.0-14.0	8.0	25	—5	18
WJ-307	12.0-18.0	10.0	25	—5	18
WJ-342	12.0-18.0	12.0	25	+7	6.5
WJ-342-9	12.0-18.0	12.0	28	+7	6.5
WJ-371	12.0-18.0	9.0	25	+12	18
WJ-425	12.0-18.0	10.0	25	+10	7.0
WJ-461	12.0-18.0	12.0	25	+7	6.5
WJ-465	12.0-18.0	12.0	25	+10	4
WJ-489	12.0-18.0	13.0	35	+13	5
WJ-489-10	12.0-18.0	13.0	37	+13	5
WJ-3045	12.0-18.0	12.0	25	+7	12.5
WJ-3006	12.0-18.0	13.0	30	+20	18
WJ-393	18.0-26.5	13.0	25	0	18
WJ-393-6	18.0-26.5	11.0	25	0	18
WJ-3000	18.0-40.0	14.0	25	+7	25
WJ-393-8	18.5-20.0	9.0	25	0	18
WJ-393-4	20.0-24.0	15.0	35	+4	18
WJ-338	26.5-40.0	14.0	25	+3	25
WJ-338-6	28.0-34.0	15.0	25	+5	25
WJ-338-5	34.0-36.0	13.0	25	+3	25
WJ-449-1	40.0-50.0	17.0	20	+5	27
WJ-449-2	40.0-60.0	19.0	20	+3	27

Note: The amplifier shall have a maximum of 1.0 dB gain compression at an input level of —15 dBm.

Only at W-J Such a Selection of Dependable

LOW-NOISE AMPLIFIERS

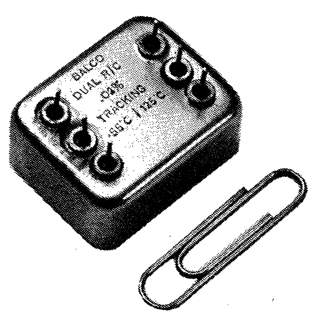


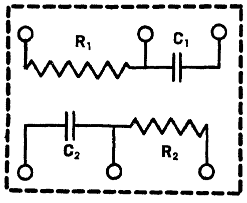
WATKINS-JOHNSON

3333 HILLVIEW AVE.
STANFORD INDUSTRIAL PARK
PALO ALTO, CALIF. 94304
(415) 326-8830

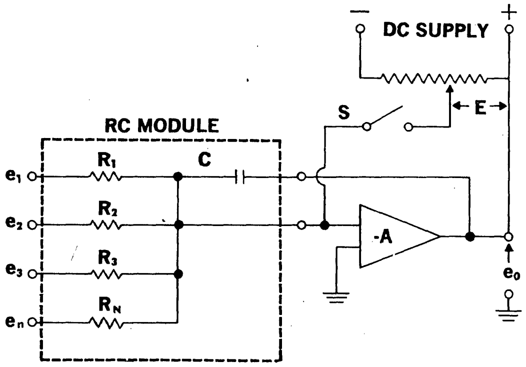
Balco marstan
BALCO ELECTRONICS, INCORPORATED
307 Washington Street, Orange, N.J. 07050 • (201) 677-1200
TWX 710-994-5812

RC NETWORK





DUAL RC NET WORK



Temp. Range	Nominal Time Constant	Closest Initial Tolerance	RC Product Stability After Temp. Cycling	RC Product Variation With Temp.
−55°C to +85°C	1.0 μsec. to 100 sec.	±0.03%	±0.02%	0 ± 4ppm/°C
	101 μsec. to 1 msec.	±0.03%	±0.03%	0 ± 4ppm/°C
	1.1 msec. to 5 sec.	±0.02%	±0.02%	0 ± 4ppm/°C
−55°C to +125°C	5.1 sec. to 20 sec.	±0.03%	±0.02%	0 ±10ppm/°C
	100 μsec. to 1 ms	±0.04%	±0.03%	0 ±10ppm/°C
	1.1 msec. to 5 sec.	±0.03%	±0.02%	0 ±10ppm/°C
	5.1 sec. to 20 sec.	±0.05%	±0.03%	0 ±10ppm/°C
	21 sec. to 200 sec.	±0.15%	±0.10%	0 ±20ppm/°C

RC Networks virtually immune to temperature change are now available; i.e., 4 PPM/°C from −55 to +85°C, and 10 PPM/°C from −55 to 125°C. Types are available with combined retrace and hysteresis effects of <.02%.

Network pairs, or dual networks can be supplied with individual RC products matched to <.02%.

These devices are available in compact hermetically sealed printed circuit cases or as discreet hermetically sealed components.

Types can be supplied to meet high reliability specifications in excess of military specifications. On request, documented test data on serialized units can be supplied with each lot shipped.

Now for the first time in one facility, Balco-Marstan combines manufacturing capabilities in Precision Film Capacitors and Precision Wire-Wound Resistors. It is no longer necessary to purchase separate components whose compatibility is a matter of chance. Attempting to closely match dissimilar parts is expensive and risky. AT BALCO-MARSTAN WE ARE SPECIALISTS. Your RC application will be reviewed by a staff experienced in the pitfalls of network design.

Our unique side by side processing insures the ultimate in component compatibility and over-all performance. From amongst our files of applications covering Integrators, Phase Shifters, Oscillators, Twin-T Filters, etc., we have selected an example.

Exceptionally stable and versatile integrator circuits are obtainable using multiple input RC modules designed specifically to provide low drift, high thermal stability, minimum leakage, and large time constants. A typical connection diagram for such a network is shown in the diagram.

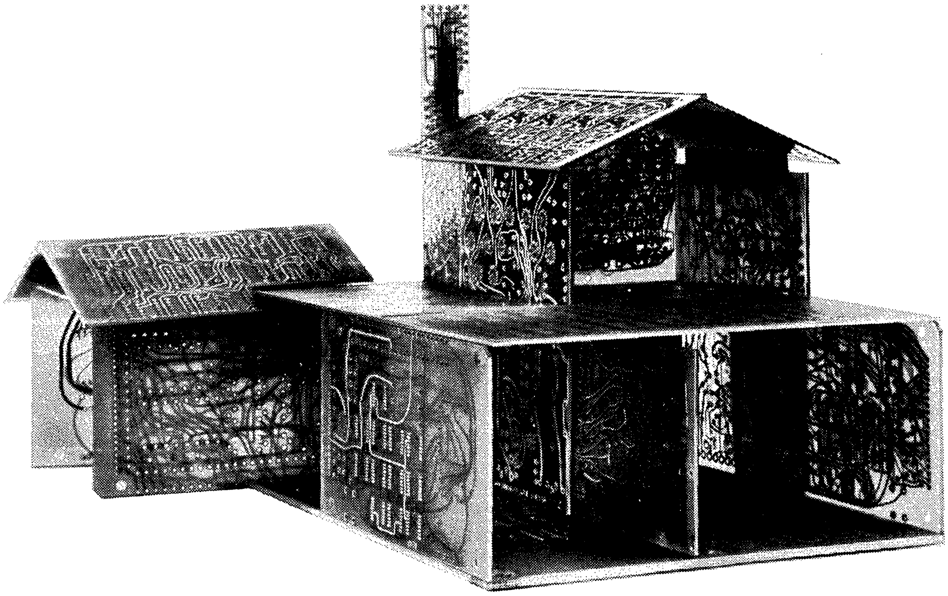
Initial conditions are established by closing the switch S, and leaving it closed for sufficient time for C to be charged to voltage E. The computing process starts when the switch is opened, performing simultaneously the operations of weighted summation and integration. The output of this circuit, in the ideal case, is in accordance with the following relation:

$$e_o = \frac{1}{C}\int_0^t \left(\frac{e_1}{R_1} + \frac{e_2}{R_2} + \frac{e_3}{R_3} \cdots + \frac{e_n}{R_N}\right) dt + E$$

Since the absolute value of each RC product is a direct factor in the circuit transfer function, all RC parameters must have high initial accuracy, and must exhibit maximum stability with both temperature and time. Dimensional specifications, however, must be considered.

RC product accuracy and stability is dependent on practical restraints on the individual components and, to aid the circuit designer in realistically computing system accuracy, the above table has been developed.

For Precision Capacitors and Precision Resistors see pages 2346, 2347 and pages 2820, 2821.



CINCH-GRAPHIK...

World's largest independent manufacturer of

- Precision double-sided, printed circuit boards with plated-thru holes
- Multilayer printed circuit boards

High volume production for Aerospace, Missile, Instrumentation and Data Processing Industries

At Cinch-Graphik you'll find the industry's newest, most modern facilities combined with the industry's most knowledgeable, experienced people... the people that have made Cinch-Graphik foremost in its field. These are the people who have devised and developed the innovations and techniques that enabled Cinch-Graphik to develop the first through-hole plating and the first multilayer boards with 36 layers on automated equipment.

Perfection is a creed at Cinch-Graphik... out of 800 people, one in every five is directly involved in inspection and quality control. To these people, meeting the requirements of Military Specifications such as MIL-P-55110 and MIL-S-9858 has become second nature.

Cinch-Graphik can handle your largest delivery requirements . . . our 125,000 square foot plant houses the most advanced precision production equipment in the industry. For high volume commercial, industrial, or military printed circuit boards, look to the leader in printed circuitry... look to Cinch-Graphik. Contact your local Cinch-Sales office listed in EEM or write Cinch-Graphik, 200 South Turnbull Canyon Road, City of Industry, California 91744. Phone (213) 333-1201.

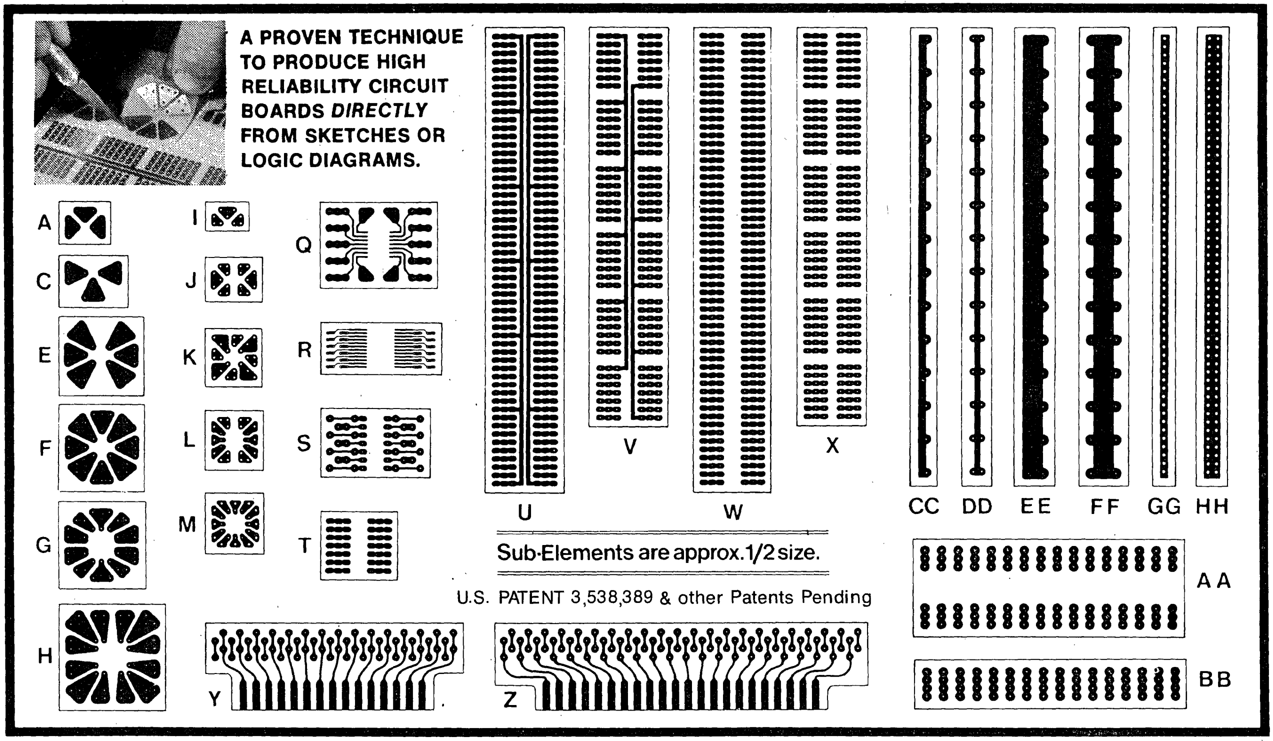
CINCH-GRAPHIK

circuit-stik INC ®

INSTANT CIRCUIT BOARDS™ • FOR INDUSTRY

ADHESIVE BACKED COPPER PATTERNS

1518 W. 132nd Street, Gardena, California 90249 • (213) 532-1450



A PROVEN TECHNIQUE TO PRODUCE HIGH RELIABILITY CIRCUIT BOARDS *DIRECTLY* FROM SKETCHES OR LOGIC DIAGRAMS.

Sub-Elements are approx. 1/2 size.

U.S. PATENT 3,538,389 & other Patents Pending

This aerospace proven concept in circuit packaging permits rapid assembly of all prototypes and limited quantity production systems directly from engineering schematics and logic flow diagrams.

All sub-element conductors are preplated and ready for soldering. Etched copper sub-elements are supplied on thin substrates which have a high strength pressure sensitive adhesive backing. They are designed to withstand soldering temperatures, and offer exceptionally good adhesion strength, yet can be removed when changes require a Circuit-Stik "instant" modification.

THE "1000" SERIES (MFR'S. TYPE) CIRCUIT-STIK SUB-ELEMENTS ARE PRE-DRILLED ON .100-INCH GRID TO MATCH PRE-PUNCHED BOARD MATERIAL — REQUIRES NO DRILLING AND NO TERMINALS

Mfr's Type	Fig.	Pcs. Per Pkg.	Sub-Element Description	Price
			TO-5 & 10-18 Sub-Elements	
1001-010	A	10	TO-18 or TO-5 3 Lead	$ 2.50
1001-030	A	30	TO-18 or TO-5 3 Lead on 5 strips	6.75
1021-010	C	10	TO-5 3 Lead	2.50
1021-030	C	30	TO-5 3 Lead on 5 strips	6.75
1023-010	E	10	TO-5 6 Lead	3.00
1023-030	E	30	TO-5 6 Lead on 5 strips	8.10
1024-010	F	10	TO-5 8 Lead	3.00
1024-030	F	30	TO-5 8 Lead on 5 strips	8.10
1025-010	G	10	TO-5 10 Lead	3.00
1025-030	G	30	TO-5 10 Lead on 5 strips	8.10
1026-010	H	10	TO-5 12 Lead	3.50
1026-030	H	30	TO-5 12 Lead on 5 strips	9.45
			Compact TO-5 Sub-Elements	
1031-010	I	10	Compact, TO-5 or TO-18 3 Lead	$ 2.50
1031-030	I	30	Compact, TO-5 3 Lead on 5 strips	6.75
1033-010	J	10	Compact, TO-5, 6 Lead	3.00
1033-030	J	30	Compact, TO-5 6 Lead on 5 strips	8.10
1034-010	K	10	Compact, TO-5 8 Lead	3.00
1034-030	K	30	Compact, TO-5 8 Lead on 5 strips	8.10
1035-010	L	10	Compact, TO-5 10 Lead	3.00
1035-030	L	30	Compact, TO-5 10 Lead on 5 strips	8.10
1036-010	M	10	Compact, TO-5 12 Lead	3.50
1036-030	M	30	Compact TO-5 12 Lead on 5 strips	9.45
			Flat Pack Sub-Elements, Spread Lead Configuration	
1061-010	Q	10	Flat Pack, 10 Lead	$ 3.00
1062-010	Q	10	Flat Pack, 14 Lead	3.00
1066-010	Q	10	Flat Pack, 22 Lead	6.00
1067-010	Q	10	Flat Pack, 24 Lead	6.00
1069-005	Q	5	Flat Pack, 28 Lead	4.25
1073-005	Q	5	Flat Pack, 36 Lead	5.00
1075-005	Q	5	Flat Pack, 40 Lead	6.50
1076-005	Q	5	Flat Pack, 42 Lead	6.50
			Compact Flat Pack Sub-Elements	
1081-010	R	10	Compact, Flat Pack, 10 Lead	$ 3.00
1082-010	R	10	Compact, Flat Pack, 14 Lead	3.00
1086-010	R	10	Compact, Flat Pack, 22 Lead	5.00

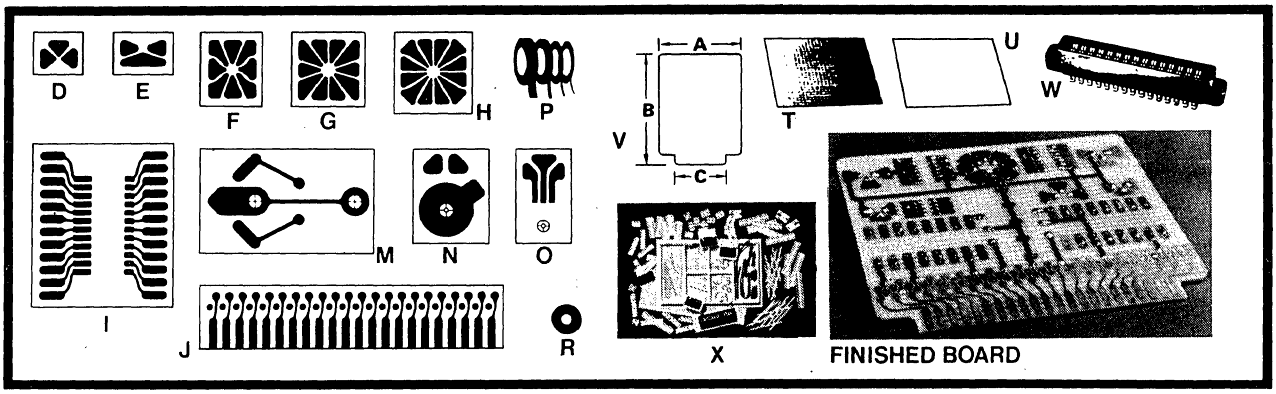
Mfr's Type	Fig.	Pcs. Per Pkg.	Sub-Element Description	Price
1087-010	R	10	Compact, Flat Pack, 24 Lead	$ 5.00
1089-005	R	5	Compact, Flat Pack, 28 Lead	3.00
1093-005	R	5	Compact, Flat Pack, 36 Lead	4.00
1095-005	R	5	Compact, Flat Pack, 40 Lead	5.00
1096-005	R	5	Compact, Flat Pack, 42 Lead	5.00
			Dual-In-Line Package Sub-Elements	
1101-010	S	10	Dual-In-Line 14 Lead	$ 3.00
1101-030	S	30	Dual-In-Line 14 Lead on 5 strips	8.10
1102-010	T	10	Dual-In-Line 14 Lead	3.00
1202-005	U	5	6 DIP's/Strip, 14/16 Lead, pwr. and gnd. avail.	7.75
1204-005	V	5	6 DIP's/Strip, 14 Lead, pwr. and gnd. pins 7/14	6.50
1206-005	W	5	Universal, 30 DIP's on 5 strips	7.75
1208-005	X	5	6 DIP's/Strip, 14 Lead	6.50
			Plug-In Connector Strips "Hard Gold over Nickel Plate"	
1351-005	Y	5	15 Pin, .100" Spacing, Component Side	$ 6.25
1352-005	Y	5	15 Pin, .100" Spacing, Circuit Side	6.25
1353-005	Y	5	15 Pin, .125" Spacing, Component Side	6.25
1354-005	Y	5	15 Pin, .125" Spacing, Circuit Side	6.25
1355-005	Y	5	15 Pin, .156" Spacing, Component Side	6.25
1356-005	Y	5	15 Pin, .156" Spacing, Circuit Side	6.25
1361-005	Z	5	22 Pin, .100" Spacing, Component Side	7.50
1362-005	Z	5	22 Pin, .100" Spacing, Circuit Side	7.50
1363-005	Z	5	22 Pin, .125" Spacing, Component Side	7.50
1364-005	Z	5	22 Pin, .125" Spacing, Circuit Side	7.50
1365-005	Z	5	22 Pin, .156" Spacing, Component Side	7.50
1366-005	Z	5	22 Pin, .156" Spacing, Circuit Side	7.50
			Discrete Component Strips	
1302-005	AA	5	16 Discrete, Component Strip, mounts 80	$ 5.50
1311-010	BB	10	Universal Strip, mounts 80 discretes	6.00
			Distribution Strips	
1321-010	CC	10	.100" wide	$ 3.50
1322-010	DD	10	.063" wide	4.10
1323-010	EE	10	.250" wide	4.50
1324-010	FF	10	.250" wide	4.80
1325-010	GG	10	Single Row .100" hole spacing	4.00
1326-010	HH	10	Double Row .100" hole spacing	4.50

circuit-stik INC

INSTANT CIRCUIT BOARDS™ • FOR INDUSTRY

ADHESIVE BACKED COPPER PATTERNS

® 1518 W. 132nd Street, Gardena, California 90249 • (213) 532-1450

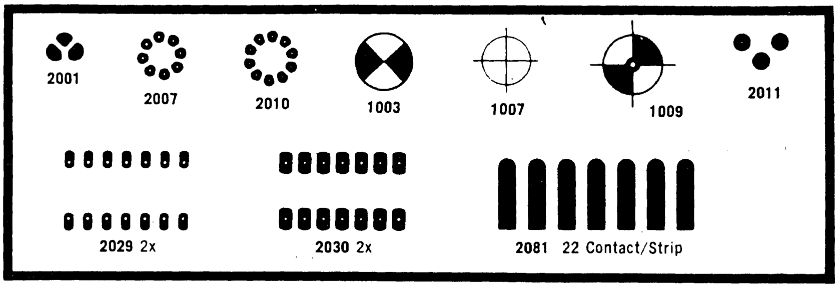


THE "2000" SERIES (MFR'S TYPE) CIRCUIT-STIK SUB-ELEMENTS ARE FOR COMPACTNESS — AND ARE NOT DRILLED.

Mfr's Type	Fig.	Pcs. Per Pkg.	Sub-Element Description	Price
2001-010	D	10	TO-18 3 Lead	$ 2.00
2001-030	D	30	TO-18 3 Lead on 5 strips	5.40
2021-010	E	10	TO-5 3 Lead	2.00
2021-030	E	30	TO-5 3 Lead on 5 strips	5.40
2024-010	F	10	TO-5 8 Lead	$ 2.50
2024-030	F	30	TO-5 8 Lead on 5 strips	6.75
2025-010	G	10	TO-5 10 Lead	2.50
2025-030	G	30	TO-5 10 Lead on 5 strips	6.75
2026-010	H	10	TO-5 12 Lead	3.00
2026-030	H	30	TO-5 12 Lead on 5 strips	8.10
2102-010	I	10	MSI Dual-In-Line 24 Lead	6.00
2367-005	J	5	22 Pin Connector, Gold Plated .156 Spacing, Component Side	6.25
2368-005	J	5	22 Pin Connector Strip, .156 Spacing, Circuit Side	6.25
2301-005	L	5	21 Discrete Components per Strip 105 total	4.75
2401-010	M	10	TO-3 Subelement (Flange Mtg.)	5.00
2402-010	N	10	SCR Stud Mtg.	3.00
2403-010	O	10	SCR Flat Pkg. Mtg.	3.00
			Copper Tape, Pressure Sensitive Adhesive	
7101	P	1	.062″ wide x 9 ft. long	$ .75
7102	P	1	.100″ wide x 9 ft. long	.90
7103	P	1	.187″ wide x 9 ft. long	1.00
7104	P	1	.250″ wide x 9 ft. long	2.00
7105	P	1	.031″ wide x 9 ft long	.75
7106	P	1	.040″ wide x 9 ft. long	.75
7107	P	1	.050″ wide x 9 ft. long	.75
			Mylar Tape, Pressure Sensitive Adhesive	
7151	P	1	.100″ wide x 30 ft. long	$ 1.00
7152	P	1	.150″ wide x 30 ft. long	1.25

Mfr's Type	Fig.	Pcs. Per Pkg.	Sub-Element Description	Price
7153	P	1	.200″ wide x 30 ft. long	$ 1.50
7154	P	1	.300″ wide x 30 ft. long	2.00
			Copper Donut Pads, Pressure Sensitive Adhesive	
7201	R	250	.100″ diameter	$ 2.50
7202	R	250	.125″ diameter	2.50
7203	R	250	.187″ diameter	3.00
7204	R	250	.250″ diameter	3.50
7251	U	5	Copper Sheet, 5″ x 6″, Adhesive Backing	5.75
7261	U	5	Epoxy-Glass Insulative Sheet, 5″ x 6″ Adhesive Backing	5.75
			Epoxy-Glass Board Material	
7301	T	1	Pre-punched 8½″ x 17″ .100 Spacing	$ 8.00
7351	U	1	Plain 6″ x 12″	1.95
7352	U	1	Plain 12″ x 18″	5.35
			Pre-Shaped Boards	
7402	V	1	Pre-Punched/"A"-4.5″, "B"-6.5″, "C"-22 pins	$ 5.25
7405	V	1	Pre-punched/"A"-4.0″, "B"-4.5, "C"-15 pins	4.25
7452	V	1	Plain "A"-4.5″, "B"-6.5″, "C"-22 pins	2.95
7455	V	1	Plain/"A"-4.0″, "B"-4.5″, "C"-15 pins	2.35
			Connectors, .156 Pin Spacing	
7501	W	1	15 Pins	$ 2.35
7502	W	1	30 Pins	2.75
7503	W	1	22 Pins	3.00
7504	W	1	44 Pins	3.50
8951	X	1	Prototype Kit	$99.50

PRECISION PRINTED ARTWORK SYMBOLS FROM CENTRON ENGINEERING, INC.



Mfr's. Type	Description	Symb. Per Pkg.	Per Package Price
2001	TO-18 2x 3 Lead	250	$ 6.50
2011	TO-5 2x 3 Lead	250	6.50
2007	TO-5 2x 8 Lead	250	6.50
2010	TO-5 2x 10 Lead	250	6.50
1003	Reg. Target	250	6.50
1007	Reg. Target	250	6.50
1009	Reg. Target	250	6.50
2029	14 Lead Plug-In	250	7.50
2030	14 Lead Plug-In	250	7.50
2081	Connector Strips .156 Spacing, 2x	30	5.00

CIRCUIT ARTWORK TAPE (BLACK CREPE) 20 YARD ROLLS

Mfr's. Type	Size	Rolls Per Pkg.	Per Package Price
CT 100-031	.031″	1	$ .75
CT 100-040	.040″	1	.75
CT 100-050	.050″	1	.75
CT 100-062	.062″	1	.75
CT 100-080	.080″	1	.75
CT 100-093	.093″	1	.75

Mfr's. Type	Size	Rolls Per Pkg.	Per Package Price
CT 100-100	.100″	1	$ .75
CT 100-125	.125″	1	.75
CT 100-156	.156″	1	.75
CT 100-187	.187″	1	.75
CT 100-200	.200″	1	.75
CT 100-250	.250″	1	.75

DONUT PADS (BLACK)

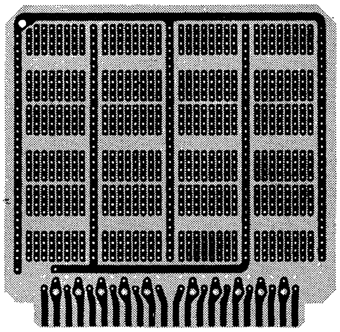
Mfr's. Type	O.D.	I.D.	Donut Pads Per Pkg.	Per Package Price
P-7100	.100	.031	500	$ 2.50
P-7140	.125	.031	500	2.00
P-7260	.187	.040	500	2.00
P-7300	.200	.040	500	2.00
P-7420	.250	.062	500	2.00
P-7460	.300	.062	500	2.50
P-7500	.312	.062	500	2.50
P-7540	.375	.062	500	2.50
P-7600	.400	.062	500	3.25
P-7720	.500	.062	500	3.75

DOUGLAS
ELECTRONICS, INC.

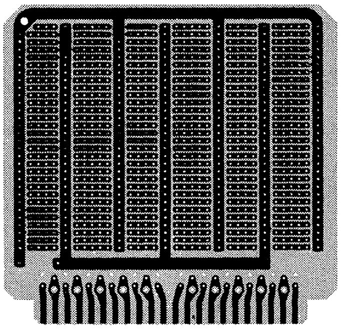
718 Marina Blvd., San Leandro, California 94577 • Telephone 415/483-8770

The complete line of off-the-shelf printed circuit breadboards shown here has been designed with one thought in mind: to help the circuit designer solve his circuit packaging problems. Our selection of over 50 standard p.c. boards, coupled with our popular card racks, cases, connectors and power supplies, provides complete support for packaging prototype and low quantity circuit designs. The off-the-shelf delivery and reasonable prices of the board line is surpassed only by their quality. All boards are etched in 2 ounce copper on flame retardant glass epoxy, plated with gold over nickel, and have double sided 44 pin, .156 center contacts, except where noted. We welcome suggested modifications to our standard boards and are happy to custom make a modified version for you.

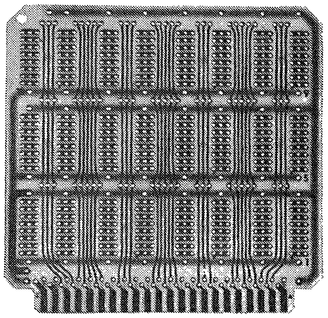
DUAL IN LINE I.C. BREADBOARDS



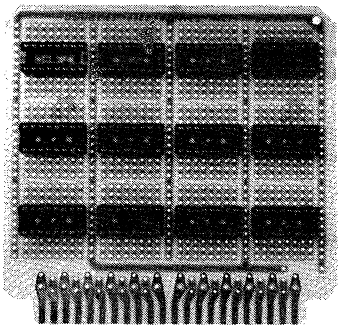
14 & 16 PIN DUAL IN LINE
11-DE-1 1-49
11-DE-3 $6.50



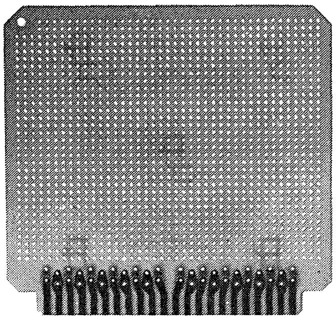
14, 16, 24 & 36 PIN DIP
12-DE-1 1-49
12-DE-3 $7.00
12-DE-6 $10.25



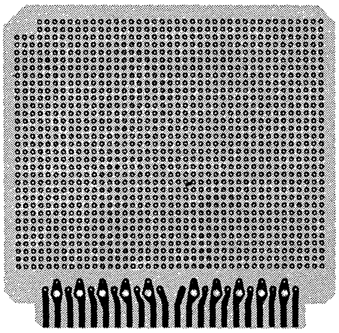
14 & 16 PIN DUAL-IN-LINE
24-DE-1 1-49
24-DE-3 $8.75



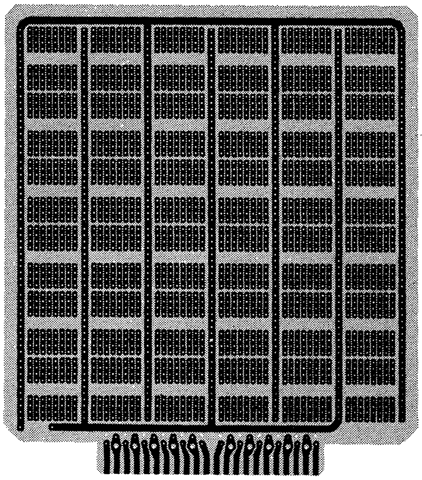
DIP BOARD W/SOCKETS
11-DE-1-S 1-49
11-DE-3-S $19.95



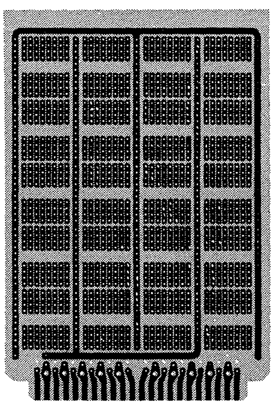
VECTOR STYLE .100 GRID
21-DE-1 1-49
21-DE-3 $6.15
21-DE-6 $8.10



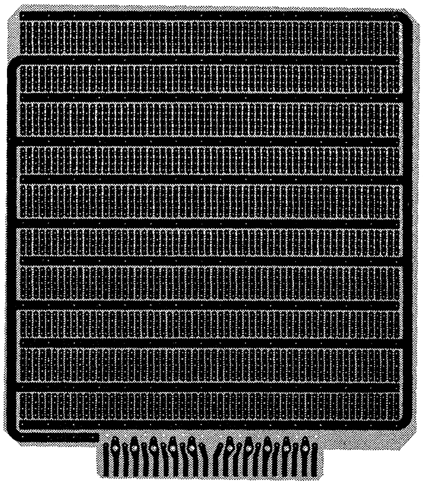
.100 GRID W/PLATED THRU HOLES 1-49
22-DE-1, 22-DE-3 $9.00
22-DE-6 $13.70



14 & 16 PIN DUAL-IN-LINE
11-DE-5 1-49 $15.00



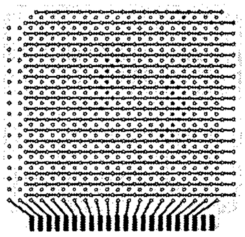
14 & 16 PIN DUAL-IN-LINE
11-DE-6 1-49 $9.75



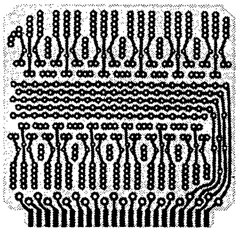
14, 16, 24 & 36 PIN DIP
12-DE-5 1-49 $17.00

DOUGLAS
ELECTRONICS, INC.
718 Marina Blvd., San Leandro, California 94577 • Telephone 415/483-8770

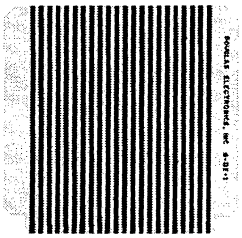
BREADBOARDS FOR DISCRETE, TO-5, FLATPACK & EXTENDERS



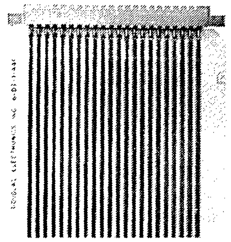
18 & 20 DIODE MATRIX
3-DE-1 1-49
3-DE-3 $10.00



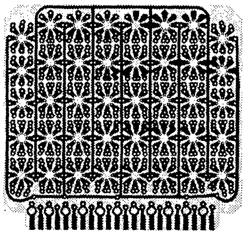
TRANSISTOR/DISCRETE
4-DE-1 1-49
4-DE-3 $4.20


DOUGLAS ELECTRONICS, INC 6-DE-1

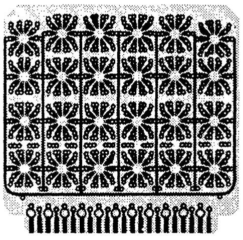
EXTENDER
6-DE-1 1-49
6-DE-3 $3.50



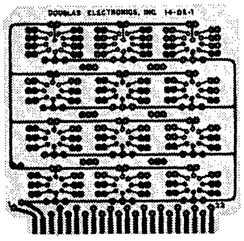
EXTENDER W/SOCKET
6-DE-1-44C $7.85
6-DE-3-44C $7.85
6-DE-5-44C $9.75
6-DE-6-44C $8.95



8 PIN TO-5
8-DE-1 1-49
8-DE-3 $10.00

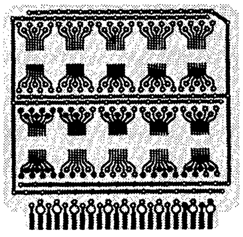


10 PIN TO-5
13-DE-1 1-49
13-DE-3 $10.00

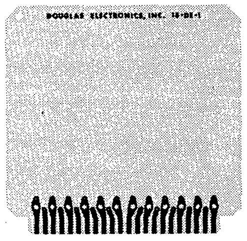

DOUGLAS ELECTRONICS, INC. 14-DE-1

LOW COST TO-5
(1 sided only)
14-DE-1 1-49
14-DE-3 $3.50

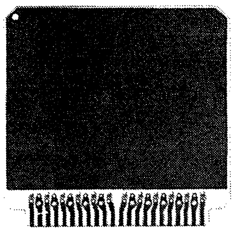
DIMENSIONS FOR DE SERIES BOARDS		
DE #	Width	Length
DE-1	4.375	4.20
DE-3	4.50	4.20
DE-5	6.50	7.50
DE-6	4.50	6.50
DE-7	2.438	5.0



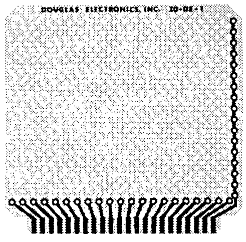
FLATPACK
15-DE-1 1-49
15-DE-3 $6.50


DOUGLAS ELECTRONICS, INC. 18-DE-1

BLANK BOARD
18-DE-1 1-49
18-DE-3 $3.50



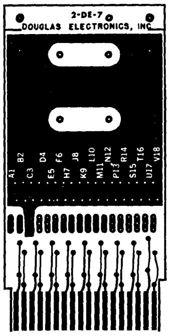
COPPER CLAD
19-DE-1 1-49
19-DE-3 $4.25


DOUGLAS ELECTRONICS, INC. 20-DE-1

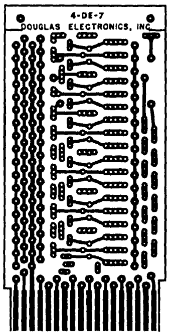
VECTOR - .200 GRID
20-DE-1 1-49
20-DE-3 $4.95

DE-7 BREADBOARDS (FOR D.E.C. SYSTEMS)

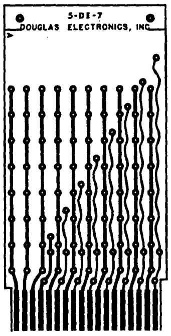
The DE-7 line is used in systems involving DEC equipment. The boards designated with an asterisk (*) are also available.in double width versions as a DE-77 part number. All boards except for the 4-DE-7, have doubled sided 36 pin connectors.


2-DE-7
DOUGLAS ELECTRONICS, INC
A1 B2 C3 D4 E5 F6 H7 J8 K9 L10 M11 N12 P13 R14 S15 T16 U17 V18

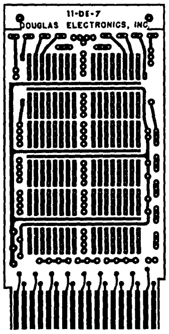
CABLE CONN.
2-DE-7 $3.75


4-DE-7
DOUGLAS ELECTRONICS, INC

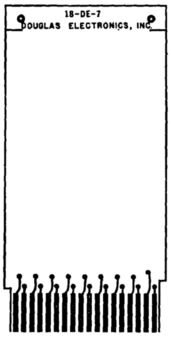
*DISCRETE
4-DE-7 $3.50


5-DE-7
DOUGLAS ELECTRONICS, INC

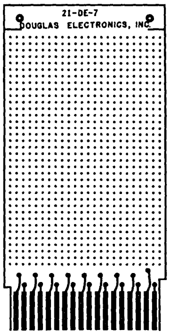
DIODE MATRIX
5-DE-7 $3.75


11-DE-7
DOUGLAS ELECTRONICS, INC

*DIP
11-DE-7 $3.75


18-DE-7
DOUGLAS ELECTRONICS, INC

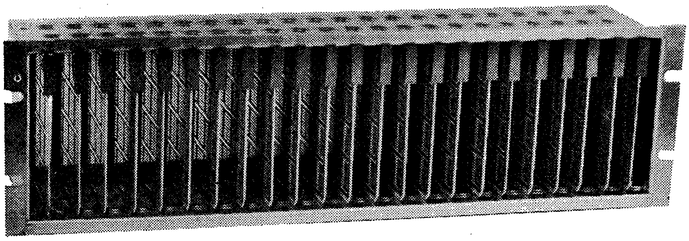
*BLANK
18-DE-7 $3.25

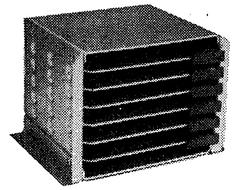

21-DE-7
DOUGLAS ELECTRONICS, INC

VECTOR-.1 GRID
21-DE-7 $5.10

DOUGLAS
ELECTRONICS, INC. 718 Marina Blvd., San Leandro, California 94577 • Telephone 415/483-8770

CIRCUIT BOARD RACKS FOR DE-1 & DE-3 BOARDS





Our unique card racks have been designed exclusively for our DE-1 and DE-3 printed circuit boards. The racks are made of .050 clear anodized aluminum and are designed so that the board is held in position by rows of dimples in the rack sides. The connectors are rigidly mounted at the back of the rack and the guiding dimples designed so as to allow for alignment with the connectors, yet still hold the cards in position. The result is a sturdy one piece unit which has no plastic parts and which requires no assembly.

Several variations are available to fill various customer requirements. Card center to center distances of ¾" and ½" are available and the racks are offered in a choice of three different sizes. The 19" rack is for standard rack mounting, the 19" and 11½" lengths are designed to fit our instrument cases and the 4-5/8" mini rack is for chassis mounting. For the 19" and 11½" racks, four different flange types are offered for various mounting situations, and the mini rack is furnished with flange as shown.

To order, specify rack number and type of mounting flange desired. If no flange is specified, we will furnish the standard front flange. Prices are for racks only and do not include the connectors. If desired, will install the connectors shown below, charging you for the price of the connectors only.

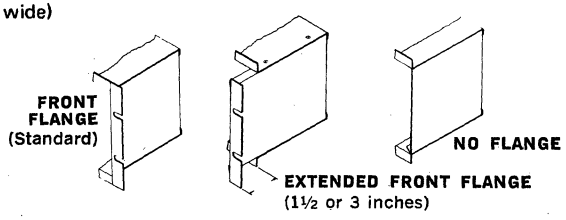
STANDARD CARD RACKS

R Series for DE-1 (4.375 wide)
M Series for DE-3 (4.5 wide)

Part Number	M-23 R-23	M-34 R-34	M-13 R-13	M-19 R-19	M-6 R-6
Nominal length (inches)	19	19	11½	11½	4⅝ (Height)
Center to Center (inches)	¾	½	¾	½	½
Number of Cards	23	34	13	19	6

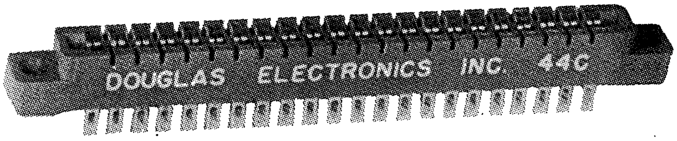
PRICES 1-9 $ 24.45 $ 12.20

OPTIONAL MOUNTING BRACKETS

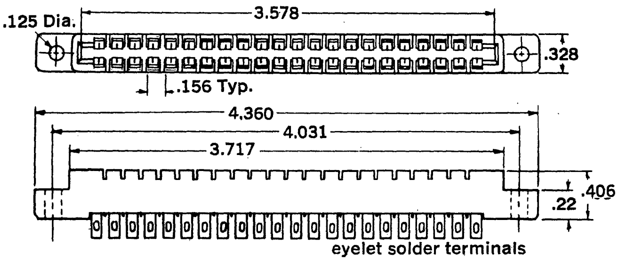


PRINTED CIRCUIT CONNECTORS & EJECTORS

The .156 center, 22 position connectors described here are compatible with our standard breadboards and card racks and are carried in stock at all times. They feature bifurcated bellows contacts in solder type terminations, both pierced and dip solder, and in .025 x .025 wire wrap terminations. The insulators are blue glass filled alkyd and are supplied with a .125 clearance hole mounting flange. The solder type connectors are available in both 22 and 44 contact versions, while the wire wrap is 44 contact only.



Part #	Type		1-49	50-99	100-249
44C	44 pin	eyelet	$2.86	$2.44	$2.11
22C	22 pin	eyelet	2.86	2.44	2.11
44DP	44 pin	dip solder	3.11	2.70	2.38
22DP	22 pin	dip solder	3.11	2.70	2.38
44WW	44 pin	wire wrap (.025 x .025)	3.70	3.41	3.05



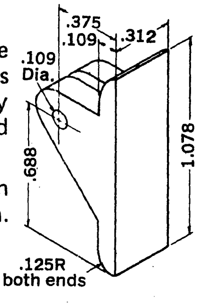
SPECIFICATIONS

Material:	Blue glass filled alkyd
Size:	22 position, single and double row
Contacts:	.156 center; gold plated copper alloy

EJECTORS

These card ejectors are designed for use with our breadboards and custom boards on the DE-1 and DE-3 size blank. They permit easy entry and removal of the card from the rack.

Material is blue Cycolac plastic and each part is supplied with a retaining pin.

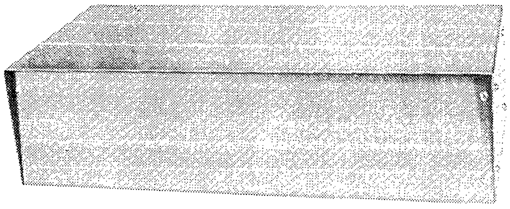


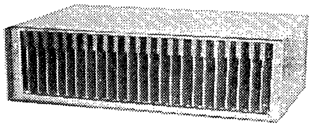
1-99 .18 ea. 100 & over .15 ea.

DOUGLAS ELECTRONICS, INC.

718 Marina Blvd., San Leandro, California 94577 • Telephone 415/483-8770

CARD RACK & INSTRUMENT CASES


Front View


Rear View

When ordering please specify the length, depth, type of back and the color you wish from the following chart.

Length	11½″	19″
Depth	7″	10″13″
Back	Solid	Perforated
Color	Blue	Clear

Clearance between the front panel and the circuit card rack is determined by the Nominal Depth of the case used.

Nominal Depth	Clearance
7″	1½″
10″	4½″
13″	7½″

Our card rack and instrument cases have been designed to hold the card racks as shown on the previous page, in addition to associated components and a panel. They are very useful for making one of a kind instruments and similar projects which require packaging in attractive enclosures.

In use, the card rack is mounted at the rear so cards can be inserted and removed when the rear panel is taken off. An inner frame mounts both the front panel and card rack as well as an optional component mounting plate (for transformers, etc.), so the unit is held together even when the outer case is removed.

Two widths are made to accommodate both the 11½″ and 19″ card racks, and offering three choices of clearance between the front panel and card rack. (See table).

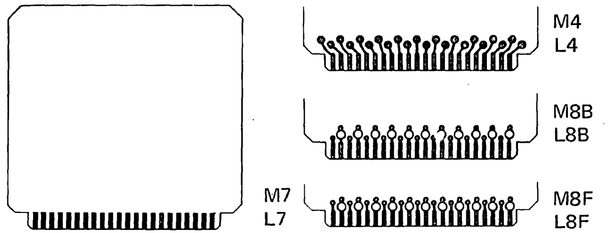
Material is .063 aluminum and we offer as standard both blue and clear anodized finishes. Cases are normally carried in stock for immediate shipment.

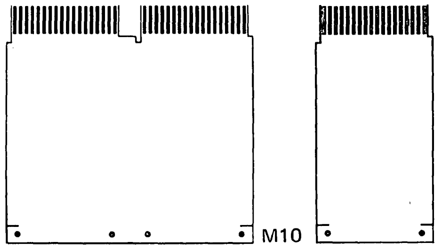
PRICES

1-9	$19.95
Component Mounting Plate	$3.00
Punching Holes in Front Panel	
Set-up	$10.00
Each hole	.15
Silk Screening White Epoxy Ink on Front Panel (supply 1:1 Positive)	
Set-Up	$15.00
Each panel	.90

MYLAR MASTERS

For the convenience of the designer, we offer mylar layout film with our board outline and with 22 pin connector fingers already photographically reproduced on the mylar. This helps save time in layout as well as helping obtain a better finished product. There are ten different types of patterns available, four for our DE-1 size blank, four for our DE-3 size blank, and two for our DE-7 size (for installation in DEC assemblies). The layout masters are available in both 2:1 and 1:1 sizes.



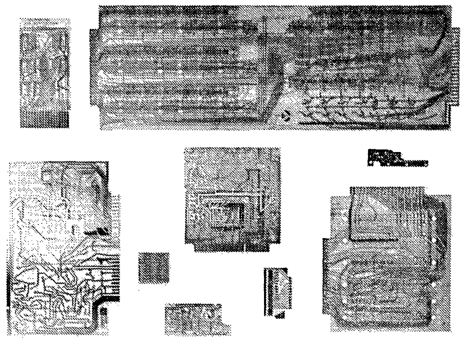


PRICES

2:1	$3.50 ea.
1:1	$1.00 ea.

NOTE:
M is for DE-1
L is for DE-3

CUSTOM CIRCUIT BOARD MANUFACTURING SERVICES



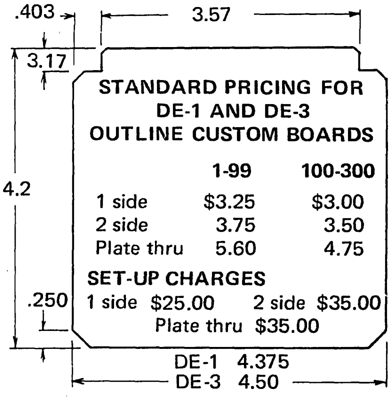
SERVICES We specialize in commercial quality work, encompassing both simple single sided boards as well as complex plated thru designs, and we are equipped to handle both production and prototype quantities. Our shop is well equipped for p.c. manufacturing, including N/C drilling, assembly and wave soldering capabilities.

COMPUTER PRICING OF P.C. BOARDS

To complement our quality p.c. board manufacturing service, we offer our exclusive quotation service using the specialized computer in our sales office. By feeding in the information shown in the table, we can obtain an instant quotation for any quantities you wish quoted.

P.C. BOARD QUOTATION DATA

1 Width of Board (inches)
2 Length of Board (inches
3 Type of Board 1. Single sided. 2. Double sided. 3. Plated-thru
4 Material 1. FR-3 2. FR-4 (G-10) 3. Other
5 Thickness 1. 1/32 2. 1/16 3. 3/32 4. 1/8
6 Plating 1. Bare Copper. 2. Gold 3. Solder 4. Solder & Gold
7 Profiling 1. Sheared 2. Rout Rect. 3. Contour Rout
8 Number of notches, slots etc.
9 Silk Screen Nomenclature 1. required 2. not required
10 Number of Holes
11 Number of holes larger than #51 (0.067)
12 Number of different hole size
13 Artwork 1. 1:1 Film work supplied 2. camera work required



STANDARD PRICING FOR DE-1 AND DE-3 OUTLINE CUSTOM BOARDS

	1-99	100-300
1 side	$3.25	$3.00
2 side	3.75	3.50
Plate thru	5.60	4.75

SET-UP CHARGES
1 side $25.00 2 side $35.00
Plate thru $35.00

AAC

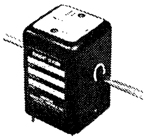
American Aerospace Controls Inc.
131 VERDI STREET, FARMINGDALE, NEW YORK 11735 ☐ (516) 694-5100

CURRENT, VOLTAGE AND POWER INSTRUMENTATION

CURRENT SENSORS D.C.

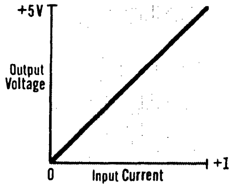
American Aerospace Controls' D.C. current sensors are used for measurement and control applications requiring an accurate high level D.C. output signal proportional to the input current. Most models feature "pass thru hole" construction for the power cable providing complete electrical isolation of the output. Models are available in grades suitable for industrial and military applications.

913A



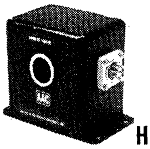
HIGH ACCURACY SMALL SIZE

Current Ranges Amps DC
100
50
20
10



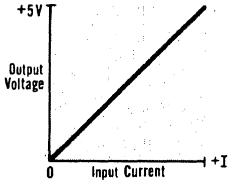
Output Volts	0 to 5 VDC
Response	10 ms
Accuracy	±1%
Excitation	24-32 VDC
Temp. Stability	.04%/°C
Weight	7 Oz.
Size	$1\frac{5}{8} \times 1\frac{5}{8} \times 2\frac{3}{8}$

902 and 916



HIGH CURRENT RANGES

Current Ranges Amps DC 902	916
300	1000
200	750
100	500
50	

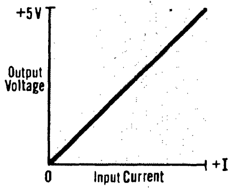


Output Volts	0 to 5 VDC
Response	10 ms
Accuracy	±1%
Temp. Stability	.04%/°C
Excitation	24-32 VDC
Size	$2\frac{3}{16} \times 3\frac{3}{4} \times 3\frac{1}{16}$

903 and 923

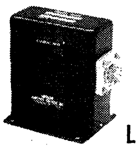
MEDIUM CURRENT RANGES

Current Ranges Amps DC 903		923
2.0	0.1	50
1.0	0.05	20
0.5	0.02	10
0.2	0.01	5



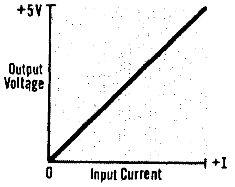
Output Volts	0 to 5 VDC
Response	50 ms
Accuracy	±1%
Temp. Stability	.04%/°C
Excitation	24-32 VDC
Size	$2 \times 2\frac{9}{16} \times 2\frac{7}{8}$

904



LOW CURRENT RANGES

Current Ranges Milli Amps DC
5
2
1
0.5
0.2
0.1

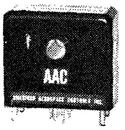


Output Volts	0 to 5 VDC
Response	50 ms
Accuracy	±1%
Temp. Stability	.04%/°C
Excitation	24-32 VDC
Size	$2 \times 2\frac{9}{16} \times 2\frac{7}{8}$

CURRENT SENSORS A.C.

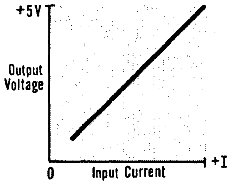
A broad line of "pass thru hole type" A.C. current sensors are available for measurement or control of current at standard line frequencies or over a broad frequency spectrum. The sensors produce a high level D.C. signal output that is electrically isolated from the current line. Power dissipation is negligible and economy models of these sensors may be used as replacements for shunts.

1003



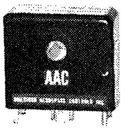
60 Hz ECONOMY

Current Range Amps AC
100
50
20
10
5



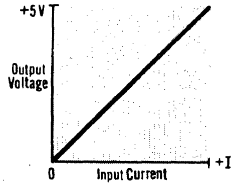
Output Volts	0 to 5 VDC
Response	50 ms
Repeatability	½%
Accuracy	5%
Excitation	Self Excited
Temp. Stability	0.1%/°C
Size	$1 \times 1\frac{3}{4} \times 2\frac{1}{16}$

1002



WIDE FREQUENCY RANGE

Current Range Amps AC	
500	100
300	50
250	25
200	10
150	–



Output Volts	0 to 5 VDC
Response	10 ms
Accuracy	2%
Frequency Range	50 to 2000 Hz
Excitation	24-32 VDC
Temp. Stability	0.1%/°C
Size	$1 \times 1\frac{3}{4} \times 2\frac{1}{16}$

AAC

American Aerospace Controls Inc.

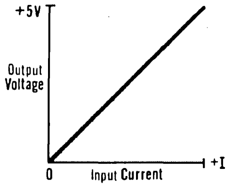
131 VERDI STREET, FARMINGDALE, NEW YORK 11735 ☐ (516) 694-5100

CURRENT SENSORS A.C.

1001

HIGH CURRENT
REMOVABLE YOKE

Current Ranges
Amps rms
2500
1500
1000
750
500
250
150

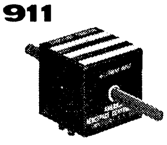


Output Voltage	0 to 5 VDC
Frequency Range	50 Hz to 2000 Hz
Accuracy	2.5% FS
Temp. Stability	.15% /°C
Response	10 ms
Size	1$\frac{9}{16}$ x 3$\frac{1}{4}$ x 4$\frac{5}{8}$

CURRENT SENSORS BIDIRECTIONAL

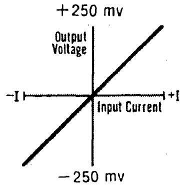
Bidirectional current sensors are used to sense either D.C. currents whose polarity or direction of flow may reverse or A.C. currents within the response capabilities of the device. The electrically isolated output signal duplicates the current wave form. Because of their fast response characteristics, these sensors may be used for pulse measurements and controls.

911



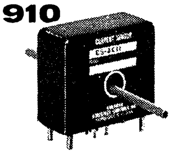
FAST RESPONSE
MINIATURE SIZE

Current Range
Amps DC or AC
150
100
50
25



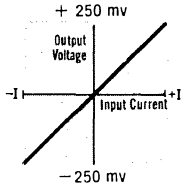
Output Volts	0 to 250 mv
Response	1 μs
Accuracy	2%
Temp. Stability	0.1% /°C
Excitation	15 VDC
Size	1 x 1 x 1

910



FAST RESPONSE
ECONOMY

Current Range
Amps DC or AC
300
200
150
100
50
25

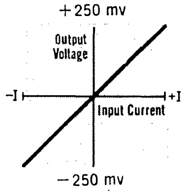


Output Volts	0 to 250 mv
Response	5 μs
Accuracy	2%
Excitation	15 VDC
Temp. Stability	0.1% /°C
Size	1 x 1$\frac{3}{4}$ x 2$\frac{1}{16}$

909

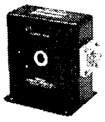
HIGH CURRENT
REMOVABLE YOKE

Current Range
Amps DC or AC
2500
1500
1000
750
500
250
150



Output Volts	0 to 250 mv
Response	200 μs
Accuracy	2%
Temp. Stability	0.15% /°C
Excitation	24-32 VDC
Size	1$\frac{9}{16}$ x 3$\frac{1}{4}$ x 4$\frac{5}{8}$

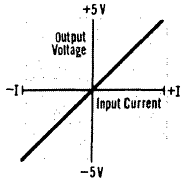
905 and 925



HIGH ACCURACY
HIGH OUTPUT

Current Ranges
Amps D.C.

905	925
2.0	50
1.0	20
0.5	10
0.2	5
0.1	



Output	0 to ±5 VDC
Response	50 ms
Accuracy	1%
Excitation	±15 VDC
Temp. Stability	.04% /°C
Size	2 x 2$\frac{9}{16}$ x 2$\frac{7}{8}$

CURRENT NULL SENSORS

Current Null Sensors are used in feed-back systems to accurately control large values of D.C. current to better than 1 part in 50,000. Small control currents are fed to the sensor which establishes a current null level. Nulls accurate to 5ma are obtainable over 0 to 300 Amps. D.C. range using 0 to 1 amp of control current. Null occurs when the input current reaches a level established by the control current. A 0 to ±5 volts D.C. output occurs for ±50ma around null.

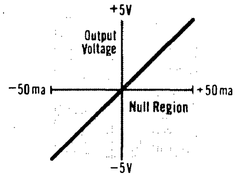
915

SENSITIVE NULL
HIGH CURRENT RANGE

Current Range
Amps D.C.
0-300

Control Current Range
Amps D.C.
0-1

Null
5mA



Output	0 to ±5 VDC
Null Stability	5 ma
Excitation	±15 VDC
Temp. Stability	.04% /°C
Response	50 ms
Size	2 x 2$\frac{9}{16}$ x 2$\frac{7}{8}$

AAC

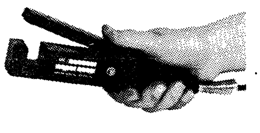
American Aerospace Controls Inc.

131 VERDI STREET, FARMINGDALE, NEW YORK 11735 ☐ (516) 694-5100

CURRENT SENSORS MOVEABLE JAW TYPE

A complete line of moveable jaw type current sensors are available for D.C., A.C. and combination D.C. and A.C. current measurements. Models cover both military and industrial applications. These transducers are well suited for diagnostic testing of automotive electric circuits. Uses include measurement of starter current, battery drain, and generator-alternator current. Fast response units permit accurate analysis of current wave forms. Output voltage can be indicated on a meter, scope or recorder.

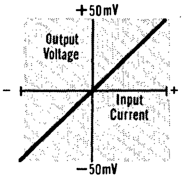
919



FAST RESPONSE
ECONOMY

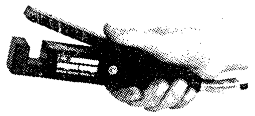
Current Ranges
Amp D.C. or rms A.C.

0-500
0-400
0-300
0-200
0-100
0-50



Output Volts	0 to ±50mV @1MA
Response	100μ sec
Accuracy	5%
Excitation	+15VDC @25MA
Temp. Coef.	0.15%/°C.
Size	1 x 1¾ x 8

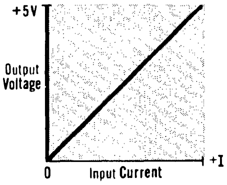
929



HI-ACCURACY
MIL-SPECS

Current Ranges
Amps. D.C.

0-1000
0-500
0-200
0-100
0-50
0-20
0-10

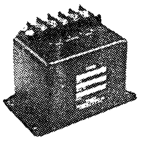


Output	0 to 5 VDC
Accuracy	1% F.S.
Excitation	28 VDC ±4 VDC
Response	10 mill sec
Temp. Range	−55°C to +85°C
Temp. Stability	0.1%/°C
Size	1$\frac{1}{16}$ x 2$\frac{1}{16}$ x 9

VOLTAGE MONITORS A.C.

American Aerospace Controls' fast response A.C. line voltage monitors provide an isolated D.C. output voltage proportional to the A.C. RMS line voltage. The monitors respond within ½ cycle of the A.C. line voltage frequency and are very useful in protecting computer systems from program destroying transient line voltages or for detecting momentary power failures.

101 and 102

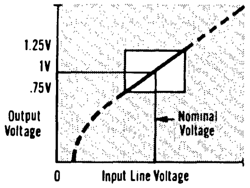


FAST RESPONSE
D.C. OUTPUT

Line Voltage Range
Volts rms AC

101
90-150 60Hz
180-300 60Hz

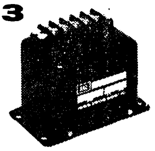
102
90-150 400Hz
155-260 400Hz



Output Voltage	1 VDC for Nominal Line Voltage
Output Scale Factor	10 mv/Volt
Excitation	Self Excited
Response	Within ½ Hz
Accuracy	2%
Size	2¼ x 2¼ x 3¾

Series 103 line voltage monitors feature adjustable zero suppression and adjustable high and low limit dead bands permitting accurate detection of those out of limit voltage levels of consequence to a particular system. Both 60 Hz and 400 Hz models may be selected.

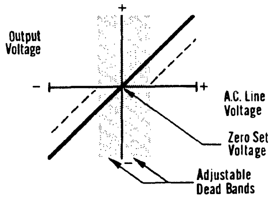
103



FAST RESPONSE
SUPPRESSED ZERO
HI AND LO DEAD BANDS

Line Voltage Ranges
Volts rms AC

90-150	60 Hz
180-300	60 Hz
90-150	400 Hz
155-260	400 Hz

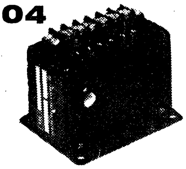


Output Scale	10 MV/Volt
Accuracy	±2% F.S.
Excitation	Self Excited
Response	Within ½ Hz.
Temp. Coef.	0.1%/°C.
Size	3 x 3½ x 4¼

WATT TRANSDUCERS A.C.

A.C. watt transducers are used for measurement or control of A.C. power. These low insertion loss devices provide a high level linear D.C. output. Models are available covering a broad wattage range.

404



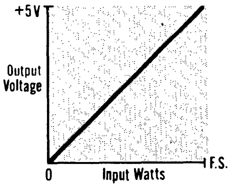
60 Hz OR 400 Hz
GENERAL PURPOSE

Current Ranges AC rms
0-10 to 0-500 Amps

Voltage Ranges

115 Volts	(60 to 170)
220 Volts	(110 to 330)
440 Volts	(220 to 660)

Wattage Ranges
0-1 KW to 0-200 KW



Output	0 to 5 VDC
Accuracy	2% FS
Excitation	Self Excited
Response	50 ms
Temp. Coef.	.15%/°C
Size	2¼ x 2$\frac{13}{16}$ x 3½

AAC

American Aerospace Controls Inc.

131 VERDI STREET, FARMINGDALE, NEW YORK 11735 □ (516) 694-5100

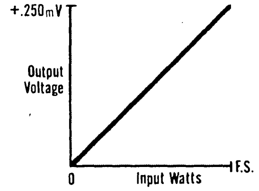
WATT TRANSDUCERS D.C.

American Aerospace Controls' D.C. watt transducers are used to measure power in a D.C. circuit. The sensors feature pass thru hole construction and zero insertion loss as well as electrical isolation of the current cable. The units generally respond in the micro second region and produce a linear D.C. output proportional to power input.

407

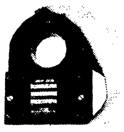
FAST RESPONSE
ECONOMY

Current Ranges
0-10 to 0-300 Amps
Voltage Ranges
0-12 to 0-240 Volts
Wattage Ranges
0-120 W to 0-60 KW



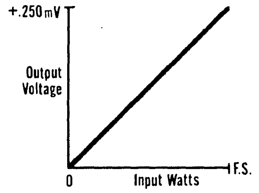
Output	0-250 mv DC
Accuracy	2% FS
Response	5 μsec
Temp. Range	–35°C to +70°C
Temp. Coef.	.15%/°C
Size	1 x 1 3/4 x 2 1/16

401



HIGH CURRENT
REMOVABLE YOKE

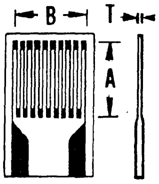
Current Ranges
0-150 to 0-3000
Voltage Ranges
0-20 to 0-150
Wattage Ranges
0-3 KW to 0-450 KW

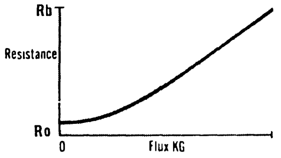


Output	0 to 250 mv
Accuracy	2.5% FS
Response	200 μsec
Temp. Range	–25°C to +75°C
Temp. Stability	0.15%/°C
Size	1 9/16 x 3 1/4 x 4 5/8

MAGNETORESISTORS

Magnetoresistors are magnetic flux sensitive resistors that change resistance proportional to an applied magnetic field. They are useful for flux measurements, D.C. position sensors, pick-offs, and many other electronic functions. **The MRA type elements are useful for cryogenic applications. The MRI-type elements are general purpose high sensitivity elements.**

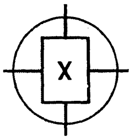


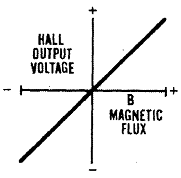


Model No.	Size – Inches A	B	T	Available Resistances At 0 Flux & 25°C Ro Ohms	Sensitivity Rb/Ro 3 KG.	10 KG.
MRA-11	1/16	1/16	.004	1 Ω to 200 Ω	1.05	1.35
MRA-12	1/8	1/8	.004	1 Ω to 1000 Ω	1.05	1.35
MRA-13	1/4	1/4	.004	1 Ω to 2000 Ω	1.05	1.35
MRA-14	1/2	1/2	.004	1 Ω to 3000 Ω	1.05	1.35
MRI-101	3/16	3/32	.010	100 Ω	2	7
MRI-201	1/8	1/8	.010	200Ω	2	7
MRI-251	3/16	3/32	.010	250Ω	3	10
MRI-501	1/8	1/8	.010	500 Ω	3	10

HALL EFFECT GENERATORS

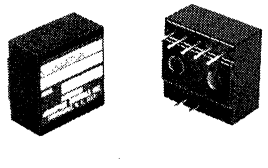
Hall effect generators are magnetic flux sensitive elements that produce a polarity sensitive output voltage proportional to the applied magnetic field intensity and direction under constant current excitation. Applications include proximity detectors, brushless D.C. motors, magnetic card readers, current probes, Gauss meters, etc. **The HA Series are suitable for cryogenic applications while the HI Series are general purpose high sensitivity elements.**





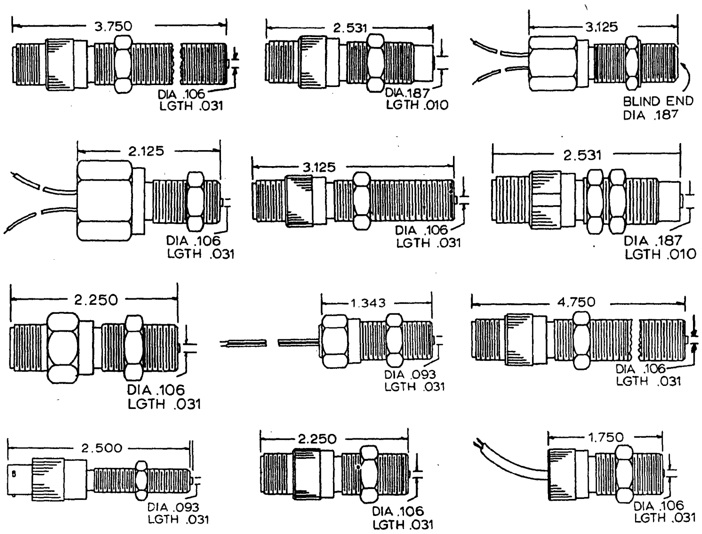
Model No.	Size – Inches Length	Width	Thickness	Magnetic Flux Range	Rated Control Currents	Output Sensitivity at Rated Control Current
HA-11	9/32	1/8	.006	5 KG.	20 MA	.5 MV/KG.
HA-12	9/16	1/4	.006	5 KG.	100 MA	1 MV/KG.
HA-13	1	1/2	.006	5 KG.	200 MA	4 MV/KG.
HI-1	.10	.125	.020	20 KG.	15 MA	12 MV/KG.
HI-5	.10	.10	.030	0.1 KG.	10 MA	400 MV/KG.

CUSTOM DESIGNED COMPONENTS



American Aerospace Controls specializes in the design and manufacture of a large variety of magnetically actuated components as well as precision mechanical devices. These include such products as **flux detectors, modulators, multipliers, current isolators, D.C. transformers, angular and linear displacement transducers, proximity detectors, angular motion compensating mechanisms, etc.** Our staff of application specialists are available to assist in the selection, design or modification of our products to meet your specific requirements.

RPM MEASUREMENT and CONTROL

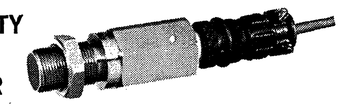


A few of the many Airpax Magnetic Pickups available.

MAGNETIC PICKUPS

Convert mechanical motion to an ac voltage without physical contact or external power. The pickup creates an external magnetic field which, when interrupted by a magnetic discontinuity, i.e., a ferrous gear tooth, generates an ac voltage.

ZERO-VELOCITY GEAR-TOOTH TRANSDUCER

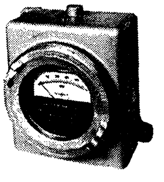


Model 4-0001 provides positive 5 volt logic as the leading (or trailing) edge of a gear tooth passes across the center of the transducer. Typical applications include:

- Analog/Digital Tachometry
- Cut-to-Length Control
- Production Totalizing
- Zero Speed Switching
- Process Control
- Variable Speed Drives

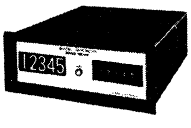
The Airpax solid state electronic tachometer system uses a frequency discriminator to convert a varying or alternating input signal to a proportional dc output. The conversion accuracy is nominally 0.25% over frequency ranges to 100 kHz. Supplied in a variety of enclosures designed for industrial and military applications and accessory components, the system represents the most accurate, inexpensive electronic tachometer or frequency converter available.

ANALOG TACHOMETER



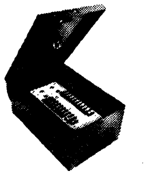
An electronic tachometer using a system of transistor amplifiers and a saturating core transformer to convert RPM, speed or frequency into a dc output.

DIGITAL PROCESS MONITOR



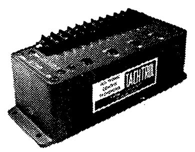
An industrial device that accepts and counts signals over a given time interval providing a displayed readout in engineering units, i.e., RPM, FPM, CPS. Also available in accumulator or ratio mode.

SWITCHING TACHOMETERS



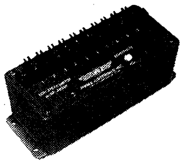
Monitor the RPM of rotating equipment and provide 1, 2 or 3 switchpoints (set-points) where predetermined action (alarm, programming or verification) takes place.

CONTROL TACHOMETER



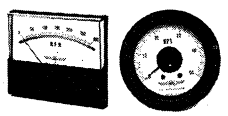
An industrial tachometer that converts RPM, speed or frequency to high level output current ranges (1-5, 4-20, 10-50 mA dc) which is linearly proportional to the input signal.

ZERO SPEED SWITCH



Is used when an alarm switching or equipment shutdown function is required as the speed of a rotating shaft approaches zero.

METERS



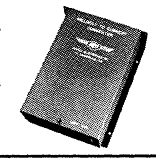
210 310

Model 210 accepts standard 0-1 mA dc output of a tachometer for visual monitoring of RPM, speed or frequency.

Model 310 is a rugged meter (similar to Model 210) but offers a 250° arc scale for increased readability.

DC MILLIVOLT-TO-CURRENT INDUSTRIAL TELEMETRY AMPLIFIER

Converts a dc mV input from a thermocouple or other mV source to a proportional dc mA output. Magnetic-transistor amplifier provides stable operation, reliability and input-output isolation. Request Bulletin 5008.



Catalog S1-1 provides complete information on RPM Measurements and Control instruments. Yours on request.

AIRPAX ELECTRONICS
CONTROLS DIVISION, P. O. BOX 8488, FORT LAUDERDALE, FLORIDA 33310
PHONE: (305) 587-1100
TELEX: 51-4448
TWX: 510-955-9866

American Zettler, inc.

MINIATURE SOLENOIDS SERIES AZM 260

FEATURES

- Compact deisgn
- Easy one-hole mounting
- Rectangular shape for optimum space/power efficiency
- Armature glides in brass housing for minimum wear

GENERAL DESCRIPTION

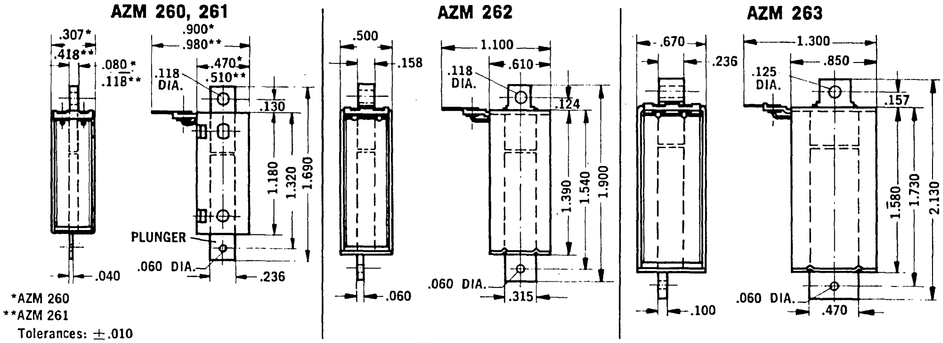
The AZ miniature solenoids are specifically designed for equipment where space and electrical efficiency are of prime importance. The rectangular shape of the AZM-260 Series allows several solenoids to be packaged together for maximum utilization of space.

AZ solenoids are designed with a cut-out armature so that the load can be centrally coupled to eliminate vectoring of the armature. The special magnetic iron used is annealed after machining is completed for highest electrical efficiency.

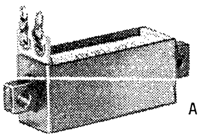
Also featured is a molded bobbin that provides optimum dielectric strength.

The AZM 260 Series solenoids are available for either intermittent or continuous duty applications.

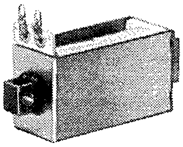
DIMENSIONS



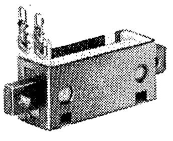
*AZM 260
**AZM 261
Tolerances: ±.010



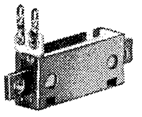
AZM 262



AZM 263



AZM 261



AZM 260

SPECIFICATIONS

Type	AZM 260	AZM 261	AZM 262	AZM 263
Max. pull force at 1/16" stroke and 20°C coil temp. a) b)	2¼ oz (70 gr) 10 oz (280 gr)	3¼ oz (90 gr) 14 oz (400 gr)	6¼ oz (175 gr) 20 oz (570 gr)	12½ oz (350 gr) 72 oz (2000 gr)
Max. stroke (inches)	5/16			
Life expectancy	Up to 10⁶ operations depending on impact at end of stroke			
Operate voltage	Up to 115VDC			
Max. coil temp.	110°C (240°F)			
Dielectric strength coil to frame	750 vrms			
Temp. rise °C/Watts	20	15	12	9
Max. cont. power dissipation at 20°C (68°F) ambient temp. (watts)	3.5	4.5	6	8.5
Pull in time	3-30ms	3.5-35ms	4-40ms	5-50ms
Weight	½ oz (12.5 gr)	¾ oz (22 gr)	1 oz (28 gr)	2½ oz (70 gr)
Terminals	Pierced solder lugs, pretinned or lead wires available on special order			

a) for continuous duty
b) for intermittent duty (10% on)

TABLE I — STANDARD COILS

A) for 100% duty cycle

Type	AZM 260	AZM 261	AZM 262	AZM 263
Force at 1/8" stroke c) d)	¾ oz (20 gr) ½ oz (15 gr)	1⅕ oz (33 gr) 1 oz (25 gr)	1⅗ oz (45 gr) 1¼ oz (35 gr)	4½ oz (130) gr) 3½ oz (100 gr)
Operate Voltage DC	Coil resistance in Ohms			
6	10	8.6	5.7	4.2
12	32	30	21	16
24	150	130	80	73
48	760	460	300	290
115	3700	2500	2300	1450

B) for 50% duty cycle at 2½ sec. max. on time

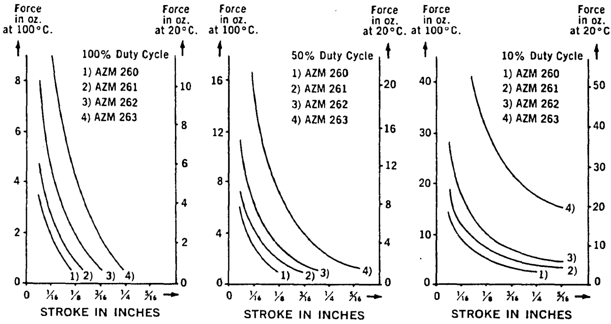
Type	AZM 260	AZM 261	AZM 262	AZM 263
Force at 1/8" stroke c) d)	1½ oz (40 gr) 1 oz (30 gr)	2⅓ oz (65 gr) 1¾ oz (50 gr)	3½ oz (100 gr) 2¾ oz (75gr)	8⅓ oz (230 gr) 6½ oz (180 gr)
Operate Voltage DC	Coil resistance in Ohms			
6	5.5	3.9	—	—
12	21	16	12	8
24	72	66	50	31
48	415	280	220	150
115	1500	1400	1250	850

C) for 10% duty cycle at ½ sec. max. on, 4½ sec. min. off time

Type	AZM 260	AZM 261	AZM 262	AZM 263
Force at 1/8" stroke c) d)	5¾ oz (160 gr) 4¼ oz (120 gr)	8¾ oz (245 gr) 7 oz (190 gr)	12 oz (330 gr) 9 oz (250) gr)	36 oz (1000 gr) 29 oz (800 gr)
Operate Voltage DC	Coil resistance in Ohms			
6	1.4	—	—	—
12	4	3.3	—	—
24	16	13	10	8
48	72	50	40	26
115	415	280	220	115

c) at 20°C coil temperature, initial force or at one shot operation
d) at 100°C coil end temperature

TYPICAL PULL CURVES FOR DIFFERENT DUTY CYCLES AT 20°C AND 100°C COIL TEMPERATURE



HOW TO ORDER:

1. Select solenoid applicable to your space and power requirements
2. Add coil resistance from Table I (A, B, or C)

If your application is not covered by the solenoids described in this brochure, send us the approximate force/stroke diagram, operating voltage or current tolerances, and ambient temperature, maximum on- and minimum off-time parameters. We will then determine the most efficient coil for your particular application.

SPECIALISTS IN CONTROL

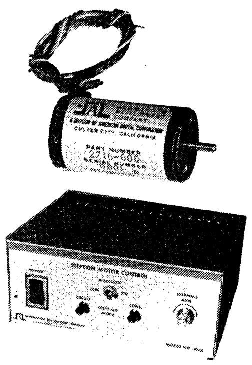
CUSTOM DESIGN and PACKAGING of COMPONENTS and SYSTEMS

A LEADING MANUFACTURER OF CONTROL SYSTEMS AND STEPPING MOTORS SINCE 1960

Either ADC off-the-shelf components, or the best of other manufacturer's components are used to assure the ultimate balance between performance, cost, and value. ADC's line is one of the most comprehensive in the control field, including stepping motors, gearmotors, controllers, driver logic, counters, converters, indicators, set-point and other electronic and electromechanical devices.

FULL DESIGN, DEVELOPMENT, PACKAGING AND MANUFACTURING CAPABILITY
WE SPECIALIZE IN SOLVING YOUR CONTROL PROBLEMS — CALL US NOW

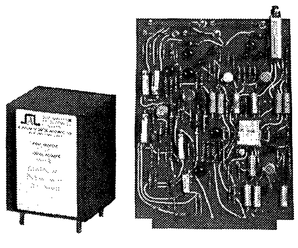
STEPPING MOTORS AND CONTROL SYSTEMS



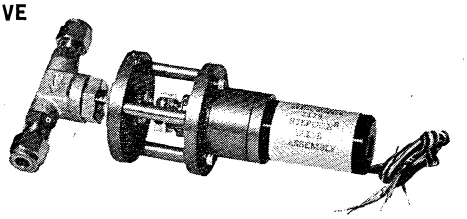
A comprehensive line of Stepcon® Stepping Motors, Gearmotors and Control Modules available off-the-shelf. Line includes high-performance true P-M motors with stepping rates to 1500 steps per second and a wide range of speeds, stepping angles and torque.
Complete control systems are available to operate stepping motors from AC power line. Contain power supplies, pulse-generators, controllers, power-savers and all necessary adjustable controls. Ideal for precise positioning and control.

CONTROL MODULES AND COMPONENTS

We can quickly assemble control systems to your requirements drawing on our full line of plug-in control modules. These include 2Ø/4Ø and 3Ø Controllers, Pulse Generators, Power Savers, Analog-to-Pulse Rate Converters, Comparators, and a wide variety of specialized components. ADC's capabilities include circuit development, PC Board layout and fabrication to your specifications. We are equally at home with use of discrete components, hybrid circuits and integrated circuits.



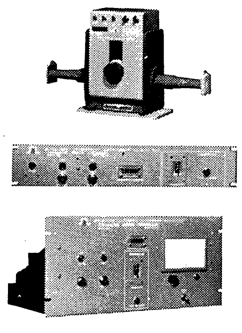
REMOTE CONTROL VALVE-DRIVE SYSTEMS



This series of remotely controlled metering valves, when suitably interfaced with ADC control modules, can respond to manual, digital, or analog commands in such precise low-flow applications as analytical instrumentation, chromatography, semi-conductor processing and a variety of other laboratory, industrial, or process control uses.

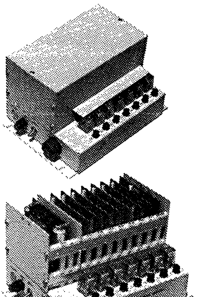
ATTENUATOR REMOTE-CONTROL SYSTEM

Typical of ADC's capability to provide precision digital servos for remote control of such devices as magnetrons, potentiometers, cameras, atomic rods, X-Y tables, etc. where precision positioning is required, this system provides accurate, stable operation of remotely located attenuators. Operating from one or more remote locations, it is adaptable to major manufacturer's attenuators and can be modified to respond to manual, digital computer, tape, or punched card commands.



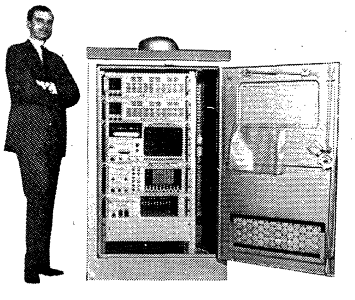
MULTI-CHANNEL REMOTE CONTROL

The illustrated seven channel, two-wire Encoder/Decoder system is designed for dependable remote control of traffic equipment, utility control, selective calling, process control and similar applications where low cost is a factor. Voice-grade telephone circuits, radio link, or direct cable may be used for interconnect. Parallel operation permits continuous control with no need to time-share. Mechanical filters avoid need for adjustment during the life of the equipment. Other Encoders and Decoders are available from stock or designed to your specifications.



MASTER TRAFFIC-CONTROL SYSTEMS

This system is typical of ADC's capability to supply all types of supervisory control equipment. It will provide such control of traffic equipment in large sections of a metropolitan area or entire control of smaller municipalities traffic systems. Compatible with manual control, pre-programmed complex schedules, and eventual computerized real-time control.



AUTOMATION DEVELOPMENT COMPANY

A DIVISION OF AMERICAN DIGITAL CORPORATION
9905 W. JEFFERSON BLVD. • CULVER CITY, CALIF. 90230 • (213) 838-7346

LOOK US OVER

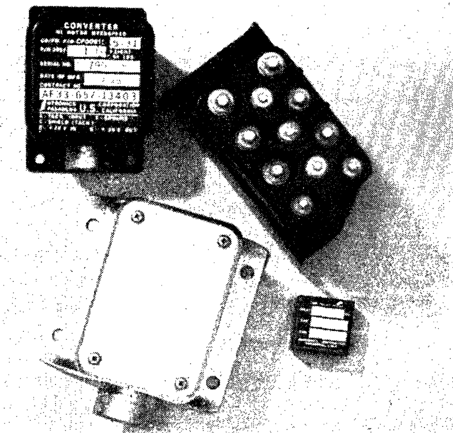
Autronics Timing, Sensing and Control Devices

Look us over — then look us up . . . today!

Engineering and manufacturing specialists in our field, we provide both standard and custom designs qualified to military, industrial, aerospace or commercial aircraft specifications. Here are a few examples of problems we have solved.

TIMERS Time delays from milliseconds to hours for . . . missile arming and launching . . . parachute deployment . . . commercial and military systems . . . satellite programming . . . high-noise surroundings.

SENSORS Voltage, current, frequency and light sensing for . . . jet engine speed warnings . . . aircraft cargo smoke detection . . . ECM over-current protection . . . GSE power phasing.



CONTROLS Compact solid-state analog and digital units for . . . lamp dimming and flashing . . . turbine start, run and shutdown command . . . drone recovery systems.

POWER CONVERTERS Special source, load, shape, size and environmental requirements applied to . . . DC/DC and AC/DC conversion . . . discrete and I/C level voltage sources for computer systems . . . multiple-output radar and sonar DC/DC supplies.

Write or call us with your requirements . . . Draw on our 15 years experience!

Representatives in major U.S. cities.

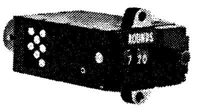
AUTRONICS CORPORATION

180 North Vinedo Avenue Pasadena, California 91107 (213) 681-3545 TWX (213) 449-2854

BOWMAR®

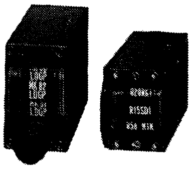
MECHANICAL COUNTERS

ELECTRIC IMPULSE COUNTERS



Rounds remaining counter with preset capability and BCD readout of the most significant wheel. This device utilizes a unique driving mechanism which assures high reliability over a wide temperature range.

MESSAGE DISPLAYS

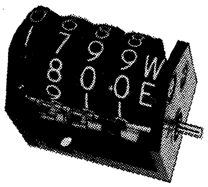


Miniature message displays feature up to 64 one-line or two-line messages. 64 position encoder output supplies one different electrical signal per message displayed.

INCHES OF MERCURY/MILLIBAR COUNTERS

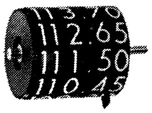
This tandem unit was designed to display inches of mercury and millibar readings. Anti-backlash gearing provides precise correlation between the least significant wheels and the output gear.

REVERSING COUNTERS



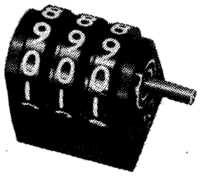
Unique design of Bowmar reversing counters permits rotation of the shaft in the same direction to provide a single sequence of both declining and increasing readings. Latitude, longitude, and decimal type readouts available on request.

FREQUENCY COUNTERS



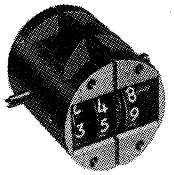
A low cost precision frequency counter is designed to utilize your housing for mounting. This lightweight low torque counter features easy to read characters. Input methods and color of characters can be varied to suit your design needs. Also available with digital encoders.

DECIMAL COUNTERS



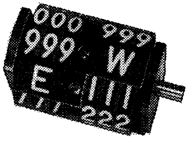
Decimal counters provide indication from 000 to 999 with return to 000 in one unit increments. Units can be supplied with servo type mounting. Two, four, or five drum units optional.

BUORD ANGLE COUNTERS



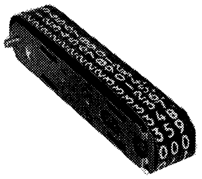
Buord angle counters provide indication of angular increments proportional to input shaft rotation from 000° to 359°, and return to 000° with full reversible operation.

VARIATION COUNTERS



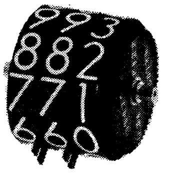
This miniature variation internal pinion counter provides high readability. Starting at 999 West, readings decrease to 001 West. The counter then transfers to 000 East and increases to 999 East. Special mask symbols available on request.

TAPE ANGLE COUNTERS



Tape angle counters provide 360° of angular indication on a reading face occupying less than a half square-inch of area. Operation is continuous and reversible at any point.

INTERNAL PINION COUNTERS



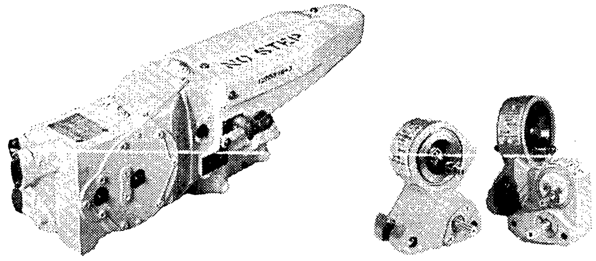
A low cost precision decimal counter designed to utilize your housing for mounting. This lightweight, low torque counter features easy to read characters. The number of wheels, color of characters and input configuration can be varied to suit your design needs.

BOWMAR INSTRUMENT CORPORATION

8000 Bluffton Road, Fort Wayne, Indiana 46809 • Tel.: (219) 747-3121 • TWX: 810-332-1510

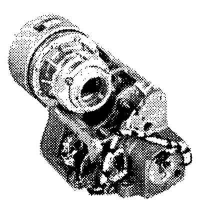
BOWMAR® ELECTROMECHANICAL CONTROLS

AIRBORNE CONTROL ACTUATORS



Electromechanical devices shown illustrate Bowmar's capability in the actuator field. These high reliability actuators are used in current high performance military aircraft. Designs can be provided with rotary and linear outputs.

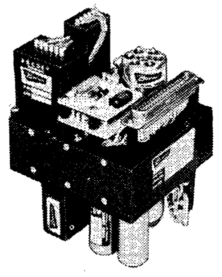
ELECTRO-OPTIC ASSEMBLIES



This optical guidance assembly provides continuous tracking capability for an advanced tank missile system. Custom designed electro-optic devices can readily be provided to meet the most critical performance requirements.

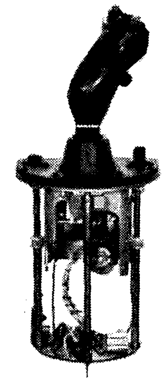
NAVIGATIONAL AND TRACKING DEVICES

Representative of Bowmar capabilities in combining many servo components into a multi-parameter assembly. Provides nagivational control within 12 minutes of arc. Contains two control transformers, two servo amplifiers, two motors, a precision geartrain, differential, nine output synchros and two potentiometers.



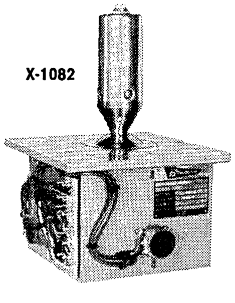
JOYSTICK CONTROLS

The X-Y Control handle is capable of 60° conical movement providing corresponding rotation of two synchros. The handle protrudes 7″ above mounting surface but is capable of being stowed and locked to a height of 4″ and provides for five distinct switching functions. Switch on mounting plate provides for additional switching, light panel displays positions and functions of this switch. Unit contains relays, transformer and diodes for additional radar interfacing. Unit excluding handle is 4 x 6 x 8 inches.

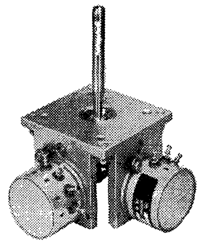


AM-3501

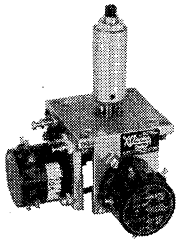
X-1082



Movement of handigrip in any direction produces corresponding rotation of potentiometers or other precision control components in both X and Y coordinates depending on stick position. The stick features a dead man thumb switch on top and may be positioned at any point in a 54° vertical cone. When released, the stick self-centers. Enclosure is 5¼ x3¼x5¼ inches. IMMEDIATE DELIVERY with standard Size 9 potentiometers.



X-2438



AM-3244

Two-axis control is provided by deflection of 1½″ fingersticks (std.) in a 57° cone of rotation. 1:6 sector gears operate precision control components mounted on outside of 1½ x 1½ x 1¼ inch enclosure. Small size and light weight (3 oz.) are especially advantageous for airborne uses and compact instrument panels. Self-centering stick is standard, with or without safety interlock switch provision. IMMEDIATE DELIVERY with standard Size 9 potentiometers in both axes.

BOWMAR INSTRUMENT CORPORATION
8000 Bluffton Road, Fort Wayne, Indiana 46809 • Tel.: (219) 747-3121 • TWX: 810-332-1510

BISSETT BERMAN

E-CELL(TM)

Something New
Under the Sun!

Timing & Integrating Components

- *μWatt Power Drain*
- *One-Shot or Reusable*
- *Military or Commercial Specs*
- *Timing Range: Seconds to Months*
- *Integrating Range: 1 to near ∞ Events*

1. WHAT IS AN E-CELL DEVICE?

An E-CELL device is a new kind of circuit element that looks like a discrete electronic component but does the work of a complex assembly. Its main functional part is a center electrode, which is surrounded by an electrolyte; the metallic container also serves as the second electrode. In terms of its physical operation, an E-CELL unit is a reversible micro-coulometer, i.e. it converts the current-time integral of an electrical function into an equivalent mass integral (or the converse operation) up to a maximum of several thousand microampere-hours. Exactly one atom is transferred for each electron impressed on the E-CELL unit. Power drain is normally in the microwatt region. The mass integral can be read out at a known current, the time to read it out being proportional to the original integral. When a mass is given as part of the initial condition, this same process generates a precise time interval.

2. WHAT DOES AN E-CELL DEVICE DO?

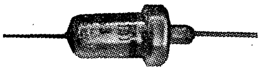
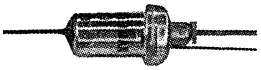
For *timing* applications a constant current is applied to a *pre-charged* E-CELL unit. The selected time delay is determined by a combination of the E-CELL type and the specific constant current being used. The range of timing is from seconds to months. The output voltage swing that occurs when the mass has been completely transferred is normally used as a bias transition with semiconductor devices. For *integration* applications an *uncharged* E-CELL unit accepts d-c, periodic, or random inputs in any waveshape and stores these as the mass equivalent of a current-time integral. Readout is handled in essentially the same manner that the timing function is handled for a pre-charged E-CELL unit, i.e. the measured time required to reach the point of the abrupt voltage swing, multiplied by the readout current, will be the accumulated charge integral. This could represent the total "count" of a series of events analogous to the input pulses.

3. APPLICATIONS

The scope of applications is as broad as timing and counting functions themselves. New uses are continually being devised. Here are two prime applications areas:

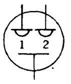
Control: You can use E-CELL devices in circuits for timing, gating, starting, stopping, delaying, relaying, monitoring, actuating, sequencing, measuring —wherever the control condition can be represented by an electrical signal.

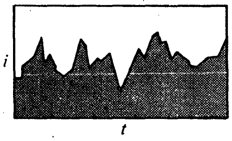
Information Handling: You can use E-CELL devices in circuits for data capture, totaling and subtotaling time periods or discrete events, elapsed time logging, running time monitoring, out-of-limits logging, maintenance status reporting, real-time analog computing—wherever the input data can be represented by an electrical signal. Readout can be formatted as either analog or digital data.

PART NUMBER	PHYSICAL CHARACTERISTICS
400 SERIES 	Single anode cell with leads; mil specs; ±4% charge accuracy for precharged types; −55°C to +71°C.
410† SERIES 	Dual anode cell, with leads; mil specs; ±5% anode 2 charge accuracy; −23°C to +55°C.

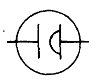
Actual size shown.

†No. 410 Dual cells are available on special order with anode 1 charges from 0 to 40 μamp-hr and anode 2 charges from 0 to 3000 μamp-hr.

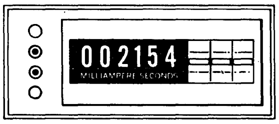




Typical Analog Input Signal



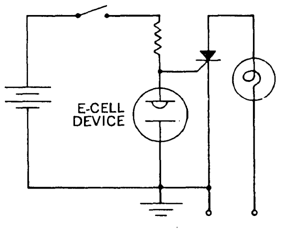
E-CELL Integrator



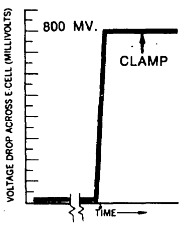
Model 300 EDR E-CELL Digital Readout Instrument

E-CELL TIMING COMPONENTS		
TYPE	NOMINAL CHARGE	NOMINAL RANGE
400-0400	40 μamp-hr	0.4-20 hr
400-2400	240 μamp-hr	2.4-80 hr
400-1441	1440 μamp-hr	14-480 hr
400-3001	3000 μamp-hr	30-1000 hr

E-CELL Timing Components with other pre-charges are available on special order.



Typical circuit using E-CELL component.



Typical E-CELL device voltage rise.

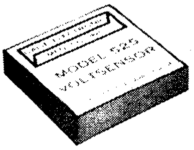
E-CELL INTEGRATING COMPONENTS		
TYPE	CHARGE	NOMINAL INTEGRATING RANGE
400-0002	None	to 1000 μamp-hrs.

E-CELL components and instruments are protected by one or more of the following U.S. patents: 2,744,217; 3,387,288; 3,423,642; 3,423,643; 3,423,644; 3,423,648. Other U.S. and foreign patents pending.

Specifications subject to change without notice.

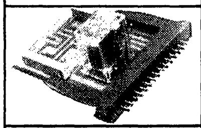
For additional technical information and applications notes, contact:

BISSETT BERMAN
BISSETT-BERMAN CORPORATION / 3860 CENTINELA AVE.
LOS ANGELES, CALIF. 90066 / PHONE: (213) 390-3585
SUBSIDIARY OF PLESSEY INCORPORATED



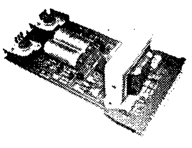
VOLTSENSORS • Precision Solid State Voltage Comparators, Relays, Relay Drivers

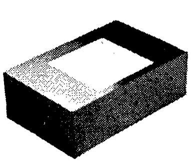
MODEL NO.	500 Logic Level	520 Single Set Point	525 Precision Single Set Point	551 Dual Set Controller	552 Dual Set Dual Out	575 Built-In Relay	565 Built-In Time Delay	585 Millivoltsensor
Trip Point Range	0.7 Volt ±0.05 Volt	Set by external potentiometers to 95% of supply voltage (Up to ±24 volts DC or peak AC)						± 0.5 VDC
Input Impedance	>10K Ohms	>100K Ohms	>100K Ohms	>100K Ohms	>50K Ohms	>100K Ohms	>100K Ohms	>100K Ohms
Operating time	<100 nanoseconds	<25 μs	<10 μs	<10 μs	<10 μs	<1 millisecond	Time Delay	<10 μs
Output rise & fall	<50 nanoseconds	<2 μs	<2 μs	<1 μs	<1 μs	N/A	N/A	<2 μs
Output	Approx. Supply voltage at 0-100 ma	Approximately 80% of supply voltage at 50ma						
Hysteresis	Approx. 100mv @ 15 v	<50mv	<4mv	Hi-off, Lo-on Control action	<4mv	<4mv	<4mv	<100 μv
Power Required	5-25 VDC @ 3-15 ma plus output	±15 VDC @ 6ma to ±25 VDC @ 10ma plus relay load	±15 VDC @ 7ma to ±25 VDC @ 12ma plus relay load	±15 VDC @ 14ma to ±25 VDC @ 24ma plus relay load	±15 VDC @ 7ma to ±24 VDC @ 12ma plus relay load	±15 VDC @ 30ma to ±25 VDC @ 55ma	±15 VDC @ 7ma tc ±25 VDC @ 12ma plus relay load	±15 VDC @ 10 ma plus relay load
Built-In Time Delay	No	No	No	No	No	No	Variable from 5-100ms	No
Size	0.6"×1.0" ×0.65"	1.5"×1.5" ×.7"						
Weight	0.6 oz.	2 oz.						
Price FOB Factory	$14.00 ea. ($9.80 @ 100 pc.)	$28.00 ea. ($19.60 @ 100 pc.)	$48.00 ea. ($33.60 @ 100 pc.)	$68.00 ea. (47.60 @ 100 pc.)	$68.00 ea. ($47.60 @ 100 pc.)	$55.00 ea. ($38.50 @ 100 pc.)	$58.00 ea. ($40.60 @ 100 pc.)	$58.00 ea. ($40.60 @ 100 pc.)



MOUNTING KITS FOR VOLTSENSORS

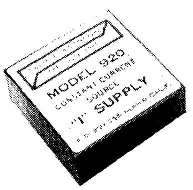
Includes Printed Circuit Board, Connector and your choice of the following to complete your "plug-in" circuit: Hi resolution potentiometer • Standard resolution potentiometer • Industrial 5 amp relay • ½ CC relay • Reed 2 form C • Reed 2 form A • Misc. • Send for details





±15 VDC DUAL REGULATED POWER SUPPLIES

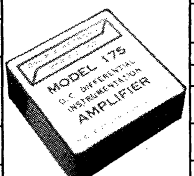
MODEL NO.	220A	222	224	226	22-100	21-500	229
Output	±15V @ 60ma (±25V @ 100ma) (Unregulated)	±15V @ 60ma (±25V @ 100ma) (Unregulated)	±15V @ 150ma	±15V @ 300ma	±15V @ 100 ma	+5V @ 500 ma	±15 @ 60ma (±24V @ 40ma) (Unregulated) +5V @ 500ma
Load Regulation	0.5%	0.05%					0.05% for ±15 0.5% for +5
Line Regulation	0.5% w/±10% voltage change	0.05% with ±10% voltage change					
Optional fixed output range	Any fixed voltage between ±10V and ±24V available (Add $7.00 ea.)				±5V to ±18V available	+4.5V to+5.5V available	±10 to ±24 +3 to +6
Operating Temperature	0°C to 60°C						
Power required	120V, 50-60 CPS						
Connector (1 ea. supplied)	AMPHENOL 143-015-01-110			AMPHENOL 143-022-01-110	Connector or 8 pin term. strip mtg. kits available.		143-022-01-110
Size Including Connector	2" high, 6¼" long, 3³⁄₁₆" wide			2"×7⅛"×4¼"	2"×3"×1" encapsulated		2"×7⅛"×4¼"
Weight	13 oz.			15 oz.	9 oz.		14 oz.
Price F.O.B. Factory	$38.00 ea. ($26.60 @ 100 pc.)	$48.00 ea ($33.60 @ 100 pc.)	$58.00 ea. ($40.60 @ 100 pc.)	$68.00 ea. ($47.60 @ 100 pc.)	$48.00 ea. ($33.60 @ 100 pc.)	$38.00 ea. ($26.60 @ 100 pc.)	$78.00 ea ($54.60 @ 100 pc.)



"I" Supplies—Constant Current Modules

MODEL NO.	920	925
Output Current (set by external 10K pot.)	0-50ma	10-50ma other ranges available
Supply voltage	+12V to +25V	+12V to +25V
Supply regulation	0.1% Volt Max.	0.001% @ 10ma load 0.005% @ 50ma load
Load regulation	0.05% @ 100% load change	0.001% @ 50% load change 0.002% @ 100% load change
Temperature Range	−25°C to +75°C	−25°C to +75°C
Temperature Stability	0.1%/°C	0.01%/°C
	Plus external component effect	
Transient Responses	>10 μs	1 μs
	Full load to dead short	
Compliance Voltage	0 to ≈ power supply voltage	0-10V
Dimensions	1.5"×1.5" ×.7" max.	
Weight	2 oz.	
Price	$38.00 ea. ($26.60 @ 100 pc.)	$78.00 ea. ($54.60 @ 100 pc.)

DC Differential Instrumentation Amplifier



MODEL NO.	175
Gain	10 to 1000 continuously adjustable
Frequency Response	DC to 100kc (@ gain of 100)
Input Impedance	>1 megohm at all gain settings
Output	±10 Volts at 50ma
Noise	5microvolts rms wideband (gain of 1000)
Common Mode Rejection	90 db; ±6 volts max. common mode signal
Drift	Less than 10 microvolts /°C (typical 5 microvolts /°C)
Operating Temperature Range	−25°C to +75°C
Power Required	±15 volts at 8ma plus load
Size	1.5"×1.5"×.7" max.
Weight	2 oz.
Price F.O.B. Factory	$78.00 ea. ($54.60 @ 100 pc.)

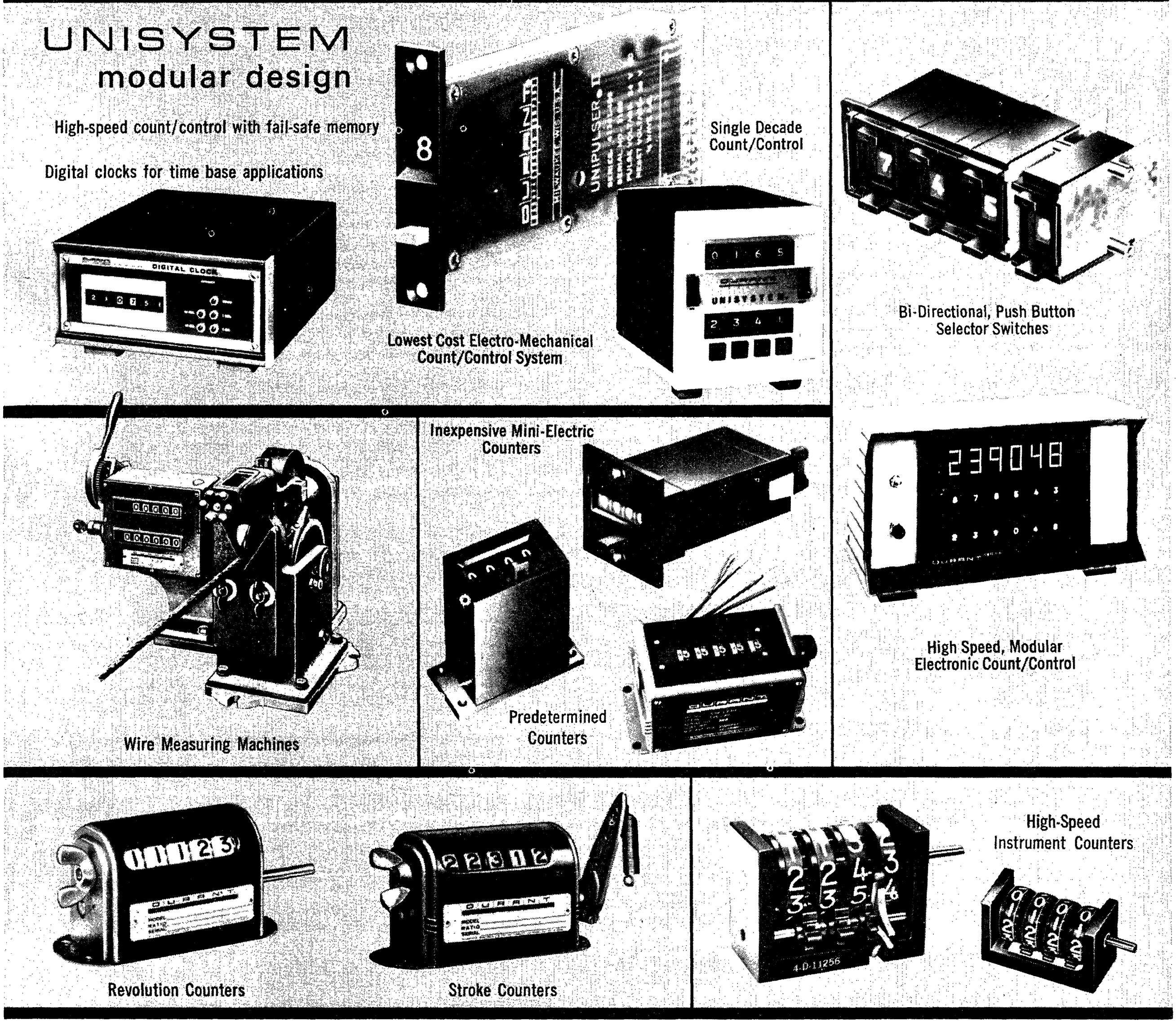
IMMEDIATE DELIVERY FROM STOCK. NEW LOWER PRICES ON MANY ITEMS. OVER 50 ADDITIONAL MODELS AND MODIFICATIONS. SPECIALS? TELL US WHAT YOU NEED! OEM DISCOUNTS AVAILABLE.

CALIF. ELECTRONIC
MFG. CO., INC.

FOR ADDITIONAL INFORMATION OR TO ORDER NOW, PHONE STEVE CUFF (415) 932-3911, OR WRITE P.O. BOX 555, ALAMO, CALIF. 94507

DURANT

EVERYTHING IN COUNT/CONTROL



UNISYSTEM
modular design

High-speed count/control with fail-safe memory

Digital clocks for time base applications

Single Decade Count/Control

Lowest Cost Electro-Mechanical Count/Control System

Bi-Directional, Push Button Selector Switches

Inexpensive Mini-Electric Counters

Wire Measuring Machines

Predetermined Counters

High Speed, Modular Electronic Count/Control

Revolution Counters

Stroke Counters

High-Speed Instrument Counters

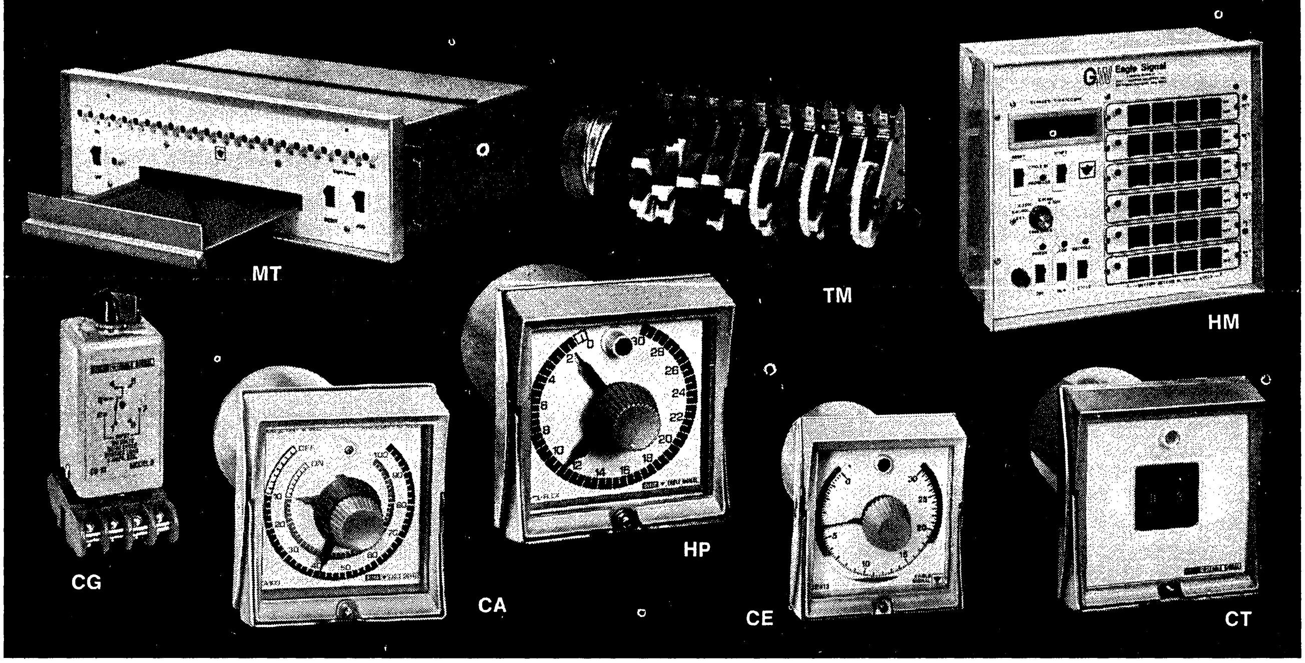
DURANT
DIGITAL INSTRUMENTS
A CUTLER-HAMMER COMPANY

CONTROL

Please write for appropriate catalog or
telephone Customer Service: 414-271-9300

COUNT/CONTROL INSTRUMENTS
MECHANICAL / ELECTROMECHANICAL / ELECTRONIC
625 North Cass Street, Milwaukee, Wisconsin 53201

EAGLE PRECISION PROGRAMMERS, TIMERS, COUNTERS



Solid State • Electronic • Electromechanical • Pneumatic

Complete line of industrial, commercial and military grade controls to meet almost every need. Or Eagle will custom-design and produce control devices and systems for special applications to the most exacting specs. Over $1 million in stock plus full service facilities at 35 major areas in the U.S., S.A., U.K., Canada and Australia. For specifics, write or call Eagle Signal, 736 Federal St., Davenport, Iowa 52803.

Time-Delay or Single-Cycle Timers:

HP Cycl-Flex.® Plug-in case installs quickly. Reduces downtime. Dial ranges from 5 sec. to 60 hrs. Series also includes solid-state reset timer, 80-count counter, pulse timer, and percentage timer.

CE400 New Solid State. Adjustable delay between actuation of control and operation of load circuits. Mirror dial minimizes parallax errors. Plug-in case for easy installation.

CG Solid-State Series. Reliable, accurate and economical for applications requiring delay up to 60 sec. Adjustable knob timer plugs into octal relay socket, a perfect replacement for pneumatic timers. Available with surface-mount enclosure.

Repeat Cycle Timers:

T/M New Time/Module. Offers many control opportunities. Modules offer uni-directional or reversing drives, 3 adjustable cam types, gear reduction module, percentage adjustment dial. Many unique usable features. 1 to 10 circuits. Time ranges: 6 sec. to 60 hrs.

CA Solid State. Continuous on-off cycles from 3 to 2000 times a minute. Load handling capacity 1 amp @ 120 VAC.

Counters:

CT120-130-140. 2, 3 and 4-digit plug-in Solid State Counters. 1200 contact closure counts/min. Minimum closure 40 ms.; opening 10 ms. Binary thumb wheels.

HM New Multiple Circuit Timer/Counter. A versatile 1 to 6 circuit control with single or dual output. Single or automatic repeat cycle. Visual readout registers timing to 0.01/sec. Impulse counts to 1200/min; frequency counts to 30 KHz. Resets in 50 ms. max. 100% count accuracy.

Sequence Programmers:

MT New Solid State Sequence Programmers. Permanent industrial control programs "in-a-drawer." 24 circuits, 24 intervals on diode matrix board may be sequenced at rate of up to 1200 per minute. Sequence programmers with programmable cams also available. Either type gives an efficient nucleus for your control circuit designs.

Write for complete catalog

G+W **Eagle Signal**
a systems division of
GULF + WESTERN INDUSTRIES, INC.

EAGLE SIGNAL 50 YEARS

PLANTS | 736 Federal Street, Davenport, Iowa • 925 Lake Street, Baraboo, Wisconsin • 348 Guelph Street, Georgetown, Ontario, Canada
Orchard Road, Royston, Herts, England • 12-14 Grosvenor Street, Abbotsford, Victoria, Australia

Design Analog Computers with Micro-Magnetics...

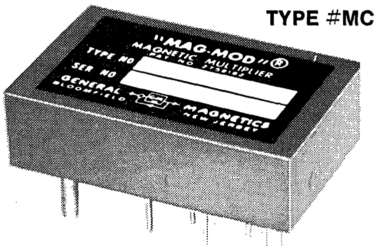
Magnetic Analog Multiplier DC x AC = AC Output

Product Accuracy ±½% Of All Theoretical Values Over The Full Military Temperature Range of —55°C To +125°C

OXO = O ± 2MV

OVER TEMPERATURE RANGE OF −55°C TO +125°C NO EXTERNAL TRIM POTENTIOMETERS REQUIRED TO OBTAIN SPECIFIED ACCURACY

TYPE #MCM 1351-2



FEATURES

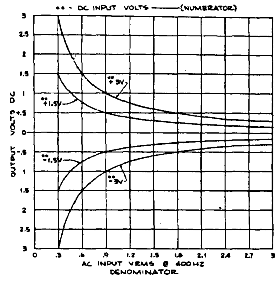
- Product accuracy is specified in % of reading for all output analog voltage product points over the full military temperature range instead of % of full scale error giving superior results for small values.
- Distortion free output AC wave over entire dynamic range regardless of temperature
- Linearity, product accuracy, and zero point virtually unaffected by temperature changes
- Magnetic circuit not sensitive to nuclear radiation
- Analog product accuracy, wave quality and phase stability allow dual multiplier assemblies to be matched in amplitude. within 1% of point of each other and 0.1° phase error over the temperature range
- Package size, power supply voltages and electrical specifications may be altered at no extra cost.

SPECIFICATIONS

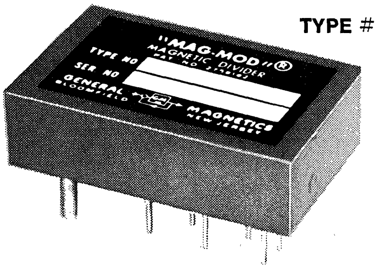
Transfer equation: E = XY/3
X & Y input signal ranges: 0 to ± 3V Peak
Maximum static and dynamic product error: ½% of point or 2 MVRMS, whichever is greater, over entire temperature range
Maximum zero point (X = 0, Y = 0): 2 MVRMS over entire temperature range
Input impedance: X = 10K; Y = 10K
Full scale output: 3 VRMS
Output impedance: Less than 50 ohms
X input band width: ± 0.5db, 0 to 200 hertz
Y input band width: ± 0.5db, 20 hertz to 1000 hertz
Operating temperature range: −55°C to +125°C
Storage temperature range: −70°C to +125°C
Zero point drift over temperature range: ± 1MVRMS maximum
DC power: ± 15V unless otherwise required @ 20 ma
Overall dimensions: 1.8″ x 1.1″ x 0.5″
Weight: Approximately 1 oz.
Case material: High permeability Nickel Alloy
Terminals: Glass to metal hermetic seal pins

Magnetic Analog Divider DC ÷ AC = DC Output

Division Accuracy ±1% Of All Theoretical Values Of Quotient Or 2MV Whichever Is Greater, Over A 10:1 Denominator Range



TYPE #MDM 1355-4



FEATURES

- Linearity, division accuracy and zero point virtually unaffected by temperature changes
- Magnetic circuit. not sensitive to nuclear radiation
- Package size, power supply voltages and specifications may be altered at no extra cost
- Accuracy specified in terms of absolute (theoretical point) not full scale
- Wide denominator ranges can be accommodated
- No external trim potentiometers required to obtain specified accuracy.

SPECIFICATIONS

Transfer equation: $Eo = \frac{0.3X}{Y}$

Division accuracy: 1% of all theoretical quotient points or ± 2MV whichever is greater over the temperature range
Input impedance: X = 90K; Y = 50K
Full scale output: 3V DC
X & Y input ranges: X = 0 to ± 3V DC
Y = 0.3V RMS to 3.0V RMS
400 Hz ± 10%
Output impedance: Less than 10 ohms
Bandwidth: 10 Hz at Y = 0.3V RMS
Operating temperature range: −55°C to +125°C
Storage temperature range: −70°C to +125°C
DC power: ± 15V @ 30 ma
AC reference: 6V RMS 400 Hz ± 10%
Overall dimensions: 2.2″ x 1.3″ x 0.5″
Weight: Approximately 1 oz.
Case material: High permeability Nickel Alloy
Terminals: Glass to metal hermetic seal pins

There is No Substitute for Reliability

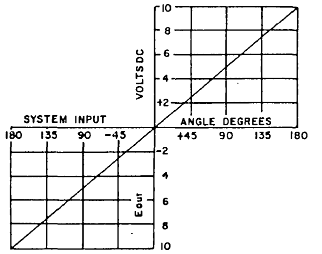
GM INC.

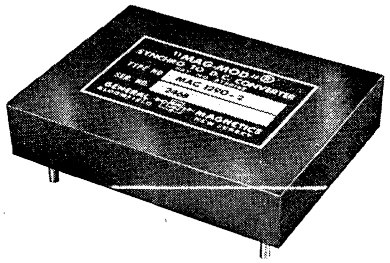
GENERAL MAGNETICS • INC
135 Bloomfield Ave., Bloomfield, New Jersey 07003 - Tel. (201) 743-2700

...for Unlimited Life and Superior Performance

Solid State 3 Wire Synchro To Linear D.C. Converter

MAC 1290-2 ACCURACY 1% OVER ENTIRE TEMPERATURE RANGE





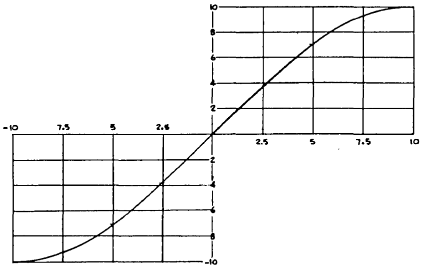
FEATURES

- Develops a DC output voltage linearly proportional to a synchro angle over a ± 180° range
- Completely solid state with all of the inherent advantages over a mechanical system such as:
  - High reliability (since there are no moving parts)
  - Light weight — 30 ozs. (approximate)
  - Small size
- Three wire inputs isolated from ground
- Package size may be altered at no extra cost
- Output short circuit protected
- Units can be altered to accept different line to line voltages or different operating frequencies at no extra cost
- Not affected by reference voltage or power supply variations

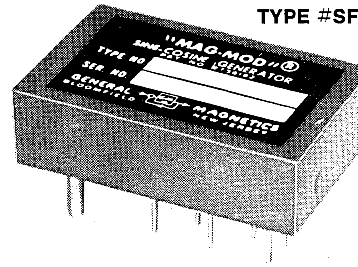
SPECIFICATIONS

Transfer equation: E = ± 1V/± 18°
Accuracy: ± 1% over temperature range
Input: 11.8V, 400 Hz line to line 3 wire synchro voltage
Full scale output: ± 10V DC (± 180°)
Output impedance: Less than 10 ohms
Output ripple: Less than 2 millivolts RMS
Input impedance: 10K minimum line to line
Reference: 26V ± 10% 400 Hz (Unit can be altered to accommodate 115V if available at no extra cost)
Operating temperature range: −25°C to +85°C
Storage temperature range: −55°C to +100°C
DC power: ± 15V ± 1% @ 100ma (approximate)
UNIT CAN BE MODIFIED FOR ± 360° OPERATION

Sine-Cosine Function Generator



TYPE #SFG 1374-1



FEATURES

- Provides a two quadrant sine function with better then 1% accuracy
- Excellent temperature stability
- Scaled for ± 10V input and output
- Operates from conventional ± 15V power supplies
- No external offset adjustments required
- Terminal provided to allow four quadrant operation
- Hermetically sealed package

SPECIFICATIONS

(AT +25°C UNLESS OTHERWISE NOTED)
DC accuracy: ± [0.1% + 0.6% × E_{IN}/10V]
DC accuracy over the complete temperature range: ± [0.25% + 0.75% × E_{IN}/10V]
Input impedance (pin 1): 9.3KΩ
Input voltage range (pin 1): ± 10V DC
Rated output — voltage: ± 10V DC
Rated output — current: ± 5ma
Output impedance: 1Ω
Frequency response for 1% accuracy: DC to 3kHz
Temperature range: −25°C to +85°C
(Full mil-spec temp. range units available on request)
Power requirements: ± 15V @ 30ma max.
Accuracy drift vs. power supply: ± 10MV/V
Size: 2.750 x 1.600 x 0.475

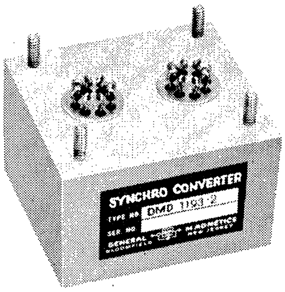
There is No Substitute for Reliability

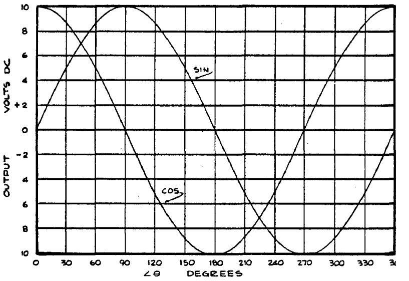
GENERAL MAGNETICS • INC
135 Bloomfield Ave., Bloomfield, New Jersey 07003 - Tel. (201) 743-2700

Solid State Sine-Cosine Synchro Converter

This new encapsulated circuits converts a 3-wire synchro input to a pair of d-c outputs proportional to the sine and cosine of the synchro angle.

- Complete solid state construction.
- Occupies a volume of only 3.2 cu. in. (Single Channel)
- Operates over a wide temperature range.





Typical Specifications
Type DMD 1193-3
Dual Channel Synchro Converter

ACCURACY — Overall conversion accuracy 6 minutes.

AMBIENT TEMPERATURE:
RANGE — Operating —40°C to +100°C
Storage —62°C to —125°C

APPLICATIONS — Analog computers
Flight systems
Fire control
Guided missiles

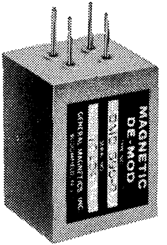
	TERMINAL		FUNCTION	
HEADER A	1	S1	SYNCHRO INPUT #1	
	2	S3		11.8 V RMS ± 10% L L 400 Hz ± 5% REFERENCE
	3	S2		
	4	R2		115 V RMS ± 5% @
	5	R1		400 Hz ± 5%
	6	+15 V DC		
	7	DC GROUND		
	8	−15 V DC		
HEADER B	1	S1	SYNCHRO INPUT #2	
	2	S3		11.8 V RMS ± 10% L L 400 Hz ± 5%
	3	S2		
	4	SINE	OUTPUT #1	10 V DC FULL SCALE OUTPUT
	5	COSINE		
	6	SINE	OUTPUT #2	10 V DC FULL SCALE OUTPUT
	7	DC GROUND		
	8	COSINE	OUTPUT #2	10 V DC FULL SCALE OUTPUT

DUAL CHANNEL SYNCHRO CONVERTER General Magnetics Model DMD 1193-2 provides two (2) completely independent sine-cosine synchro converter circuits in one package. Overall conversion accuracy is six (6) minutes. Temperature range is —40°C to +100°C.

This new General Magnetics circuit converts a 3 wire synchro input to a pair of d-c outputs proportional to the sine and cosine of the synchro angle. The circuit features complete solid state construction, occupies a volume of only 3.2 cubic inches and operates over a wide temperature range. Overall conversion accuracy defined by the tangent of the angle whose sine and cosine are generated is six (6) minutes. Models are available with both single and dual channel outputs.

Solid State Magnetic Demodulators

FREQ. RANGE 60 Hz to 10 KHz



G/M MAGNETIC DEMODULATORS are solid state circuits for converting phase reversing AC signal voltages into phase detected polarity reversing DC voltages; the amplitude and polarity of the DC output are directly proportional to the phase and amplitude of the AC signal.

High reference impedance resulting in very small reference power requirements.

Output as high as ±10 v. DC in present units.

Unit operation frequencies; 60 Hz to 10 KHz.

Operation over wide environmental range.

Very low DC offset null voltages (as low as 0.1% of full scale).

Signal and reference terminals may be isolated.

Low output impedance.

Small physical size.

TYPE NUMBER	DMD 1012-1	DMD 1017-1	DMD 1028-1	DMD 1040-1	DMD 1066-1	DMD 1133-1
REFERENCE						
A. Voltage	115 V	115 V	15 V	115 V	115 V ±10%	115 V
B. Frequency	60 Hz	400 Hz	50 to 60 Hz	400 Hz	400 Hz	400 Hz
C. Impedance	> 50 K	> 5 K	≈ 5.1 K	> 100 K	> 40 K	> 100 K
SIGNAL						
A. Voltage Range	0-1 V	0-10 V	0-10 V	0-3.2 V	0-10 V	0-2.5 V
B. Frequency	60 Hz	400 Hz	50 to 60 Hz	400 Hz	400 Hz	400 Hz
C. Impedance	10 K ±10%	> 10 K	≈ 3 K	> 3 K	> 15 K	> 200 K
OUTPUT						
A. Maximum Output	±0.5 V ±5%	±3 V ±5%	±10 V ±5%	±5 V ±5%	±1.0 V ±5%	±1.0 V ±5%
B. Load	25 K ohms	2 K ohms	10 K ohms	50 K ohms	1 K	10 K
C. Linearity	±1% fs	±1% fs	±1% fs	±1% fs	± 1% fs	±1% fs
D. Frequency Response	—	40 Hz	—	—	N.S.	> 30 Hz
E. Ripple	No Filter	< 150 mv	< 400 mv	No Filter	< 40 mv	< 30 mv
F. Null	< 10 mv	< 10 mv	< 15 mv	< 10 mv	< 4 mv	< 4 mv
AMBIENT TEMP. RANGE	—30°C to +85°C	—30°C to +71°C	—10°C to +55°C	—30°C to +85°C	—55°C to +90°C	—40°C to +68°C
PHYSICAL SIZE	1 X 1 X 2.5	1 X 1 X 2.5	1.9 X 1.25 X 2.9	1 X 1 X 2.5	1.6 X 0.8 X 0.6	1 X 1 X 2.5
D.C. POWER	+15 V	+28 V	+15 V	No	±10 V	+24 —32 V

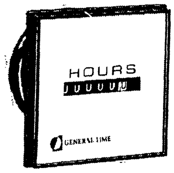
There is No Substitute for Reliability

GM INC.

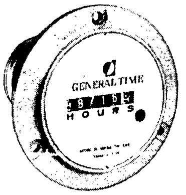
GENERAL MAGNETICS • INC
135 Bloomfield Ave., Bloomfield, New Jersey 07003 - Tel. (201) 743-2700

Full line of high quality industrial time count, control devices

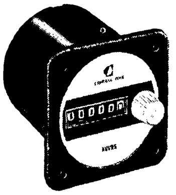
ELAPSED TIME INDICATORS



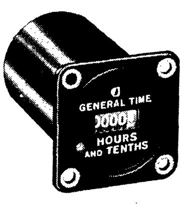
EF 27 BULLETIN EF-1
Simple through-panel stud mounting. All mounting hardware provided. Synchronous AC motor direct drives six digits, readout in minutes—or hours—and tenths. Monitors maintenance, rental time, running time . . . wherever accurate record of elapsed time is important. Square Bezel 2⅜″ unit, depth 1 23/32″, barrel diameter 2.077″.



EF BULLETIN HD-12
Synchronous motor-driven, panel mounted non-resettable unit registers minutes and tenths, or hours and tenths. 6 digits. 120 or 240 VAC, 50 or 60 Hz. Round bezel 2⅞ diameter,unit depth 1.790″ and barrel diameter 2.110″.



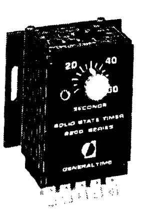
EN & ER BULLETIN HD-12
Dust cover enclosed unit with round or square bezel. These meters read in minutes and tenths or hours and tenths. Can be resettable or non-resettable. Units operate on 120 or 240 VAC, 50 or 60 Hz. Bezel diameter 3½″, Rd; 3.0″, Sq. Unit depth 3¾″, barrel 2 23/32″ dia.



7010-004 HERMETICALLY SEALED MILITARY TYPE INDICATOR BULLETIN HD-12
A very small, lightweight running time meter, hermetically sealed. Meets Mil specification requirements per Mil-M-7793C and Mil-E-5272C. Life tested over 78,000 hours. Readout four digits plus tenths. Temperature range —55°C to +85°C. Round case 1¾″ square bezel; 2 37/64″ deep, barrel diameter 1½″. 115 volts 400 Hz. Solder terminals. Shipping weight: ¾ lb. Also available as ED 71 Commercial version 60 Hz.

SOLID STATE

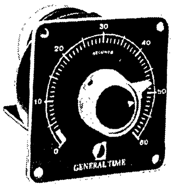
SERIES 2110 SOLID STATE TIMERS BULLETIN SS
Plug-in type for delay, interval or D.O.D. (delay on de-energization) timing modes. Versatile standard timers meet the broadest range of applications. Features: exceptional repeat accuracy; transient protection; eleven time ranges; isolated outputs; AC or DC input; relay or solid state switch; low operating temperatures and no first cycle effect. UL and CSA recognized. Size: 2.50″ W x 11.875″ D x 4.505″ H (including .625″ h knob and .580″ plug length).



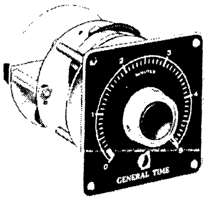
SERIES 2210 SOLID STATE TIMERS, REAR MOUNT TYPE BULLETIN SS
Same specifications and features as 2110, except bracket type, provided with slotted mounting holes and spade type terminals. Size: 3 7/16″ W x 2 1/32″ D (plus knob .625″) x 4⅜″ H.

ELECTRICAL RESET TIMERS

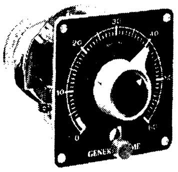
SERIES DA TIME DELAY TIMERS, REAR MOUNTING BULLETIN HD-12
Type DA11. Manually adjustable by knob. Apply wherever delay, interval or repeat cycle timing functions are required (repeat cycle requires two units). Resets to start position when power is removed. SPDT switch rated 20 amps. 125 or 250 VAC, resistive; solder lug terminals. Min. setting 0 sec. Repeat accuracy ±¾% of total time range. 5 watt motor. 120 VAC 60 Hz. U/L listed. Size: 3⅜″ W x 2 13/16″ D x 3⅛″ H. Weight: 1½ lbs.
Type DA21. Same as DA11 but with locknut adjustment to eliminate tampering.



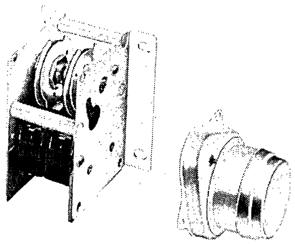
SERIES DP11 PANEL MOUNTING RESET TIMER BULLETIN HD-12
Adjustable time range by simple pointer knob. Apply wherever delay, interval or repeat cycle timing are needed. Readout of elapsed time by pointer in center of knob. Unit resets to start position when power is removed. 125 or 250 VAC resistive. Timing motor rated 5 watts max. 120 VAC 60 Hz. Repeat accuracy ±1% of total time range. Screw terminals. Size 3 5/16″ sq. x 3 3/32″ D., behind panel; requires 3 3/16″ dia. mounting hole cut.



BN41 (INTERVAL) AND BN42 (DELAY) PANEL MOUNT BULLETIN HD-12
Dial and setting knob with readout of elapsed time by pointer in center of knob. SPDT relay rated 10 amps at 125 or 250 VAC. Timing motor rated 5 watts max. 120 VAC 60 Hz. Repeat accuracy ±¾ of 1% of total time range. Screw terminal block. Size: 3 5/16″ sq. x 4⅜″ D.; behind panel. Requires 3 3/16″ dia. mounting hole.

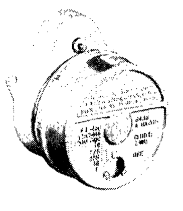


SERIES BJ-12 PUSH-BUTTON INTERVAL TIMER BULLETIN BJ
Panel-mount timer. Timing interval is initiated by manually setting knob to selected position and manually depressing the push button. Readout of elapsed time by pointer in center of setting knob. Instant reset to start position automatically. SPDT switch rated 15 amps, 125 or 250 VAC resistive. 120 VAC 60 Hz. Repeat accuracy ±½% of full scale. Combination spade and solder lugs size: 3 5/16″ Sq x 2 23/32″ D, behind panel; requires 3 3/16″ dia. mounting hole. Weight: 1½ lbs.

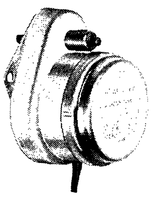


SERIES RE62 REPEAT CYCLE MULTI-CAM TIMERS BULLETIN HD-12
Run continuously, repeating set cycles of multiple switching operations as long as motor is energized. Complete unit requires one motor and one or more switch stacks. Two-switch unit size 2 5/16″ H x 3 5/32″ W x 3 9/16″ D; add 11/16″ to depth for each additional switch.

TIMING MOTORS



MA26 BULLETIN MA
The MP26 is a hysteresis type motor designed for timing operations. Power output is 6 oz./in. at 1 RPM 60 Hz. Output shaft speeds are available from 1 rev per month to 60 RPM. 450 RPM without geartrain @ 60 Hz. Output shafts are available in four standard, plus many special configurations in round, flatted, knurled, and with cross-drilled hole. Operating voltage ranges are 24, 120 and 240 VAC. Frictions are available for manual turning of shaft below 15 RPM. MP26 has standard pear shape gear housing and mounting flange. Mounting holes are on 1.875″ centers.

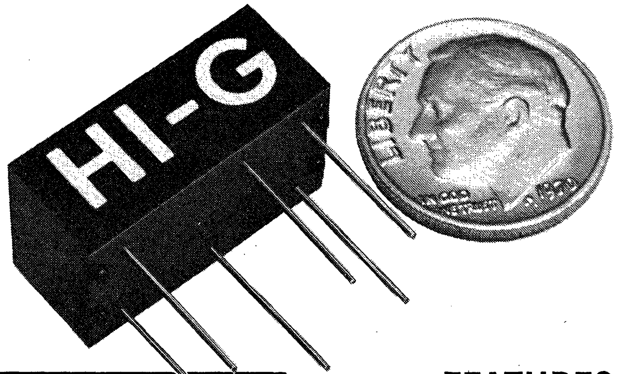


MP20 POWER MOTOR BULLETIN MP-20
This timing size synchronous AC motor has an output rating of 200 oz./in. @ 1 RPM over the range of 103 to 132 VAC or 206 to 264 VAC at 60 Hz. Guaranteed minimum running life 10,000 hours. Output shaft speeds 1, 2, 3, 4, 5, 6, 10, 15, 20, 30 and 60 RPM. Output shaft available in 2 standard types, long round and long with flat, for other configurations consult factory. Mounting standard pear shape holes on 1⅞″ centers. Rotation can be CW or CCW.

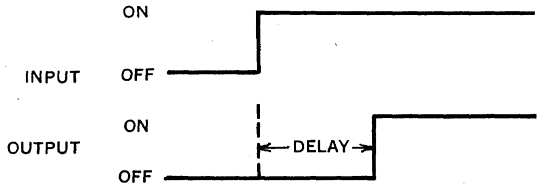
GENERAL TIME
A Subsidiary of Talley Industries, Inc.
INDUSTRIAL CONTROLS DIVISION
Torrington, Connecticut 06790 (203) 482-4481

HYBRID INTEGRATED CIRCUIT
TIMING MODULE

SERIES
6100



TIMING DIAGRAM — Delay-On-Make



FEATURES

- **Time delays from 50 ms to 60 sec.**
- **State-of-the-art reliability.**
- **Package less than ⅜″ x ½″ x ⅞″.**
- **Delay-on-make-operation.**
- **Dual-in-line compatible.**
- **Life 1,000,000 operations minimum.**
- **External time adjustment possible.**

DESCRIPTION

Hi-G Series 6100 are completely solid state delay-on-make timing devices. They use Hybrid thick film integrated circuits to provide state-of-the-art performance and reliability. The design of the 6100 Series offers smaller, lighter, low profile, dual-in-line compatible timers for direct mounting to printed circuit boards. This packaging enables these timers to be used over a wide range of applications.

OPERATION

Application of power to the input initiates the timing cycle. After the preset time delay, the output is energized and remains energized until the timer is reset by the removal of power at the input.

ELECTRICAL SPECIFICATIONS

INPUT VOLTAGE:	18 to 32 volts DC, reverse polarity protection provided.
DELAY TIME:	50 milliseconds to 60 seconds. Factory set, fixed time.
DELAY TIME TOLERANCE:	±10%.
RESET TIME:	10 microseconds (max).
RECYCLE TIME:	0.5% (nominal delay time) = max. recycle time @ 25°C.
RECOVERY TIME:	100 milliseconds max.
OUTPUT SWITCH:	S.P.N.O. — solid state.
OUTPUT RATING:	½ amp resistive at 28 VDC (25°C). ¼ amp resistive at 28 VDC (85°C).
CURRENT DRAIN:	6 ma @ 28 VDC (25°C) plus load current.
OUTPUT LEAKAGE:	1 ma max. in non-conducting state
CONTACT DROP:	2 VDC max. in conducting state

ENVIRONMENTAL CHARACTERISTICS

TEMPERATURE RANGE:	−55°C to +85°C.
VIBRATION:	20 G's, 10 to 2,000 Hz.
SHOCK:	50 G's, 11 ± 1 millisecond duration.
LIFE:	1,000,000 cycles minimum.

PHYSICAL DATA

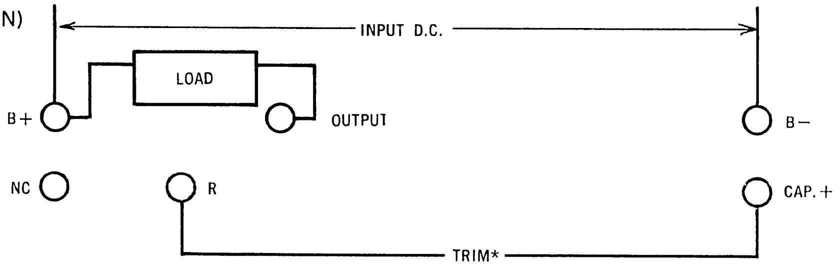
HEIGHT:	0.370 inches.
WIDTH:	0.460 inches.
LENGTH:	0.800 inches.
FOOTPRINT:	Dual -in-Line (0.3″ wide x 0.1″ grid).
CONNECTIONS:	Solder pins, ½″ long.
ENCAPSULATION:	Epoxy.
WEIGHT:	Approx. 0.2 ounces.

HYBRID INTEGRATED CIRCUIT TIMING MODULE

ELECTRICAL DIAGRAM

*Units can be trimmed in timing to allow custom fitting into systems prior to finalization of timing requirements, by connecting components external to units.

(NC = NO CONNECTION)



SPECIAL OPTIONS

Variations on standard devices are available. Hi-G will assign a special part number prefixed with Series 6100 and customize to your specific application.

Partial list of options:

- Longer delay times.
- Hermetic sealing.
- Lower profile.
- Transient protection.
- Multiple outputs.
- Higher output rating.
- 125°C operation.

DETERMINATION OF MODULE PART NUMBER

A complete part number consists of 2 elements.

1) Series Number—This number establishes the function and enclosure style, i.e., Series 6100 is a solid state output with solder pins for printed circuit board mounting.

2) Timing Code Determination — The timing code consists of four digits and denotes time in milliseconds. The first three digits are significant figures and the last digit is the number of zeros to follow. Thus 100 milliseconds is coded 1000; 1.1 seconds is 1101 (1100 milliseconds); and 60 seconds is 6002 (60,000 milliseconds).

Example: 6100 6002

SERIES NUMBER

TIMING CODE

This number designates a solid state output timer with 60 seconds (60,000 milliseconds) time delay.

ORDERING INFORMATION

Series	Contact Configuration	Rating	Temperature Range	Delay Min. Max.
6100*	SPNO	0.5A	−55°C to +85°C	0.05 to 60 sec.

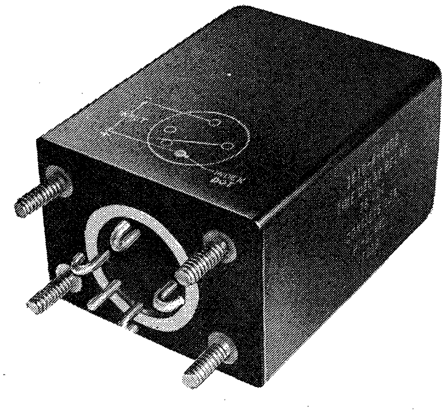
*Add timing code designation.

ELECTRONIC PRODUCTS DIVISION

HI-G INCORPORATED

SPRING ST. AND ROUTE 75, WINDSOR LOCKS, CONN. 06096
PHONE: (203) 623-2481 TWX: 710-420-0592

ADJUSTABLE TIMING MODULE SERIES 1700
FIXED TIMING MODULE SERIES 1600



4 AND 10 AMPERES RATING CHART

Type	DC, 10 Amp	AC or DC, 4 Amp
Input Voltages	18 to 31 VDC, unregulated	DC Units, 18 to 31 volts, Unregulated AC Units, 105 to 125 volts, 400 Hz Unregulated
Delay Time	50 milliseconds to 180 seconds	50 milliseconds to 180 seconds
Contact Rating at 30 Volts DC	10 amperes, Resistive 5 amperes, Inductive	4 amperes, Resistive
Contact Configuration	1, 2 Poles, double-throw	1- 2- 3- and 4-pole, double-throw
Current Drain at 25°C at 28 volts DC	135 ma maximum	1-pole: 100 ma maximum; 2-pole: 150 ma maximum; 3 and 4 pole: 200 ma maximum

10 AMPERE MODULE SERIES NUMBER — TABLE

Series	Function	Contact Arrangement
1610	Fixed	1 PDT
1611	Fixed	2 PDT

Series	Contact Arrangement	Adjustable Range	Timing Code
1710	1 PDT	.1 to 1.0 sec.	1001
1711	1 PDT	.5 to 5 sec.	5001
1712	1 PDT	1.0 to 10 sec.	1002
1713	1 PDT	5 to 50 sec.	5002
1714	1 PDT	18 to 180 sec.	1803
1715	2 PDT	.1 to 1.0 sec.	1001
1716	2 PDT	.5 to 5 sec.	5001
1717	2 PDT	1.0 to 10 sec.	1002
1718	2 PDT	5 to 50 sec.	5002
1719	2 PDT	18 to 180 sec.	1803

4 AMPERE MODULE SERIES NUMBER— FIXED & ADJUSTABLE TABLE

Series	Input	Temperature Range	Housing Length (Dim. "A")	Contact Arrangement
1601	DC	−55° to +85°C	$1\frac{9}{16}$	1 PDT
1602	DC	−55° to +85°C	$1\frac{21}{32}$	2 PDT
1603	DC	−55° to +85°C	2	3 PDT
1604	DC	−55° to +85°C	2	4 PDT
1621	DC	−65° to +125°C	$1\frac{9}{16}$	1 PDT
1622	DC	−65° to +125°C	$1\frac{21}{32}$	2 PDT
1623	DC	−65° to +125°C	2	3 PDT

4 AMPERE MODULE SERIES NUMBER (cont'd)

Series	Input	Temperature Range	Housing Length (Dim. "A")	Contact Arrangement
1624	DC	−65° to +125°C	2	4 PDT
1651	AC	−55° to +85°C	2	1 PDT
1652	AC	−55° to +85°C	2	2 PDT
1653	AC	−55° to +85°C	$2\frac{3}{8}$	3 PDT
1654	AC	−55° to +85°C	$2\frac{3}{8}$	4 PDT
1671	AC	−65° to +125°C	2	1 PDT
1672	AC	−65° to +125°C	2	2 PDT
1673	AC	−65° to +125°C	$2\frac{3}{8}$	3 PDT
1674	AC	−65° to +125°C	$2\frac{3}{8}$	4 PDT
1701	DC	−55° to +85°C	$1\frac{9}{16}$	1 PDT
1702	DC	−55° to +85°C	$1\frac{21}{32}$	2 PDT
1703	DC	−55° to +85°C	2	3 PDT
1704	DC	−55° to +85°C	2	4 PDT
1721	DC	−65° to +125°C	$1\frac{9}{16}$	1 PDT
1722	DC	−65° to +125°C	$1\frac{21}{32}$	2 PDT
1723	DC	−65° to +125°C	2	3 PDT
1724	DC	−65° to +125°C	2	4 PDT
1751	AC	−55° to +85°C	2	1 PDT
1752	AC	−55° to +85°C	2	2 PDT
1753	AC	−55° to +85°C	$2\frac{3}{8}$	3 PDT
1754	AC	−55° to +85°C	$2\frac{3}{8}$	4 PDT
1771	AC	−65° to +125°C	2	1 PDT
1772	AC	−65° to +125°C	2	2 PDT
1773	AC	−65° to +125°C	$2\frac{3}{8}$	3·PDT
1774	AC	−65° to +125°C	$2\frac{3}{8}$	4 PDT

NOTE: Shaded series are adjustable.

ELECTRICAL SPECIFICATIONS

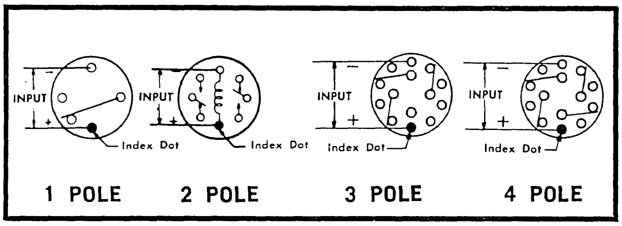
INPUT VOLTAGES:	Refer to above chart.
DELAY TIMES:	50 milliseconds to 180 seconds.
DELAY ON "MAKE":	Refer Timing Diagram Page 4.
DELAY TIME TOLERANCE:	±10% or 10 milliseconds, whichever is greater.
RECYCLE TIME:	0.5% T (sec.) = T recycle max. @ 25°C.
RECOVERY TIME:	0.1 second maximum from 50 milliseconds to 90 seconds; 0.5 second maximum from 90 seconds to 180 seconds.
CONTACT RATING:	Refer to above chart.
CURRENT DRAIN:	Refer to above chart.
RESET TIME:	10 milliseconds maximum for DC units and 40 milliseconds maximum for AC units

ENVIRONMENTAL CHARACTERISTICS

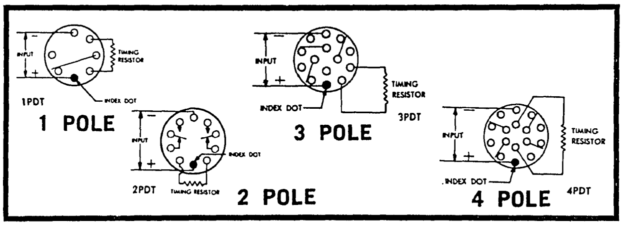
TEMPERATURE RANGE:	−55°C to +85°C or −65°C to +125°C.
VIBRATION:	20 G's; 10 to 2000 Hz.
SHOCK:	50 G's, 11 ±1 millisecond duration.
INSULATION RESISTANCE:	1000 megohms at 500 volts DC, all terminals to case.
DIELECTRIC STRENGTH:	1000 volts rms, 60 Hz, all terminals to case.
SEALING:	Hermetic, 1.3 inches mercury.
LIFE:	100,000 operations minimum.

ADJUSTABLE AND FIXED TIMING MODULE

ELECTRICAL DIAGRAM — FIXED DELAY — 1600

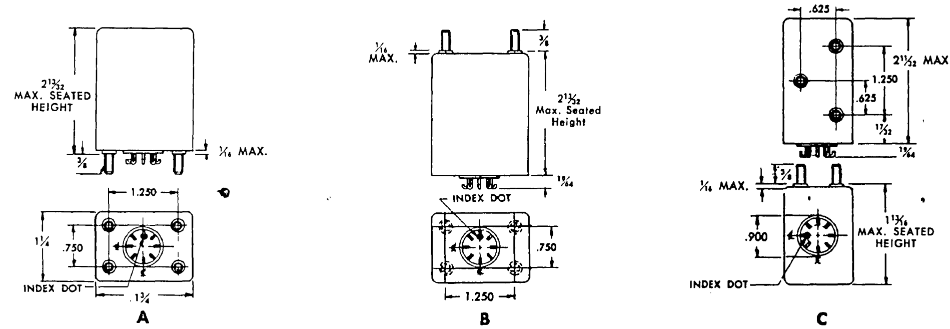

INPUT
Index Dot
1 POLE
2 POLE
3 POLE
4 POLE

ADJUSTABLE DELAY — 1700


INPUT
TIMING RESISTOR
INDEX DOT
1PDT
1 POLE
2PDT
2 POLE
3PDT
3 POLE
4PDT
4 POLE

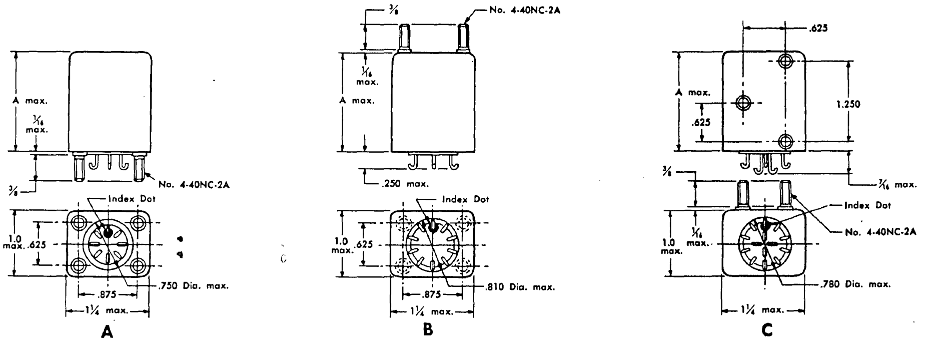
MOUNTING STYLES

10 AMP UNITS


2¹³⁄₃₂ MAX. SEATED HEIGHT
³⁄₁₆ MAX.
1.250
.750
1¼
1¾
INDEX DOT
A
³⁄₁₆ MAX.
2¹³⁄₃₂ Max. Seated Height
INDEX DOT
.750
1.250
B
.625
2¹¹⁄₃₂ MAX.
1.250
.625
1¹³⁄₁₆ MAX. SEATED HEIGHT
.900
INDEX DOT
C

Note: Studs shown are 6-32 thread size

4 AMP UNITS


A max.
No. 4-40NC-2A
Index Dot
1.0 max.
.625
.875
1¼ max.
.750 Dia. max.
A
.250 max.
.810 Dia. max.
B
.625
1.250
.780 Dia. max.
C

ADJUSTABLE TIMING FORMULA

The resistance required to obtain timing within this range is determined using the formula:

$$Rx = 400K \left(\frac{T}{T_{max}}\right) - 40K$$

Rx = External Res. in OHMS
T = Desired time in seconds
T max. = Maximum time (code)

A high quality deposited carbon ±1%, .1 watt (min.) resistor is recommended for external resistance.

DETERMINATION OF MODULE PART NUMBER — ORDERING INFORMATION

Hi-G Adjustable Time Delay Modules cover one decade, e.g., 62 milliseconds to 620 milliseconds; you may select any decade that best suits your application within the range of 50 milliseconds to 180 seconds. (Of course, longer ranges are available on special order.) The upper decade limit is T_{max} in the timing formula and is the timing code number in the part number described in the following paragraph.

The part number for a Hi-G Time Delay Module consists of three elements: the series number (from the Table), a letter signifying mounting style, and the timing code number. The timing code number consists of four digits and gives the time in milliseconds. The first three digits are the significant figures and the last digit is the number of zeroes following the significant figures; thus, 50 milliseconds would be coded 0500, 1.1 seconds would read 1101, and 1 minute (60 seconds) would be 6002.

A typical part number for an adjustable timing module is 1722-C-1102; this is a DC unit in the −65°C to +125°C temperature range with a 2 pdt contact arrangement, in a style C mounting, and with a time delay range of 1.1 to 11 seconds.

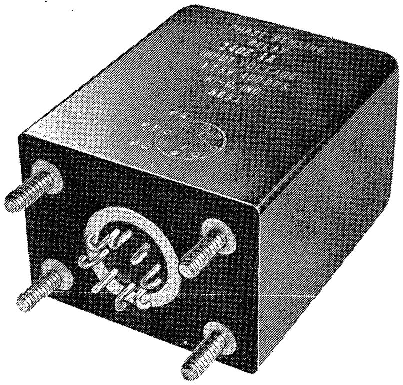
ELECTRONIC PRODUCTS DIVISION

HI-G INCORPORATED
SPRING ST. AND ROUTE 75, WINDSOR LOCKS, CONN. 06096
PHONE: (203) 623-2481 TWX: 710-420-0592

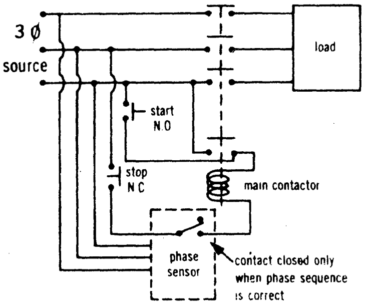
3 φ POWER SYSTEM MONITOR

PHASE SENSOR

SERIES 1400



TYPICAL APPLICATION CONNECTIONS



FEATURES

Hi-G Phase Sensors monitor three-phase power systems and protect both the power source and the equipment being driven. They are complete units, ready to install, designed and manufactured to meet the most stringent of requirements of military electronics. Broad applications also exist in commercial and industrial fields.

TWO STANDARD TYPES

P TYPE FOR STATIC LOAD

With line voltages and frequency within operating limits, P-Type Units will energize only when input phase are in sequence A-B-C. They will de-energize only when power is removed. The P-Type unit is best suited to applications where static loads are used and where regenerated voltage will not be present if a phase opens.

Q TYPE FOR MOTOR LOADS

Q-Type units perform the same function as the P-Type since they will energize only when input phases are in sequence A-B-C. In addition, the units will de-energize when any phase is disconnected or grounded provided the voltage input to the unit is below 50% of the nominal phase-to-phase voltage input. Q-Type units are suitable for motor loads where a regenerated voltage is produced.

NO NEUTRAL CONNECTION

Neither P- or Q-Type units require connection to neutral leg.

For high-current applications, phase sensors are used with slave relays having heavy duty contact ratings.

For applications having special requirements as to voltage, frequency, contact arrangements, and ratings, consult the factory.

ELECTRICAL SPECIFICATIONS

OPERATE TIME:	50 milliseconds maximum.
RELEASE TIME:	100 milliseconds maximum.
CONTACTS:	1PDT.
CONTACT RATING:	2 amperes resistive @ 30 volts DC. 0.5 ampere inductive @ 30 volts DC. 0.25 ampere resistive or inductive @ 115 volts, 60 or 400 Hz.

ENVIRONMENTAL CHARACTERISTICS

TEMPERATURE:	−55°C to +85°C.
VIBRATION:	20 G's, 10 to 2000 Hz.
SHOCK:	50 G's, 11 ±1 milliseconds
INSULATION RESISTANCE:	1000 megohms minimum @ 500 volts DC, all terminals to case.
DIELECTRIC STRENGTH:	1000 volts rms, 60 Hz, @ sea level, all terminals to chse.

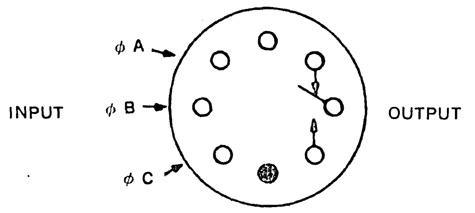
PHASE SENSOR

DETERMINATION OF PART NUMBER—HOW TO ORDER

A typical part number for a Phase Sensor is 1408-1A; The 1408 is the part type number which is obtained from the table below. The (1) indicates the number of poles and the mounting style (A).

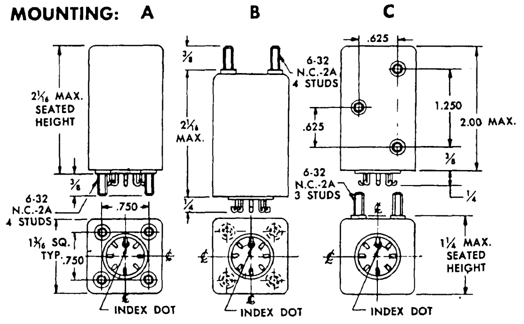
1408 -1 A
MOUNTING
OUTPUT 1PDT
TYPE

ELECTRICAL DIAGRAM


φ A
INPUT
φ B
φ C
OUTPUT

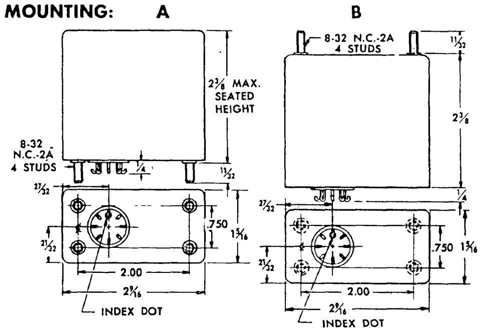
MOUNTING STYLES

FIGURE 1


MOUNTING: A
B
C
2 1/16 MAX. SEATED HEIGHT
3/8
6-32 N.C.-2A 4 STUDS
.750
1 5/16 SQ. TYP.
.750
INDEX DOT
2 1/16 MAX.
1/4
INDEX DOT
.625
6-32 N.C.-2A 4 STUDS
1.250
2.00 MAX.
.625
3/8
6-32 N.C.-2A 3 STUDS
1/4
1 1/4 MAX. SEATED HEIGHT
INDEX DOT

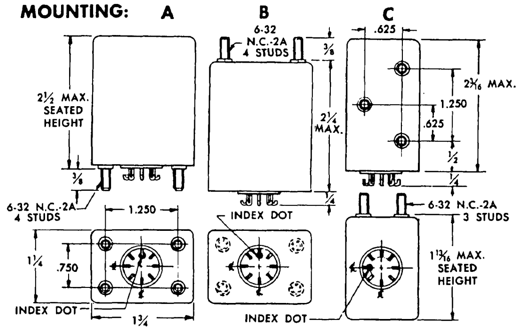
TYPE 1408

FIGURE 2


MOUNTING: A
B
2 3/8 MAX. SEATED HEIGHT
8-32 N.C.-2A 4 STUDS
11/32
.750
1 5/16
2.00
2 5/16
INDEX DOT
8-32 N.C.-2A 4 STUDS
11/32
2 3/8
1/4
.750 1 5/16
2.00
2 5/16
INDEX DOT

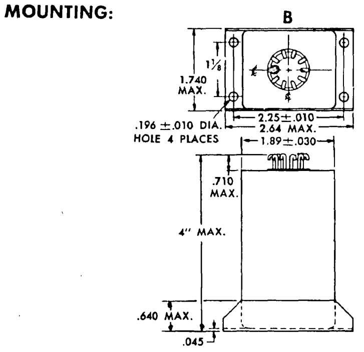
TYPE 1437

FIGURE 3


MOUNTING: A
B
C
2 1/2 MAX. SEATED HEIGHT
3/8
6-32 N.C.-2A 4 STUDS
1.250
1 1/4
.750
INDEX DOT
1 3/4
6-32 N.C.-2A 4 STUDS
3/8
2 1/4 MAX.
INDEX DOT
INDEX DOT
.625
2 3/16 MAX.
1.250
.625
1/2
1/4
6-32 N.C.-2A 3 STUDS
1 13/16 MAX. SEATED HEIGHT

TYPES 1407, 1409, 1410, 1438

FIGURE 4


MOUNTING:
B
1 1/8
1.740 MAX.
.196 ±.010 DIA. HOLE 4 PLACES
2.25±.010
2.64 MAX.
1.89±.030
.710 MAX.
4" MAX.
.640 MAX.
.045

TYPES 1439, 1440

PHASE SENSOR TYPE TABLE

Part Type	Load Type	Voltage* ±10%	Frequency ±10%	Max. Power Required	Mounting	Refer Mounting Figure Styles
1407	P	115V	60 cps	4 Watts	A, B, C	3
1408	P	115V	400 cps	4 Watts	A, B, C	1
1409	P	208V	60 cps	6 Watts	A, B, C	3
1410	P	208V	400 cps	6 Watts	A, B, C	3
1437	Q	115V	60 cps	6 Watts	A, B	2
1438	Q	115V	400 cps	6 Watts	A, B	3
1439	Q	208V	60 cps	9 Watts	B	4
1440	Q	208V	400 cps	9 Watts	B	4

*Line-to-line voltage.

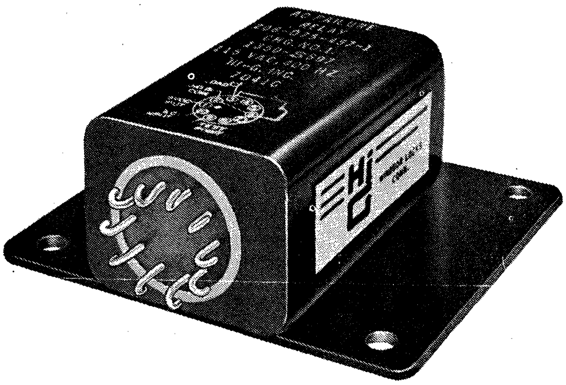
ELECTRONIC PRODUCTS DIVISION

HI-G INCORPORATED
SPRING ST. AND ROUTE 75, WINDSOR LOCKS, CONN. 06096
PHONE: (203) 623-2481 TWX: 710-420-0592

AC AND DC MONITORING

VOLTAGE LEVEL SENSOR

SERIES 1300



FEATURES

DC SENSOR — SERIES 1310

The Hi-G 1310 Series DC Voltage Sensor is essentially a voltage monitoring device operating on a snap-action transistor circuit with low drift and inherent temperature compensation. This device will either open or close a circuit when a predetermined voltage is present at the input.

By using a Hi-G electro-mechanical relay as the output of the voltage sensor, a positive switching action can be achieved with very close difference between pull-in and drop-out voltages.

AC SENSOR — SERIES 1350

The Hi-G 1350 Series AC Voltage Sensor provides an output "signal" when the monitored power line voltage reaches a predetermined level. This rugged unit with reliable solid state design, provides precise, repeatable operation over a wide temperature extreme.

The input voltage is fed into a temperature compensated comparator circuit. When the input reaches the pre-set level, transistor amplifiers switch the output relay to provide a "signal." This output may control any external device, process, or warning system to protect expensive equipment.

The units for both series are potted and hermetically sealed and are designed to meet the environmental requirements of airborne applications.

PART TYPE CHARACTERISTICS

Specification	Part Number	
	1310	1350
Pull-in Voltage	17.0 to 33.0V DC	90 to 120V AC
Smallest Increment	0.1 Volt	1.0 Volt
Drop-out Voltage (Rel. to Pull-in)	+0, −0.5 Volts	+0, −0.5 Volts
Current Drain @ 25°C	15 MA Max.	100 MA Max.

ELECTRICAL SPECIFICATIONS

ACCURACY:	±2½ % of set point over temperature range.
MAXIMUM ALLOWABLE APPLIED VOLTAGE:	150% of specified pull-in voltage.
AUXILIARY VOLTAGE:	None required.
OPERATE AND RELEASE TIMES:	50 milliseconds maximum over the temperature range.
LIFE:	100,000 operations minimum.
CONTACT ARRANGEMENT:	2 PDT.
CONTACT RATING:	2 amperes resistive @ 30 volts DC; 0.3 amperes resistive at 115 volts RMS, 400 Hz.

ENVIRONMENTAL CHARACTERISTICS

TEMPERATURE:	−55°C to +125°C.
VIBRATION:	20 G's, 10 to 2000 Hz.
SHOCK:	50 G's, 11 ±1 milliseconds duration.
INSULATION RESISTANCE:	1000 megohms minimum @ 500 volts DC, all terminals to case.
DIELECTRIC STRENGTH:	1000 volts RMS, 60 Hz @ sea level, all terminals to case.
SEALING:	Hermetic, 1.3 inches of mercury.

VOLTAGE LEVEL SENSOR

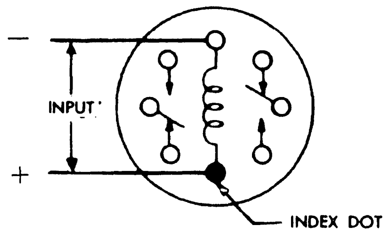
STANDARD OPTIONS

The following are available for both the 1310 and 1350:

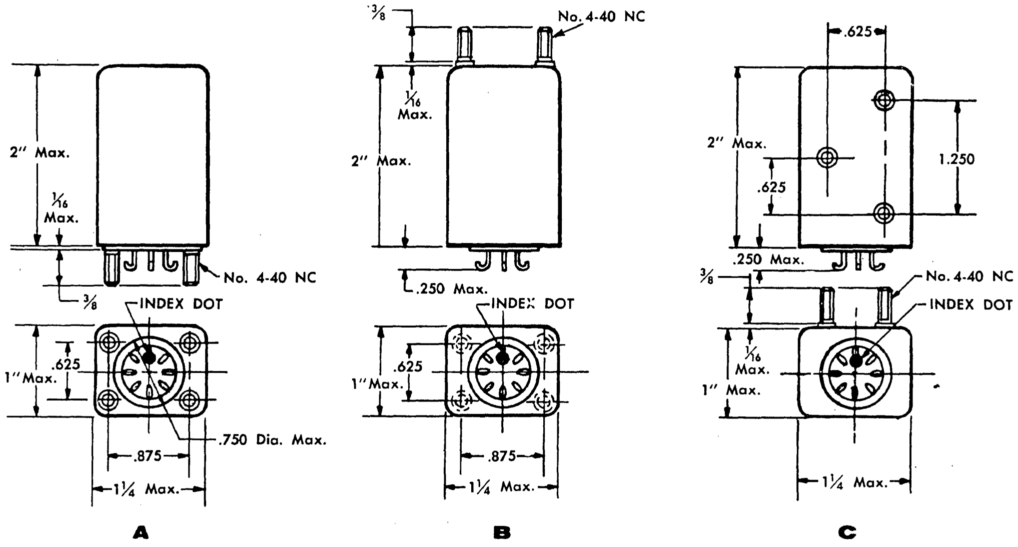
1. Solid State Output.
2. Two Stage Sensing (Voltage Band).
3. Up to 10 Amp Relay Output.
4. Other Voltage Sensing Levels.
5. Drop-out Differential.
6. Operate with Auxiliary Control Voltage.

1350 ONLY: Special 3 Phase Version Available.

ELECTRICAL DIAGRAM


−
INPUT
+
INDEX DOT

MOUNTING STYLES — 1310 AND 1350


2" Max.
1/16 Max.
No. 4-40 NC
3/8
INDEX DOT
.625
1" Max.
.750 Dia. Max.
.875
1¼ Max.
A
3/8
No. 4-40 NC
1/16 Max.
2" Max.
.250 Max.
INDEX DOT
.625
1" Max.
.875
1¼ Max.
B
.625
2" Max.
.625
1.250
.250 Max.
3/8
No. 4-40 NC
INDEX DOT
1/16 Max.
1" Max.
1¼ Max.
C

DETERMINATION OF SENSOR PART NUMBER — BOTH 1310 AND 1350

Using 1310 as the general sensor type part number, a typical part number would be 1310-2A-24.5. The 2A signifies the number of poles (2) and the mounting style (A). The required pull-in voltage is signified by "24.5," to the nearest tenth of a volt. The standard drop-out voltage is 0.5 volt under pull-in, or 24.0 volt.

EXAMPLE:

1310	2	A	24.5
TYPE	2 PDT	MOUNTING STYLE	PULL-IN VOLTAGE

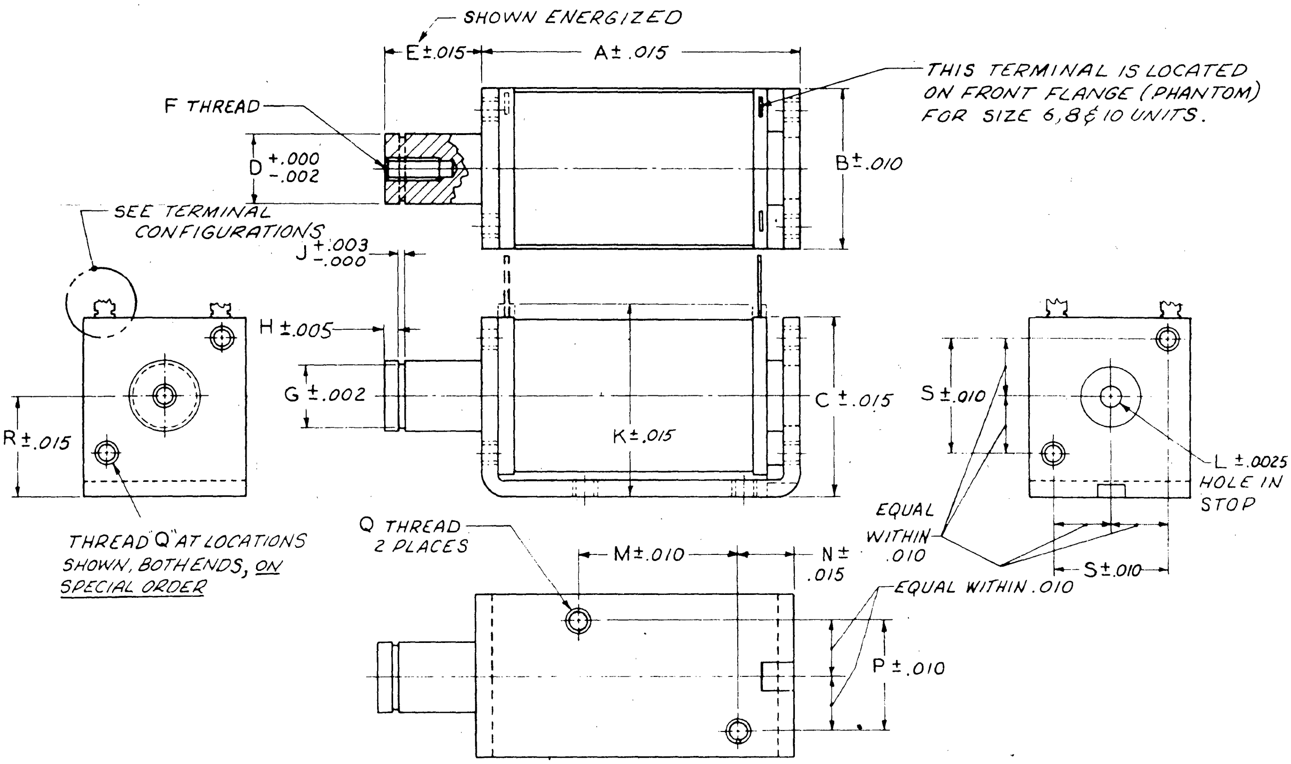
ELECTRONIC PRODUCTS DIVISION

HI-G INCORPORATED
SPRING ST. AND ROUTE 75, WINDSOR LOCKS, CONN. 06096
PHONE: (203) 623-2481 TWX: 710-420-0592

Solenoids by Hi-G Incorporated

SERIES "SA" SOLENOIDS

BASIC CONFIGURATION
PULL TYPE


SHOWN ENERGIZED
E±.015
A±.015
THIS TERMINAL IS LOCATED ON FRONT FLANGE (PHANTOM) FOR SIZE 6,8 & 10 UNITS.
F THREAD
D +.000 −.002
B±.010
SEE TERMINAL CONFIGURATIONS
J +.003 −.000
H ±.005
G ±.002
C ±.015
K±.015
S ±.010
R±.015
L ±.0025 HOLE IN STOP
THREAD "Q" AT LOCATIONS SHOWN, BOTH ENDS, ON SPECIAL ORDER
Q THREAD 2 PLACES
M±.010
N± .015
EQUAL WITHIN .010
EQUAL WITHIN .010
S±.010
P ±.010

TERMINAL CONFIGURATIONS

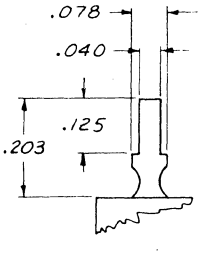

.078
.040
.125
.203

FIG. 1

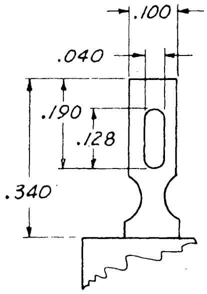

.100
.040
.190
.128
.340

FIG. 2

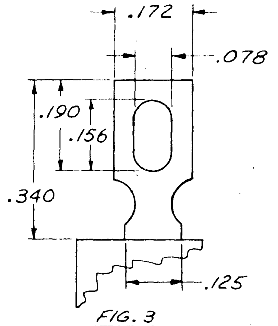
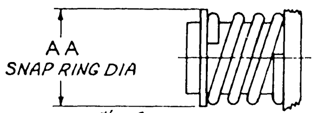

.172
.078
.190
.156
.340
.125

FIG. 3

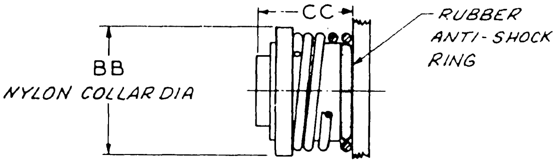
Unit Size	A	B	C	D	E	F	Min. Full Thd.	G	H	J	K	L	M	N	P	Q	R	S
6	.825	.365	.435	.150	.218	2-56	.219	.116	.035	.029	.500	.078	.310	.187	.250	2-56	.230	.250
8	.975	.490	.535	.187	.281	2-56	.219	.147	.035	.029	.597	.078	.500	.218	.375	2-56	.285	.310
10	1.210	.615	.700	.250	.359	4-40	.250	.188	.040	.029	.780	.109	.625	.250	.440	4-40	.390	.440
12	1.480	.740	.820	.312	.453	4-40	.250	.188	.062	.029	See Dim. C	.109	.630	.250	.440	4-40	.465	.500
14	1.730	.865	.980	.375	.531	4-40	.250	.210	.078	.029		.109	.865	.310	.600	4-40	.545	.620
16	1.980	.990	1.140	.437	.640	6-32	.312	.250	.093	.039		.140	.990	.370	.660	6-32	.640	.680
18	2.230	1.115	1.260	.500	.718	8-32	.438	.250	.109	.039		.140	1.115	.430	.750	8-32	.700	.810
20	2.480	1.240	1.420	.562	.812	10-32	.438	.343	.125	.039		.140	1.240	.500	.810	10-32	.795	.880

Today's Component People

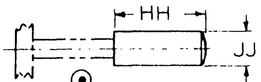
AVAILABLE ADAPTIONS TO BASIC CONFIGURATION



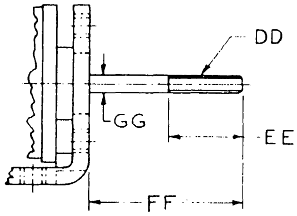
STYLE #1 (RETURN SPRING)



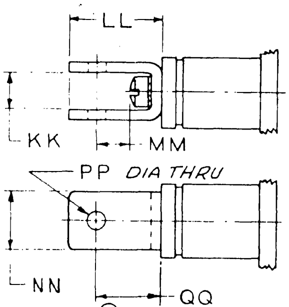
STYLE #2 (SHOCK DAMPENER - LESS RETURN SPRING)
STYLE #3 (SHOCK DAMPENER - WITH RETURN SPRING)



PLASTIC TIP ⊙ (T) ADAPTS TO STYLE #5



PUSH TYPE ⊙ (P)



CLEVIS ⊙ (C)

⊙ WHEN ORDERING "CLEVIS" SPECIFY SUFFIX "C" AFTER STYLE NUMBER
WHEN ORDERING "PUSH TYPE" SPECIFY "P" AFTER STYLE NUMBER OR LETTER "C"
WHEN ORDERING "PLASTIC TIP" SPECIFY "T" AFTER "P"

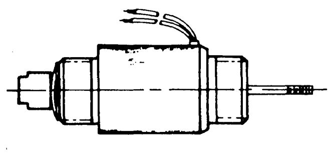
Unit Size	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP	QQ
6	.335	.375	.233	0-80	.340	.440	.062	.400	.156	.160	.265	.093	.156	.062	.187
8	.375	.406	.297	0-80	.340	.440	.062	.400	.156	.160	.265	.093	.156	.062	.187
10	.446	.468	.376	2-56	.410	.560	.093	.500	.187	.222	.375	.125	.218	.078	.250
12	.446	.531	.471	2-56	.410	.560	.093	.500	.187	.222	.375	.125	.218	.078	.250
14	.516	.625	.550	2-56	.410	.560	.093	.500	.187	.222	.375	.125	.218	.078	.250
16	.588	.718	.660	5-40	.625	.940	.125	.650	.250	.255	.437	.156	.250	.093	.312
18	.588	.781	.739	5-40	.625	.940	.125	.650	.250	.318	.562	.218	.312	.125	.375
20	.746	.875	.834	5-40	.625	.940	.125	.650	.250	.380	.625	.255	.375	.156	.437

"SA" Series available in push or pull construction, 3-160 VDC coils, leads on coil instead of terminals, push and pull in same unit. Contact factory for force-stroke curves and any modification you desire.

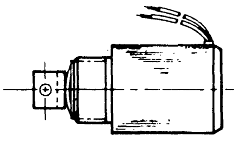
CLOSED SOLENOIDS

Hi-G offers the widest, most complete line of solenoids ever produced for industrial and military applications. Hi-G offers in-depth experience and capabilities for custom designing of solenoids to meet particular requirements. These include PUSH-PULL pressurized and nonpressurized as well as PUSH-TYPE manual override.

NON-PRESSURIZED

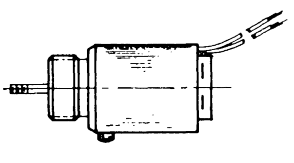


Push Type

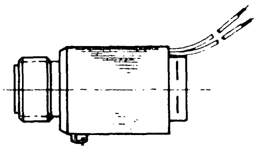


Pull Type

PRESSURIZED



Push Type

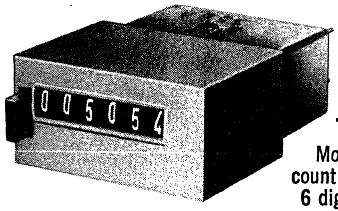


Pull Type

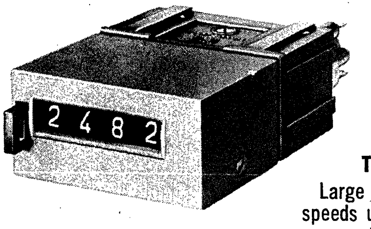
FOR ADDITIONAL INFORMATION CALL:
Area Code (203) 623-2481
TWX: 710-420-0592

HI-G INCORPORATED
SPRING STREET AND ROUTE 75
WINDSOR LOCKS, CONN. 06096

High Performance Electromagnetic Counters Digital Line & Ticket Printers

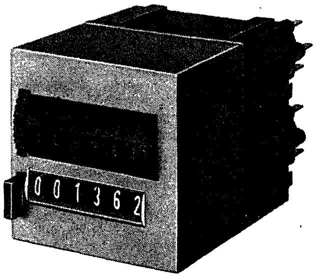


Totalizing Counter 404
Modular plug-in counter, count speeds up to 60 cps, 6 digits, non-reset, manual and electrical reset. Life in excess of 200 MIO operations.

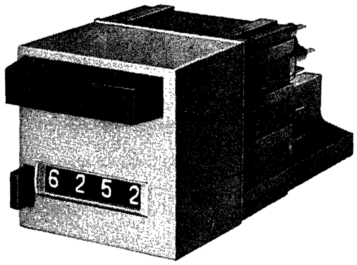


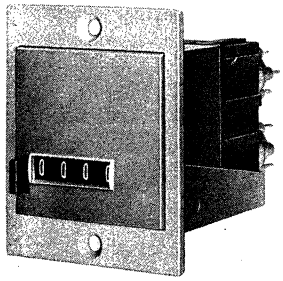
Totalizing Counter 414
Large figure totalizor count speeds up to 40 cps, 4 digits, non-reset, manual & electrical reset. Many standard options.

Predetermining Counter 422
Operates on adding principle, count speeds up to 40 cps, 6 digits, with manual, electrical or automatic reset, preset retained for repetition.

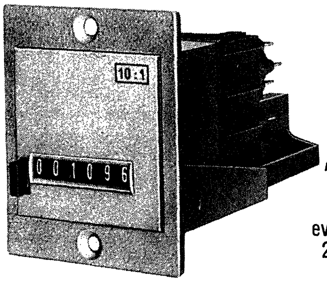


Predetermining Counter 441
Operates on subtracting principle, count speeds up to 40 cps, 4 digits, with easy push button preset optional presignal available.



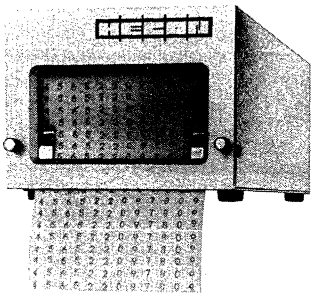


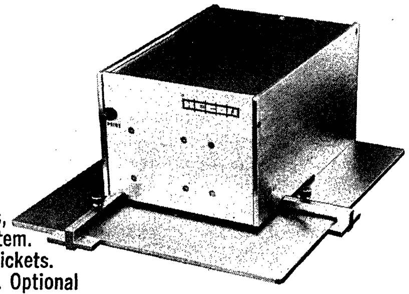
Bi-Directional Counter 431
Accepts positive and negative inputs serially or simultaneously without loss of counts. Count speeds up to 25 cps. Optional zero contact available.



Periodic Output Counter 411
Adding totalizor with built-in wiper contact wheel for periodic output signal, i.e. every 2, 5, 10, 20, 50, 100, 200, 500, 1000 pulses. Count speeds up to 25 cps.

Digital Line Printer DP 500
4 to 12 active columns, asynchoronous operation, BCD or pulse train input. Print speed 5 lines per sec. With control electronics.





TICKET PRINTER TP 900
Up to 18 active columns, including Time-Date system. For single and multiple tickets. BCD or pulse train input. Optional ticket adjustments available.

HECON.

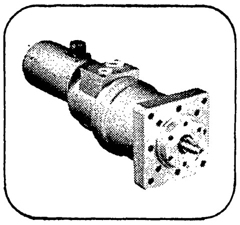
Better by Design

HECON CORPORATION 31 Park Road, New Shrewsbury, New Jersey, (201) 542-9200 Telex 132-457
HECON OF CANADA LTD., 80 Galaxy Boulevard, Rexdale, Ontario, Canada 416-678-2441 Telex 0622-773
Members of the World Wide Hengstler Group of Companies

direct digital positioning

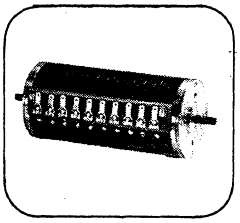
Automatic systems, sub-systems and modules for automatic control in manufacturing, electronics, data processing, graphics, instrumentation and research

ICON AUTOMATIC MOTION CONTROL SYSTEMS INCLUDE



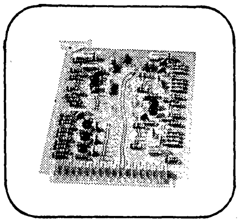
ELECTROHYDRAULIC
PULSE MOTORS

. . . a complete line of high power motors built by Fujitsu, Ltd., for direct digital positioning in heavy applications such as machine tools, textile and printing machinery, welders, typesetters, automated production machinery, etc. Torque output exceeds 500 in-lbs. at 2000 steps per second. Power ranges from .8 to 10 HP at 16,000 steps per second.



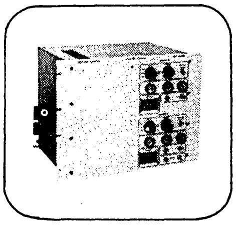
HIGH SPEED ELECTRIC
STEPPER MOTORS

. . . variable reluctance steppers that are the fastest, most advanced digital actuators in America, today. Available in a wide range of torques with error-free response rates of 2000 pps, and running speeds in excess of 10,000 pps.



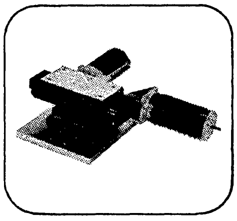
DIGITAL SYSTEM POSITIONING
MODULES

. . . for the engineer who wants to design and package his own positioning control system. A full line of solid-state driver modules for most stepping motors, plus general purpose system logic modules using NAND logic.



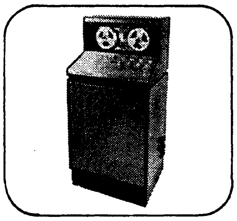
MULTI-AXIS STEPPER
PROGRAMMERS & DRIVE UNITS

. . . Icon Series 400 positioning systems emphasize high motor performance and input flexibility. Able to drive up to 6 independent steppers of any type. Accept inputs ranging from switch closure to computer. Readily interface with other system elements.



NUMERICALLY-CONTROLLED
X-Y TABLES

. . . two complete lines of X-Y tables covering the motion range from 2" x 2" through 12" x 12". Speeds in excess of 2 ips, resolution of .001 inch. Ideal for automation of production, assembly and test. Many control options available.



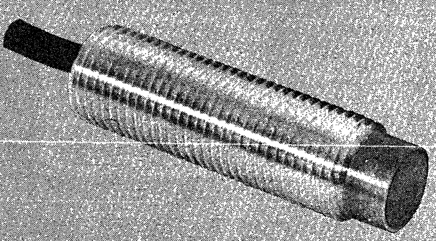
HIGH SPEED NUMERICAL
CONTROL SYSTEMS

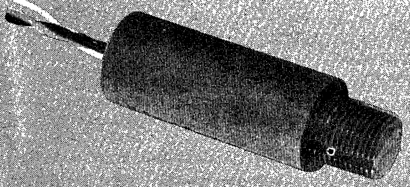
. . . with extremely reliable I.C. logic, very flexible program structure. Advanced, low-cost control for a wide range of automatic 2 or 3 axis point-to-point positioning applications. Open-loop, all-digital design for simple application, operation, service.

icon
CORPORATION
156 Sixth Street, Cambridge, Massachusetts 02142
Telephone: 617 / 868-5400

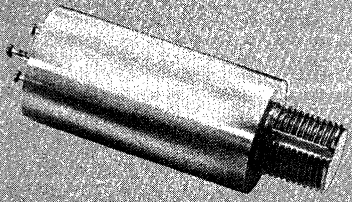
Motion
Technology
Group
USM Corporation

SPEED INDEPENDENT MAGNETIC PICK-UPS

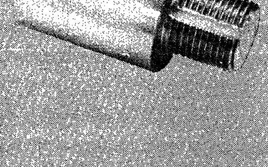




The ISC*Magnetics family of Magnetic Pick-Ups are devices having output voltage amplitudes that are independent of the rate of change to the external magnetic field. This characteristic results in a device ideally suited for use in a multitude of static as well as dynamic sensing applications.



The applications for ISC*Magnetics Magnetic Pick-Ups encompass the limited environment of computer peripheral equipments, the rugged environment of internal combustion engines, as well as the extreme reliability requirement of aerospace. New variations are being developed in answer to new potential applications.

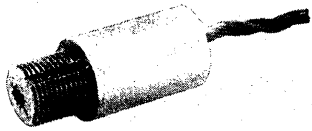


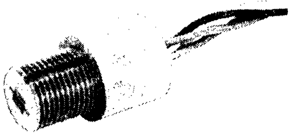
Computer applications include sensing of indexing marks for the drive mechanisms in card readers, magnetic tape memories, and the paper roll drive and character selection in printers, as well as contactless limit switching. Economically priced, these units can be used in many applications previously employing photo sensors.

Transportation applications include wheel speed sensing (for skid-controlled braking systems), ignition system timing, vehicle sensing (traffic control). Ruggedly constructed, suitable for vehicle axle mounting and operable from noisy and widely varying power sources, these units simplify many designs.

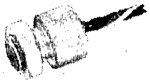
PATENTS PENDING

ALL MAGNETIC PICK-UPS ARE SHOWN ACTUAL SIZE

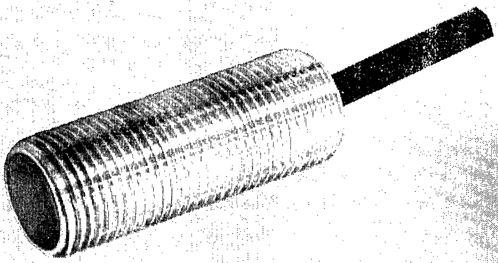


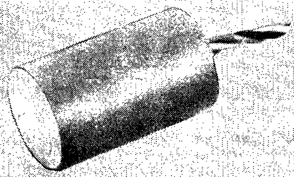


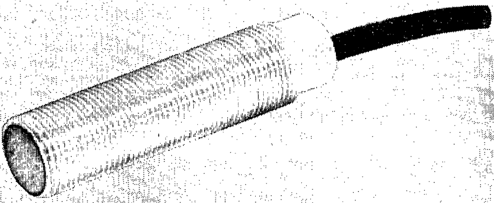
Industrial applications include speed, position and limit sensing and parts counting for various process control systems. ISC∗Magnetics Pick-Ups are particularly well suited for space application because of their low power consumption, operation from logic power bus, freedom from EMI (these Pick-Ups have no internal choppers or oscillators) and freedom from the need of an actuator mechanism (as in the case of conventional limit switches). ISC∗Magnetics Magnetic Pick-Ups exhibit a very high reliability.

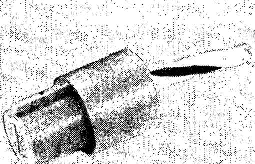


ISC*Magnetics' staff of engineers is ready to discuss your particular requirements. For technical assistance or further information regarding any of ISC*Magnetics product line of Magnetic Pick-Ups, Solid-State Switches, Solid-State Load Controllers, Hall Effect Devices, Magnetoresistors, Fluxmeters or Gaussmeters, contact:







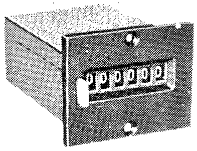


ISC MAGNETICS

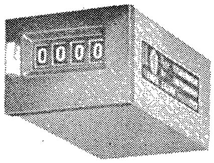
Division of INSTRUMENT SYSTEMS CORPORATION
770 PARK AVENUE, HUNTINGTON, NEW YORK 11743
TWX: 510-226-6983 / Telephone: (516) 423-6200 / Cable Address: INSSYSTHTGH

ELECTRIC and PNEUMATIC COUNTERS and ACCESSORIES

E-16 TOTALIZING

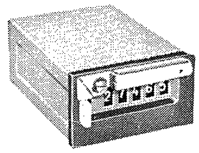


E-14 TOTALIZING

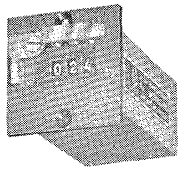


- Adds at speeds up to 100/sec.
- Long life
- Small rugged size
- Choice of 5 mountings
- Special wheels available

EVS-15 PREDETERMINING 5 DIGIT

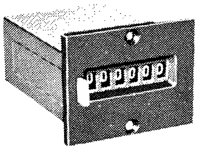


EVS-13 PREDETERMINING 3 DIGIT



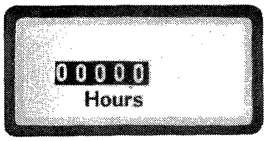
- Up to 50 counts/sec.
- Counts down from the pre-set No. to operate a built-in control switch as count passes zero.
- Electrical reset
- Automatic reset and recycling

ED-15 ADD-SUBTRACT



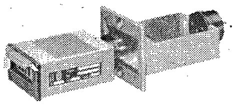
- Speeds to 40/sec. Add or Subtract
- Electrical reset available
- 5 digits maximum

B-2 RUNNING TIME METER



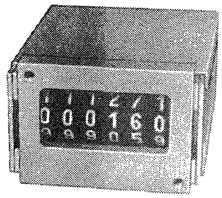
- Snap-in mounting
- Attractive appearance
- Small size but easily readable

MOUNTING OPTIONS



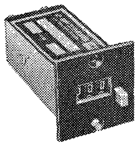
- Plug-in (illustrated)
- Snap-in
- Sealed housings

SPECIAL MODIFICATIONS



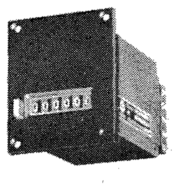
. Operating temp. down to minus 20° F.
. Shock and vibration resistant
. Special wheels for minutes, seconds, hours
. Illumination

MEDIUM DUTY ER SERIES



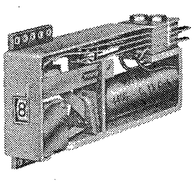
- 3, 4, 5 & 6 digits
- With or without manual reset
- Extremely small size
- Numerous mounting options

EA-16 and EDA-15 TOTALIZING OR ADD-SUBTRACT WITH READOUT



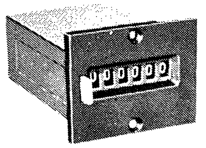
. Visual as well as electrical readout
. Very low power requirement
. BCD or 10 line readout

EQ SINGLE DECADE COUNT/ CONTROL MODULE



- Totalizing or add-subtract
- Resets from DC
- Visual as well as electrical readout

P-16 and P-15 PNEUMATIC COUNTERS PREDETERMINING and TOTALIZING



- Pneumatic reset available
- Built-in pneumatic switch
- Speeds up to 50/sec.
- Operating pressures from ¾ PSI and up

KEP

KESSLER-ELLIS PRODUCTS

120 FIRST AVENUE • ATLANTIC HIGHLANDS • NEW JERSEY 07716
PHONE (201) 291-0500

We've combined the right amounts of Swiss precision and American manufacturing know-how. You get the most reliable impulse counters available. So reliable that many of them last up to 4 times as long as competitive models. To complement this broad range of counters, we supply all necessary accessories and backup equipment.

RG Series: 3, 4, 5, 6, 8 digit counters. Our newest, compact counters feature wattages as low as 0.8W. DC counting speeds up to 60 i/s, AC to 25 i/s. Life expectancy is 200,000,000 counts. Advanced plug-in design offers 3 mounting styles and 3 widths to choose from. Send for Bulletin 601.

TCe Series for flush panel mounting. Complete series of impulse counters in 3, 4, 5, 6, 7 and 8 digit models. Non-reset models in all numbers of digits: manual toggle reset in 3 through 6 digits and electric reset in 4 through 6 digits. Counting speeds 10, 25 and 50 i/s. Features small overall size, low power consumption, and high reliability. Send for Bulletin 201.

TCeB space saving counters. Shallowest mounting depth in the industry. Available in 4, 5, 6 and 7 digit units without reset. Speeds 10 or 25 i/s for DC models, 10 i/s for DC models, 10 i/s for AC. Features include ±15% voltage tolerances, reliable and accurate performance; over 200,000,000 count life. Send for Bulletin 212.

Printing counters. Visual readout plus printed data on tape and/or cards. Tape printout on single channel size, tape *with* ticket on dual channel, and ticket or tape on multi channel. Serial or parallel data entry, many printing options, DC or AC operation. Send for Bulletin 372.

ES type single decade counters. The largest, easiest-to-read figures found on any single drum counter. *ES-2 Series* features forward or backward counting, 10 or 25 i/s counting speeds, high reliability and accuracy. *ES-4 Series* offers read-out terminals, predetermining selector switches, built-in spark suppressor, plug-in mounting. Send for Bulletins 101 and 102.

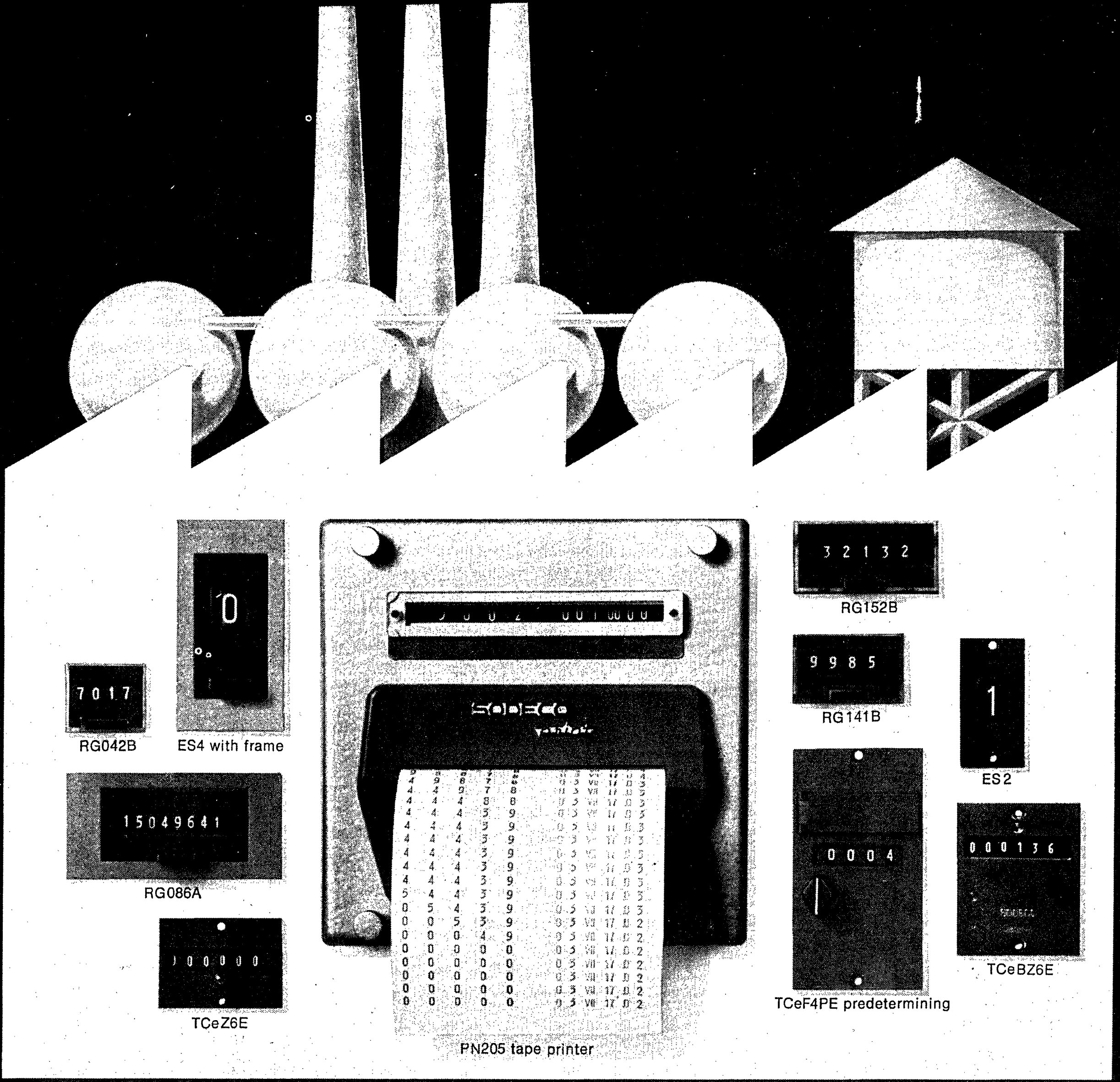
Predetermining counters. Small, compact, panel-mounted *4 digit TCe...4 PE Series* and *5 digit EN Series* combine in-line count and control functions. Standard voltages 12, 24 and 110 VDC, others optional. Manual or electric reset; 10 or 25 i/s counting speed. Four digit AC operated 2TCeF4PE has 10 i/s speed. Send for Bulletin 402.

Sodeco, 4 Westchester Plaza, Elmsford, N. Y. 10523. Tel: (914) 592-4400; TWX: (710) 567-1219; Telex: 137345. In Canada, 2063 Chartier Street, Dorval 760, Quebec. Tel: (514) 631-9069.

SODECO

A Division of LANDIS & GYR

Sodeco impulse counters take the pulse of industry

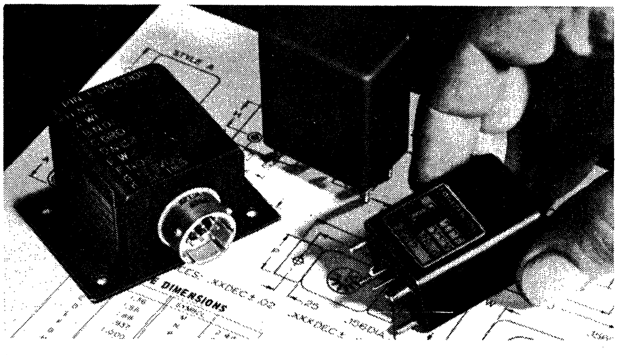


LOGITEK, INC.

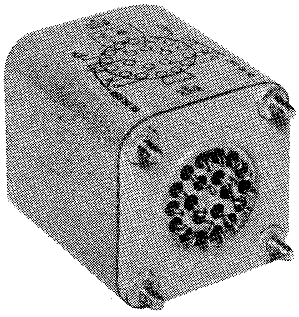
ELECTRONIC SENSORS & CONTROLS

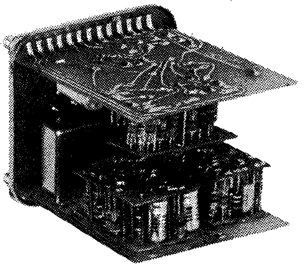
INDUSTRIAL
MILITARY

VOLTAGE SENSORS/FREQUENCY SENSORS/PHASE SEQUENCE SENSORS/CURRENT SENSORS/POWER MONITORS/TIME DELAY RELAYS/AC SOLID STATE RELAYS/SOLID STATE FLASHERS



Logitek's comprehensive line of time-delay relays and voltage-, frequency- and phase-sensors utilize the most advanced design and manufacturing techniques for accuracy and long-term reliability—provide uncompromising performance in rigorous military, aerospace and industrial systems. All units are hermetically sealed, meet applicable requirements of MIL-I-6181D, MIL-R-5757D, MIL-R-6106C, and MIL-Std-704A. Contact ratings 2A and 10A resistive, 1A and 5A inductive, operating life 100,000 cycles minimum. MIL-Q-9858 quality control.

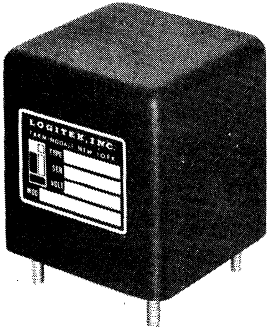




AC VOLTAGE SENSORS

Provide alarm, indication or disconnect signals for single — or 3 — phase lines when voltage exceeds high or low limits. Available with time delays to prevent dropout due to transients.

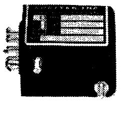
Input Power: 115 vac, 60/400 Hz nominal*
Sense Bands: 95 to 150 vac
Accuracy: ±1%, ±5%
Time Delays: 250 ms to 10 sec.
* Also DC operated

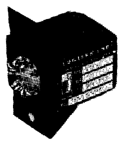


FREQUENCY SENSORS

Time-delayed, band frequency sensing relays, for applications where systems must be de-energized or alarms actuated when line frequency departs from normal.

Line Voltage: 100-130 vrms
Frequency Sense Range: 50/60 or 360/440 Hz*
Accuracy: ±1%, ±5%
Delay: 250 ms to 10 sec*
* As specified.





PHASE SEQUENCE SENSORS

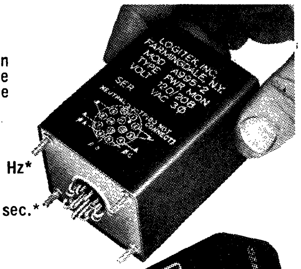
Protect rotating components and other three-phase loads from damage that could occur from phase reversals or absence of any phase. Contacts may be used to disconnect load or operate alarms.

Operating Voltage: 120/208 vac, 60/400 Hz, 3ϕ
Phase Displacement: 120 ±5 degrees max.
Permissible Distortion: total 8%, any harmonic 5%

SOLID STATE FLASHERS

Up to 10 channels; conform to MIL specs for airborne applications. Cordwood packaging for maximum density, hard mounted and encapsulated.

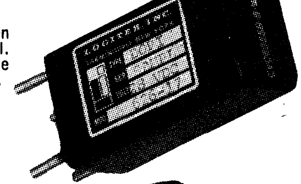
Input: 18-31 vdc
Load Current: up to 2.5 A
Flash Rate: up to 120 per min.
Flash/Off Ratio: up to 2.4:1



POWER MONITORS

Provide time-delayed alarm or shutdown signals when voltage, frequency or phase sequence characteristics of power line depart from specified limits.

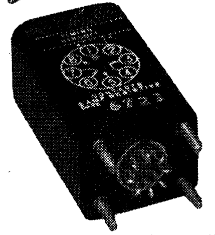
Voltage: 120/208 vac, single/three phase
Voltage Sense Band: 95-150 vrms
Frequency Sense Range: 50/60 or 360/440 Hz*
Accuracy: ±1%, ±5%
Pickup and Dropout Delay: 250 ms to 10 sec.*
* As specified



DC VOLTAGE SENSORS

Provide alarm or disconnect signals when DC line voltage departs from normal. Insensitive to normal transients. Available with factory-set or adjustable bandwidth.

Sense Band: 10-200 vdc
Accuracy (including hysteresis): ±1%.



TIME DELAY RELAYS

Delay on drop-out, pull-in, true delay on drop-out and controlled-delay on drop-out. Timing ranges from 50 msec to 300 sec, factory-set or externally adjustable. Standard and crystal can sizes.

Operating Voltages: 18-31 vdcs
Accuracy: 10%, 5%, 2%
Repeatability: ±1%, any voltage and temperature
Reset Time: 5 msec max.
Solid State Outputs available.

AC SOLID STATE RELAYS

Contactless relays for long life and high reliability. Normally-open and normally-closed configurations with complete isolation between switching and coil terminals.

Operating Voltage: 12-32 vdc
Control Signal: Ground
Switched Signal: 2-150 vac, 40-400 Hz
Pull-In Time: 100 usec max.
Drop-Out Time: ½ cycle max.

NEW! INDUSTRIAL TIME DELAY RELAYS POWER MONITORS VOLTAGE SENSORS FREQUENCY SENSORS PHASE SENSORS

LOGITEK, INC.
42 CENTRAL DRIVE, FARMINGDALE,
NEW YORK 11735 • (516) 694-3080

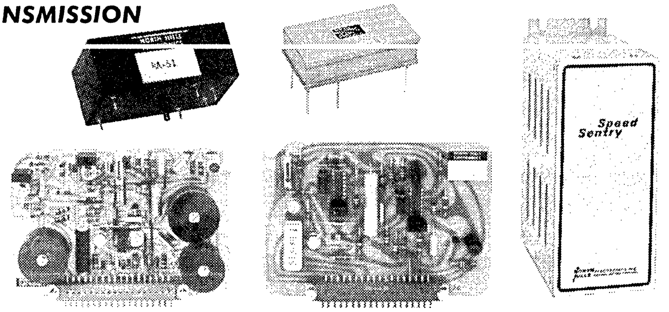
SEE OUR COMPLETE CATALOG IN EEM Vol. 2/SEC. 4500/PGS. 1750-1759

NORTH HILLS · HIGH-PERFORMANCE SYSTEM MODULES

ALARM, CONTROL, INSTRUMENTATION, DATA TRANSMISSION

North Hills offers a wide variety of equipment and system modules for data conditioning, transmission, automatic test and process control applications.

The products briefly described below are representative. North Hills is ready to furnish custom systems using existing or new designs. Your inquiries are invited.



FREQUENCY AND SPEED INSTRUMENTATION

ELECTRONIC TACHOMETERS. Series SD tachometers operate with North Hills non-reactive transducers or magnetic pickups, photochoppers, ac generators, and similar speed sensors.

Outputs are dc voltages or currents proportional to frequency, virtually independent of input waveform or amplitude. Stable trip points for alarm purposes.

VOLTAGE TO FREQUENCY CONVERTERS. DF Series. Low cost and compact. Standard models for full scale frequencies of 100, 500 Hz, 1, 5, 10, 100 kHz. Exceptional linearity and stability.

ELECTRONIC INTEGRATORS. Time integration of dc input voltage or current. Generate drive signals for external electronic or electromechanical totalizing counters. Count-rate field-settable throughout 100 to 50,000 counts/hour range. Jumper-selectable inputs.

IV-100 — Inputs: 0-4 Vdc, 1-5, 4-20, 10-50 mA dc.
Output: 24 V drive pulse for 9 W counter.

IV-200 — Input: −4 to +4 Vdc.
Dual outputs for up-and-down counter.

FREQUENCY TO VOLTAGE CONVERTERS. Series FD-10 provide dc voltage or current proportional to frequency.

Series FD-50 feature ultra-fast (two-cycle) response time, low ripple.

Series FD-70 are ultra-fast frequency deviation monitors. Output proportional to deviation from preset center frequency.

FREQUENCY MONITORS. Series FM-10 Frequency Monitors are frequency responsive limit switches for over, under, or bandpass conditions. Feature fast (two-cycle) response with excellent repeatability and stability.

ANALOG DATA TRANSMISSION SYSTEM

DLT and DLR Series terminals transmit analog data as constant amplitude, variable frequency signals over telephone-quality lines.

Operation is in the 300 Hz to 3 kHz band, with exceptional noise immunity, linearity, stability, and response time.

Matched TIME DIVISION MULTIPLEX equipment (TDM Series), permits sharing of a common transmission line by multiple data channels.

Tone signaling transmits all required control and timing signals to receiving equipment.

INDUSTRIAL CONTROL ALARMS AND TRANSMITTERS

TEMPERATURE AND MILLIVOLT ALARMS. CA Series provide relay contact closure when input exceeds preset level. CA-103 Series are thermocouple alarms with cold junction compensation for any standard thermocouple. Temperature effects as low as .05°/°C. CA-203 Series are millivolt alarms.

Both have CMRR $>$120 dB, high input impedance, single or dual set points.

TEMPERATURE AND MILLIVOLT TRANSMITTERS. CA-113 and CA-213 Series have standard current outputs of 1-5, 4-20, and 10-50 mA dc proportional to input levels for thermocouple or millivolt inputs.

DC VOLTAGE REFERENCE MODULES

Output stability typically 3 ppm, with TC's to 1 ppm/°C. Short-circuit protected.

RS-11. 0 to 10 V, 20 mA voltage source. Output set by six-decade selector.

SERIES RA-50. Solid state compact modules for pc board mounting. Unregulated 30 V input, 10 V dc low-impedance output.

RA-151. Programmable module, 0-10 V dc.

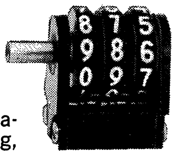
SEE EEM SECTION 4000 FOR PRECISION POWER SOURCES, AND SECTION 5600 FOR WIDEBAND TRANSFORMERS AND HYBRIDS

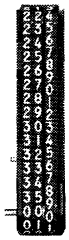
North Hills
Electronics, INC.
GLEN COVE, N.Y. 11542 • 516 671-5700

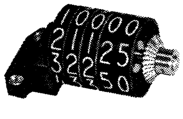
planet instruments
Thomas A Edison
McGRAW EDISON
INSTRUMENT DIVISION
1520 PROGRESS ROAD, FORT WAYNE, IND. 46808
PHONE: 219-483-8194 • TWX: 810-332-1419

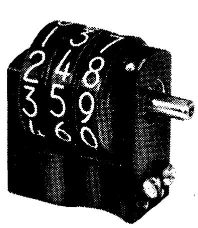
Precision Counters

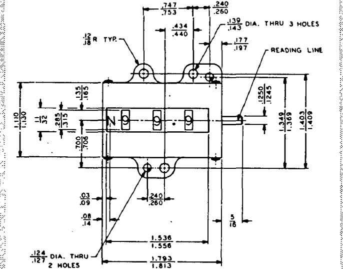
Planet readout counters can be designed for navigational, tracking, ranging, time, positioning, computing, fire control and industrial applications. Typical parameters include high speed, low torque, light-weight, miniaturization and maximum reliability.


A-513-1
Three Digit
Decimal Counter

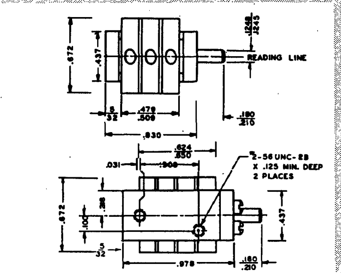

A1042
Three Digit
Tape Angle
Counter


A-681-1
Digital Fuel
Metering Counter
(Internal Pinion Type)

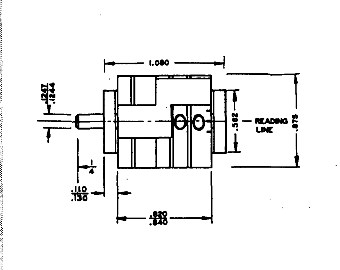

A-749-1
Digital Counter
(Internal Pinion Type)



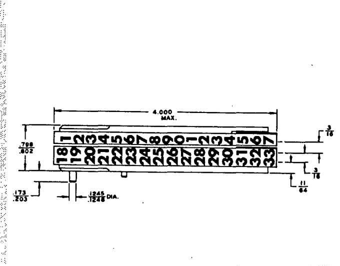
In-Line Double Bank Variation Counter
Applications—To indicate variations in navigational, dead reckoning, missile guidance and tracking systems.



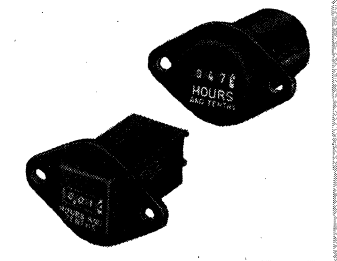
Miniature 3 and 4 Drum Internal Pinion Counters
Applications—Navigational components, missile tracking devices, fuel flow measurements, engine performance measurements, altimeter readings, various linear indications.



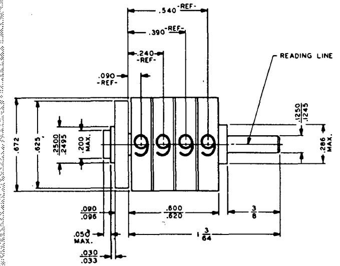
Double Bank Internal Pinion Variation Counter
Applications—To indicate variations in navigational, dead reckoning, guidance and tracking systems.



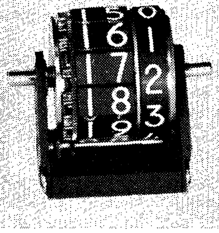
Tape Angle Counter
Applications—Navigation, servo position indication, fire control systems, azimuth indication, missile tracking systems, and any application requiring readout in angular increments.



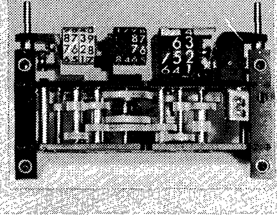
Sub-Miniature Elapsed Time Indicators
These elapsed time indicators are part of a complete line of indicating devices marketed by Planet Instruments. They are microminiature hermetically sealed units, available for operation on 400 Hz. All standard MS 17322 models, plus many optional mounting configurations are available.



Cantilevered Internal Pinion Counter
Applications—Navigational components, missile tracking devices, fuel flow measurements, engine performance measurements, altimeter readout, various linear measurements.

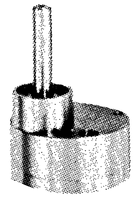


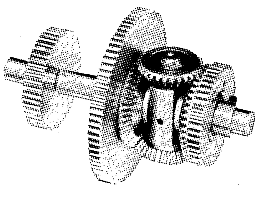
3 Digit Angle Counter
A revolutionary new concept in a mechanical angular readout counter. The Tri-Block angle counter measures only 1.250 x 1.084 x 1.392 yet incorporates large .250 high numerals. This unique design eliminates costly and complex timing assemblies found in other types of angle counters while providing distinct advantages in the area of torque, human engineering characteristics, viewing angle and numeral alignment.

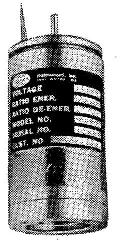


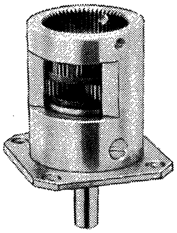
Altitude Select/Alert Controller Display
A fully integrated panel display for use on Altitude Alert Systems. All inputs are mechanically integrated thru the differential and geartrain to course and fine tune synchros or potentiometers that may be attached to the rear bearing plate. Many additional features such as built in clutches, auxiliary push to actuate micro switches may be provided as required.

OTHER PLANET INSTRUMENT QUALITY PRODUCTS


Special Gearheads


Differentials


2-Speed Gearheads
Sizes 8 and larger

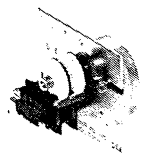

Planetary
Gearheads

Precision
Angle
Compensator

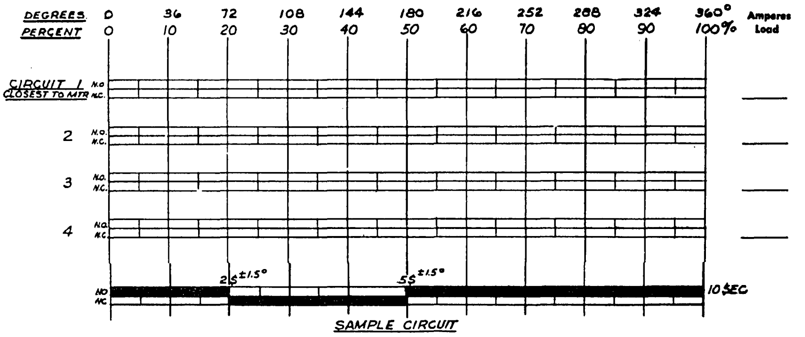
PRECISION PROGRAM TIMERS

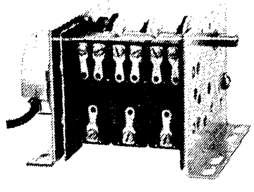
PRECISION TIMER CO., INC. WESTBROOK, CONN. 06498 (203) 399-6253

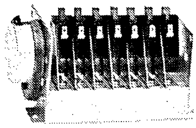
- Motor driven multicam recycle timers — single-pole flashers.
- Synchronously rotating camshaft programs switches sequentially when motor is energized.
- May be wired for single-revolution-and-stop operation.
- Available in over 100 stocked and standard speeds (time per camshaft revolution) — See Speed Selection Table A.
- Choice of 10, 15, 20, or 25 amperes switch ratings — See Switch Selection Table.
- Custom built from huge inventory of stocked components on fast delivery.
- Precision timed at factory to your Timing Diagram (also field adjustable).
- Absolute premium quality throughout at competitive low prices.
- UL and CSA approved.



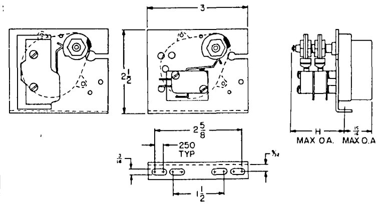
TIMING DIAGRAM


DEGREES 0 36 72 108 144 180 216 252 288 324 360°
PERCENT 0 10 20 30 40 50 60 70 80 90 100%
Amperes Load
CIRCUIT 1 CLOSEST TO MTR N.O. N.C.
2 N.O. N.C.
3 N.O. N.C.
4 N.O. N.C.
2.5 ±1.5°
5.5 ±1.5°
NO NC
10 SEC
SAMPLE CIRCUIT

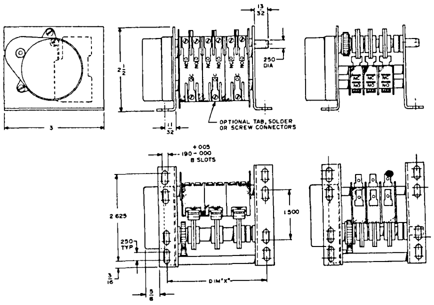




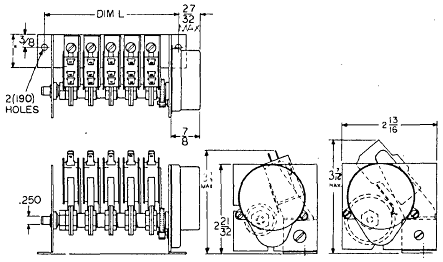
SERIES 115, 116, 120, 121


3
2 1/2
2 5/8
.250 TYP
1 1/2
H MAX O.A.
MAX O.A

SERIES 130, 131


13/32
.250 DIA
2 1/2
3
11/32
OPTIONAL TAB, SOLDER OR SCREW CONNECTORS
+.005 .190 -.000 8 SLOTS
2.625
1.500
.250 TYP
3/16
5/8
DIM "X"

SERIES 150, 151, 160, 161


DIM L
27/32 MAX
3/8
2(190) HOLES
7/8
2 13/16
.250
2 21/32

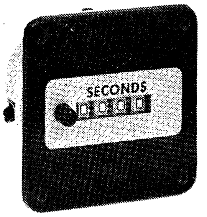
MODEL SELECTION CHART

Number of Poles	SUB-BASIC SWITCHES					BASIC SWITCHES				
		"V" 10 Amperes		"W" 15 Amperes			"M" 20 Amperes		"E" 25 Amperes	
	Length Dimen.	7/8" CAMS	1½" CAMS	7/8" CAMS	1½" CAMS	Length Dimen.	7/8" CAMS	1½" CAMS	7/8" CAMS	1½" CAMS
1	11/32	115-V	116-V	115-W	116-W	1 25/32	115-M	116-M	115-E	116-E
2	1 25/32	115-2V	116-2V	115-2W	116-2W	2 7/32	116-2M	116-2M	115-2E	116-2E
3	2 7/32	115-3V	116-3V	115-3W	116-3W	—	—	—	—	—
1	1¼	120-V	121-V	120-W	121-W	1¼	120-M	121-M	120-E	121-E
2	1⅝	120-2V	121-2V	120-2W	121-2W	—	—	—	—	—
3	—	—	—	—	—	3.00	130-3M	131-3M	130-3E	131-3E
4	3.08	130-4V	131-4V	130-4W	131-4W	3.69	130-4M	131-4M	130-4E	141-4E
5	3.52	130-5V	131-5V	130-5W	131-5W	4.38	—	—	—	—
6	3.95	130-6V	131-6V	130-6W	131-6W	5.06	—	—	—	—
2	2.218	150-2V	160-2V	150-2W	160-2W	2.500	151-2M	161-2M	151-2E	161-2E
3	2.812	150-3V	160-3V	150-3W	160-3W	3.375	151-3M	161-3M	151-3E	161-3E
4	3.406	150-4V	160-4V	150-4W	160-4W	4.250	151-4M	161-4M	151-4E	161-4E
5	4.000	150-5V	160-5V	150-5W	160-5W	5.125	151-5M	161-5M	151-5E	161-5E
6	4.593	150-6V	160-6V	150-6W	160-6W	6.000	151-6M	161-6M	151-6E	161-6E
7	5.187	157-7V	160-7V	150-7W	160-7W	6.875	151-7M	161-7M	151-7E	161-7E
8	5.781	150-8V	160-8V	150-8W	160-8W	7.750	151-8M	161-8M	151-8E	161-8E
9	6.375	150-9V	160-9V	150-9W	160-9W	8.625	151-9M	161-9M	151-9E	161-9E
10	6.968	150-10V	160-10V	150-10W	160-10W	9.500	151-10M	161-10M	151-10E	161-10E
11	7.562	150-11V	160-11V	150-11W	160-11W	10.375	151-11M	161-11M	151-11E	161-11E
12	8.156	150-12V	160-12V	150-12W	160-12W	11.250	151-12M	161-12M	151-12E	161-12E
13	8.750	150-13V	160-13V	150-13W	160-13W	12.125	151-13M	161-13M	151-13E	161-13E
14	9.343	150-14V	160-14V	150-14W	160-14W	13.000	151-14M	161-14M	151-14E	161-14E
15	9.937	150-15V	160-15V	150-15W	160-15W	13.875	151-15M	161-15M	151-15E	161-15E
16	10.531	150-16V	160-16V	150-16W	160-16W	—	—	—	—	—
17	11.125	150-17V	160-17V	150-17W	160-17W	—	—	—	—	—
18	11.718	150-18V	160-18V	150-18W	160-18W	—	—	—	—	—
19	12.312	150-19V	160-19V	150-19W	160-19W	—	—	—	—	—
20	12.906	150-20V	160-20V	150-20W	160-20W	—	—	—	—	—

- Series 120 and 121, at low cost, are available from Factory Stock only in speeds in **Bold Type** in Speed Selection Chart A.
- Series 130, 131, 150, 151, 160, 161 may be ordered at no extra cost with friction clutch, permitting manual override. **Specify.** Dials and Knobs available.
- Series 150, 151, 160, 161 may be ordered with clutch-motor drives and reset mechanisms for use as Multipole Delay Relays. Consult factory.

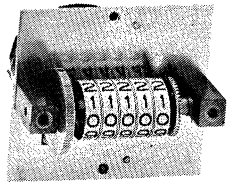
PRECISION HOURS METERS

PRECISION TIMER CO., INC. WESTBROOK, CONN. 06498 (203) 399-6253



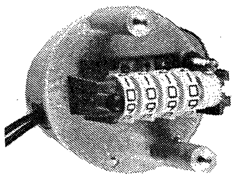
- A fully synchronous recording meter for front panel installation. Commences timing when motor is energized, stops when power is removed. NEMA standard dimensions.
- Extremely accurate. Draws only 3 watts.
- Reset models return to 0000 with touch of pushbutton.
- UL and CSA approved.
- Supplied with 8″ leads and with mounting hardware.
- Life expectancy many years.

Reset	Reads To	By	Non-Reset	Reads To	By
SR-240-1	999.9 sec.	1/10 sec.	SN-200-1	9999.9 sec.	1/10 sec.
SR-240-2	9999 sec.	1 sec.	SN-200-2	99999 sec.	1 sec.
SR-240-3	99.99 min.	1/100 min.	SN-200-3	999.99 min.	1/100 min.
SR-240-4	999.9 min.	1/10 min.	SN-200-4	9999.9 min.	1/10 min.
SR-240-5	9999 min.	1 min.	SN-200-5	99999 min.	1 min.
SR-240-6	99.99 hrs.	1/100 hrs.	SN-200-6	999.99 hrs.	1/100 hrs.
SR-240-7	999.9 hrs.	1/10 hrs.	SN-200-7	9999.9 hrs.	1/10 hrs.
SR-240-8	9999 hrs.	1 hr.	SN-200-8	99999 hrs.	1 hr.



- For behind-panel and chassis installations, at least possible cost.
- Reset models return to 00000 by rotation of thumbwheel.
- UL and CSA approved.

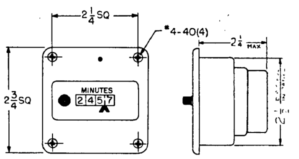
Reset	Reads To	By	Non-Reset	Reads To	By
R-210-1	9999.9 sec.	1/10 sec.	N-210-1	9999.9 sec.	1/10 sec.
R-210-2	99999 sec.	1 sec.	N-210-2	99999 sec.	1 sec.
R-210-3	999.99 min.	1/100 min.	N-210-3	999.99 min.	1/100 min.
R-210-4	9999.9 min.	1/10 min.	N-210-4	9999.9 min.	1/10 min.
R-210-5	99999 min.	1 min.	N-210-5	99999 min.	1 min.
R-210-6	999.99 hrs.	1/100 hrs.	N-210-6	999.99 hrs.	1/100 hrs.
R-210-7	9999.9 hrs.	1/10 hrs.	N-210-7	9999.9 hrs.	1/10 hrs.
R-210-8	99999 hrs.	1 hr.	N-210-8	99999 hrs.	1 hr.

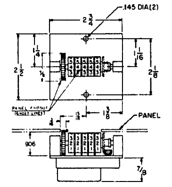


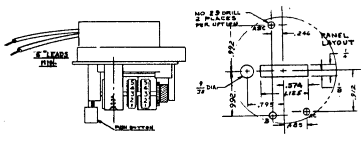
- For behind-panel and chassis installations, at least possible cost.
- Reset models return to 0000 with touch of pushbutton.
- UL and CSA approved.

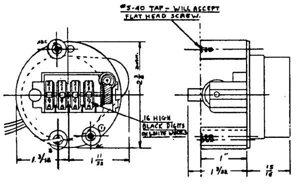
Specify:—
Option "A" — Standoffs at "A" and "A"
Option "B" — Standoffs at "B" and "B"
Option "C" — No Standoffs. Customer uses holes "C" and "C"

Reset	Reads To	By
R-240-1	999.9 sec.	1/10 sec.
R-240-2	9999 sec.	1 sec.
R-240-3	99.99 min.	1/100 min.
R-240-4	999.9 min.	1/10 min.
R-240-5	9999 min.	1 min.
R-240-6	99.99 hrs.	1/100 hrs.
R-240-7	999.9 hrs.	1/10 hrs.
R-240-8	9999 hrs.	1 hr.


2 1/4 SQ
#4-40(4)
2 1/4 MAX
2 3/4 SQ
MINUTES
2457


.145 DIA(2)
2 3/4
PANEL

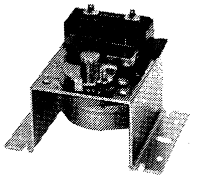

NO 29 DRILL 2 PLACES PER OPTION
PANEL LAYOUT
.246
.992
.574
PUSH BUTTON

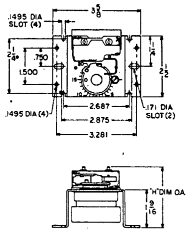

#5-40 TAP - WILL ACCEPT FLAT HEAD SCREW.
ABC
.16 HIGH BLACK DIGITS ON WHITE WHEELS

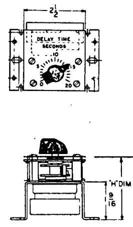
PRECISION DELAY RELAYS

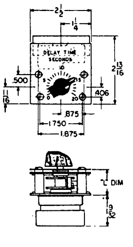
- Times down to zero (transferring load switch) when motor is energized. Resets to set position (fully adjustable) when power to motor is removed.
- Available time ranges 0-5, 0-10, 0-20, 0-30, 0-60, and 0-120 seconds.
- May be wired as Delay Relay or as Interval Timer.
- UL and CSA approved.

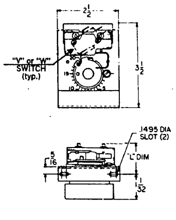
No. of Poles	SUB-BASIC SWITCHES "H" or "L" Dimen. Max.	10 Amp Type V	15 Amp Type W	BASIC SWITCHES "H" or "L" Max. Dimen.	Type M 20 Amp	Type E 25 Amp
1	2.38	400-V	400-W	2.54	400-M	400-E
2	2.87	400-2V	400-2W			
1	2.54	401-V	401-W	2.54	401-M	401-E
2	3.00	401-2V	401-2W			
1	1.05	404-V	404-W	1.05	404-M	404-E
2	1.40	404-2V	404-2W			
1	1.36	405-V	405-W	1.36	405-M	405-E
2	1.71	405-2V	405-2W			
1	1.36	406-V	406-W	1.36	406-M	406-E
2	1.71	406-2V	406-2W			

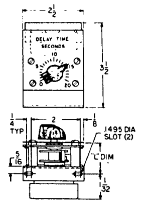


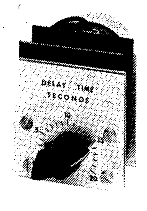

.1495 DIA SLOT (4)
3 5/8
2 1/4
.750
1.500
1 1/4
2 1/2
2.687
2.875
3.281
.1495 DIA (4)
.171 DIA SLOT (2)
"H" DIM OA
9/16

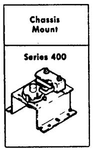

2 1/2
DELAY TIME SECONDS
"H" DIM OA
9/16

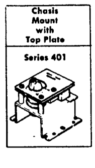

2 1/2
1 1/4
DELAY TIME SECONDS
2 13/16
.500
11/16
.406
.875
1.750
1.875
"L" DIM
1 9/32

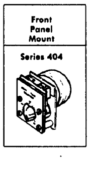

2 1/2
"V" or "W" SWITCH (typ.)
3 1/2
.1495 DIA SLOT (2)
"L" DIM
5/16
1 1/32

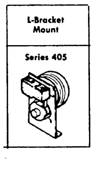

2 1/2
DELAY TIME SECONDS
3 1/2
1/4 TYP
2
1/8
.1495 DIA SLOT (2)
"L" DIM
5/16
1 1/32

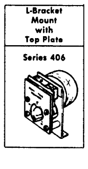

DELAY TIME SECONDS


Chassis Mount
Series 400


Chasis Mount with Top Plate
Series 401


Front Panel Mount
Series 404


L-Bracket Mount
Series 405


L-Bracket Mount with Top Plate
Series 406

PRECISION PANEL-MOUNT TIMERS

PRECISION TIMER CO., INC. WESTBROOK, CONN. 06498 (203) 399-6253

SERIES DPB — DELAY RELAY

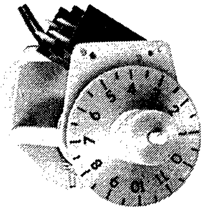
A fully adjustable synchronous motor driven Delay Relay for front panel installation. May be wired as Delay Relay or as Interval Timer. Available in one or two pole models at 10, or 15 ampere switch capacity, in over one hundred time ranges from one second to one month.

Operator selects delay (interval) time by manually setting dial to desired value, which remains fixed until operator readjusts dial to new value, which may be done while motor is energized or reenergized.

Push on button causes clutch to disengage mechanically, permitting timer to back off of load and timer motor switch(es) and permitting spring-powered reset to set position. Removal of finger from button permits clutch to reengage and commences timing cycle (see Table A).

Please advise with your Order, your desired program for second switch of two-pole units.

	SUB-BASIC SWITCHES			BASIC SWITCHES		
No. of Poles	"X" Dimen. Max.	10 Amp Type V	15 Amp Type W	"X" Dimen. Max.	20 Amp Type M	25 Amp Type E
1	1.40	DPB-V	DPB-2V	—	—	—
2	1.40	DPB-2V	DPM-2W	—	—	—



SERIES FLR — PROGRAM TIMER

A simple cam program timer for front panel installations, with rotating dial indication of angular position. Synchronously rotating cam shift programs switches sequentially when motor is energized.

Friction clutch permits manual positioning, whether operating or deenergized.

One through five or more poles. Choice of 10, 15, 20, or 25 ampere switches. See Table A for available cam shaft speeds (Time per Cycle).

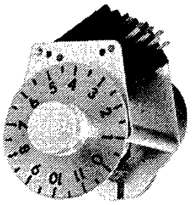
Cams are fully adjustable. Prices include settings to your Timing Diagram. May be wired for single-revolution-and-stop.

Use as programmer, flasher, interruptor, pulse accumulator, delay or interval timer, power operated sequencing or selecting switch, stepping switch, reversing timer.

Specify Series FLR (as shown) for repeat-cycle-construction.

Specify Series INM (similar) for manually settable Interval Timer construction with stop-pin at zero degrees of rotation (off position of Dial).

	SUB-BASIC SWITCHES			BASIC SWITCHES		
No. of Poles	"X" Dimen. Max.	10 Amp Type V	15 Amp Type W	"X" Dimen. Max.	20 Amp Type M	25 Amp Type E
1	.83	FLR-V	FLR-W	1.00	FLR-M	FLR-E
2	1.40	FLR-2V	FLR-2W	1.75	FLR-2M	FLR-2E
3	1.40	FLR-3V	FLR-3W	2.50	FLR-3M	FLR-3E
4	2.15	FLR-4V	FLR-4W	—	—	—
5	2.60	FLR-5V	FLR-5W	—	—	—



SERIES DRM — DELAY RELAY

A fully adjustable synchronous motor driven Delay Relay for front panel installation. May be wired as Delay Relay or as Interval Timer. Available in one, two, or three pole models at 10, 15, 20, or 25 amperes switch capacity. Available in Time Ranges 6, 12, 18, 25, 40, 75, 150, 300, and 500 seconds.

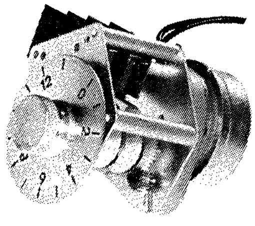
Operator selects delay (interval) time by manually setting dial to desired value, which remains fixed until operator readjusts dial to new value, which may be done while motor is energized or deenergized.

Operation is initiated upon energizing motor which causes timer to "time down" to zero transferring load switch. Timer backs off load switch and resets to set position when motor is deenergized, ready for next usage.

Please advise with your Order, desired relative time program among switches of multi-pole units.

At less cost, order Series DRF if adjustability is not needed. Identical to Series DRM, but delay time is fixed at factory to any value you specify between 0.5 and 500 seconds. No front dial.

	SUB-BASIC SWITCHES			BASIC SWITCHES		
No. of Poles	"X" Dimen. Max.	10 Amp Type V	15 Amp Type W	"X" Dimen. Max.	20 Amp Type M	25 Amp Type E
1	.83	DRM-V	DRM-W	1.00	DRM-M	DRM-E
2	1.40	DRM-2V	DRM-2W	1.75	DRM-2M	DRM-2E
3	1.71	DRM-3V	DRM-3W	—	—	—



SERIES IPB — INTERVAL TIMER

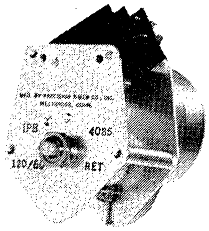
Yields a precise fixed timed interval upon operation of feather-touch pushbutton.

Transfers a snap-action load switch at start of fixed cycle when pushbutton is depressed. Return-transfers this switch at exact end of fixed time cycle. Time Ranges per Table A.

Select your choice among hundreds of available time cycles. Choice of one, two, or three poles. Choice of 10, 15, 20, or 25 ampere switch ratings. Prices of multiple units include timing to your Timing Diagram. Extra poles of multipole units may be within-cycle programmed.

Available on fast delivery from stocked and standard components and subassemblies.

	SUB-BASIC SWITCHES			BASIC SWITCHES		
No. of Poles	"X" Dimen. Max.	10 Amp Type V	15 Amp Type W	"X" Dimen. Max.	20 Amp Type M	25 Amp Type E
1	.83	IPB-V	IPB-W	1.00	IPB-M	IPB-E
2	1.40	IPB-2V	IPB-2W	1.75	IPB-2M	IPB-2E
3	1.71	IPB-3V	IPB-3W	—	—	—



SERIES PER — PERCENTAGE TIMER

Series PER Percentage Timer is a repeat-cycle timer with unique within-cycle adjustability.

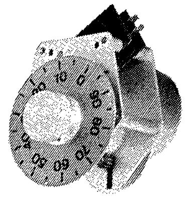
A latching mechanism holds a load switch transferred during an adjustable percentage of each consecutive fixed-time cycle. Each synchronous rotation of timer's camshaft is divided by dial adjustment into "ON" time and "OFF" time of load switch, expressed as percentage of repeat-cycle time.

Either side of the single-pole double-throw load switch may be used for controlling "ON" or "OFF" a percentage of repeat-cycle time. Or both sides may be used, for proportioning or metering applications.

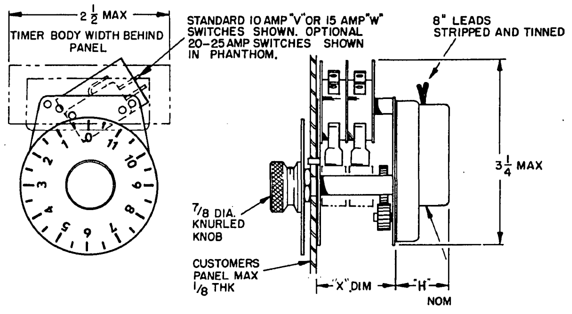
Series VPP Variable Pulse Programmer is identical to the above, but also incorporates an additional pole for straight programming functions, thus providing unusual system timing capabilities. Series VPP may be wired for single-revolution-and-stop operation.

Choice among hundreds of operating speeds (see Table A). Choice among 10, 15, 20, or 25 ampere load switches.

	SUB-BASIC SWITCHES			BASIC SWITCHES		
No. of Poles	"X" Dimen. Max.	10 Amp Type V	15 Amp Type W	"X" Dimen. Max.	20 Amp Type M	25 Amp Type E
1	1.75	PER-V	PER-W	1.75	PER-M	PER-E
2	1.75	VPP-2V	VPP-2W	—	—	—



ALL MODELS UL AND CSA APPROVED


2 1/2 MAX
TIMER BODY WIDTH BEHIND PANEL
STANDARD 10 AMP "V" OR 15 AMP "W" SWITCHES SHOWN. OPTIONAL 20-25 AMP SWITCHES SHOWN IN PHANTHOM.
8" LEADS STRIPPED AND TINNED
3 1/4 MAX
7/8 DIA. KNURLED KNOB
CUSTOMERS PANEL MAX 1/8 THK
"X" DIM
"H" NOM
0
1
2
3
4
5
6
7
8
9
10
11

Series DPB, FLR, INM, IPB, PER, VPP

- Employ Inductor Motor Type A.
- "H" dimension is 7/8" nominal (1 3/16" for speeds slower than 1 R.P.H.).

Series DRM, DRF

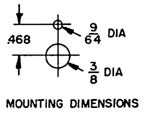
- Employ Hysteresis Clutch Motor Type C.
- "H" dimension is 1 1/4 nominal.
- Construction is left-handed.

Typical Ordering Information

FLR-4V1 — 60 sec. — 120/60 (with Timing Diagram).

Switch Ratings

See "Technical Information" (last page of this ad). UL and CSA approved.



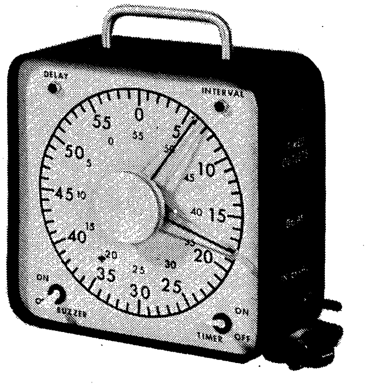
MOUNTING DIMENSIONS

PRECISION UTILITY TIMERS

PRECISION TIMER CO., INC. WESTBROOK, CONN. 06498 (203) 399-6253

MODEL 70 UTILITY TIMER

BIG 8″ DARKROOM DIAL
BIG 25 AMPERE SWITCH



$42.00

f.o.b. Westbrook, Conn.
DELIVERY FROM SHELF STOCK
For 105-125V 60 cycle operation

Operation: Fast and slow clock hands are manually positioned to desired time setting. When Timer is turned "ON," Precision Synchronous Motor drives hands down to "Zero" transferring heavy duty 25-ampere rated load Switch. Thoroughly grounded for your safety. UL and CSA listed. Rugged, durable, long-lived, easily cleaned, corrosion resistant. Zero maintenance. Warranteed. Finest construction and materials throughout. Made entirely in USA.

For 210-250V 60 cycle operation — **$48.00**
For 105-125V 50 cycle operation — **$48.00**
For 210-250V 50 cycle operation — **$48.00**

Size 8″ x 8″ x 5″
Weight 5 lbs.

HUGE 8″ DIAL — 25 AMPERE SWITCH CAPACITY
GENERAL PURPOSE PRECISION TIMER for
INDUSTRIAL, COMMERCIAL, LABORATORY, CLASSROOM

Photolabs
Classrooms
Lecture Halls
Displays
Biolabs
Clinics
Surgery
X-Ray
Machine Shops
Assy. Operations
Time Studies
Apparatus
Test Labs
Medical Labs
Machinery Control
Athletic Events

HAS BUZZER and RED-LUMINOUS DIAL

Model 70-H	Model 70-M
Slow Hand — Hours	Slow Hand — Minutes
Fast Hand — Minutes	Fast Hand — Seconds

USEFUL AS:

Delay Timer: Plug your appliance into "DELAY" outlet — timer will shut off appliance at end of timed period.

Interval Timer: Plug your appliance into "INTERVAL" outlet — timer will supply power to your appliance for duration of timed period.

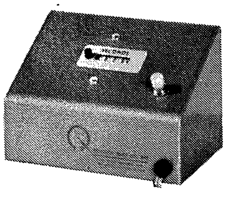
Dual Timer: Do both of the above with two appliances or electrical devices.

Tandem: Complex timing functions may be commanded by attaching a first Model 70 to a second Model 70 and to a third, etc.

Elapsed Time Recorder: Model 70 Timer can be used to record elapsed time of test, event, etc. (Use inner circle of numbers on dial.)

PROVIDES 3600 DISCRETE TIMING SETTINGS

MODEL UT-1
HOURS METER
"ELECTRIC STOPWATCH"



$20.00

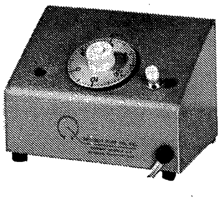
RECORDS OPERATING TIME IN SECONDS, HOURS, OR MINUTES
CONVENIENT PUSH-ON/PUSH-OFF CONTROL PUSHBUTTON — CONVENIENT RESET PUSHBUTTON

SPECIFY:

UT-1-1	Reads to 999.9 sec. by 1/10 sec.
UT-1-2	Reads to 9999 sec. by 1 sec.
UT-1-3	Reads to 99.99 min. by 1/100 min.
UT-1-4	Reads to 999.9 min. by 1/10 min.
UT-1-5	Reads to 9999 min. by 1 min.
UT-1-6	Reads to 99.99 hrs. by 1/100 hr.
UT-1-7	Reads to 999.9 hrs. by 1/10 hr.
UT-1-8	Reads to 9999 hrs. by 1 hr.

For 120V 60 cycle only.

MODEL UT-2
DELAY RELAY
"TIMED SWITCH"
10 ampere load rating



$23.00

DELAY RELAY: Will delay start of/or sustain an electrical function for pre-selected time period.

CONVENIENT RESET PUSHBUTTON

SPECIFY:

UT-2-10S	10 sec. Full Range
UT-2-30S	30 sec. Full Range
UT-2-60S	60 sec. Full Range
UT-2-120S	2 min. Full Range
UT-2-300S	5 min. Full Range
UT-2-10M	10 min. Full Range
UT-2-30M	30 min. Full Range
UT-2-60M	60 min. Full Range
UT-2-120M	2 hrs. Full Range
UT-2-300M	5 hrs. Full Range
UT-2-10H	10 hrs. Full Range
UT-2-10H	30 hrs. Full Range
UT-2-60H	5 days Full Range

For 120V 60 cycle only.

TECHNICAL STANDARDS

SPEED SELECTION TABLE A

For timers employing inductor motor Type A

Seconds: **1**, 1⅕, 1⅓, 1⅖, 1½, 1⅔, 1⅘, **2**, 2⅖, 2½, 2⅔, 2⅘, **3**, **3⅓**, 3¾, **4**, 4½, 4⅔, **5**, 5⅓, 5⅗, **6**, 6⅔, 7, 7½, 8, 8⅓, 8⅖, 9, 10, 11¼, **12**, 12½, 13⅓, **15**, 16, 16⅔, 16⅘, 18, **20**, 21, 22½, 24, 25, 26⅔, 28, 30, 33⅓, 36, 37½, 40, 45, 48, 50, **60**, 75, 80, 84, 90, 100, **120**, 135, 150, 160, 168, **180** — and others.

Minutes: **1**, 1¼, 1⅓, 1⅖, 1½, 1⅔, **2**, 2¼, 2½, 2⅔, 2⅘, **3**, 3⅓, 3¾, 4, 4⅕, 4½, **5**, **6**, 6⅔, 7, 7½, 8, 8⅓, 8⅖, 9, **10**, 11¼, 12, 12½, 13⅓, 14, 15, 16⅔, 18, **20**, 24, 25, 26⅔, 28, 30, 33⅓, 40, 45, **60**, 75, 80, 84, 90, 100, **120**, 150, 160, 168, 180 — and others.

Hours: **1**, 1¼, 1⅓, 1⅖, 1½, 1⅔, **2**, 2½, 2⅔, 2⅘, **3**, **3⅓**, 4, 5, 6, **8**, 9, 10, **12**, 13⅓, 16, 18, 20, **24** — and others.

Days: **1**, 1¼, **1⅓**, 1⅖, 1½, 1⅔, 2, 2½, 3, 4, **5**, 6⅔, 7, 7½, 10, 12½, 15, 20 — and others.

SWITCH SELECTION TABLE

V-1 — Sub-Basic Type, single pole, double throw — 10 amperes ⅓ horsepower at 125 or 250 VAC — ½ ampere at 125 VDC — ¼ ampere at 250 VDC — 4 amperes at 125 VACL. .187 male tab terminals.

V-2 — Same, .250 male tab terminals.

W-1 — Sub-Basic Type, single pole, double throw — 15 amperes ⅓ horsepower at 125 or 250 VAC — ½ ampere at 125 VDC — ¼ ampere at 250 VDC — 5 amperes at 125 VACL. .187 male tab terminals.

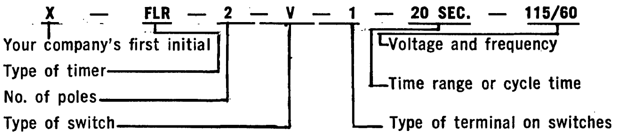
W-2 — Same, .250 male tab terminals.

MA — Basic Type, single pole, double throw — 25 amperes at 125, 250, or 480 VAC — ¼ horsepower at 125 VAC — ½ horsepower at 250 VAC — ½ ampere at 125 VDC — ¼ ampere at 250 VDC. #6 screw terminals.

MB — Same, solder terminals.

E — Basic Type, single pole, double throw — 25 amperes at 125, 250, or 480 VAC — 1 horsepower at 125 VAC — 2 horsepower at 250 VAC — lilot duty 750 VA at 125 or 250 VAC. Available only with #8 screw terminals.

ORDERING INFORMATION — NOMENCLATURE


X — FLR — 2 — V — 1 — 20 SEC. — 115/60
Your company's first initial
Type of timer
No. of poles
Type of switch
Voltage and frequency
Time range or cycle time
Type of terminal on switches

CAM SELECTIONS

Standard ⅞″ or 1½″ cams (as ordered — see Text) are molded nylon, 180° cut, fully adjustable 360°, mounted in pairs. Specially cut cams to your Order. Our prices **include** setting of cams to your Timing Diagram (please supply with Order where applicable).

MOTOR VOLTAGES AND FREQUENCIES

Motors are stocked in over 50 speeds for 120 volt 60 cycle operation. All other internationally standard voltages and frequencies are available on your Order.

DIALS AND KNOBS

Timers illustrated with dials and knobs, may be ordered bare for use with your own dial or knob arrangements. Shafts are all standard at ¼″ diam.

QUALITY

Absolute prime quality materials, components, construction, design, and workmanship throughout and fully warranteed. Maximum usage of corrosion resistant materials throughout. 100% Q. C.

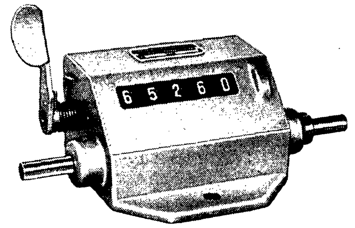
PROCUREMENT INFORMATION

Delivery on most items from stock or quickly available from pre-assembled sub-assemblies. Phone for prices and please ask about our very high quantity discounts. Grouped purchases and Blanket orders welcome. Daily pickups by mail, UPS, and radio-airfreight.

ASK US ABOUT SPECIAL DESIGNS
NO CHARGES FOR ENGINEERING SERVICES

PRESIN CO., INC.

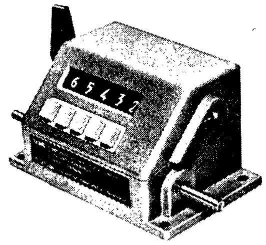
the most complete line of COUNTING DEVICES in the world!



MECHANICAL COUNTERS

Revolution, Stroke & Measuring

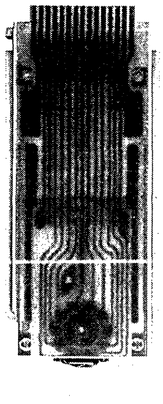
In many case and digit sizes, with non-reset, reset by knob or lever, for all types of mechanical operation. Illustrated: Model U 211, coil winding counter.

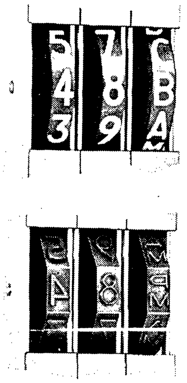


PREDETERMINING MECHANICAL COUNTERS

Revolution, Stroke & Measuring Preset by pushbutton

Two basic types: adding to the preset number or subtracting from the preset number to zero. Reset and recycle by lever or electrically. Single or double pushbutton preset —fast, foolproof, environment proof. To 10,000 rpm.

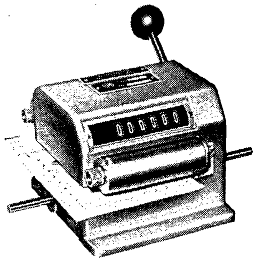




COUNT MODULES

Print / Indicate / Control
Data / Time / Date / Count

These Count Modules are single digit units suitable for display and printing. Two basic types: Switching or commutating. Fit into a wide variety of tape or card printers . . . or build your own.

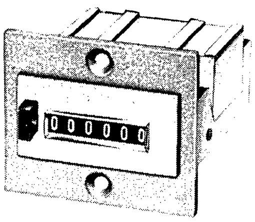


PRINTING COUNTERS

Mechanical or Electrical

To print tickets, cards, or on tape. Printing by lever or electrical, with or without reset. Up to 6 digits. Parallel visual and printing. Also special textile printers.

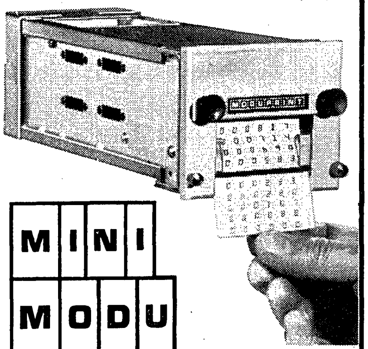
Illustrated: U 270 card printing revolution counter.



ELECTRICAL or PNEUMATIC IMPULSE COUNTERS

For AC or DC operation with all types of reset or non-reset, for panel or base mounting. From 3 to 8 digits. With pushbutton or electrical reset with front panel or stackable dovetail interlocking with other totalizing or preset counters.

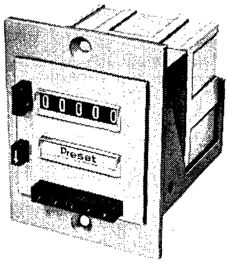
CMMP Series



MINI MODU PRINT

ADDS THE NECESSARY DIMENSION TO DIGITAL INSTRUMENTS

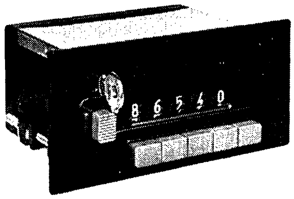
- 6 columns; 3 lines per second
- Full BCD T^2 L interface built-in, for IC instrument compatibility.
- Entire printer a plug-in
- Size: 3″ x 3½″ on panel



PREDETERMINING ELECTRICAL COUNTERS

Adding / Preset by pushbutton

To the 50 x 50 mm standard and interchangeable with others into same panel cutout. With fast, foolproof pushbutton presetting. Pushbutton, electrical or Key reset. Automatic batching also.



PREDETERMINING ELECTRICAL COUNTERS

Subtracting / Preset by pushbutton

Fast, foolproof, environment proof. Set to the desired number and count down to the zero switching point. Reset and recycle by pushbutton or electrically. Optional precontact and lock. 3 or 5 large digits.

SEND FOR COMPLETE LITERATURE

PRESIN CO., INC. Trap Falls Road, Shelton, Connecticut 06484 • (203) 929-1495 • Telex 96-4217

The Measurement and Control Company **schaevitz engineering**

See Sections 4100 and 5500 for additional information

MEASUREMENT AND CONTROL SYSTEMS using LVDT TRANSDUCERS

Displacement, Position, Pressure, Level, Flow, Force, Weight, Thrust, Torque, Acceleration, Velocity, Temperature — are parameters commonly encountered in the laboratory, on the production line and in the processing plant. Linear Variable Differential Transformer (LVDT) devices have the resolution and repeatability necessary for converting these parameters into accurate and reliable measurements. Precise measurement is the most important requirement for successful automation and control. Schaevitz Engineering utilizes the unique features of LVDT transducers in a wide variety of high performance measurement and control systems.

Measurement and control systems can vary from simple single channel to complex multi-channel equipment. Three criteria govern which category applies:

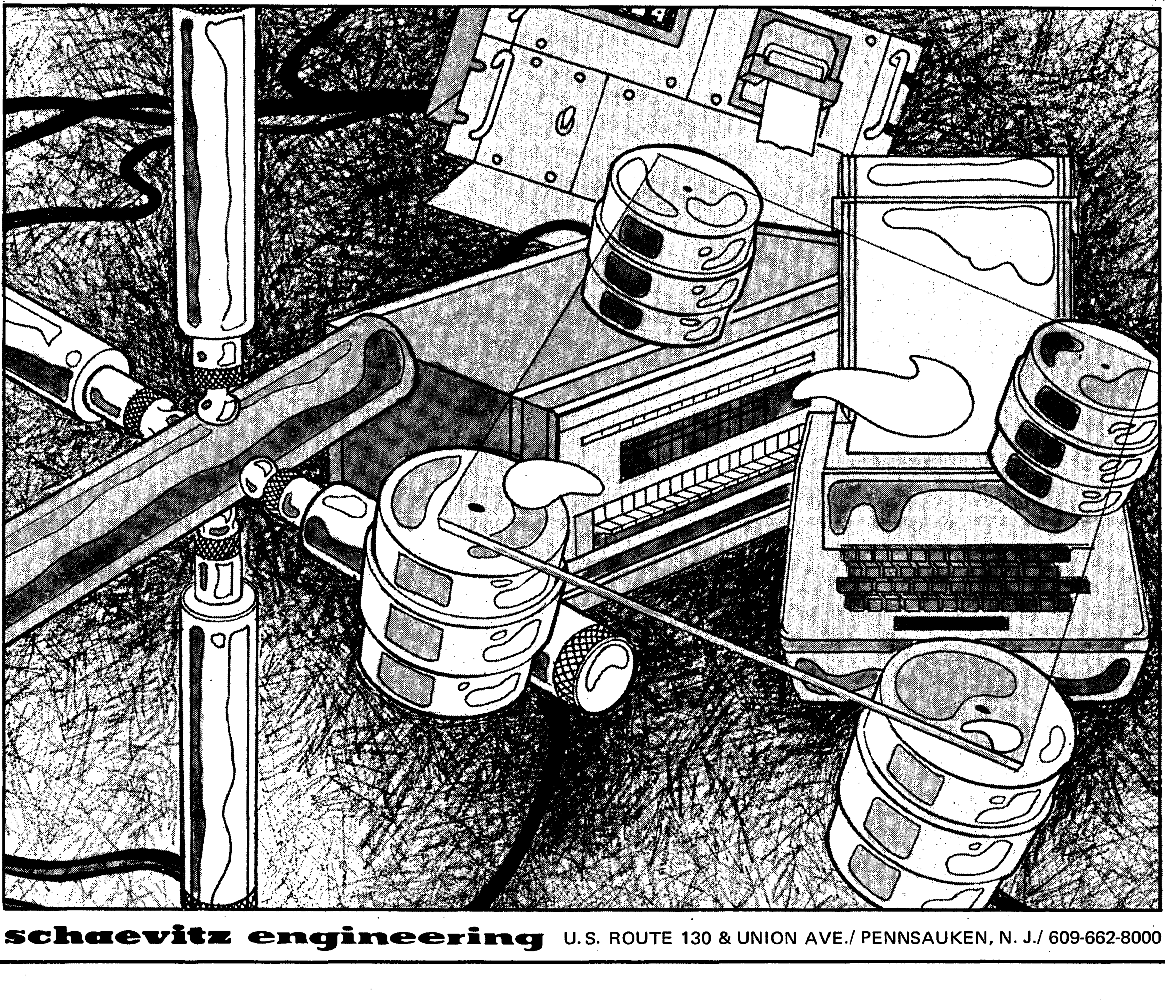
1 — number of parameters involved. 2 — data requirements. 3 — degree of control decision.

Simple systems involve few parameters, have little need for recorded data and require a simple decision for control. A simple system normally utilizes wired logic whenever multichannel transducer devices with absolute comparators, out-of-tolerance signaling and optional display or readout will provide adequate control. Schaevitz Engineering can supply a wide variety of off-the-shelf wired-logic measurement and control systems — in completed form or as a component package. Request Technical Bulletin 7501.

Complex systems involve many parameters, demand high speed data acquisition and require a complex decision-making process. Any one of these criteria will justify the use of a digital computer to take over the data acquisition and decision making processes.

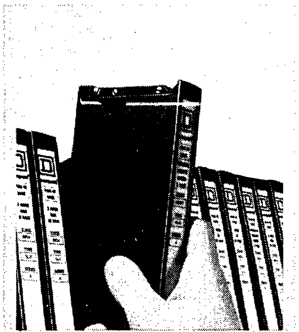
The introduction of the mini-computer has made measurement and control systems for smaller process requirements in weighing, mixing, gaging, sorting, and testing economically feasible. Schaevitz Engineering can furnish complete computerized measurement and control systems from the transducer through the servo-actuator and including computer hardware and software. Request Technical Bulletin 7501.

Years of experience in the field of measurement and control systems have made Schaevitz Engineering very conversant with the factors involved in the design of successful automation and control equipment for the testing laboratory, the batch process industry and the continuous process industry. Let us put this experience to work for you.

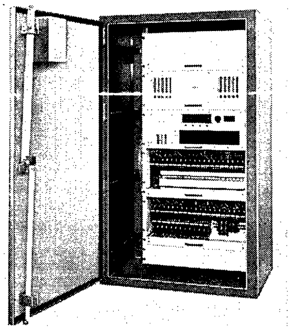


schaevitz engineering U.S. ROUTE 130 & UNION AVE./ PENNSAUKEN, N. J./ 609-662-8000

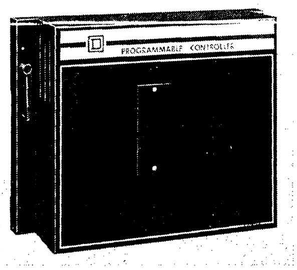
Complete control systems capability.



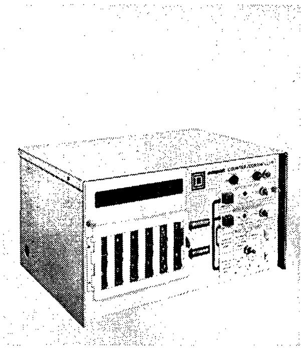
Plug-in NORPAK® is an advanced solid state logic system that provides many convenience and reliability benefits. Plug-in modules are easy to replace. All interconnections are in the back plane but wire changes are still easily accomplished. Plug-in components are protected by a phenolic case that is held in place by two captive screws. Plug-in NORPAK provides maximum design flexibility for fixed sequence control, data storage or counting functions. A complete line of logic functions and accessories are available.



The Program Sequence Controller is an inexpensive solid state controller, quickly and easily programmed to handle a wide variety of control problems. It accepts multiple inputs and produces multiple outputs in any sequence. It is modular in design and expandable to suit most applications. It has up to eight different time delays with individual adjustments. It requires no special programming language and can be programmed for alternate sequences. The Program Sequence Controller can be re-programmed and the modular components can be easily replaced. It can be linked to a computer for monitoring purposes.



The Programmable Controller is a solid state modular controller designed to run repetitive systems. It delivers the maximum flexibility at the minimum cost for complex systems. It allows control engineers to solve control situations ranging from the routine to the impossible. Simple to install, easy and inexpensive to maintain, the Controller has no moving parts subject to mechanical failure. Its hardwired memory prevents electrical interference from erasing the program. The Square D Programmable Controller provides multi-machine capabilities, re-programming capability, easy diagnosis of machine malfunctions and computer monitoring and control.



NORPAK® Solid State Counter/Controller is the economically priced answer to industrial bidirectional counting applications requiring high speed, precision and reliability. It comes completely assembled and ready to work. Plug-in decade modules allow tailoring to the job. Three to six decade versions with in-line readout as standard. Power supply has extra capacity to drive rotary pulse generator circuits or additional NORPAK logic. Solid state amplifiers, rated 1 ampere continuous at 120 volts ac, supply an adjustable timed output pulse of up to one-half second. Table-top, rack or cabinet mounting. Anti-bounce circuits for contact inputs. Both automatic and manual reset.

For specific engineering data on Plug-in NORPAK, the Program Sequence Controller, the Programmable Controller or NORPAK Counter/Controller, contact your Square D field office. Or write Square D Company, Dept. SA-711, Milwaukee, Wisconsin 53201.

SQUARE D COMPANY

Wherever Electricity is Distributed and Controlled

the broadest line of solid state timing devices

Syracuse Electronics transistorized series of timers (time delay relays) are of the fixed or adjustable type, designed for use in light or heavy industrial and commercial applications. Timers consist of solid state circuitry driving a self-contained relay, (except MTS — fully solid state).

Since the timer circuit eliminates cams, clutches and motors, there can be no mechanical wear, thus affording long dependable life and highly reliable operation. Many models are interchangeable with mechanical, pneumatic, thermal and other electronic timers.

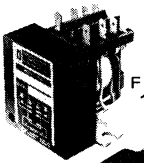


Fig. 1

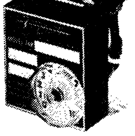


Fig. 2

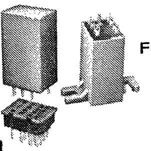


Fig. 3

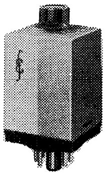


Fig. 4

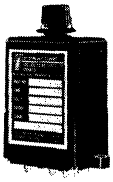


Fig. 5

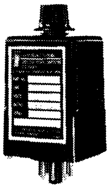


Fig. 6

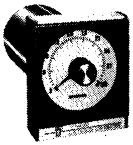


Fig. 7

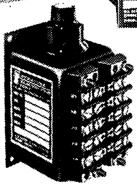


Fig. 8

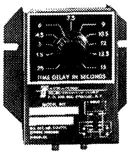


Fig. 9

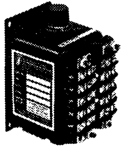


Fig. 10

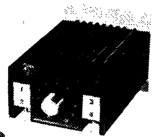


Fig. 11

MODEL	ENCLOSURE FIG. #	MODE OF OPERATION	MIN.-MAX. TIME DELAY RANGES (SECONDS)	REPEAT ACCURACY ± %	OUTPUT RATING (AMPS)	CONTACT FORM	TYPE TERMINATION	APPROX. SIZE L" x W" x H"	APPROX. UNIT PRICE
TIR U.L.	1	ON DELAY (FIXED)	.1 TO 180	±7%	10	DPDT (RELAY)	QUICK CON SOLDER	2 x 1 7/8 x 2	$9
TAR	2	ON DELAY	.1 TO 180	7	10	DPDT (RELAY)	QUICK CON SOLDER	2 x 1 7/8 x 2 3/16	$12
TLR U.L.	5-6	ON DELAY	.1 TO 480	5	10	DPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$19
TER U.L.	5-6	ON DELAY	.1 TO 480	2	10	DPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$24
THR U.L.	5-6	ON DELAY	.1 TO 480	1	10	DPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$29
PTR	7	ON DELAY	.25 TO 480	1	10	DPDT (RELAY)	SCREW PANEL MOUNT	5 9/16 x 3 3/4 x 4 3/8	$68
PLR	7	ON DELAY	.25 TO 480	5	10	DPDT (RELAY)	SCREW PANEL MOUNT	5 9/16 x 3 3/4 x 4 3/8	$48
PIR	7	ON DELAY INST.	.25 TO 480	2	10	2-DPDT (RELAY)	SCREW PANEL MOUNT	5 9/16 x 3 3/4 x 4 3/8	$52
TTR	10	ON DELAY	.1 TO 480	2	10	DPDT (RELAY)	TERMINAL BLOCK	3 1/2 x 2 x 2 1/2	$27
STR	9	ON DELAY	.1 TO 480	5	10	DPDT (RELAY)	QUICK CON SOLDER	3 3/4 x 3 3/8 x 2 5/8	$17
DDR	5-6	OFF DELAY	.1 TO 480	2	10	SPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$24
DLR	5-6	OFF DELAY	.1 TO 480	5	10	SPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$19
TSR	5-6	SINGLE SHOT	.1 TO 480	2	10	SPDT (RELAY)	QUICK CON OCTAL PLUG-IN	2 x 1 1/2 x 4	$29
TFR	8	ON-OFF RECYCLE	.25 TO 360	2	10	DPDT (RELAY)	TERMINAL BLOCK	3 1/2 x 2 x 2 1/2	$37
MTS	11	ON DELAY	.1 TO 360	3	1	SPST N.O. (SOLID STATE)	SCREW	2 3/8 x 2 3/8 x 3 1/4	$44
TIS	4	ON DELAY	.1 TO 180	5	1	SPST N.O. (SOLID STATE)	OCTAL PLUG-IN	1½ x 1½ x 3	$11
HIR	3	ON DELAY (FIXED)	.5 TO 30	5	5	DPDT (RELAY)	QUICK CON SOLDER PLUG-IN	1⅛ x ⅞ x 2⅛	$7
TES	4	ON DELAY	.1 TO 240	2	1	SPDT N.O. (RELAY)	OCTAL PLUG-IN	1½ x 1½ x 3½	$19

In addition to the timing products shown, Syracuse Electronics Corporation manufactures Temperature, Photo, Power, Liquid Level, and a host of other solid state controls for the Industrial, Commercial and Military consumers.

SYRACUSE ELECTRONICS CORPORATION

P. O. Box 566 Syracuse, New York 13201 Phone: 315 488-4911

motion controls

TRANSDUCERS

- **Series 70 Mag Shapers — ⅝″pickup**
  Combines pickup and shaping circuit for constant pulse width in one package for direct use with meter, and energize electromechanical devices.
- **Series 75 Mag Shapers — ⅜″ pickup**
  Same as Series 70 but packaged with a ⅜″ monopole.
- **Series 71 Mag Shaper — ⅝″ pickup**
  Used when constant pulse width is not required but high sensitivity and snap on/off output is needed.
- **Series 76 Mag Shaper — ⅜″ pickup**
  Same as above but housed with ⅜″ monopole.

28V Model standard, 5V and 12V Models available on request.

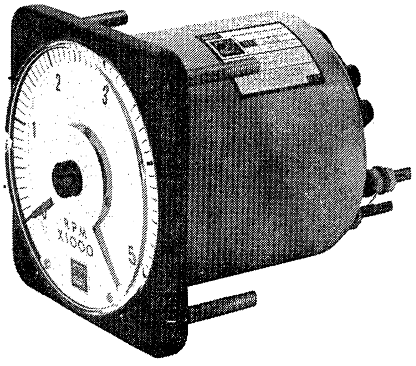
MODEL
SER
PAT. NO

- **Series 80 Speed Switch — ⅝″ pickup**
  Combines pickup and frequency sensing circuit in one unit. The monopole senses rotation of ferromagnetic material. When rotation reaches a pre-determined frequency a solid-state output is provided.

SPEED CONTROLS

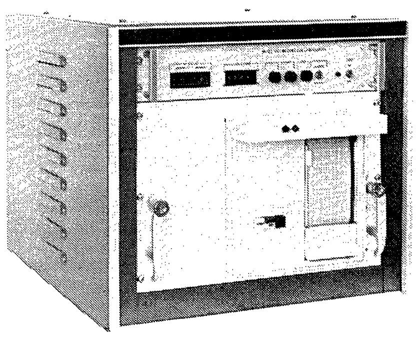
- **Under/Over Speed Detectors**
  For monitoring frequencies up to 20 KHz.
- **Multi-point Speed Detection Systems**
  For use in areas where correct sequencing is vital.
- **Open and Closed Loop DC Speed Control Systems**
- **DC Motor Controls**
  For braking of DC motors at rapid rates.

RPM METERS



- **Switchboard Tachometers**
  Utilizes a taut band movement providing 2% accuracy, featuring a span adjustment. 110 VAC and monopole input are the only electrical connections. Available in 0-5,000 RPM; 0-10,000 RPM.
- **Digital Tachometers**
  3, 4 or 5 digit resolution; enclosed in a 3″ x 8″ x 8″ case; read-outs have .5 inch character height.
- **Digital Scaler**
  For use as a tachometer when parameters are variable from use to use.

SYSTEMS AVAILABLE



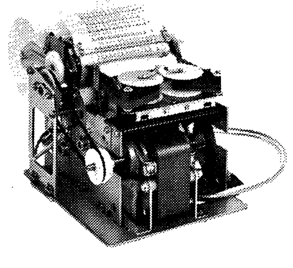
- **Data Loggers**
  Sequentially converts analog data to digital code, BCD or ASCII up to 100 channels available.
- **Velocimeter with Printer**
  Used for dividing dist/time for velocity measurement of single moving object.
- **Machine Gun Chronograph with High Speed Printer**
  Used for computing velocity of projectiles at a rate up to 12,000 rounds/min.
- **Multi-Channel A/D Converters**
  For use when high conversion rates are required.

SEE TEMPO FOR YOUR SPECIAL REQUIREMENTS

TEMPO INSTRUMENT DIVISION
Allen Electric and Equipment Company

9135 Independence Avenue
Chatsworth, Calif. 91311 Tel. 213-882-7722

TEC's miniaturized LINE PRINTER


Type LP-102

Built for every O.E.M. needing...

- **Compact (5-11/16″ W, 5-5/16″ H)**
- **18 columns, 20 charac./col.**
- **5 lines per second**
- **10 million operations**
- **Black-and-red printing**
- **Low cost**

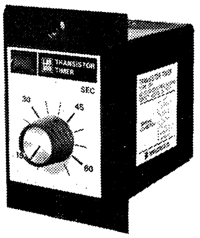
DIGITAL LINE PRINTER that can be readily tailored to his products.

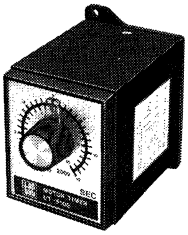
This is a drum-type, magnetic pickup printer using a 3-1/2″ wide paper roll. Developed for simplicity of construction, high-speed operation and reliability. Operates with 1-volt line output signals and household voltage to drum drive. Serves in a minus 10 to plus 80 deg. C ambient. One of TEC's many success items. For application to electronic desk top printing calculator, output equipment of measuring instruments, peripheral devices of communications station, and recording devices for business machines.

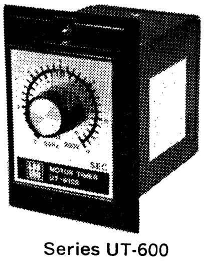
Major specifications and data

Printing speed: 5 lines per second (50 or 60 Hz)/**Printing time:** 140 milliseconds max./**Paper feeding speed:** 40 milliseconds min./**Per-line characters:** 18/**Per-column characters:** 20/**Printed column spacing:** 4 mm pitch/**Printed line spacing:** 4.23 mm pitch/**Printing paper:** 89 mm wide, 83 mm in diameter/**Ribbon:** Black-and-red, 13 mm wide, 10 m long/**Hammer magnets:** 9-ohm d-c resistance, 3-millisecond energization at d-c 40 volts/**Paper feed magnet:** 40-ohm d-c resistance, 40-millisecond energization at d-c 40 volts/**Black/red selector magnet:** 80-ohm d-c resistance, 180-millisecond energization at d-c 40 volts/**Drive motor:** Induction motor, a-c 100 volts/**Ribbon switching:** By selection pulse

TEC's miniaturized TIMERS


Series TR-400


Series UT-500


Series UT-600

6 time-ranges from 0.1~1 to 15~60 seconds (solid-state TR-4 timers)
12 time-ranges from 0.4~10 seconds to 0.8~24 hrs (motor timers UT-5 & -6)

● Compact (2-1/2″x3-3/4″ front, 4″ depth) ● High accuracy (±2% for TR-4, ±5% for UT-5 & -6) ● Long life (5 million for TR-4, 1 million for UT)

Timer	Range (seconds)	Operating voltage a-c	Operating voltage d-c	Contact
TR-401	0.1~1	110/220 V 50/60 Hz	24 48 110	SPDT
TR-403	0.3~3			
TR-406	1~6			
TR-415	3~15			
TR-430	5~30			
TR-460	15~60			

Timer		Time range	
UT-5	UT-6	50 Hz	60 Hz
UT-510S	UT-610S	0.4~12 sec.	0.4~10 sec.
UT-530S	UT-630S	1~36 sec.	1~30 sec.
UT-501M	UT-601M	2~72 sec.	2~60 sec.
UT-503M	UT-603M	0.1~3.6 min.	0.1~3 min.
UT-506M	UT-606M	0.2~7.2 min.	0.2~6 min.
UT-515M	UT-615M	0.5~18 min.	0.5~15 min.
UT-530M	UT-630M	1~36 min.	1~30 min.
UT-501H	UT-601H	2~72 min.	2~60 min.
UT-503H	UT-603H	0.1~3.6 hr.	0.1~ 3 hr.
UT-506H	UT-606H	0.2~7.2 hr.	0.2~ 6 hr.
UT-512H	UT-612H	0.4~14.4 hr.	0.4~12 hr.
UT-524H	UT-624H	0.8~28.8 hr.	0.8~24 hr.

For application to industrial machines, machine tools, processing machines, medical electronics equipment including X-ray devices and photographic apparatus, power equipment, protective devices and all else needing space-saving high-accuracy timing and delay actions.

TOKYO ELECTRIC CO.,LTD.
14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan

You are cordially invited
to explore with us
the exciting world of the...

THYRISTOR

THAT IS TRIAC, SCR, UJT, CUJT, SUS, SCS, DIAC, SBS, CSCR, LASCR and LASCS.

Triac ELECTRONIC SYSTEMS INC. manufactures a comprehensive line of THYRISTOR SYSTEMS, SUB SYSTEMS and ANCILLARY DEVICES derived from a broad range of thyristors, used alone or in combination with other solid state components (discrete and/or I.C.), and some hybrid electro-mechanical devices, to provide a variety of A.C. power control and D.C. specialized control from the milliwatt range to 600 amps at 1200 volts.

These products are reliable, versatile and low in cost, and directed towards OEM consumption in industry, agriculture, commerce and entertainment, where economy is essential.

The technology is available today to provide sophisticated functions not available yesterday because of cost or state of the art. We invite you to explore with us the exciting world of the thyristor (TRIAC, SCR, UJT, CUJT, SUS, SCS, DIAC, SBS, CSCR, LASCR and LASCS) as it may pertain to your applications and our product line as follows:

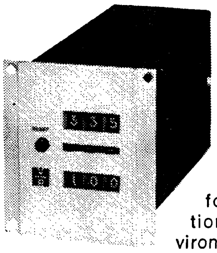
- Power Supplies, Constant VAC, Auto Transformers
- Solid State Relays, Sensitive Relays
- High Current Static Switches
- Zero Voltage Controls
- Phase Controls
- Soft Start and/or Stop (Up ramp, down ramp)
- Over Voltage Crowbars
- Transient Suppressors, Snubber Networks
- Threshold Detectors
- Over Current Breakers
- Motor Speed Controls
- Welding Controls and Timers
- Electronic Precision Timers
- Latching Switches, Memories, Logic Boards
- Shift Registers, Counters, Ring, Preset
- Converters, Inverters, Cyclo-Converters
- Pulse Modulators, Transformers, Triggers
- Lighting Controls
- Traffic Appliances
- Automotive
- Alarm Logic, Boiler Water Level Controls
- Electro Mechanical Hybrids
- Temperature, Pressure Controls
- Steam, Hydraulic, Pneumatic Flow Systems
- Sensors, Probes, Thermistors, Transducers
- Proximity Controls, Sensors

Whatever your requirements, we possess the capacity to innovate, design, develop and manufacture large or small orders, and are equipped to supply prototypes or samples quickly. We would welcome the opportunity to quote on your requirements or merely to discuss your applications and make your acquaintance.

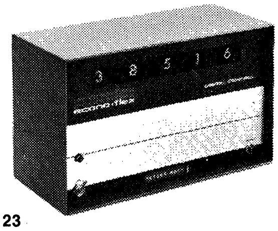
Triac ELECTRONIC SYSTEMS, INC.

PAN AM BLDG., Suite 303E, 200 PARK AVE., NEW YORK, N.Y. 10021 / (212) 687-0620

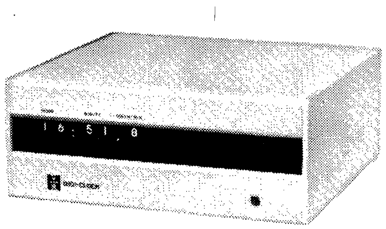
When it comes to counting, recording or controlling, come to Veeder-Root



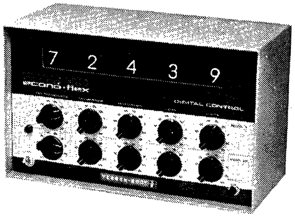
The 7102 Digi-Flex* Predetermining Counter: Electrically driven. Off-the-shelf. Both versatile and economical. Ideally suited for control applications in industrial environments.



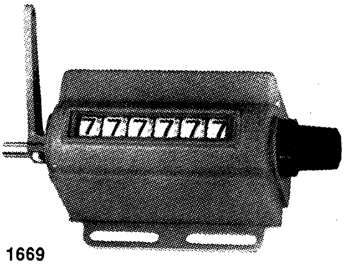
The 7123
Econo-Flex* Totalizing Counter:
Five decade, in-line illuminated display. High speed, high readability. Solid state. Integrated electronic circuitry. Long life tubes, polarized window filter. Counts even if lamp fails. For linear measuring, rapid production totalizing of steel, metals, textiles, containers, pills, etc.



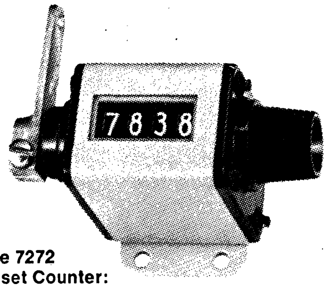
The 7108
Digi-Clock Time Display:
Offers a wide range of features for computer input. Self-contained desk unit or component of larger systems. Readout code: decimal or BCD.



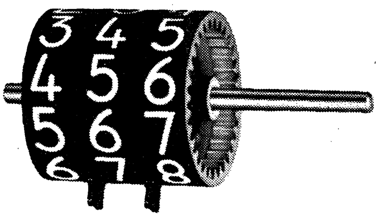
The 7122 Econo-Flex Predetermining Counter: High speed—up to 10,000 CPS—counting and controlling instrument. Has reliability of integrated circuitry. Low cost. Accepts input signals from photo heads, contact closures, switching devices. Ideal for all types of high speed cut-to-length weighing and blending applications.



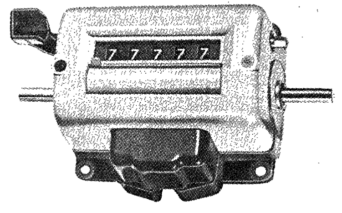
The 1669
Visicounter* Totalizer:
Ruggedly-built counter with distinct figures. Ideal for use on heavy equipment like power presses and industrial machines.



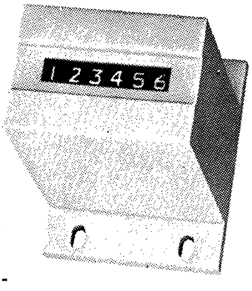
The 7272
Reset Counter:
For indoor and outdoor use where small size, accuracy, and legible figures are essential. Features acetal resin components and a corrosion-resistant case.



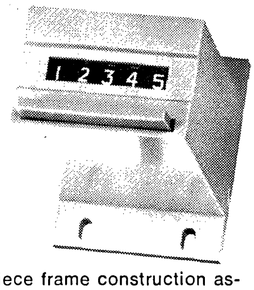
The 7170
Precision Instrument Odometer:
Light yet durable counter with modular wheel construction, providing flexible design opportunities. High speed 500 rpm. Meets applicable Mil Specs.



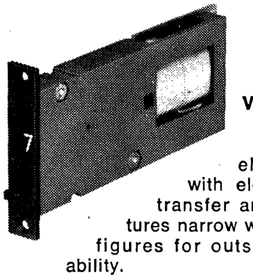
The 7283
Predetermining Counter:
Rapid reset counter with positive electrical knock-off. Features a positive interlock and base or panel mount. Recommended for industrial precision control.



The 7437
Electric
Counter:
A low cost electric counter featuring a one piece frame construction for greater reliability and simplicity of design. Ideal for office machines or coin-operated equipment. Available with 5 or 6 figures and a variety of mounting configurations. AC or DC.



The 7438
Reset
Electric
Counter:
Offers the convenience of push-bar reset with the economy of rotary reset. Simple, one piece frame construction assures reliability. Ideal for test equipment, control equipment and office machines. Available with 5 figures and a variety of mountings. AC or DC.



The 1969
Veeder Decade*
Totalizer:
Single wheel, electric counter with electric readout, transfer and reset. Features narrow width with large figures for outstanding readability.

*Trademark of Veeder-Root

Veeder-Root always comes through with the finest equipment you can buy.

In fact, our line of counters is so complete, it'll solve any application problems you may have.

For further information on our full line of mechanical, electrical and electronic totalizers and controls, write to: Veeder-Root, Hartford, Connecticut 06102.

VEEDER-ROOT

INNOVATORS IN NUMERICS: COUNTING/RECORDING/CONTROLLING

A VEEDER INDUSTRIES COMPANY

Veeder-Root World-Wide: Argentina: Buenos Aires•Australia: Melbourne•Brazil: São Paulo
England: New Addington, Surrey•Scotland: Dundee•West Germany: Neuhausen/Filder•Canada: Toronto

LOW COST COMPUTER CLOCK
Series 90

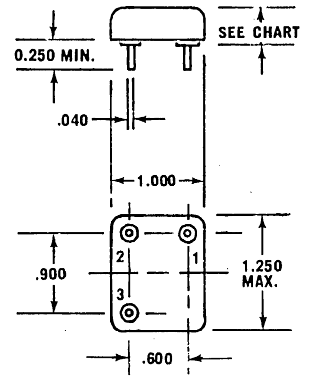
30Hz to 150MHz

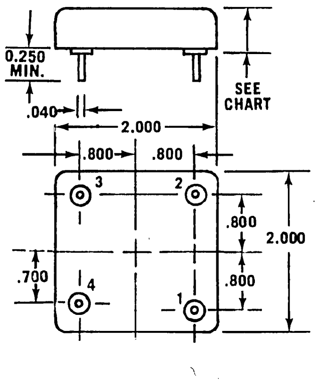
FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	CJ	JL	KM	
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C	
Frequency Stability	±0.005%	±0.001%	±0.0005%	

BASE DIMENSIONS

ORDERING GUIDE	
0	2





FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	2	2	4	
Frequency	30Hz to 6MHz	6MHz to 50MHz	50MHz to 150MHz	
Waveform	Square	Square	Compatible with Hi-Speed Logic	
Case Height	0.50″ Base Option 2	0.50″ Base Option 0	0.75″ Base Option 0	

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	29	69
Frequency Range	30Hz to 6MHz	6MHz to 50MHz	50MHz to 150MHz
Supply Voltage	+5VDC ±5%	+5VDC ±5%	+ or −5VDC ±5%
Waveform	Square	Square	Output compatible with Hi-Speed logic. Please specify when ordering.
Rise Time	<50NS	<15NS	
Fall Time	<25NS	<10NS	
Source Voltage	>2.5V & <5V peak	>2.5V & <5V peak	
Sink Voltage	0.0V ±0.3V @ 5MA	0.0V ±0.3V @ 5MA	
Load	TTL & DTL Logic		TTL & ECL Logic
Fan-Out	10	5	5

TERMINATION

ORDERING GUIDE	
P	
BASE "0" Pin #1 — Common #2 — Plus #3 — Output	BASE "2" Pin #1 — Plus #2 — Common #3 — Common #4 — Output

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE					
	30Hz to 500Hz	500Hz to 4KHz	4KHz to 1MHz	1MHz to 30MHz	30MHz to 80MHz	80 MHz to 150MHz
Current Drain	60MA typ	50MA typ	45MA typ	30MA typ	50MA typ	60MA typ
Symmetry	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±20%	50/50 ±20%

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is JL 0 2 69 P

When ordering, please specify Series No., Model No. and frequency.

				P
Frequency Stability CJ, JL or KM	Base Dimensions 0 or 2	FrequencyWaveformHeight 2, 2 or 4	Output Specifications 28, 29 or 69	Terminations P

accutronics

Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600

accutronics

SYSTEM CLOCK
Series 100

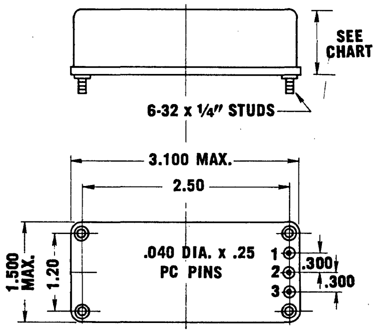
1Hz to 1MHz

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	CD	JJ	KK	
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C	
Frequency Stability	±0.025%	±0.005%	±0.002%	

BASE DIMENSIONS

ORDERING GUIDE
8



FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	5	2	7	5
Frequency	1 Hz to 15KHz	15KHz to 1MHz	60Hz to 15KHz	15 KHz to 1MHz
Waveform	Square	Square	Sine	Sine
Case Height	1.00"	0.50"	1.50"	1.00"

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	27	12
Frequency Range	1Hz to 1MHz	1Hz to 1MHz	60Hz to 1MHz
*Supply Voltage	+5VDC ±5%	+12VDC ±5%	+12VDC ±5%
Waveform	Square	Square	Sine
Rise Time	<50 NS 10pfd load	<100 NS 10pfd load	———
Fall Time	<25 NS 10pfd load	<50 NS 10pfd load	———
Distortion	———	———	<5%
Source Voltage	5V peak ±5% from 680Ω	12V peak ±5% from 1KΩ	———
Sink Voltage	0.0V ±0.3V @ 10MA	0.0V ±0.3V @ 10MA	———
Output Voltage	———	10V P/P nominal	1V rms ±30%
Load Resistance	IC Logic	10KΩ resistive	10KΩ resistive
Source Impedance	680Ω	1KΩ	8KΩ Max.
Output Stage	NPN Common Emitter	NPN Common Emitter	———

TERMINATION

ORDERING GUIDE
P
PRINTED CIRCUIT PINS Pin #1 — Plus Supply #2 — Output #3 — Common

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE				
	1Hz to 4Hz	4Hz to 60Hz	60 Hz to 960 Hz	960Hz to 15 KHz	15KHz to 1MHz
Current Drain	<175MA	<140MA	<65MA	<75MA	<50MA
Symmetry	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±20%

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is KK 8 7 28 P

When ordering, please specify Series No., Model No. and frequency.

	8			P
Frequency Stability **CD, JJ or KK**	**Base Dimensions** **8**	**Frequency Waveform Height** **5, 2, 7 or 5**	**Output Specifications** **28, 27 or 12**	**Terminations** **P**

accutronics

Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600

accutronics

MINIATURE OSCILLATOR Series 110

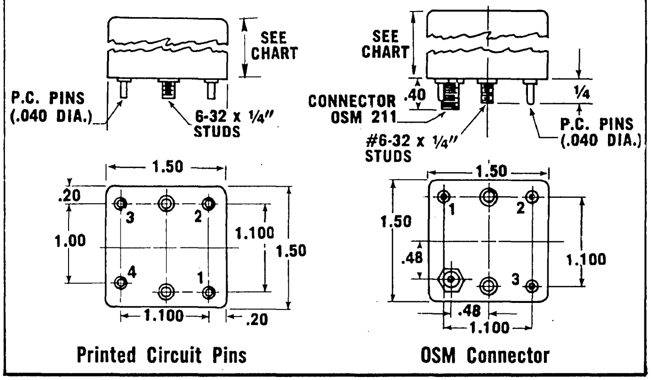
1MHz to 250MHz

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	CJ	JL	KM	
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C	
Frequency Stability	±0.005%	±0.001%	±0.0005%	

BASE DIMENSIONS

ORDERING GUIDE
1



Printed Circuit Pins

OSM Connector

FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	2	4	5	7
Frequency	1MHz to 60MHz	60MHz to 150MHz	1MHz to 100MHz	10MHz to 250MHz
Waveform	Square	Compatible with Hi-Speed Logic	Sine	Sine
Case Height	0.50" PC pins	0.75" PC pins	1.00" PC pins	1.50" - OSM connector

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	69	11
Frequency Range	1MHz to 60MHz	60MHz to 150MHz	10MHz to 250MHz
*Supply Voltage	+5VDC ±5%	+ or −5VDC ±5%	+12VDC ±5%
Waveform	Square	Output compatible with Hi-Speed logic. Please specify when ordering.	Sine
Rise Time	<25 NS		———
Fall Time	<15 NS		———
Distortion	———		<10%
Source Voltage	5V peak ±5% from 680Ω 5V peak ±5% from 330Ω >10MHz		——— ———
Sink Voltage	0.0V ±0.3V @ 5MA		———
Output Voltage	———		+10 dbm ±3 db
Load Resistance	IC Logic	TTL & ECL Logic	50Ω resistive
Output Stage	NPN Common Emitter	———	———

TERMINATION

ORDERING GUIDE	
P	L
PRINTED CIRCUIT PINS Pin #1 Plus Supply #2 Common #3 Common #4 Output	OSM CONNECTOR Pin #1 Plus Supply #2 Common #3 Common OSM Output

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE			
	1MHz to 10MHz	10MHz to 20MHz	20MHz to 60MHz	60MHz to 250MHz
Current Drain	< 50MA	< 20MA	< 30MA	< 60MA
Symmetry	50/50 ±1%	50/50 ±20%	50/50 ±20%	———

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is CJ 1 2 28 P

When ordering, please specify Series No., Model No. and frequency.

Frequency Stability
CJ, JL or KM

1
Base Dimensions
1

Frequency Waveform Height
2, 4, 5 or 7

Output Specifications
28, 69 or 11

Terminations
P or L

accutronics

Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600

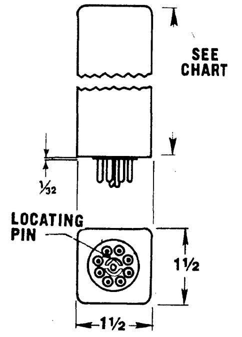
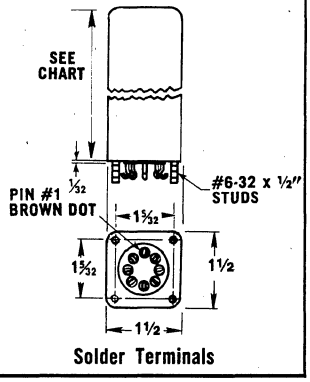
CHASSIS MOUNTED OSCILLATOR
Series 140

1Hz to 1MHz

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	CD	JJ	KK	
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C	
Frequency Stability	±0.025%	±0.005%	±0.002%	

BASE DIMENSIONS

ORDERING GUIDE
1
 Octal Plug  SEE CHART PIN #1 BROWN DOT 1/32 #6-32 x ½" STUDS 1 5/32 1 5/32 1½ 1½ Solder Terminals

FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE		
	9		
Frequency	1Hz to 1MHz		
Waveform	Square or Sine		
Case Height	3.00"		

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	27	12
Frequency Range	1Hz to 1MHz	1Hz to 1MHz	60Hz to 1 MHz
*Supply Voltage	+5VDC ±5%	+12VDC ±5%	+12VDC ±5%
Waveform	Square	Square	Sine
Rise Time	<50 NS 10pfd load	<100 NS 10pfd load	———
Fall Time	<25 NS 10pfd load	<50 NS 10pfd load	———
Distortion	———	———	<5%
Source Voltage	5V peak ±5% from 680Ω	12V peak ±5% from 1KΩ	———
Sink Voltage	0.0V ±0.3V @ 10MA	0.0V ±0.3V @ 10MA	———
Output Voltage	———	10V P/P nominal	1V rms ±30%
Load Resistance	IC Logic	10KΩ resistive	10KΩ resistive
Source Impedance	680Ω	1KΩ	10KΩ Max.
Output Stage	NPN Common Emitter	NPN Common Emitter	———

TERMINATION

ORDERING GUIDE	
Z	Q
OCTAL PLUG Pin #1—Common #2—Plus Supply #8—Output	**SOLDER TERMINALS** Pin #1—Common #2—Plus Supply #8—Output

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE				
	1Hz to 4Hz	4Hz to 60Hz	60Hz to 960 Hz	960Hz to 15KHz	15KHz to 1MHz
Current Drain	<175MA	<140MA	<65MA	<75MA	<50MA
Symmetry	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±1%	50/50 ±20%

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is CD 1 9 28 Z

When ordering, please specify Series No., Model No. and frequency.

Frequency Stability CD, JJ or KK

1 Base Dimensions 1

9 FrequencyWaveformHeight 9

Output Specifications 28, 27 or 12

Terminations Z or Q

accutronics

Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600

accutronics

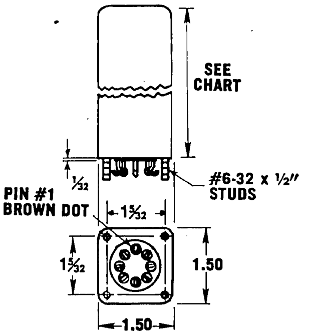
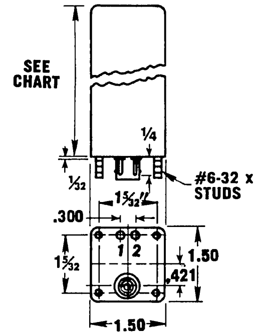
CHASSIS MOUNTED OSCILLATOR
Series 150

1MHz to 250MHz

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE				
	CJ	JL	KL		
Temperature Range	−55°C to +75°C	0°C to +60°C	+15°C to +35°C		
Frequency Stability	±0.005%	±0.0015%	±0.001%		

BASE DIMENSIONS

ORDERING GUIDE	
1	
 SEE CHART 1/32 PIN #1 BROWN DOT #6-32 x 1/2″ STUDS 1 5/32 1 5/32 1.50 1.50 Solder Terminals	 SEE CHART 1/4 1/32 #6-32 x 1/2″ STUDS 1 5/32″ .300 1 2 1 5/32 1.50 .421 1.50 BNC Connector

FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	9	0		
Frequency	1MHz to 250MHz	1MHz to 250MHz		
Waveform	Square to 60 MHz or Sine	Sine		
Case Height	3.00″ Solder Pins	3.50″ BNC Connector		

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	28	12	11
Frequency Range	1MHz to 60MHz	1MHz to 10MHz	10MHz to 250MHz
*Supply Voltage	+5VDC ±5%	+12VDC ±5%	+12VDC ±5%
Waveform	Square	Sine	Sine
Rise Time	<30 NS	———	———
Fall Time	<20 NS	———	———
Distortion	———	<5%	<10%
Source Voltage	5V peak ±5% from 680Ω	———	———
Sink Voltage	0.0V ±0.3V @ 5MA	———	———
Output Voltage	———	1V rms ±30%	+10 dbm ±3 db
Load Resistance	IC Logic	1KΩ resistive	50Ω resistive
Output Stage	NPN Common Emitter	———	———
Spurious Response	———	———	−60db

TERMINATION

ORDERING GUIDE	
Q	M
SOLDER TERMINALS Pin #1—Common #2—Plus Supply #8—Output	**BNC CONNECTOR** Pin #1—Common #2—Plus Supply BNC—Output

GENERAL SPECIFICATIONS

PARAMETER	FREQUENCY RANGE				
	1MHz to 10MHz	10MHz to 20MHz	20MHz to 60MHz	1MHz to 10MHz	10MHz to 250MHz
Current Drain	<10MA	<10MA	<20MA	<25MA	<35MA
Symmetry	50/50 ±20%	50/50 ±20%	50/50 ±20%	———	———

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is CJ 1 9 28 Q

When ordering, please specify Series No., Model No. and frequency.

	1			
Frequency Stability CJ, JL or KL	Base Dimensions 1	FrequencyWaveformHeight 9 or 0	Output Specifications 28, 12 or 11	Terminations Q or M

accutronics

Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600

accutronics

LOW CURRENT DRAIN
Series 162

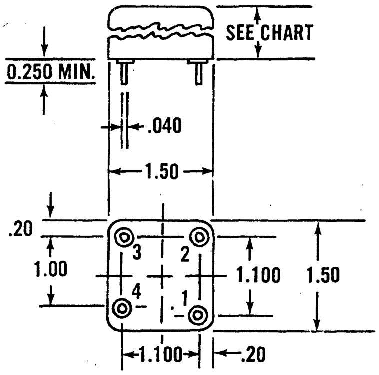
1Hz to 1MHz

FREQUENCY STABILITY

PARAMETER	ORDERING GUIDE			
	TE	PJ	QL	
Temperature Range	−55°C to +85°C	0°C to +50°C	+15°C to +45°C	
Frequency Stability	±0.02%	±0.005%	±0.001%	

BASE DIMENSIONS

ORDERING GUIDE
1



FREQUENCY, WAVEFORM & HEIGHT

PARAMETER	ORDERING GUIDE			
	3	5	6	
Frequency	1 Hz to 1 MHz	1 Hz to 1 MHz	300Hz to 1MHz	
Waveform	Square Output Option 26	Square Output Option 28	Sine Output Option 12	
Case Height	0.625″	1.000″	1.370″	

OUTPUT SPECIFICATIONS

PARAMETER	ORDERING GUIDE		
	26	28	12
Frequency Range	1Hz to 1MHz	1Hz to 1MHz	300Hz to 1MHz
*Supply Voltage	−20VDC ±5%	+5VDC ±5%	+12VDC ±5%
Waveform	Square	Square	Sine
Rise Time	<250NS 25 pfd load	<50NS 10 pfd load	———
Fall Time	<200NS 25 pfd load	<25NS 10 pfd load	———
Distortion	———	———	<5%
Source Voltage	−15V min @ 10 MOS loads	5V peak ±5% from 680Ω	———
Sink Voltage	−0.1V max @ 10 MOS loads	0.0V ±0.3V @ 10MA	———
Output Voltage	———	———	1V RMS ±30%
Load Resistance	MOS Logic	TTL Logic	10KΩ resistive
Symmetry	50/50 ±1%	50/50 ±1%	———
Current Drain	<1MA @ 1Hz	<15MA @ 1Hz	<15MA @ 300Hz

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

TERMINATION

ORDERING GUIDE
P
PRINTED CIRCUIT PINS Pin #1 — Plus Supply #2 — Common #3 — Common #4 — Output

GENERAL APPLICATION DATA

- Very Low Current Drain
- Compatible with MOS or TTL Logic
- PC Board Mounting or Chassis
- Excellent Stabilities
- Replaces Tuning Forks Oscillators
- Sine Wave Output
- Crystal Controlled
- Small Size

FILL IN BLANKS BELOW TO CONSTRUCT YOUR PART NO. Typical No. is TE 1 5 26 P

When ordering, please specify Series No., Model No. and frequency.

	1			P
Frequency Stability TE, PJ or QL	Base Dimensions 1	FrequencyWaveformHeight 3, 5 or 6	Output Specifications 26, 28 or 12	Terminations P

accutronics

Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600

accutronics

HIGH STABILITY OSCILLATOR

Series 165

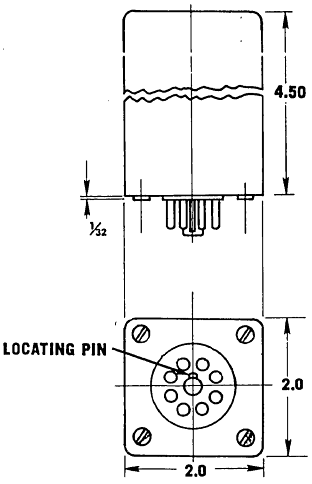
1MHz to 150MHz

FEATURES

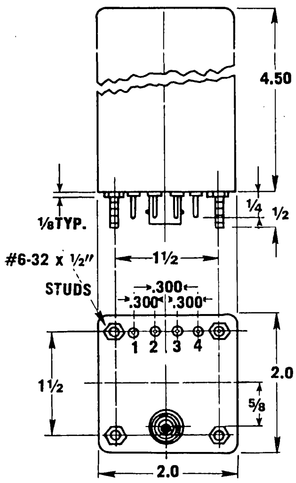
- **All Units Operate On Frequency Without Multiplication**
- **Low Spurious Content**
- **Excellent Short Term Stability**
- **Low Harmonic Content**
- **Logic Compatibility**

APPLICATIONS

- **Frequency Source For Multiplier Chain**
- **Telemetry Main Carrier Source**
- **Integrated Circuit Clock**
- **Digital Scanning Clock**
- **Computer Time Base**
- **Reference Oscillator**



Pin #1 — Common OSC
#2 — Plus Supply OSC
#5 — Oven Plus
#6 — Oven Common
#8 — Output



Pin #1 — Plus Supply OSC
#2 — Common OSC
#3 — Common Oven
#4 — Plus Supply Oven
BNC — Output

SPECIFICATIONS

PARAMETER		MODEL JU2013	MODEL JT2013	MODEL JN2011	MODEL JT2011
Frequency Range		1MHz to 20MHz	20MHz to 60MHz	60MHz to 100MHz	100MHz to 150MHz
Frequency Adjust		±5 PPM Min.			
Temperature Range		0°C to +60°C			
***Supply Voltage (OSC)**		+12VDC ±2%			
***Supply Voltage (Oven)**		+24VDC ±5% or 28VDC ±5% (Specify)			
Waveform		Sine			
Load		50 Ohms Resistive			
Oven Power		15 Watts at turn-on: 6 Watts at 25°C Following 1 Hr. Warmup			
Power Output		0DBM ±1.5DBM	0DBM ±1.5DBM	0DBM ±1.5DBM	0DBM ±1.5DBM
Harmonic Content		−30DB	−30DB	−20DB	−20DB
Spurious Response		−70DB	−60DB	−60DB	−60DB
Current (OSC)		35 Ma	50 Ma	50 Ma	50 Ma
Short Term Stability		$<5x10^{-10}$ Per Sec.	$<1x10^{-9}$ Per Sec.	$<1x10^{-9}$ Per Sec.	$<1x10^{-9}$ Per Sec.
Tolerance		$\pm5x10^{-8}$	$\pm1x10^{-7}$	$\pm5x10^{-7}$	$\pm5x10^{-7}$
Unit Shipped at		$\pm5x10^{-8}$ Per 24 Hrs.	$\pm5x10^{-7}$ Per 24 Hrs.	$\pm1x10^{-7}$ Per 24 Hrs.	$\pm1x10^{-7}$ Per 24 Hrs.
Drift after 200 Hrs. (Typical)		$\pm2x10^{-8}$ Per 24 Hrs.	$\pm5x10^{-8}$ Per 24 Hrs.	$\pm1x10^{-7}$ Per 24 Hrs.	$\pm1x10^{-7}$ Per 24 Hrs.
Stabilization to $\pm5x10^{-7}$ of nom. freq.		35 Min.	45 Min.	45 Min.	45 Min.
Size		2" x 2" x 4½"			
Header	**add Y**	Octal Plug	Octal Plug	N/A	N/A
	add M	BNC & Solder Pins			

PARAMETER		MODEL JU2028	MODEL JT2028
Frequency Range		1MHz to 20MHz	20MHz to 60MHz
Frequency Adjust		±5 PPM Min.	
Temperature Range		0°C to +60°C	
Supply Voltage (OSC)		+12VDC ±2%	
Supply Voltage (Oven)		+24VDC ±5% or 28VDC ±5% (Specify)	
Waveform		Square	
Output Voltage ("1")		Minimum of 3.5V peak from 100Ω Source	
Output Voltage ("0")		0.0V ±0.4V at 5 Ma Sink Current	
Oven Power		15 Watts at turn-on: 6 Watts at 25°C Following 1 Hr. Warmup	
Short Term Stability		$<\pm5x10^{-10}$/Sec.	$<\pm1x10^{-9}$/Sec.
Tolerance		$\pm5x10^{-8}$	$\pm1x10^{-7}$
Unit Shipped at		$\pm5x10^{-8}$/24 Hrs.	$\pm5x10^{-7}$/24 Hrs.
Drift after 200 Hrs. (Typical)		$\pm2x10^{-8}$/24 Hrs.	$\pm5x10^{-8}$/24 Hrs.
Stabilization to $\pm5x10^{-7}$ of nom. freq.		35 Min.	45 Min.
Rise Time		<20 NS	<10 NS
Fall Time		<20 NS	<10 NS
Size		2" x 2" x 4½"	
Header	**add Y**	Octal Plug	
	add M	BNC & Solder Pins	

Note: Unit must be loaded with 200 ohm load to preserve waveform fidelity

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

ORDERING INFORMATION:

To Order, Specify Model No. (Example JU2028) Header (Y or M) and Frequency.

accutronics

Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600

LC VOLTAGE CONTROLLED OSCILLATOR Series 170

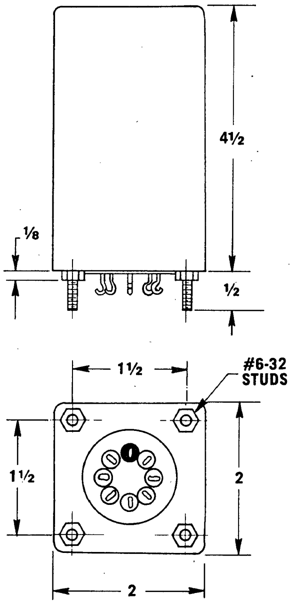
1MHz to 100MHz

FEATURES

- Wide Deviation
- Low Jitter
- Logic Compatibility
- Excellent Stability
- Ovenized & Non-ovenized
- Low Power
- Small Size

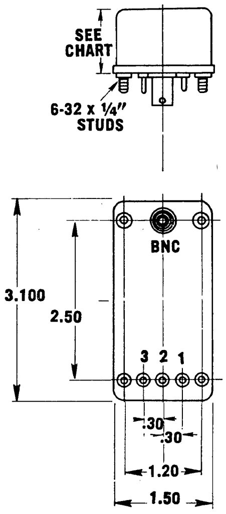
APPLICATIONS

- Phase Locking System
- Telemetry
- Pulse Frequency Modulation
- Analog to Frequency Converters
- Transducer to Frequency Conversion
- Digital Phase Locking



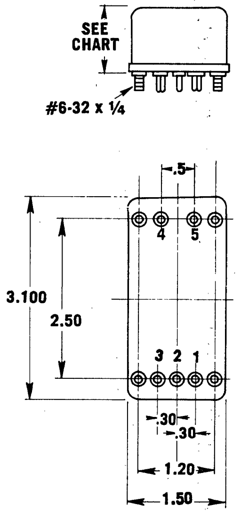
Models JB2028Q & JB2029Q

Pin #1 — Osc. Common
#2 — Osc. Plus
#3 — Control Vo.
#4 — Case Ground
#5 — Oven Plus
#6 — Oven Common
#7 — N/C
#8 — Output



Models JW8512M & JY8512M

Pin #1 — Plus Supply
#2 — Control Voltage
#3 — Common
BNC — Output



Models JS8412P, JW8412P, JW8428P, JX8528P

Pin #1 — Plus Supply
#2 — Control Voltage
#3 — Common
#4 — Signal Output (Hi)
#5 — Signal Output (Lo)

SPECIFICATIONS

PARAMETER	MODEL			
	JS8412P	JW8512M	JW8412P	JY8512M
Frequency Range	1MHz to 60MHz	60MHz to 100MHz	1MHz to 60MHz	60MHz to 100MHz
Frequency Tolerance	±1%	±2%	±2%	±4%
Temperature Range	0°C to +60°C			
***Supply Voltage**	+24VDC ±1%			
Control Voltage	0 to +10V or ±5V (Specify)			
Waveform	Sine			
Output Voltage	>+5DBM			
Load	50Ω			
Current Drain	<50 Ma			
Deviation	±10%	±10%	±20%	±20%
Linearity	±3%	±5%	±5%	±10%
Height	.75″	1″	.75″	1″
Size	1.5″ x 3.1″			
Header	5 PC Pins	3 PC Pins and BNC Conn.	5 PC Pins	3 PC Pins and BNC Conn.

PARAMETER	MODEL			
	JW8428P	JX8528P	JB2028Q	JB2029Q
Frequency Range	1MHz to 10MHz	10MHz to 60MHz	1MHz to 10MHz	10MHz to 60MHz
Frequency Tolerance	±2%	±3%	±0.1%	±0.1%
Temperature Range	0°C to +60°C			
Supply Voltage	+24VDC ±1%			
Control Voltage	0 to +10V or ±5V (Specify)			
Waveform	Square			
Output Voltage ("1")	5.1V ±5% from 470Ω Source			
Output Voltage ("0")	0.0 ±0.3V at 5 Ma			
Rise & Fall Times	<10 NS			
Current Drain	<60 Ma		<350 Ma at Turn-on 150 Ma at +25°C	
Deviation	±30%	±20%	±30%	±20%
Linearity	±5%	±10%	±5%	±10%
Height	.75″	1″	4.5″	4.5″
Size	1.5″ x 3.1″		2″ x 2″	
Header	5 Printed Circuit Pins	5 Printed Circuit Pins	8 Hooked Pins	8 Hooked Pins

* These are standard operating supply voltages and output voltages. Other voltages are available upon request.

ORDERING INFORMATION:

To Order, Specify Model No. (Example JW8512M) and Frequency.

accutronics

Div. of Gibbs Mfg. & Res. Corp.
628 North St. Geneva, Illinois
Area Code 312 232-2600

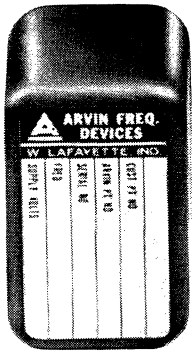
accutronics

ARVIN FREQUENCY DEVICES

complete frequency management capability

ARVIN TCXO & TCXO^2

Arvin temperature compensated crystal oscillators provide precise frequency management without the use of ovens, permitting small size, light weight, instant warm-up, and low power drain. Sine, square, or pulse outputs are available. Units generating more than one frequency can be provided. All circuit values are computer optimized. Following are typical specifications. Let us know your exact requirements.



TCXO

Many units available off-the-shelf.

Example: 1 MHz $\pm 5 \times 10^{-7}$ -40°C to $+75$°C @ $150 in single quantities, 5-day delivery.

Example: 2 to 10 MHz $\pm 1 \times 10^{-5}$ -55°C to $+85$°C @ $55 in single quantities, 5-day delivery.

TCXO^2

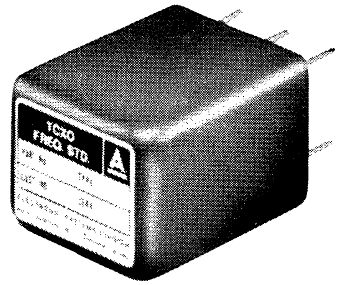
Designed to fill the gap between TCXO's and high-power ovens.

Typical specifications: 1 to 10 MHz $\pm 1 \times 10^{-8}$ -40°C to $+75$°C.

Dimensions: 2″ × 2″ × 1″.

ARVIN TC/VCXO

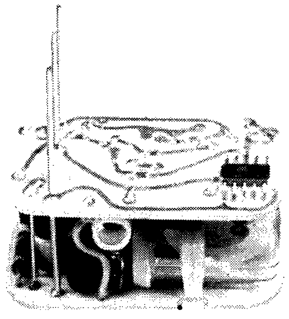
Arvin TC/VCXO's have all the advantages of Arvin TCXO's combined with a unique voltage control capability. This gives Arvin TC/VCXO's even greater flexibility without the need for external compensating circuitry or added power. Units generating one or more frequencies can be provided with sine, sawtooth, or pulse outputs. Following are typical specifications for Arvin TC/VCXO's. Send us your exact requirements.



Frequency Range.......to 150 MHz
Frequency Deviation..to±3000 PPM depending upon freq. and temp.
Deviation Sensitivity.......to ± 200 PPM/volt
Deviation Rate ....DC — 20 KHz
Linearity...........to ± 1% of best straight line
Input Voltage....± 10 to ± 50 VDC
Packaging...........MIL, NASA, or commercial
Frequency Stability.....to ±1 PPM depending on frequency and temperature

OSCILLATOR & SYNTHESIZER R&D

Arvin Frequency Devices is equipped to design, develop, and manufacture in quantity a variety of oscillators and frequency control equipment. Our specialty is high reliability TCXO, VCXO, TC/VCXO devices, low frequency crystal oscillators and synthesizers for miniaturized communications applications. We have built TCXOs for satellite, missile, airborne, and portable ground equipment applications. Arvin Frequency Devices provide precise frequency management in the smallest possible package, some as small as one cubic inch, with low power drain and stabilities as high as 1 PP 10^7 in a range to 200 MHz. Let us help solve your frequency management problems. We welcome research and development contracts. Call us early in the design stage.



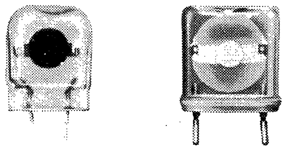
FOR ADDITIONAL INFORMATION WRITE:

ARVIN FREQUENCY DEVICES
ELECTRONIC SYSTEMS DIV., ARVIN INDUSTRIES, INC.

15th STREET PLANT • COLUMBUS, INDIANA 47201 • PHONE: (812) 379-3842 • TWX: (810) 352-1275

BULOVA QUARTZ CRYSTALS

- AT • CT • DT • +5° (E and H Elements) GT • MT • NT • PT (XY^1 Flex.) • JT • SL
- Military Types • General Communications • Precision SSB
- Coldweld • Glass Sealed • Glass Bulb • Metal Holders
- Military crystals meet latest MIL-C-3098 specifications
- Special shock and vibration mounts available



HIGH PRECISION GLASS-ENCAPSULATED CRYSTALS

Covering a frequency range of 5,000 Hz thru 180 MHz, Bulova has available in glass holders the Mil types HC-26/U and HC-27/U, as well as the standard vacuum tube types. A 3rd overtone 5 MHz crystal is available in the HC-27/U holder with Q's in excess of 1 million and stability of 1 pp 10^{10} for 24 hours.

FILTER AND OSCILLATOR CRYSTAL

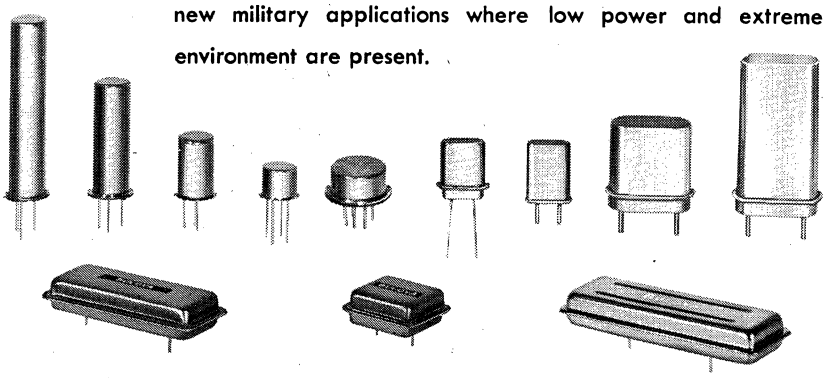
Bulova has designed a line of quartz crystals for filter, clock oscillator and TCXO applications, with fundamental frequencies from 2,000 Hz to 33 MHz as well as overtones up to 180 MHz.

- Spurious attenuation as low as 60 db.
- Motional parameters of L and C can be held to within ±3%.

A COMPLETE LINE FOR ALL APPLICATIONS IN A FREQUENCY RANGE OF 2,000 Hz THRU 180 MHz

Commercial: Crystals for Aviation, Marine and Data communications equipment. Manufactured to the highest quality in standard type holders or modified to suit special designs.

Military: Bulova produces all the standard military "CR" types and is Q.P.L. on most of the current "CR" types. Designs crystals for new military applications where low power and extreme environment are present.



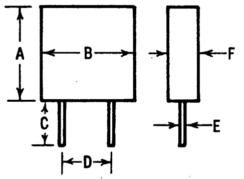
Coldweld Sealed Crystals—

Bulova has extended the developmental perimeter of coldweld types to provide a more miniaturized package with a broader frequency output. A support facility has been built capable of handling volume production. Series 100 coldweld holders consists of twelve (12) configurations which include the seven (7) main military types. The military crystals fit within the dimensional requirements of the military drawing.

Features:

- High Quality-High Reliability
- Tolerances as close as 3 ppm of nominal can be held on initial adjustment.
- Aging rates up to 3 pp 10^8 per week.
- Small package/broad frequency capability.

CRYSTAL HOLDERS



MIL TYPE	BULOVA TYPE	DIMENSIONS IN INCHES					
		A (Max)	B (Max)	C	D	E	F (Max)
HC-6/U	70	.775	.757	.238	.486	.050	.352
HC-13/U	73	1.526	.757	.238	.486	.050	.352
HC-18/U	80	.530	.435	1.500	.192	.017	.183
HC-25/U	83	.530	.435	.238	.192	.040	.183
HC-27/U	77	.775	.757	.238	.486	.050	.352
HC-26/U	76	.530	.435	1.500	.192	.017	.185

Manufacturer of the widest range of Frequency Control Components: Crystals • Crystal Oscillators • Crystal Filters • LC Filters • Tuning Forks • Fork Oscillators • Ovens • Coils • Servo Amplifiers

BULOVA fcp

BULOVA FREQUENCY CONTROL PRODUCTS

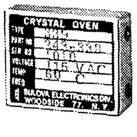
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

BULOVA TEMPERATURE CONTROLLERS/OVENS

A wide selection of temperature control devices and enclosures . . . compact—highly versatile

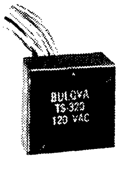
Solid State Controllers:



339 Transistat

BULOVA
TRANSISTAT

184 Transistat



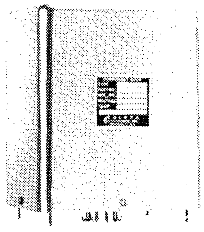
320 Conax

Available as AC Switches, DC Switches or Proportional Controllers, they are designed to handle power requirements of as little as .4 watt to 3KW. Package sizes of as small as .5 cubic inches are available; temperature control as close as .01°C, dependent on application.

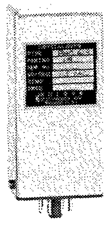
	Type 184-115 184-26	Type 339	Type 320-115* 320-26
Voltage	20VAC to 125VAC 60 to 400 cps	115VAC 400 cps	20VAC to 125VAC 60 to 400 cps
Peak Heater Current	1.5 amp. (Half Wave)	1 amp. cont. 1.5 amp. 50% Duty Cycle	1.5 amp. (Half Wave)
Set Temperature Range	Any Temperature, 5° intervals, −55°C to +125°C		
Temperature Stability Over Ambient	.1°C	.1°C	.75°C
R.F.I.	none	Mil I 26-600	none
Ambient Operating	−55°C to +125°C		
Vibration	Mil Std. 202 Method 204D		none
Shock	Mil Std. 202 Method 202		none
Size	.625 Dia. .437 Hgt.	1.390 x 1.075 .380 Hgt.	1.250 Sq. .380 Hgt.

***Commercial**

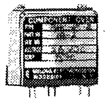
Crystal and Component Ovens:



341



613



BHC-18-2

Crystal ovens are available to hold from a single crystal to 15 crystals; component ovens are available up to 50 cubic inches. Many ovens are available with either bi-metal thermostats or solid state control.

	BHC-18 Series	BHC-613 Series	COM-341 Typical Large Cavity Oven
Accomod.:	1-15, HC-18 or HC-25 crystal holders	Single HC-6 crystal holder to small printed circuit board	Up to 50 cubic inches
Oper. Volt:	To 28 VDC or 115 VAC dependent on controller		
Temp. Set:	5° intervals +55°C to +100°C		
Controls Available:	Bi metal or solid state	Bi metal, solid state or mercury	
Stability:	Up to ±.5°C	Up to ±.01°C	Up to ±.1°C
Mounting:	Flange, bracket or stud	Flange, octal plug or stud	
Termination:	N/A	To 15 pins	To 20 pins

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA fcp

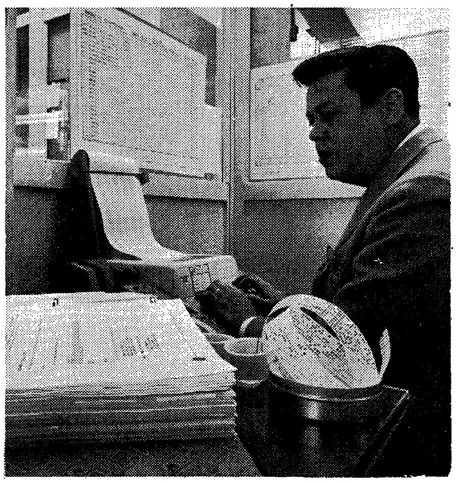
BULOVA FREQUENCY CONTROL PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

BULOVA CRYSTAL FILTERS

Computer Designed for Reliable Performance Accurate — 4KHz to 150MHz



COMPUTER OPTIMIZED FILTER DESIGNS

To provide optimized designs for individual system requirements, Bulova has a co-related library of computer programs. From pre-packaging tolerance analysis of individual components to the finished product spec'd to the customer's parameters, we can determine design "trade-off" quickly and economically.

The prime parameters have been programmed to make available the following crystal filter types

1. **Butterworth Designs**
2. **Butterworth-Thompson Designs**
3. **Chebyshev Designs**
4. **Bessel Designs**
5. **Elyptic Designs**
6. **Lerner Designs**
7. **Gaussian (Transitional)**
8. **Image Parameter**

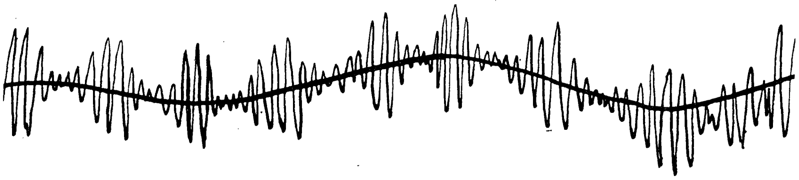
FULL PRODUCTION CAPABILITY

From crystal configuration to finished product, each segment of manufacture utilizes the most advanced and controlled production techniques. Geared to large volume requirements, Bulova's modern automated test facilities allows for a mass production output with no loss in quality—fully equipped environmental laboratory available for most testing. Short runs and engineering prototypes are handled in our pre-production shop.

The business of Crystal Filter design and production has been Bulova's business since 1955. It is another reason for our leadership in the broad area of frequency control and related precision products.

We are a design/production center to fulfill the most exacting system specifications. Combining many years of experience, an engineering team of many design disciplines and advanced computer techniques, we can produce 'state-of-the-art' filters in cost-controlled packages to military and commercial specifications.

TYPICAL FILTER APPLICATIONS FROM



4KHz * **150 MHz**

Band Pass
Band Elimination
Single Side Band
Narrow Band
Wide Band
Linear Phase
RF & IF

Notch
Time Delay
Equalizer
Lerner
Time Domain

Discriminators

*For areas not specified above, consult our application engineering department.

CUSTOM DESIGNED TO THESE POSSIBLE PARAMETERS:

Band Widths	from .001% to 8% of Center frequency
Shape Factor:	1.08 Ratio for 60 db BW to 3 db BW
Ripple Factor	<0.5 db
Phase Linearity	<5%
Carrier Rejection	>70 db
Ringing	>40 db
Insertion Loss	<3 db
Attenuation	>100 db
Phase Matching	closer than 3° (Filter to Filter) over environmental requ.
Temperature Tolerances	<0.005% (depending upon frequency)
Max. Operating Temperature Range	−55°C to +125°C
Shock & Vibration	All applicable MIL specifications

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA
fcp

BULOVA FREQUENCY CONTROL PRODUCTS

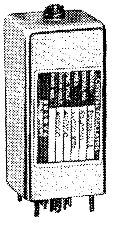
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

BULOVA CRYSTAL OSCILLATORS

Bulova offers a full line of both Military and Industrial crystal oscillators—provides a total capability from custom engineering to volume production, using the latest automatic test equipment. Bulova's full line of crystal oscillators includes • high stability crystal oscillators • temperature compensated crystal oscillators (TCXO) • computer clock oscillators • voltage-controlled crystal oscillators (VCXO)

HIGH STABILITY CRYSTAL OSCILLATORS

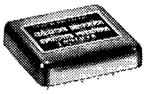


PCOXO

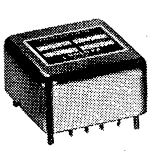
The high frequency stability of these oscillators results from housing a high precision crystal and an oscillator circuit with AGC to maintain low constant crystal drive in a stable DC proportional control oven.

	MILITARY		INDUSTRIAL	
MODEL	**PCOXO-101**	**PCOXO-106**	**PCOXO-3**	**PCOXO-5**
Frequency Range	1.0 to 10MHz	30 to 100 MHz	1.0 to 10MHz	1.0, 3.0 or 5.0MHz
Temp. Range	−55°C to +70°C	·55°C to+70°	0°C to +60°C	0°C to +60°C
Stability				
Temp. Range	±1PP10^{3}	±5PP10^{7}	4PP10^{10}/°C	2PP10^{10}/°C
Aging per day	1PP10^{9}	5PP10^{8}	5PP10^{9}	5PP10^{10}
Line Voltage ±10%	±5PP10^{9}	±5PP10^{7}	±5PP10^{9}	±5PP10^{9}
Load ±10%	±1PP10^{9}	±5PP10^{7}	±1PP10^{9}	±1PP10^{9}
Warm-up at +25°C after 1 hr.	±1PP10^{8}	±1PP10^{7}	±3PP10^{8}	±1PP10^{8}
Output	.5VRMS (min)	1 MW (Min)	1VRMS (min)	1VRMS
Load	50 ohms	50 ohms	1K ohms	1K ohms
Input Voltage	+28VDC	+28VDC	+28VDC	+28VDC
Turn on Power	18W	18W	12W	12W
Power at 25°C	4.5W (Typ)	4.5W (Typ)	4.5W (Typ)	4.2W (Typ)
Size	2″ x 2″ x 4″	2″ x 2″ x 4″	2″ x 2″ x 4″	2″ x 2″ x 4″

TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS



TCXO-1
TCXO-100

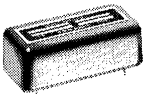


TCXO-2
TCXO-50

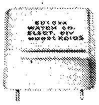
Bulova temperature compensated crystal oscillators employ a computer selected and optimized variable capacitance diode and thermistor compensation network to maintain frequency stability over wide temperature ranges, without the use of an oven.

MODEL	TCXO-1	TCXO-2	TCXO-50	TCXO-100
Frequency Range	3MHz to 12MHz	3, 4 or 5MHz	1MHz to 12MHz	1MHz to 20MHz
Frequency Adjustment Range	±3PPM	±0.3PPM	±3PPM	±3PPM
Frequency Stability	±1PPM over Temp. Range of −40°C to +70°C	±0.2PPM over Temp. Range of −40°C to +75°C	±0.5PPM over Temp. Range of 0°C to +60°C	±2.5PPM over Temp. Range of 0°C to 60°C
Aging Rate per wk.	±1PP10^{8}	±1PP10^{8}	±1PP10^{8}	±1PP10^{8}
Power Input	12VDC ±2% at 150mw	12VDC ±5% at 50mw	12 and 5 VDC	12 and 5 VDC
Output	1VP-P into 1K ohm	125 mv RMS into 50 ohms	T^{2}L	T^{2}L
Size	2″ x 2″ x 0.5″	2″ x 2″ x 1″	2″ x 2″ x 1″	2″ x 2″ x 0.5″
Weight	3 oz.	5 oz.	5 oz.	3 oz.

COMPUTER CLOCK OSCILLATORS



XO-140
XO-14



XO-5
XO-105

These computer clock oscillators feature crystal stability, printed circuit board mounting and outputs directly compatible with DTL or TTL loads.

MODEL	XO-140	XO-105	XO-14	XO-5
Frequency Range	8KHz to 1MHz	1MHz to 25MHz	8KHz to 1MHz	1MHz to 25MHz
Temp. Range	−40°C to +70°C	−55°C to +85°C	0°C to +60°C	0°C to +60°C
Frequency Stability over Ambient	±120PPM	±50PPM	±65PPM	±25PPM
Input Voltage	+5VDC	+5VDC	+5VDC	+5VDC
Output	Logic Zero: 0 to .4V Logic One: 2.6 to 5V	Logic Zero: 0 to .4V Logic One: 2.6 to 5V	Logic Zero: 0 to .4V Logic One: 2.6 to 5V	Logic Zero: 0 to .4V Logic One: 2.6 to 5V
Size	1″ x 2″ x .5″	1″ x 1″ x .5″	1″ x 2″ x .5″	1″ x 1″ x .5″

Manufacturer of the widest range of Frequency Control Components: **Crystals • Crystal Oscillators • Crystal Filters • LC Filters • Tuning Forks • Fork Oscillators • Ovens • Coils • Servo Amplifiers**

BULOVA fcp

BULOVA FREQUENCY CONTROL PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

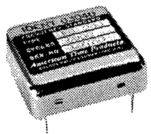
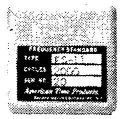
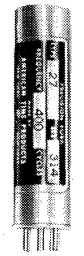
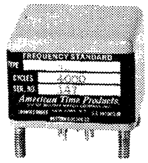
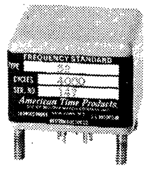
BULOVA FORK OSCILLATORS/RESONATORS

- From 100 KHz to 1 Cps
- Accuracies up to ±.002%
- Units compatible with logic circuitry available
- Multi-frequency units available
- Unique capability to meet special custom requirements

Whatever your requirements for tuning forks and oscillators, Bulova has either the product available or the inherent capability to meet your need. Reliability, accuracy and size criteria can be quickly met, with appreciable savings in engineering time and production costs. Each product is founded on the same design experience that has made the ACCUTRON a by-word of precision and accuracy.

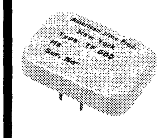
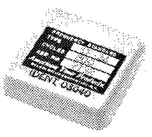
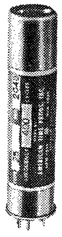
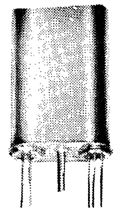
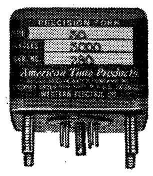
PRECISION OSCILLATORS

(Complete Standards)

					
Type	FS 200	FS 11	FS 27	FS 300	FS 32
Frequency	360 to 1000 Hz	400 Hz to 50 kHz	360 to 1300 Hz	Multiple Outputs:60 120, 240, 480 Hz	240 Hz to 100 kHz
Frequency Accuracy	up to ±.01%	up to ±.02%	up to ±.002%	up to ±.002%	up to ±.002%
Temperature Range	FOR SOME ACCURACIES AS MUCH AS −65°C to + 125°C				
Input	1.5 V DC at 6 to 20 microamps	STANDARD 28 V DC (AVAILABLE 3 to 40 V DC)			
Output	0.1 volt	APPROXIMATELY 5 V RMS (UNITS CAMPATIBLE WITH LOGIC CIRCUITRY ARE AVAILABLE)			
Load	500 K ohms	10 K OHMS TO 500 K OHMS OR LOGIC CIRCUITRY			
Size	1-5/16″ x 1-5/16″ x 3/8″	1-1/2″ x 1-1/2″ x 3/8″	23/32″ x 3″	1-1/2″ x 1-1/2″ x 1-3/16″	1-1/2″ x 1-1/2″ x 1-3/16″
Weight	1 ounce	2-1/2 ounces	2 ounces	2-1/2 ounces	2-1/2 ounces

PRECISION FORK RESONATORS

(External Drive Circuit Required)

					
Type	TF 600	TF 34	TF 25	TF 500	TF 30
Frequency	400 to 2400 Hz	240 Hz to 50 kHz	200 to 1400 Hz	240 Hz to 50 kHz	240 Hz to 50 kHz
Frequency Accuracy	up to ±.02%	up to ±.02%	up to ±.002%	up to ±.02%	up to ±.002%
Temperature Range	FOR SOME ACCURACIES AS MUCH AS −65°C TO +125°C				
Output, Input and Load	DEPENDENT ON EXTERNAL CIRCUITRY USED. RECOMMEND CIRCUITS SUPPLIED TO CUSTOMERS				
Size	1.2 x .9 x .24″	1-1/2 x 1-1/2 x 3/8″	23/32 x 3″	3/8″ x 1-1/2″	1-1/2 x 1-1/2 x 1-1/8
Weight	1/2 ounce	1/2 ounce	2 ounces	1/2 ounce	2-1/2 ounces

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA AMERICAN TIME PRODUCTS

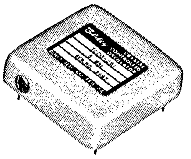
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

For further information call (814) 838-3571 or TWX 510-696-6886
BLILEY ELECTRIC COMPANY • ERIE/PENNSYLVANIA 16512
2545 W. GRANDVIEW BOULEVARD

Bliley
If you buy quality

TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS


TCCO Series

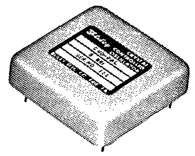
TCCO-26 MODELS	FREQUENCY STABILITY WITH TEMPERATURE DEVIATION	
TCCO-26	±1 x 10^{-6}	0-50°C
TCCO-26-1	±5 x 10^{-7}	0-50°C
TCCO-26-2	±2 x 10^{-6}	−20 to +70°C
TCCO-26-3	±5 x 10^{-7}	−20 to +70°C
TCCO-26-4	±1 x 10^{-6}	−40 to +70°C
TCCO-26-5	±3 x 10^{-6}	−55 to +70°C

FREQUENCY STABILITY WITH TIME		
24 Hour Period	5 x 10^{-8} Max. with Ambient Temp. 25°C	
After 72 Hours Continuous Operation	1 x 10^{-7}/wk.	1-10 MHz
	2 x 10^{-7}/wk.	10-20 MHz

BLILEY TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS are designed to integrate the characteristics of high quality crystals with temperature compensated circuitry to achieve improved frequency stability without temperature control. Standard models are supplied for sine wave output in frequency range 1-20 MHz. Also available with TTL compatible logic output for frequency range 200 kHz-20 MHz. Specify 12 Vdc (2% regulation) or 5 Vdc operation.

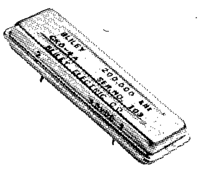
STOCK ITEMS						FAST DELIVERY
	TCCO-26M-5	12 VDC MODEL	1 MHz OUTPUT	DRIVES 12V TTL'S	STABILITY ±2PPM OVER 0-60°C	
	TCCO-26N-6	12 VDC MODEL	10 MHz OUTPUT	DRIVES 5V TTL'S	STABILITY ±2PPM OVER 0-60°C	

CRYSTAL CLOCK OSCILLATORS
TTL COMPATIBLE LOGIC OUTPUT FOR DIGITAL APPLICATIONS


CMO Series

STABILITY LIMITS							
WAVEFORM	STANDARD LOGIC OUTPUT					OPTIONAL SINE WAVE OUTPUT	
TEMPERATURE RANGE	CMO-26			CMO-3	CMO-31	CMO-26	CMO-3
	50 Hz to 4 kHz	1 kHz to 50 kHz	50 kHz to 25 MHz	200 kHz to 25 MHz	200 kHz to 25 MHz	800 kHz to 100 MHz	3 MHz to 100 MHz
15° to 35°C	±.002%	±.0015%	±.0008%	±.0008%	±.005%	±.0008%	
0° to 50°C	±.004%	±.003%	±.001%	±.001%	±.005%	±.001%	
0° to 70°C	±.006%	±.005%	±.0012%	±.0012%	±.01%	±.0012%	
−20° to 50°C	±.007%	±.006%	±.0015%	±.0015%	±.015%	±.0015%	
−40° to 70°C	±.01%	±.007%	±.002%	±.002%		±.002%	

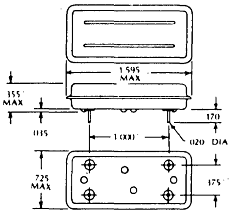
All CMO Series models are designed for operation on +5 Vdc. Logic output models have amplitude needed to drive normal DTL and TTL circuity. Types CMO-26 and CMO-3 are hermetically sealed and Type CMO-26 is available as custom option, with mechanical or electrical trim adjustment. The CMO-31 is available with dual complementary output as custom option. Specify CMO-32 for use with 14 pin DIP sockets or CMO-33 for use with 24 pin DIP sockets.


CKO Series

CKO Series — FREQUENCY TOLERANCE		
SPECIFY	DEVIATION	AMBIENT RANGE
A	±10 ppm	0° to 50°C
or		
B	±20 ppm	−40° to +70°C

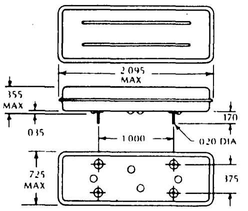
STANDARD MODELS		
SPECIFY TYPE	FREQUENCY kHz	OUTPUT WAVEFORM
CKO-4A	200-20000	Logic
CKO-4B	200-20000	Square Wave
CKO-3	3000-20000	Sine Wave

CKO - 3


1.595 MAX
355 MAX
035
170
1.000
020 DIA
725 MAX
375

1 - NEG. OSC.
2 - VOLTAGE CONTROL 0 TO +5V
3 - +5V DC
4 - OUTPUT

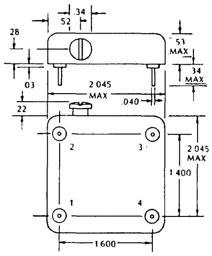
CKO-4


2.095 MAX
355 MAX
035
170
1.000
020 DIA
725 MAX
375

1 - NEG. OSC.
2 - VOLTAGE CONTROL 0 TO +5V
3 - +5V DC
4 - OUTPUT

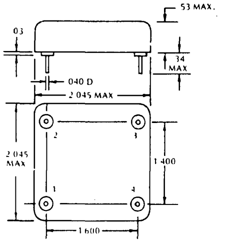
THE CKO SERIES FEATURES AN ULTRA COMPACT LOW PROFILE CRYSTAL OSCILLATOR designed to provide choice of LOGIC or SINE WAVE output for IC applications where space is limited. The koldweld sealed package operates on 5 Vdc with output ratings as shown above. When specified, electrical trim adjustment is available to offset long term aging.

TCCO - 26


.34
52
28
53 MAX
34 MAX
03
2.045 MAX
.040
22
2
3
1
4
2.045 MAX
1.400
1.600

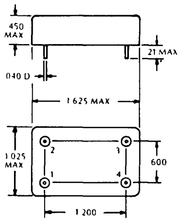
1 - NEG. OSC.
2 - CASE GROUND
3 - +12V DC OSC.
4 - OUTPUT

CMO - 26


53 MAX.
03
34 MAX
040 D
2.045 MAX
2.045 MAX
1.400
2
3
1
4
1.600

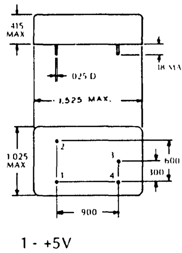
1 - NEG. OSC. & RF GND
2 - VOLTAGE CONTROL OR NC
3 - +5V
4 - OUTPUT

CMO - 3


450 MAX
21 MAX
040 D
1.625 MAX
1.025 MAX
2
3
1
4
600
1.200

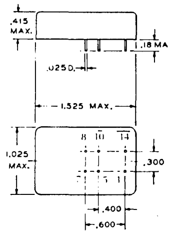
1 - NEG. OSC. & RF GND
2 - N.C.
3 - +5V
4 - OUTPUT

CMO - 31


.415 MAX
18 MAX
.025 D
1.525 MAX.
1.025 MAX
2
3
1
4
600
300
900

1 - +5V
2 - COMMON
3 - COMP. OUTPUT
(IF SPECIFIED)
4 - OUTPUT

CMO - 32


.415 MAX.
.18 MAX.
.025 D.
1.525 MAX.
8
10
14
1.025 MAX.
.300
7
5
1
.400
.600

1, 5, 10 - N.C.
7 - COMMON
8 - OUTPUT
14 - +5V DC

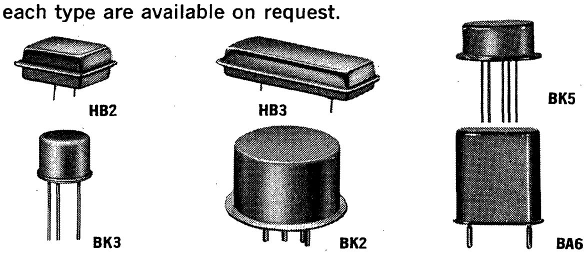
For further information call (814) 838-3571 or TWX 510-696-6886
BLILEY ELECTRIC COMPANY • ERIE/PENNSYLVANIA 16512
2545 W. GRANDVIEW BOULEVARD

Bliley
if you buy quality

CRYSTALS

Koldweld Sealed Crystal Holders for High Reliability

This group of crystal holders is hermetically sealed by a koldweld process, without heat or flux, to minimize contamination. Crystal units supplied in these enclosures have improved aging and reliability. All units are custom built to your specifications. Data sheets for each type are available on request.


HB2
HB3
BK5
BK3
BK2
BA6

KOLDWELD SERIES

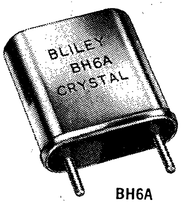
BLILEY HOLDER	HB2	HB3	BK2	BK3	BK5	BA2	BA4	BA6	BA9
FREQUENCY RANGE	0.2-100 MHz	2.5-250 kHz	1-15 MHz	8-150 MHz	2-30 MHz	3-150 MHz	2-150 MHz	0.2-100 MHz	2-250 kHz
DIMENSIONAL DRAWING	8	9	10	11	12	13	14	15	16

General Communication and Mil-Type Crystal Holders

Bliley offers a complete selection of solder sealed Mil-type crystal holders and commercial variations such as wire leads, mounting brackets and ruggedized models. For quotation, choose the basic holder style required, indicate any special variations and advise performance characteristics for complete crystal unit.

GENERAL COMMUNICATIONS AND MIL-TYPE CRYSTAL HOLDERS

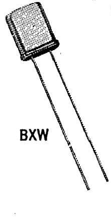
BLILEY HOLDER	MIL HOLDER	FREQUENCY RANGE	DIMENSIONAL DRAWING
BH9T	—	1-2 kHz	1
BH9A	HC-13/U	2-250 kHz	2
BH91A	—	2-250 kHz	2
BH9W	HC-34/U	2-250 kHz	2
BH120	—	100-250 kHz	3
BH120W	—	100-250 kHz	3
BH6A	HC-6/U	0.2-150 MHz	4
BH61A	HC-17/U	0.2-150 MHz	4
BH6W	HC-33/U	0.2-150 MHz	4
BH4	HC-32/U	2-150 MHz	5
BH4W	—	2-150 MHz	5
BK2	HC-40/U	1-15 MHz	10
BK3	HC-35/U	8-150 MHz	11
BK5	HC-37/U	2-30 MHz	12
BXW	HC-18/U	3-150 MHz	6
BXP	HC-25/U	3-150 MHz	6
B27	HC-27/U	2-30 MHz	7
HB2	HC-39/U	0.2-100 MHz	8
HB3	HC-41/U	2.5-250 kHz	9
BA2	HC-42/U	3-150 MHz	13
BA6	HC-36/U	0.2-100 MHz	15


BLILEY
BH6A
CRYSTAL

BH6A

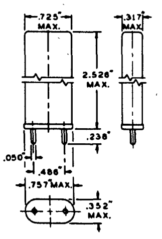
BLILEY
BH9A
CRYSTAL

BH9A

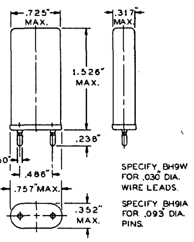


BXW

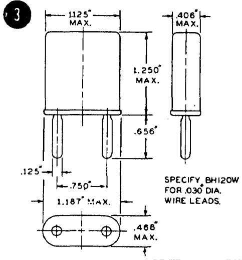
1


.725" MAX.
.317" MAX.
2.526" MAX.
.238"
.050"
.486"
.757" MAX.
.352" MAX.

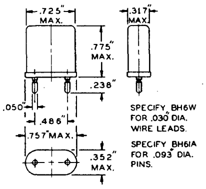
2


.725" MAX.
.317" MAX.
1.526" MAX.
.238"
.050"
.486"
.757" MAX.
.352" MAX.
SPECIFY BH9W FOR .030" DIA. WIRE LEADS.
SPECIFY BH91A FOR .093" DIA. PINS.

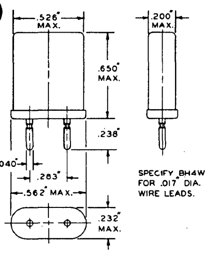
3


1.125" MAX.
.406" MAX.
1.250" MAX.
.656"
.125"
.750"
1.187" MAX.
.468" MAX.
SPECIFY BH120W FOR .030" DIA. WIRE LEADS.

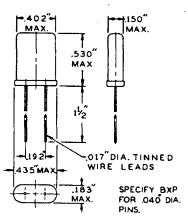
4


.725" MAX.
.317" MAX.
.775" MAX.
.238"
.050"
.486"
.757" MAX.
.352" MAX.
SPECIFY BH6W FOR .030" DIA. WIRE LEADS.
SPECIFY BH61A FOR .093" DIA. PINS.

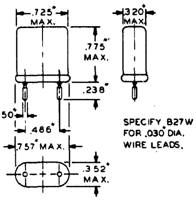
5


.526" MAX.
.200" MAX.
.650" MAX.
.238"
.040"
.283"
.562" MAX.
.232" MAX.
SPECIFY BH4W FOR .017" DIA. WIRE LEADS.

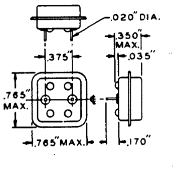
6


.402" MAX.
.150" MAX.
.530" MAX
1½"
.192
.435" MAX
.017" DIA. TINNED WIRE LEADS
.183" MAX.
SPECIFY BXP FOR .040" DIA. PINS.

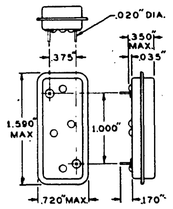
7


.725" MAX.
.320" MAX.
.775" MAX.
.238"
.050"
.486"
.757" MAX.
.352" MAX.
SPECIFY B27W FOR .030" DIA. WIRE LEADS.

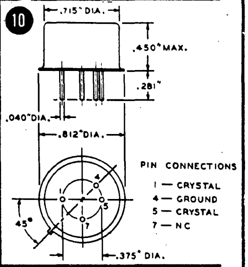
8


.020" DIA.
.350" MAX.
.375"
.035"
.765" MAX.
.765" MAX.
.170"

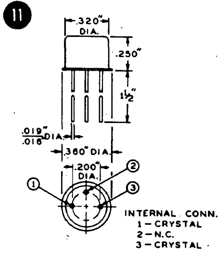
9


.020" DIA.
.350" MAX.
.375"
.035"
1.590" MAX
1.000"
.720" MAX.
.170"

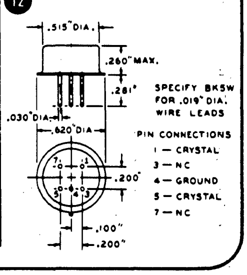
10


.715" DIA.
.450" MAX.
.281"
.040" DIA.
.812" DIA.
1
4
5
7
45°
.375" DIA.
PIN CONNECTIONS
1 — CRYSTAL
4 — GROUND
5 — CRYSTAL
7 — NC

11


.320" DIA.
.250"
1½"
.019" .016" DIA.
.360" DIA.
.200" DIA.
①
②
③
INTERNAL CONN.
1 — CRYSTAL
2 — N.C.
3 — CRYSTAL

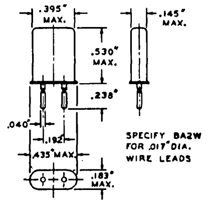
12


.515" DIA.
.260" MAX.
.281"
.030" DIA.
.620" DIA
.200"
.100"
.200"
7 1
5 4 3
SPECIFY BK5W FOR .019" DIA. WIRE LEADS
PIN CONNECTIONS
1 — CRYSTAL
3 — NC
4 — GROUND
5 — CRYSTAL
7 — NC

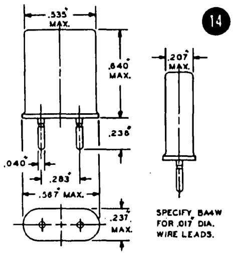
For further information call (814) 838-3571 or TWX 510-696-6886
BLILEY ELECTRIC COMPANY • ERIE/PENNSYLVANIA 16512
2545 W. GRANDVIEW BOULEVARD

Bliley
If you buy quality

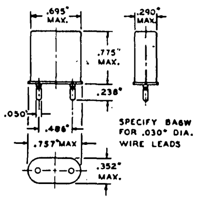
⑬


.395" MAX.
.145" MAX.
.530" MAX.
.238"
.040"
.192"
.435"MAX.
.183" MAX.
SPECIFY BA2W FOR .017"DIA. WIRE LEADS

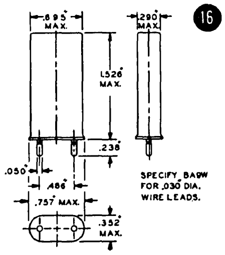
⑭


.535" MAX.
.207" MAX.
.640" MAX.
.238"
.040"
.283"
.567" MAX.
.237" MAX.
SPECIFY BA4W FOR .017" DIA. WIRE LEADS.

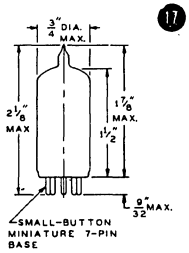
⑮


.695" MAX.
.290" MAX.
.775" MAX.
.238"
.050"
.486"
.757"MAX
.352" MAX.
SPECIFY BA6W FOR .030" DIA. WIRE LEADS

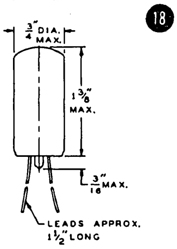
⑯


.695" MAX.
.290" MAX.
1.526" MAX.
.238"
.050"
.486"
.757" MAX.
.352" MAX.
SPECIFY BA9W FOR .030" DIA. WIRE LEADS.

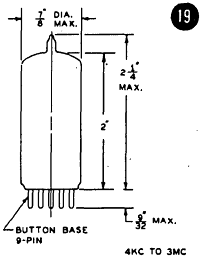
⑰


3/4" DIA. MAX.
2 1/16" MAX
1 7/8" MAX.
1 1/2"
9/32" MAX.
SMALL-BUTTON MINIATURE 7-PIN BASE

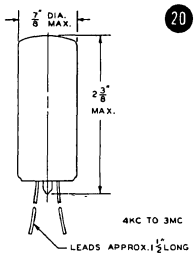
⑱


3/4" DIA. MAX.
1 3/8" MAX.
3/16" MAX.
LEADS APPROX. 1 1/2" LONG

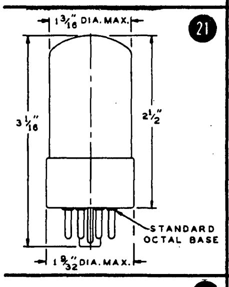
⑲


7/8" DIA. MAX.
2 1/4" MAX.
2"
9/32" MAX.
BUTTON BASE 9-PIN
4KC TO 3MC

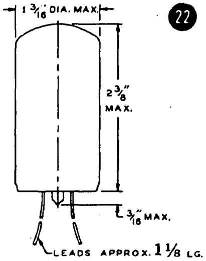
⑳


7/8" DIA. MAX.
2 3/8" MAX.
4KC TO 3MC
LEADS APPROX. 1 1/2" LONG

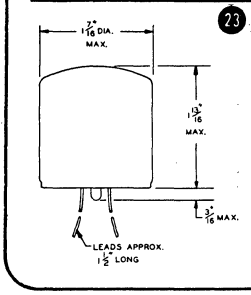
㉑


1 3/16" DIA. MAX.
3 1/16"
2 1/2"
STANDARD OCTAL BASE
1 9/32" DIA. MAX.

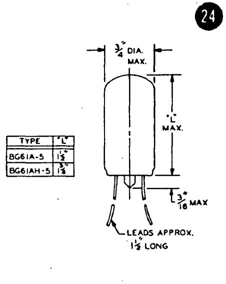
㉒


1 3/16" DIA. MAX.
2 3/8" MAX.
3/16" MAX.
LEADS APPROX. 1 1/8 LG.

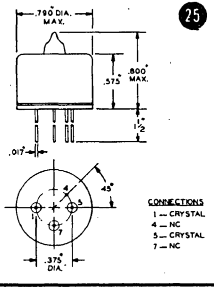
㉓


1 7/16" DIA. MAX.
1 13/16" MAX.
3/16" MAX.
LEADS APPROX. 1 1/2" LONG

㉔

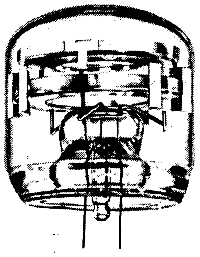

3/4" DIA. MAX.
"L" MAX.
3/16" MAX
LEADS APPROX. 1 1/2 LONG
TYPE
"L"
BG61A-5
1 5/8"
BG61AH-5
1 7/8"

㉕

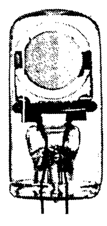

.790 DIA. MAX.
.800" MAX.
.575"
1/2"
.017"
45°
.375" DIA.
CONNECTIONS
1 — CRYSTAL
4 — NC
5 — CRYSTAL
7 — NC

CRYSTALS

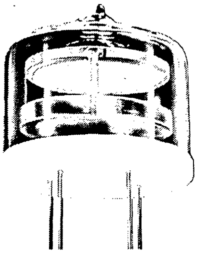
Ultra High Stability Glass Units



BG11AH-5



BG61A-5



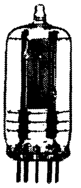
BG61AH-5S

This is an outstanding group of crystal units incorporating the advanced technology and craftsmanship that has made Bliley famous for quality without compromise. Exceptionally low aging and high Q characteristics provide precision reference for synthesizers and systems clocks. Complete data available in special bulletins supplied on request.

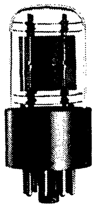
ULTRA HIGH STABILITY GLASS SEALED CRYSTAL UNITS

BLILEY TYPE	FREQUENCY RANGE	MODE	Q	AGING	DIMENSIONAL DRAWING
BG61A-5	5 MHz	Fifth	2.5×10^6	2×10^{-9}/wk.	24
BG61AH-5	5 MHz	Fifth	2.5×10^6	2×10^{-9}/wk.	24
BG61AH-5S	5 MHz	Fifth	2.5×10^6	7×10^{-10}/wk.	25
BG11AH-5	2.5 MHz	Fifth	4.5×10^6	5×10^{-10}/wk.	23
BG61AH-3S	5 MHz	Third	2×10^6	2×10^{-9}/wk.	25
B27	5 MHz	Third	1.8×10^6	2×10^{-8}/wk.	7
B27	10 MHz	Third	1.5×10^6	2×10^{-8}/wk.	7
BG93A	1 MHz	Fund.	1.5×10^6	1×10^{-8}/wk.	22

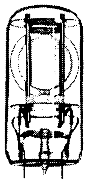
Glass Sealed Crystal Holders



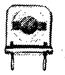
BG7N



BG9D



BG93A



B27

Vacuum sealed crystals in this group of holders exhibit superior aging characteristics and long term reliability. Ideal for use in high stability crystal and oven combinations as indicated in separate listing of crystal ovens.

GLASS SEALED CRYSTAL HOLDERS

BLILEY HOLDER	FREQUENCY RANGE	DIMENSIONAL DRAWING
B27	2-30 MHz	7
BG6A	3-100 MHz	17
BG61A	3-100 MHz	18
BG7	4-3000 kHz	19
BG72A	4-3000 kHz	20
BG9D	90-160 kHz	21
BG9A	1-5 MHz	21
BG93D	90-160 kHz	22
BG93A	1-5 MHz	22

For further information call (814) 838-3571 or TWX 510-696-6886
BLILEY ELECTRIC COMPANY • ERIE/PENNSYLVANIA 16512
2545 W. GRANDVIEW BOULEVARD

If you buy quality

CRYSTAL FILTERS

BLILEY CRYSTAL FILTERS are custom engineered devices that may be supplied with a wide variety of characteristics over the frequency range in which quartz crystal resonators can be produced. With over forty years of experience in the design and manufacture of quartz crystal resonators, Bliley offers a unique combination of crystal technology and filter design capability for your custom applications.

A general guide for determination of bandwidth limits is presented in Table 1. The chart on Page 7 provides greater detail for various segments of the frequency range. Selectivity (the ratio of 60 db bandwidth to 6 db bandwidth) is generally a compromise between desired performance and economics. Typical selectivity is 2, with requirements of 1.5 not uncommon. Passband ripple, for narrow band filters, is normally 0.3 db with 1 db maximum over the temperature range —55° to +90°C. Wide band filters typically exhibit 0.5 db ripple and very wide passbands may exhibit 2 db ripple at temperature extremes.

TABLE 1 Range kHz	Bandwidth % at 6 db Min.	Max.
100-250	.05	6
200-400	.04	5
300-600	.035	5
1000-5000	.01	2
5000-20000	.02	2
20000-30000	.03	1

The following listing presents a sample of typical Bliley filters showing performance characteristics that have been established. Our design range covers Butterworth, Gaussian (linear phase), Chebyshev, band reject, and comb sets including contiguous comb sets.

TABLE 2 Type No.	Center Frequency	Bandwidth (6 db)	Bandwidth (60 db)	Maximum Insertion Loss	Nominal Impedance (ohms)	Case Size L x W x H (in.)
BFN-0018B21	18.75 kHz	20 Hz	250 Hz	3 db	27 k	3 1/2 x 1 17/32 x 1 5/16
BFN-0060B21	60 kHz	15 Hz	200 Hz	6 db	1 k	2 x 2 x 3 1/16
BFN-0100B31	100 kHz	500 Hz	1.5 kHz	6 db	27 k	4 x 1 3/8 x 2 7/32
BFN-0100B23	100 kHz	3 kHz	7 kHz	3 db	680	4 x 1 3/8 x 2 7/32
BFN-0112B21	112 kHz	5.5 kHz	12 kHz	3 db	10 k	4 x 1 3/8 x 2 7/32
BFN-0200B32	200 kHz	100 Hz	400 Hz	3 db	8.2 k	2 27/64 x 1 47/64 x 1 7/16
BFN-0330B33	330 kHz	250 Hz	1 kHz	3 db	6 k	1 9/16 x 1 23/64 x 1 3/4
BFN-0500B41	500 kHz	300 Hz	1.2 kHz	3 db	4 k	2 3/8 x 1 x 1 1/4
BFN-2000B21	2000 kHz	100 Hz	1000 Hz	3 db	1.5 k	2 3/8 x 1 x 1 1/4
BFN-2000B22	2000 kHz	4 kHz	16 kHz	3 db	50	2 3/8 x 1 x 1 1/4
BFN-2215B28	2215 kHz	250 Hz (3 db)	1 kHz	3 db	4 k	2 9/16 x 1 5/16 x 1 47/64
BFN-2215B27	2215 kHz	2.5 kHz (3 db)	10 kHz	3 db	4 k	2 9/16 x 1 5/16 x 1 47/64
BFN-2400B42	2400 kHz	4.4 kHz (3 db)	18 kHz	3 db	2 k	2 3/8 x 1 x 1 1/4
BFN-2500B36	2500 kHz	5 kHz (3 db)	20 kHz	3 db	2 k	2 9/16 x 1 5/16 x 1 5/16
BFN-3000B14	3000 kHz	3 kHz	12 kHz	3 db	4.7 k	2 3/8 x 1 x 1 1/4
BFN-3000B47	3000 kHz	3 kHz (3 db)	6 kHz	6 db	2 k	2 9/16 x 1 5/16 x 1 1/8
BFN-4000B21	4000 kHz	5 kHz (3 db)	20 kHz	3 db	50	2 3/8 x 1 x 1 1/4
BFN-5000B50	5000 kHz	500 Hz	2500 Hz (40 db)	3 db	1.6 k	2 27/64 x 1 47/64 x 1 7/16
BFN-5000B16	5000 kHz	3.5 kHz	12 kHz	3 db	1.6 k	2 3/8 x 1 x 1 1/4
BFN-5000B23	5000 kHz	5kHz (3 db)	20 kHz	4 db	50	2 3/8 x 1 x 1 1/4
BFN-5000B22	5000 kHz	10 kHz	40 kHz	3 db	1.6 k	2 9/16 x 1 5/16 x 1 47/64
BFN-5000B53	5 MHz	80 kHz	175 kHz	10 db	100	2 3/8 x 1 x 1 1/32
BFN-7000B22	7000 kHz	8 kHz	50 kHz	6 db	500	2 3/8 x 1 x 1 1/4
BFN-9000B22	9000 kHz	1 kHz	10 kHz	3 db	1 k	2 3/8 x 1 x 1
BFN-9000B13	9000 kHz	3 kHz	12 kHz	3 db	600	2 3/8 x 1 x 1
BFN-11B53	10.00 MHz	1 kHz	2 kHz	3 db	220	2 3/8 x 1 x 1
BFN-11B36	10.01 MHz	8 kHz	20 kHz	3 db	50	2 3/8 x 1 x 1
BFN-11B8	10.7 MHz	4.2 kHz	10 kHz	3 db	400	2 3/8 x 1 x 1
BFN-11B23	10.7 MHz	13 kHz	30 kHz (80 db)	3 db	1 k	2 3/8 x 1 x 1 1/32
BFN-11B21	10.7 MHz	15 kHz	32 kHz	3 db	1 k	2 3/8 x 1 x 1 1/32
BFN-11B22	10.7 MHz	30 kHz	60 kHz	3 db	2 k	2 3/8 x 1 x 1 1/32
BFN-11B41	10.7 MHz	40 kHz	80 kHz	5 db	1 k	2 3/8 x 1 x 1
BFN-11B60	10.7 MHz	90 kHz	220 kHz	3 db	3.3 k	2 9/16 x 1 5/16 x 1
BFN-11B61	10.7 MHz	210 kHz	450 kHz	10 db	50	2 3/8 x 1 x 1 1/32
BFN-11B51	11.00 MHz	3 kHz	10 kHz	3 db	180	2 3/8 x 1 x 1
BFN-11B34	11.5 MHz	37.5 kHz	85 kHz	3 db	50	2 3/8 x 1 x 1
BFN-11B35	11.5 MHz	37.5 kHz	200 kHz (402db)	3 db	50	2 3/8 x 1 x 1
BFN-12B21	12.00 MHz	41 kHz	82 kHz	3 db	1.8 k	2 3/8 x 1 x 1
BFN-13B1	13 MHz	15 kHz	30 kHz	3 db	680	2 3/8 x 1 x 1
BFN-13B2	13 MHz	30 kHz	60 kHz	3 db	1.5 k	2 3/8 x 1 x 1
BFN-15B21	15.00 MHz	1.1 kHz	10 kHz	3 db	50	2 3/8 x 1 x 1
BFN-18B21	18.00 MHz	20 kHz	50 kHz	3 db	50	2 3/8 x 1 x 1
BFN-20B21	20 MHz	60 kHz	200 kHz	3 db	1 k	2 3/8 x 1 x 1 1/32
BFN-20B23	20 MHz	210 kHz	500 kHz	4 db	3 k	2 9/16 x 1 5/16 x 1
BFN-21B24	21.4 MHz	30 kHz	75 kHz	3 db	1.3 k	2 3/8 x 1 x 1
BFN-30B21	30 MHz	45 kHz	85 kHz	3 db	1 k	2 3/8 x 1 x 1

For further information call (814) 838-3571 or TWX 510-696-6886
BLILEY ELECTRIC COMPANY • ERIE/PENNSYLVANIA 16512
2545 W. GRANDVIEW BOULEVARD

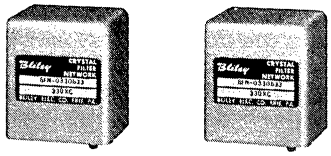
If you buy quality

CRYSTAL FILTERS

FILTER COMB SETS

Contiguous or spaced filter comb sets for use in Doppler or airborne radar systems for the frequency range from 80 kHz to 20 MHz.

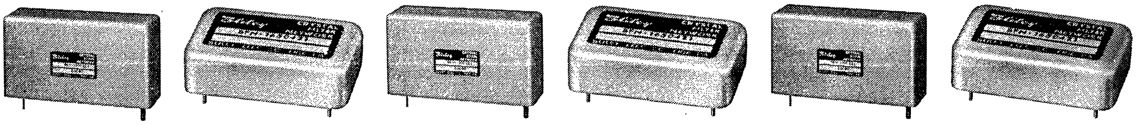
Typical contiguous filter bank for 50 filter units:



Center Frequency:	from 300,000 Hz to 304,900 Hz at 100 Hz intervals
3 db Bandwidth:	100 Hz
30 db Bandwidth:	700 Hz
Impedance in and out:	8k ohms
Insertion Loss:	3 db maximum
Ripple:	0.5 db maximum

TYPICAL SINGLE SIDEBAND FILTERS

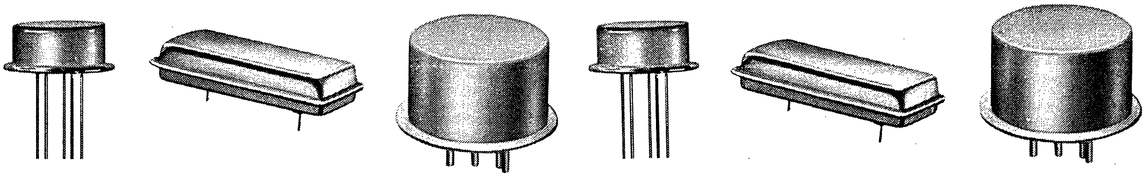
Type	Carrier Frequency	Carrier Attenuation	Sideband Attenuation	Bandwidth (3 db)	Max. Insertion Loss	Nominal Impedance (ohms)	Case Size (L x W x H in.)
BFN-0100U22	100 kHz	20 db	60 db at −300 Hz	+300 to +6000 Hz	10 db	8.2k	5⅜ x 3 x 2½
BFN-1650U21	1650 kHz	50 db	65 db at −200 Hz	+300 to +3000 Hz	3 db	12k	3⁵⁄₆₄ x 1⁷⁄₁₆ x 1½
BFN-1750L21	1750 kHz	25 db	50 db at +250 Hz	−250 to −2500 Hz	3 db	12k	2⁹⁄₁₆ x 1⁵⁄₁₆ x 1⁵⁄₁₆
BFN-9000U21	9000 kHz	25 db	60 db at −500 Hz	+300 to +3300 Hz	3 db	600	2⅜ x 1 x 1



MONOLITHIC CRYSTAL FILTERS

A monolithic filter consists of a quartz wafer with pairs of metal electrodes deposited on its major surfaces. These miniature devices are available in koldweld sealed cases such as TO-5, TO-8 and flatpack configurations.

Two and three pole monolithic designs are currently available for use as single filters or in cascade combinations. Bandwidths in the range of 0.01% to 0.1% are obtainable with reasonable economy at the present design level for center frequencies in the range 5 MHz to 20 MHz. Bliley monolithics can be supplied with Butterworth, Chebyshev, Gaussian or other characteristics to meet your requirements.



CRYSTAL DISCRIMINATORS

Crystal discriminators are readily available in a wide range of frequencies and exhibit many of the advantages of other quartz crystal products; namely, frequency stability with time and temperature, ability to withstand severe environmental conditions, and compact size. Typical characteristics are shown in following tabulation.

Type	Frequency	Peak-Peak Bandwidth (min.)	Linearity	Impedance (ohms)		Case Size (L x W x H in.)
				Source	Load	
BDN-11D21	10.7 MHz	5 kHz	4% ± 1 kHz	1k	100k	1¾ x 1¼ x ½
BDN-11D22	10.7 MHz	50 kHz	4% ± 10 kHz	10k	100k	1⅛ x 1⅛ x ¾
BDN-11D23	11.5 MHz	50 kHz	4% ± 10 kHz	390	100k	1¾ x 1¼ x ½
BDN-21D21	21.4 MHz	30 kHz	4% ± 6 kHz	500	100k	1⅛ x 1⅛ x ¾
BDN-21D23	21.4 MHz	80 kHz	10% ± 25 kHz	500	100k	1⅛ x 1⅛ x ¾

For further information call (814) 838-3571 or TWX 510-696-6886
BLILEY ELECTRIC COMPANY • ERIE/PENNSYLVANIA 16512
2545 W. GRANDVIEW BOULEVARD

if you buy quality

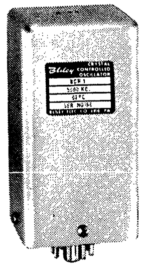
COMPONENT AND CRYSTAL OVENS

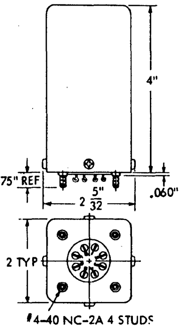
Standard oven designs in this group utilize all silicon transistors in the control circuitry. Oven types with the prefix BP are for proportional temperature control. Oven types with the prefix BC or BS utilize mercury thermostats. Detail specifications available on separate data sheets supplied on request.

COMPONENT OVENS

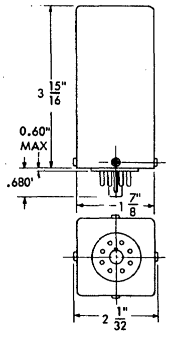
TYPE	BPO-12	BPO-13	BPOC	BPOC-1	BCR-4	BST-4	BPCO-30-1	BPCO-40-1	BPCO-31-1	BPCO-41-1
AMBIENT CONDITION	0°C to +60°C	0°C to +60°C	0°C to +60°C	0°C to +60°C	0°C to +65°C	0°C to +65°C	0°C to +65°C		0°C to +65°C	
STABILITY	±0.2°C	±0.2°C	±0.25°C	±0.25°C	±1°C	±1°C	±1°C		±1°C	
OVEN TEMPERATURE	70°C	70°C	70°C	70°C	75°C	75°C	75°C		75°C	
OVEN VOLTAGE	12 VDC	27 VDC	12 VDC	27 VDC	115VAC	27 VDC	27 VDC		12 VDC	
CAVITY SIZE	.960" diam. 2.375" long	.960" diameter 2.375" long	1⁷⁄₁₆" wide ¾" high 2½" long	1⁷⁄₁₆" wide ¾" high 2½" long	1.450" diam. 3" height	1.450" diam. 3" height	.25 cubic inches	.46 cubic inches	.25 cubic inches	.46 cubic inches

BCR-1



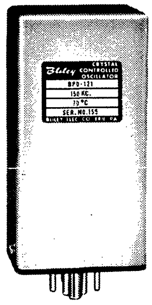

4"
.375" REF
.060"
2 5/32"
2 TYP
#4-40 NC-2A 4 STUDS

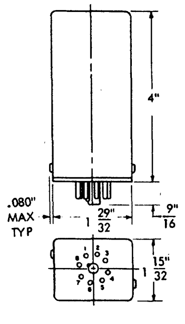
BCR-4 and BST-4


3 15/16"
0.60" MAX
.680"
1 7/8"
2 1/32"

BCR-1 and BST-1 Series

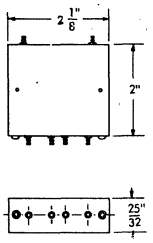
BPO-121



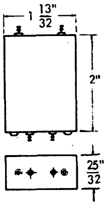

4"
.080" MAX TYP
1 29/32"
9/16"
1
2
3
4
5
6
7
8
1 15/32"

BPO Series

BPCO-3

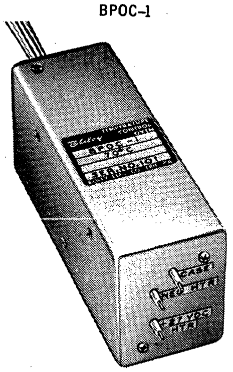


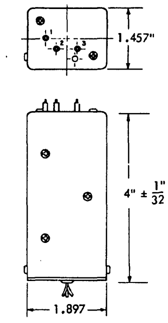
BPCO-2


1 13/32"
2"
25/32"

BPCO-3

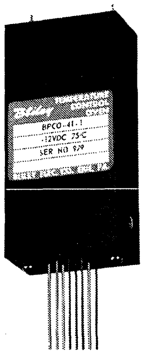
BPOC-1

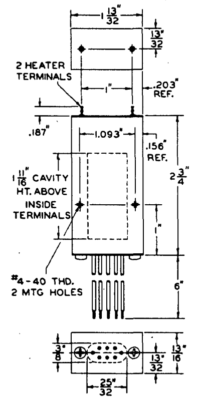

CASE
NEG HTR
+27 VDC HTR


1
2
3
1.457"
4" ± 1/32"
1.897

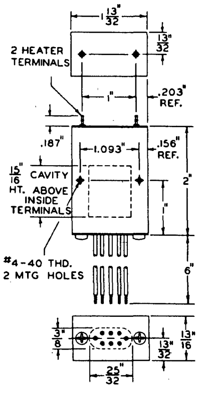
BPOC Series

BPCO-41-1




1 13/32"
13/32"
2 HEATER TERMINALS
1"
.203" REF.
.187"
1.093"
.156" REF.
1 11/16" CAVITY HT. ABOVE INSIDE TERMINALS
2 3/4"
1"
#4-40 THD. 2 MTG HOLES
6"
3/8"
13/32"
13/16"
25/32"

BPCO-41-1


1 13/32"
13/32"
2 HEATER TERMINALS
1"
.203" REF.
.187"
1.093"
.156" REF.
15/16" CAVITY HT. ABOVE INSIDE TERMINALS
2"
1"
#4-40 THD. 2 MTG HOLES
6"
3/8"
13/32"
13/16"
25/32"

BPCO-31-1

CRYSTAL OVENS

TYPE	FOR CRYSTAL TYPE	TEMPERATURE STABILITY		OVEN TEMP.	OVEN VOLTAGE
		Fixed Ambient	Range 0°C to 60°C		
BPO-121	BG7	±.01°C	±0.1°C	70°C	12VDC
BPO-131	BG7	±.01°C	±0.1°C	70°C	27VDC
BPCO-21	BH4 (2 units)	±.05°C	±0.5°C	75°C	12VDC
BPCO-2	BH4 (2 units)	±.05°C	±0.5°C	75°C	27VDC
BPCO-31	BH6 or B27	±.05°C	±0.5°C	75°C	12VDC
BPCO-3	BH6 or B27	±.05°C	±0.5°C	75°C	27VDC
BCR-1	BG61	±.02°C	±0.2°C	68°C	115VAC
BST-1	BG61	±.02°C	±0.2°C	68°C	27VDC

CTS KNIGHTS, INC.

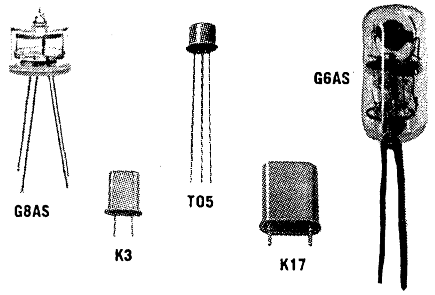
SPECIALISTS IN FREQUENCY MANAGEMENT

CRYSTALS

LET US SOLVE YOUR CRYSTAL PROBLEMS...

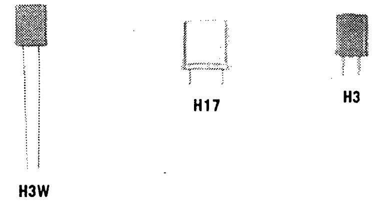
CTS Knights, Inc. offers a complete line of crystals in the frequency range of 1000 Hz to 200 MHz. Precision crystals with stabilities of 1 x 10^{-10} per day — high frequency crystals of all types including a new line of low cost coldweld units — low frequency crystals for all applications. CTS has the combination of high volume production capability and sophisticated engineering to economically meet any crystal requirement.

PRECISION CRYSTALS



TYPE	FREQUENCY RANGE	MODE	STABILITY VS. TIME	HOLDER
G8AS	5 MHz	Fifth OT	1 x 10^{-10}/day	Glass
G6AS	4.98-6.14 MHz	Fifth OT	5 x 10^{-10}/day	Glass
K17	2-20 MHz	Fund.	5 x 10^{-9}/day	Coldweld
	4-10 MHz	O.T.	1 x 10^{-9}/day	Coldweld
K3	6-20 MHz	Fund.	1 x 10^{-8}/day	Coldweld
	20-200 MHz	O.T.	1 x 10^{-8}/day	Coldweld
TO5	6-20 MHz	Fund.	1 x 10^{-8}/day	Coldweld
	20-200 MHz	O.T.	1 x 10^{-8}/day	Coldweld

HIGH FREQUENCY CRYSTALS



FREQUENCY RANGE	CUT/MODE	Rs (Ohms)	STABILITY VS. TEMP.	TEMPERATURE RANGE	HOLDER
1-5 MHz	AT-Fund.	500	±.005%	−55 to +105°C	H17, K17
4-20 MHz	AT-Fund.	150	±.004%	−55 to +105°C	H3, K3
20-60 MHz	AT-3rd	50	±.004%	−55 to +105°C	H3, K3
60-100 MHz	AT-5th	60	±.004%	−55 to +105°C	H3, K3
100-140 MHz	AT-7th	80	±.004%	−55 to +105°C	H3, K3
140-180 MHz	AT-9th	120	±.004%	−55 to +105°C	H3, K3

LOW FREQUENCY CRYSTALS

FREQUENCY RANGE	CUT/MODE	Rs (Ohms)	STABILITY VS. TEMP.	TEMPERATURE RANGE	HOLDER
1-4 kHz	J-Plate	200K	±.02%	−40 to +70°C	G9 Glass
4-10 kHz	J-Plate	125K	±.02%	−40 to +70°C	H17T
10-12 kHz	NT	125K	±.01%	−40 to +70°C	H17T2
12-16 kHz	NT	80K	±.01%	−40 to +70°C	H17T1
16-140 kHz	NT	40K	±.01%	−40 to +70°C	H17T
140-250 kHz	E-Plate	5K	±.02%	−40 to +70°C	H17T
180-1000 kHz	DT	5K	±.01%	−40 to +70°C	H17

Whatever your crystal needs may be, they can be furnished by CTS Knights, Inc. The illustrations and descriptions above portray a limited picture of the more popular types — let us quote on these and on more specialized requirements.

ORDERING INFORMATION: Place orders using the following address:
CTS Knights, Inc., 222 Reimann Avenue, Sandwich, Illinois 60548 • Telephone (815) 786-8411 • TWX 910-642-0860

CTS KNIGHTS, INC.

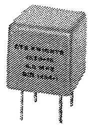
SPECIALISTS IN FREQUENCY MANAGEMENT

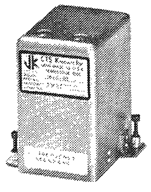
OSCILLATORS

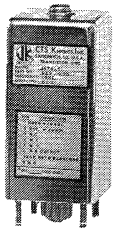
LET US SOLVE YOUR OSCILLATOR PROBLEMS...

CTS Knights, Inc. has the breadth of product line and the engineering depth to custom design an oscillator to your requirements. The best solution to your problem might be an uncompensated oscillator, an ovenized oscillator, a temperature compensated oscillator, a voltage controlled oscillator, a temperature compensated crystal, or some combination of these units — CTS Knights offers them all. CTS specializes in using in-depth engineering knowledge to custom design a unit specifically for your requirements.

OVENIZED CRYSTAL OSCILLATORS

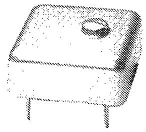

JKTO-16

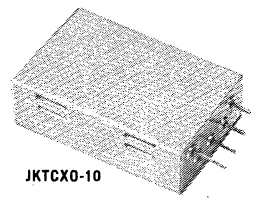

JKTO-83


JKTO-41

Type	Frequency Range	Stability vs Time	Stability vs Temperature	Oscillator Input	Oven Input	Size	Special Features
JKTO-16	5-20 MHz	1x10^{-6}/yr.	5x10^{-8}(0°C to +50°C)	5 VDC	28 V	1x1x1	
JKTO-30	1-10 MHz	5x10^{-8}/day	5x10^{-8}(−10°C to +55°C)	12 VDC	28 V, 115 V	2x2x4	Low Cost
JKTO-41	1-100 MHz	5x10^{-8}/day	3x10^{-8}(−40°C to +70°C)	28 VDC	28 V	2x2x4	
JKTO-56	4-6 MHz	1x10^{-9}/day	1x10^{-8}(−10°C to +60°C)	12 VDC	28 V	2x2x4	Low Power 2.5 watts
JKTO-83	1-6 MHz	1x10^{-9}/day	1x10^{-8}(−55°C to +70°C)	30 VDC	30 VDC	2½x2½x3	Fast Warmup

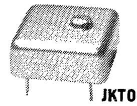
TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS

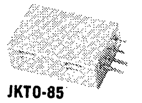

JKTCXO-8


JKTCXO-10

Type	Frequency Range	Stability vs Time	Stability vs Temperature	Oscillator Input	Size	Special Features
JKTCXO-2	3-5 MHZ	1x10^{-8}/wk	5x10^{-7}(−40°C to +70°C)	12-28 VDC	2x2x⅝	
JKTCXO-5	20-120 MHz	1.2x10^{-5}/yr	1x10^{-6}(0°C to +70°C)	12 VDC	2x2x1	
JKTCXO-7	3-10 MHz	1x10^{-6}/yr	1x10^{-6}(0°C to +70°C)	12 VDC	1½x1½x¾	
JKTCXO-8	25 KHz-20 MHz	1x10^{-6}/yr	2x10^{-6}(−55°C to +85°C)	12 VDC	2x2x⅝	
JKTCXO-10	3-5 MHz	1x10^{-6}/yr	2x10^{-6}(−40°C to +70°C)	8 VDC	1x1½x½	Low Power (12 mw)

VOLTAGE CONTROLLED CRYSTAL OSCILLATORS

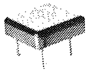

JKTO-86


JKTO-85

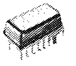
Type	Frequency Range	Modulation Input	Deviation	Oscillator Input	Size	Special Features
JKTO-85	17.5 to 22.5 MHz	±2VPP DC to 20 KHz	±20 KHz	8 VDC	1x1½x½	20mw power
JKTO-86	5 to 30 MHz	±2VPP DC to 20 KHz	±1000 ppm	12 VDC	2x2x¾	

CRYSTAL CLOCK OSCILLATORS

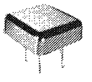
JKTO-78

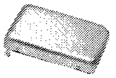


JKTO-73



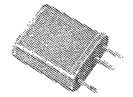
JKTO-79


JKTO-77


JKTO-72

Type	Frequency Range	Stability vs Time	Stability vs Temperature	Oscillator Input	Size	Special Features
JKTO-72	2 KHz-20 MHz	6x10^{-6}/yr	50ppm(0°C to +70°)	5 VDC	1½x2⅜x²⁵⁄₆₄	Low Cost
JKTO-73	10 MHz	3x10^{-6}/yr	50ppm(0°C to +70°)	5 VDC	⁶¹⁄₆₄x¹⁷⁄₃₂x²³⁄₆₄ High	DIP
JKTO-77	5-20 MHz	5x10^{-6}/yr	100ppm(−55°C to +125°C) 50ppm(0°C to +70°C)	5 VDC	1x1x⅜	TTL Output
JKTO-78	1.8-50 MHz	5x10^{-6}/yr	100ppm(−55°C to +125°C) 50ppm(0°C to +70°C)	5 VDC	1½x1½x²⁷⁄₆₄	TTL Output
JKTO-79	156 KHz-25 MHz	5x10^{-6}/yr	100ppm(−55°C to +105°C)	5 VDC	TO-8 Can	TTL Output

TEMPERATURE COMPENSATED CRYSTALS



Type	Frequency Range	Stability vs Time	Stability vs Temperature	Oscillator Input	Size	Special Features
TCX	6-25 MHz	3x10^{-6}/yr	5ppm(−30°C to +60°C)	10 VDC	HC-6/U	3 Lead

The illustrations and descriptions above illustrate a limited number of our standard designs. Contact us for your oscillator requirements.

ORDERING INFORMATION: Place orders using the following address:
CTS Knights, Inc., 222 Reimann Avenue, Sandwich, Illinois 60548 • Telephone (815) 786-8411 • TWX 910-642-0860

CTS KNIGHTS, INC.

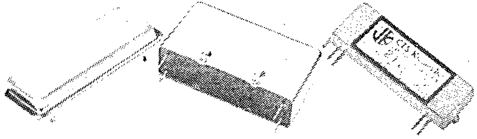
SPECIALISTS IN FREQUENCY MANAGEMENT

FILTERS

LET US SOLVE YOUR FILTER PROBLEMS...

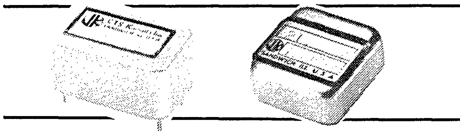
CTS has total capability in crystal filters. Symmetrical and asymmetrical bandpass, band reject and discriminators from 1 KHz to 100 MHz are available. Our experienced design engineers will use monolithic filter crystals in their computer-aided designs whenever desirable. Give us an opportunity to custom design a filter to your requirements.

CRYSTAL FILTERS



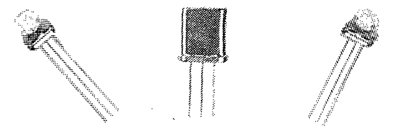
Part Number	Center Frequency	3 DB Bandwidth	Shape Factor	No. Poles	Insertion Loss	Max. Ripple	Nominal Impedance	Ultimate Attenuation	Package
961-0160	10.7 MHz	240 KHz Min.	5/1	4	5 db Max.	1.5 db	500 ohms	50 db	2.0″x1.0″x.6″
961-0253	21.4 MHz	30 KHz Min.	1.8/1	8	2 db Max.	1.0 db	2000 ohms	100 db	1.75″x.6″x.22″
961-0217	21.4 MHz	25 KHz Min.	1.8/1	8	2 db Max.	1.0 db	3000 ohms	80 db	1.6″x.73″x.35″

CRYSTAL DISCRIMINATORS



Part Number	Center Frequency	Band-width	Distor-tion	Voltage Slope	Crossover Stability	Video Freq. Response	Z in, Z out	Package
964-0015	21.4 MHz	100 KHz	2% Max.	35mv/KHz	±1 KHz Max.	DC-75 KHz	2K ohms 100K ohms	1.03″x1.03″x.4″
964-0014	17.0 MHz	65 KHz	2% Max.	200mv/KHz	±1 KHz Max.	DC-75 KHz	50 ohms 300K ohms	1.6″x.95″x.75″

MONOLITHIC FILTER CRYSTALS

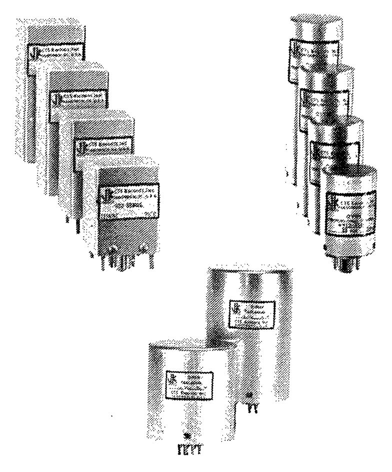


CTS is a leader in the high volume production of monolithic dual coupled resonators. We have the capability to design and manufacture dual coupled resonators to fulfill your specific requirement. Our experienced engineering staff will assist you in tailoring dual coupled resonators that can be combined to form 4, 6, or 8 pole filters. This building block approach allows you to take advantage of the low cost and small size of the dual coupled resonator, and also gives the overall advantage of building your own filter in-house. For further information ask for our publication, "Application Notes on Monolithic Coupled Resonators" or contact us directly for help with your filter problems.

OVENS

LET US SOLVE YOUR OVEN PROBLEMS...

CTS Knights offers a complete line of thermostat controlled and proportional controlled ovens for commercial and/or military applications. If a standard oven does not fit your application, our experience with precise temperature control provides us with excellent capability to design custom ovens for your special application.



Series	Group	External Size (Seated Height)	Cavity Size	Calibration Temperature	Cycling @ 25°C	Voltage	Mounting
905	THERM	$1\frac{5}{16}$″ x $1\frac{3}{4}$″	$1\frac{1}{64}$″ ID x $\frac{13}{16}$″	65° to 85°C ±2.5°C	±.1°C	6.3 to 26V AC/DC, 115V AC	Octal Plug-in
906	THERM	$1\frac{5}{16}$″ x $2\frac{9}{16}$″	$1\frac{1}{64}$″ ID x $1\frac{5}{8}$″	65° to 85°C ±2.5°C	±.1°C	6.3 to 26V AC/DC, 115V AC	Octal Plug-in
915	THERM	$1\frac{33}{64}$″ x $1\frac{19}{64}$″	10 HC-18/U Crystals	65° to 85°C ±3°C	±.5°C	6.3 to 26V AC/DC, 115V AC	Two 2/56 Screws
916	THERM	$1\frac{5}{8}$″ x $2\frac{21}{32}$″	$1\frac{21}{64}$″ ID x $1\frac{3}{8}$″	65° to 85°C ±2.5°C	±.1°C	13, 26 AC/DC 115V AC	Octal Plug-in
918	THERM	$2\frac{1}{4}$″ x $3\frac{9}{16}$″	$1\frac{11}{16}$″ ID x $2\frac{1}{2}$″	65° to 85°C ±3°C	±.05°C	26V AC/DC 115V AC	Octal Plug-in
919	THERM	$2\frac{1}{4}$″ x $4\frac{9}{16}$″	$1\frac{11}{16}$″ ID x $3\frac{1}{2}$″	65° to 85°C ±3°C	±.05°C	26V AC/DC 115V AC	Octal Plug-in
923	P.C.	2″ x 2″ x 1″	$1\frac{29}{64}$″ sq. x $\frac{29}{64}$″	60°C to +100°C ±2°C		24 to 32V DC	Pins
927	P.C.	$1\frac{9}{16}$″ x $1\frac{7}{8}$″ x $4\frac{5}{16}$″	$1\frac{1}{32}$″ ID x $2\frac{55}{64}$″	65° to 85°C ±1°C		24 to 32V DC	Octal Plug-in
930	P.C.	2″ x 2″ x $4\frac{1}{8}$″	$1\frac{17}{64}$″ Sq. x $2\frac{23}{32}$″	60°C to +100°C ±2°C		12 to 36V DC	Octal Plug-in
932	P.C.	$1\frac{7}{16}$″ Sq. x $2\frac{1}{4}$″ to $4\frac{3}{4}$″	$1\frac{1}{32}$″ ID x $1\frac{17}{64}$″ to $3\frac{23}{64}$″	+40°C to +100°C ±3°C		12 to 115V AC/DC	Octal Plug-in
947	THERM	$3\frac{5}{16}$″ x $3\frac{1}{2}$″	$2\frac{15}{32}$″ ID x $2\frac{13}{32}$″	65° to 85°C ±3°C	±.05°C	26V AC/DC 115V AC	Octal Plug-in
948	THERM	$3\frac{5}{16}$″ x $4\frac{7}{8}$″	$2\frac{15}{32}$″ ID x $3\frac{27}{32}$″	65° to 85°C ±3°C	±.05°C	26V AC/DC 115V AC	Octal Plug-in
952	P.C.	$1\frac{5}{8}$″ x $2\frac{5}{16}$″ to $4\frac{17}{32}$″	$1\frac{1}{32}$″ ID x $1\frac{1}{8}$″ to $3\frac{21}{64}$″	+35°C to +75°C ±1°C		28V DC	Octal Plug-in

Contact us for your crystal filter and component oven requirements.

Illustrations and descriptions above illustrate a limited number of our standard designs.

ORDERING INFORMATION: Place orders using the following address:

CTS Knights, Inc., 222 Reimann Avenue, Sandwich, Illinois 60548 • Telephone (815) 786-8411 • TWX 910-642-0860

IC COMPATIBLE OSCILLATORS

Connor-Winfield's IC compatible oscillators are designed primarily for use with IC systems and are compatible with the 7400 series or other IC devices. These crystal oscillators and RC oscillators are not affected by magnetic fields or mounting position and are resistant to shock, vibration and humidity. Their operation is silent. Each RC oscillator is custom compensated over the operating temperature range.

SQUARE

IC Compatible Square Wave Oscillators For FREQUENCY TOLERANCE and TEMPERATURE RANGE see TABLE A

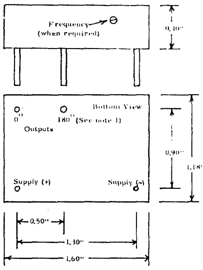
Output	Model	Type	Frequencies Available	Frequency Adjust.	Supply Voltage	Supply Current	Size	Terminal	Weight	Unit Price
Logic zero <0.4V, I_{sink} 16ma Logic one >2.4V into 200Ω to 2KΩ load Duty cycle 50%, risetime <50ns Amplitude stability ±5% with fixed supply voltage	IC5A1 thru J1	Xtal	0.1Hz to 400kHz	Optional	5Vdc ±10%	15ma to 100ma	Dwg. A	Gold Plated Solder Pins	21gm (0.7 oz.) Nominal	$58 to $208
	IC5K1 thru Y1		>400kHz to 10MHz		5Vdc ±5%					$58 to $68
	L117A	RC	1Hz to 20kHz	Screw Adjust		25ma Nominal				$63 to $73
	IC5K3 IC5R3 IC5Y3	Xtal	0.1Hz to 10MHz	No		<15ma to 250ma	Dwg. B		13gm (0.4 oz.) Nominal	$93 to $233
Logic zero <0.4V, I_{sink} 2ma Logic one >2.4V into 600Ω to 4KΩ load Duty cycle 50%, risetime <50ns Amplitude stability ±5% with fixed supply voltage	IC5K4 IC5R4 IC5Y4					<5ma to 50ma				$113 to $253
≤200kHz, amplitude 10vpp nominal into a 10KΩ load >200kHz, amplitude 8Vpp nominal into a 2KΩ load ≤200kHz, duty cycle 50% >200kHz, single ended duty cycle 50% ±10% Amplitude stability ±5% with fixed supply voltage	L120A	Xtal	100kHz to 10MHz	Optional	12Vdc ±10%	15ma Nominal	Dwg. A		21gm (0.7 oz.) Nominal	$58 to $73
Amplitude 10Vpp nominal into a 10KΩ load Duty cycle 50%, risetime 1μs nominal Amplitude stability ±5% with fixed supply voltage	L118A	RC	1Hz to 20kHz	Screw Adjust	12Vdc ±5%	10ma Nominal				$58

OTHER SUPPLY VOLTAGES Many units are also available to operate from a non-standard supply voltage. Phone or write.

Table A

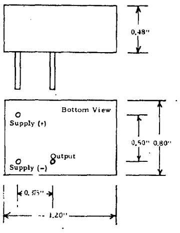
FREQUENCY TOLERANCE and TEMPERATURE RANGE

Model	Frequency Tolerance	Temperature Range Degrees C
IC5K1 IC5K3 IC5K4	±.001%	+20 to +40
IC5A1	±.002%	+20 to +40
IC5N1	±.0025%	+10 to +40
IC5R1 IC5R3 IC5R4	±.0025%	0 to +50
IC5S1	±.003%	0 to +50
IC5T1	±.003%	0 to +65
IC5U1	±.004%	0 to +65
IC5X1	±.004%	−25 to +50
IC5B1	±.005%	0 to +50
IC5C1	±.005%	0 to +65
IC5Y1 IC5Y3 IC5Y4	±.005%	−25 to +65
L120A	±.005%	0 to +50
IC5D1	±.01%	0 to +65
IC5E1	±.01%	−25 to +70
IC5F1	±.02%	−25 to +70
IC5G1	±.02%	−55 to +70
IC5H1	±.05%	−55 to +70
IC5J1	±.05%	−55 to +125
L117A L118A	±.05%	+15 to +35
	±0.1%	0 to +50
	±0.25%	0 to +65
	±0.5%	−25 to +65

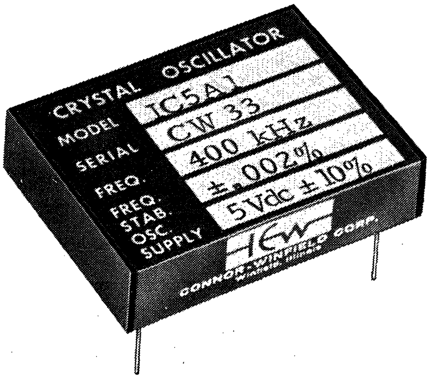

Frequency (when required)
0.10"
Bottom View
0°
180° (See note 1)
Outputs
Supply (+)
Supply (−)
0.90"
1.18"
0.50"
1.30"
1.60"

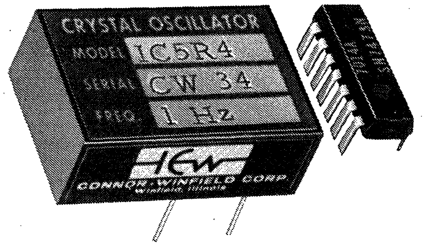
[1] Standard on the models L118A and the L120A below 200kHz. It is optional on the other models.

Drawing A


0.48"
Bottom View
Supply (+)
Supply (−)
Output
0.50"
0.80"
0.375"
1.20"

Drawing B


CRYSTAL OSCILLATOR
MODEL IC5A1
SERIAL CW 33
FREQ. 400 kHz
FREQ. STAB. ±.002%
OSC. SUPPLY 5Vdc ±10%
CONNOR-WINFIELD CORP.


CRYSTAL OSCILLATOR
MODEL IC5R4
SERIAL CW 34
FREQ. 1 Hz
CONNOR-WINFIELD CORP.

VARIATIONS

Most square wave models are available with gating pin, multiple frequency outputs, mounting studs or inserts, and remote or internal frequency adjustment at small extra charge. Internal frequency adjustment is standard on the L117A and L118A.

DELIVERY OF MOST UNITS STOCK TO 2 WEEKS.

CONNOR-WINFIELD CORPORATION

PHONE (312) 231-5270

WINFIELD, ILLINOIS 60190

PULSE

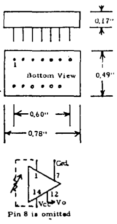
IC Compatible Pulse Oscillators

For FREQUENCY TOLERANCE and TEMPERATURE RANGE see TABLE B

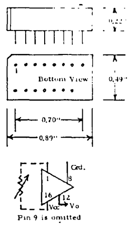
Output	Model	Type	Frequencies Available	Frequency Adjust.	Supply Voltage	Supply Current	Size	Terminal	Weight	Unit Price
Negative pulse, risetime 0.4 μs nominal duration 60μs nominal Amplitude 2.4Vp nominal into a 2KΩ load	L14A	RC	100Hz to 50kHz	External	5Vdc ±5%	2ma Nominal	Dwg. C	14 Pin DIL Package	1.9gm (.06 oz.) Nominal	$28
	L16A						Dwg. D	16 Pin DIL Package	2.5gm (.08 oz.) Nominal	$53
Negative pulse, duration 20 to 100μs, risetime 1μs nominal Amplitude 4Vp nominal into a 1KΩ load Amplitude stability ±5% with fixed supply voltage	L79A		1Hz to 50kHz	Screw Adjust		1ma Nominal	Dwg. E	Gold Plated Solder Pins	13gm (0.4 oz.) Nominal	$48
Negative pulse, duration 20 to 100μs, risetime 1μs nominal Amplitude 10Vp nominal into a 10KΩ load Amplitude stability ±5% with fixed supply voltage	L80A				12Vdc ±5%					$43

Table B
FREQUENCY TOLERANCE and TEMPERATURE RANGE

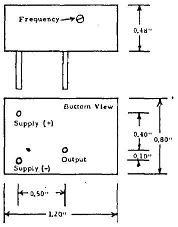
Model	Frequency Tolerance	Temperature Range Degrees C
L79A	±.05%	+15 to +35
L80A	±0.1%	0 to +50
L16A	±0.1%	+20 to +40
	±0.25%	0 to +50
L79A	±0.25%	0 to +65
L80A	±0.5%	−25 to +65
L14A	±1.0%	0 to +50



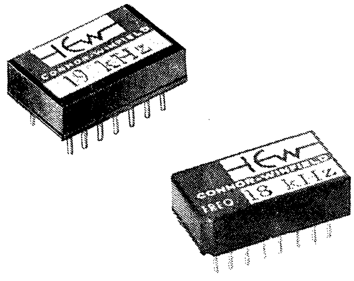
Drawing C



Drawing D



Drawing E



SINE

IC Compatible Sine Wave Oscillators

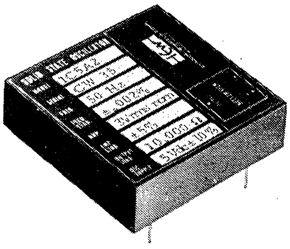
For FREQUENCY TOLERANCE and TEMPERATURE RANGE see TABLE C

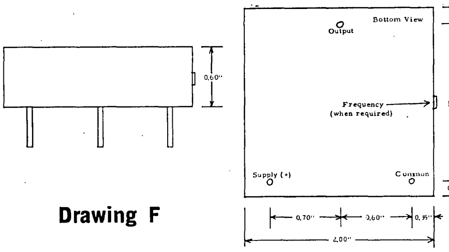
Output	Model	Type	Frequencies Available	Frequency Adjust.	Supply Voltage	Supply Current	Size	Terminal	Weight	Unit Price
Amplitude 3V$_{rms}$ nominal into a 10KΩ load Harmonic distortion <5% Amplitude stability ±5% with fixed supply voltage	IC5A2 thru J2	Xtal	50Hz to 400kHz	Optional	5Vdc ±10%	15ma to 100ma	Dwg. F	Gold Plated Solder Pins	70gm (2.5 oz.) Nominal	$93 to $188
	L199B	RC	50Hz to 20kHz	Screw Adjust	5Vdc ±5%	25ma Nominal				$83
Amplitude 5V$_{rms}$ nominal into a 10KΩ load Harmonic distortion <5% Amplitude stability ±5% with fixed supply voltage	L220A thru J	Xtal	200Hz to 500kHz	Optional	12Vdc ±10%	15ma to 100ma				$93 to $188
	L200B	RC	50Hz to 20kHz	Screw Adjust	12Vdc ±5%	15ma Nominal				$78

Table C FREQUENCY TOLERANCE and TEMPERATURE RANGE

Model	Frequency Tolerance	Temperature Range Degrees C
IC5A2, L220A	±.002%	+20 to +40
IC5B2, L220B	±.005%	0 to +50
IC5C2, L220C	±.005%	0 to +65
IC5D2, L220D	±.01%	0 to +65
IC5E2, L220E	±.01%	−25 to +70
IC5F2, L220F	±.02%	−25 to +70
IC5G2, L220G	±.02%	−55 to +70
IC5H2, L220H	±.05%	−55 to +70
IC5J2, L220J	±.05%	−55 to +85
L199B L200B	±.05%	+15 to +35
	±0.1%	0 to +50
	±0.25%	0 to +65
	±0.5%	−25 to +65

AC VOLTAGE STANDARDS The units shown on this page are available with ±0.1% amplitude stability and sine wave distortion <1% for use as an AC Voltage Reference. Phone or write for further information.





Drawing F

VARIATIONS

Most sine wave models are available with amplitude adjustment, phase synchronization pin, gating pin, simultaneous square and sine wave output, and mounting studs or inserts at a small extra charge. Models IC5A2, IC5B2, L220A and L220B are available with an internal frequency adjustment.

Models L199B and L200B are available with an external frequency adjustment. Models L220A thru J and the L200B are available with a 0.7 V$_{rms}$ (1 mw) nominal output into a 600Ω load.

PLUG-IN CASES

All models shown are also available in older style plug-in cases with octal plug or solder hooks.

CONNOR-WINFIELD CORPORATION

PHONE (312) 231-5270 **WINFIELD, ILLINOIS 60190**

International Frequency Control Specialists.

International buyers specify Croven's highly reliable Coldweld Crystals for long term frequency stability imperative to commercial and military uses in communications and transportation.

Croven's expanding Crystal Filter capability now offers precision symmetrical bandpass filters of the Butterworth and non-zero Chebyshev types, both conventional and monolithic.

Skilled hands, plus our Government approved environmental test lab, and attention to your requirements have put Croven on Q.P.L. (Qualified Products List) in countries around the world.

May we help you?

croven LIMITED

ALL U.S.
SHIPMENTS
F.O.B. BUFFALO, N.Y.

We clear Customs & Pay
all Duties

500 Beech Street, Whitby, Ontario, Canada
Telephone (416) 668-3324 TWX 610-384-2750

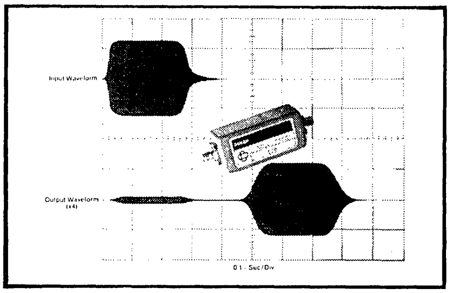
Affiliated with
OVENAIRE INC., CHARLOTTESVILLE, VIRGINIA

Kidde

DAMON...specialists in frequency control devices.

Surface-Wave Delay Lines

Damon Surface-Wave Delay Lines transfer the signal across the surface instead of through the body as in conventional bulk-wave delay lines. Result: smaller size, lower cost, superior performance over a 30 MHz to 300 MHz range. They consist of coupled transducer arrays accurately spaced on a lithium niobate or quartz substrate, using precision photo-etching techniques.

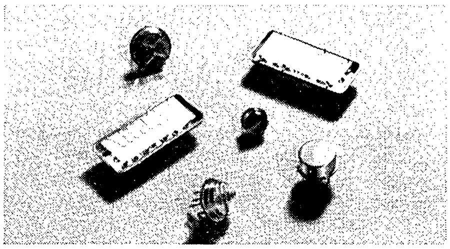


RANGE OF PARAMETERS:

Frequency Range	30 MHz - 300 MHz
Time Delay Range	0.5 microsecs. — 10 microsecs.
Bandwidth at —3 dB	3% - 30% of Center Frequency
Insertion Loss	10 - 20 dB
Spurious Responses	25 - 30 dB below desired response
Environment	Full military temperature, shock, vibration available
Typical Size	Less than one cubic inch

Monolithic Crystal Filters

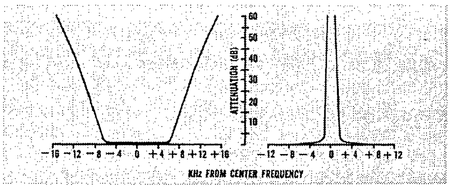
Damon Monolithic Filters utilize a single quartz plate for multiple resonators and the coupling medium between them. Advantages over conventional crystal filters include smaller size, superior stability, and lower cost. Available in a wide variety of computer-assisted designs from Chebyshev to Gaussian characteristics and from 2 to 8 poles.



Center Frequency	3 - 30 MHz
3 dB Bandwidth	0.3 - 30 KHz
No. of Coupled Resonators	2 - 8
Insertion Loss	1 - 6 dB
Ripple	0.5 dB max
Terminations	50 ohms to 20 kilohms
Size	TO-5, TO-8, or Flat-Pack

Band-Pass/Reject Crystal Filters

A wide variety of conventional crystal filters are produced at Damon Engineering. Standards designs such as Butterworth, Chebyshev, Gaussian, Bessel, and Legendre, as well as custom tailored designs are available.

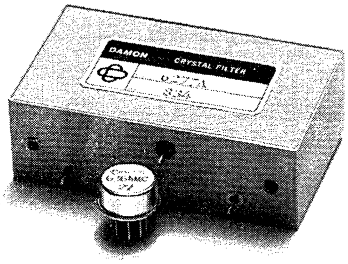


RANGE OF PARAMETERS:

Center Frequency	10 KHz - 75 MHz
Bandwidth	.01% - 3% of C. F.
Phase Linearity	± 5%
Transient Overshoot	40 dB down
Shape Factor	down to 1.4:1
Differential Phase Shift	±2°
Group Delay Uniformity	±5%

Gaussian Crystal Filters

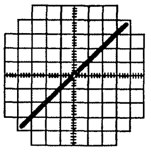
Gaussian Crystal Filters of either conventional or monolithic design. Useful in FM communications or radar systems where flat time delay is required. In a coherent pulsed radar, it can minimize return-pulse overshoot. Eliminates ringing problems in swept spectrum analysis. Available in 2 to 6 pole designs.

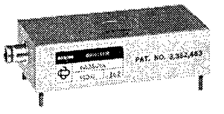


Center Frequency	
Conventional	100 KHz - 35 MHz
Monolithic	3 - 30 MHz
3 dB Bandwidth	100 Hz - 30 KHz
Shape Factor, 30 dB to 3 dB	3:1 to 7:1
Ringing, Pulse or Impulse	25 - 40 dB down
No. of Poles	
Conventional	2 - 6
Monolithic	2 - 4
Volume	
Conventional	1 - 6 cu. in.
Monolithic	0.016 - 0.4 cu. in.

VCXO's — 1 KHz to 500 MHz

Damon VCXO's provide high stability over a broad range of center frequencies. An optional square wave or pulse output signal compatible with I. C. logic circuits is available.

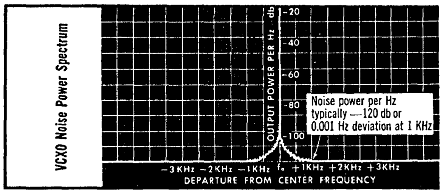




Center Frequency	1 KHz to 500 MHz
Deviation	.01% to 0.2% of Center Frequency
Linearity	1% to 2% of Peak Deviation
Frequency Stability	1% of Peak Deviation over 0° to 50°C temp. range

Low Noise VCXO's

Damon low noise miniaturized VCXO's are all solid state quartz crystal stable oscillators whose frequencies can be varied linearly by an external DC or AC modulating signal. Only a source of power and control signal are required ... no auxiliary compensating circuitry.



TYPICAL CHARACTERISTICS:

Center Frequency	10.000 MHz ±1 KHz
Deviation	±10 KHz
Linearity	±1%
Modulation Rate	Flat to 4 KHz
Output Power	>1 MW

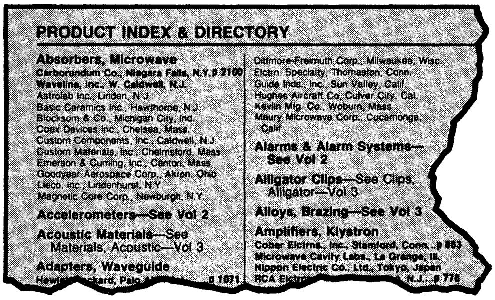
Write for technical bulletins.
Electronics Division, Damon Corporation
115 Fourth Avenue, Needham, Mass. 02194
(617) 449-0800

DAMON

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y. p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N J
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass
Emerson & Cuming, Inc., Canton, Mass
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.
Accelerometers—See Vol 2
Acoustic Materials—See Materials, Acoustic—Vol 3
Adapters, Waveguide
Hewl ckard, Palo p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co., Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Alarms & Alarm Systems—See Vol 2
Alligator Clips—See Clips, Alligator—Vol 3
Alloys, Brazing—See Vol 3
Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. .p 883
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctr N.J. .p 778

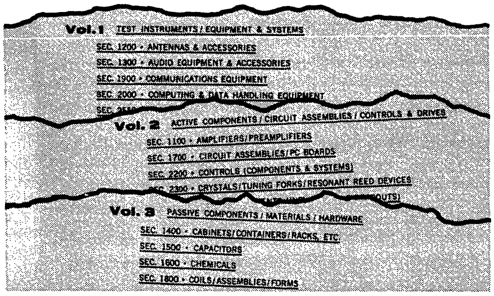
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT
Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES
Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in eem are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

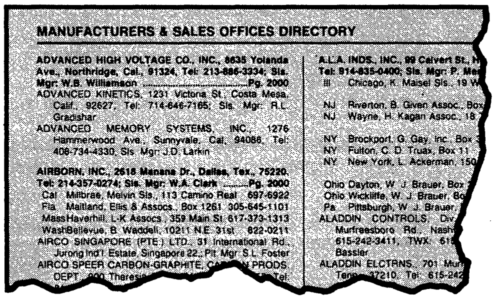
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



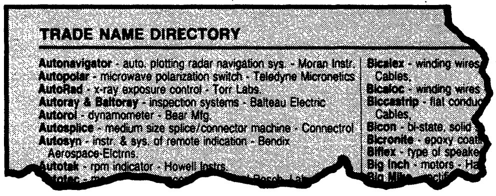
MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal. 94086, Tel: 408-734-4330, Sls. Mgr: J.D. Larkin
AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St. 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE.) LTD., 31 International Rd., Jurong Ind'l Estate, Singapore 22,; Plt. Mgr: S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C N PRODS. DEPT. Theres Tel:
A.L.A. INDS., INC., 99 Calvert St.,
Tel: 914-835-0400; Sls. Mgr: P.
Ill Chicago, K. Maisel Sls., 19
NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18
NY Brockport, G. Gay, Inc., Box
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150
Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer,
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-3411, TWX 61 Bassler
ALADDIN ELCTRNS., 701 Mur Tenn 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires Cables,
Bicaloc - winding wires
Biccastrip - flat condu Cables,
Bicon - bi-state, solid
Bicronite - epoxy coat
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

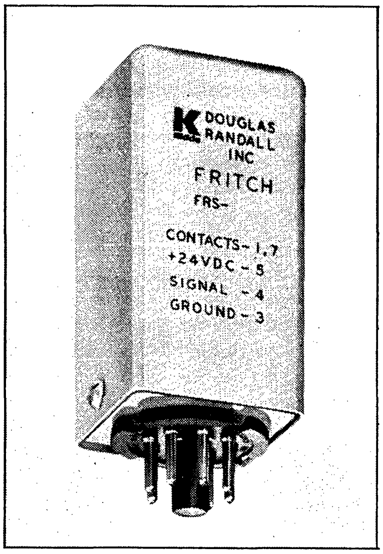
Douglas Randall

DIVISION OF WALTER KIDDE & COMPANY, INC. • 6 PAWCATUCK AVE., PAWCATUCK, CONN. 02891 • (203) 599-1750

Kidde

MODULAR TONE CONTROLS

FRITCH®: FREQUENCY RESPONSIVE SWITCH



- **Broad Frequency Range** — Preset to any frequency from 7 Hz to 100 KHz
- **Low Signal Power**—As low as 40 mv into 100,000 ohms, standard 1 VRMS
- **Fast Response Time** — To 75 Operations per second
- **Shock & Vibration Resistance** — Solid state circuitry — mountable in any position
- **Wide Variety of Outputs** — Solid State or Reed Relay from Form 1A to 2C; Time delays to 15 minutes; Latching reed relays or flip flops
- **Low Power drain** — Requires only .012A @ 12V DC

MATCHING OSCILLATORS—Single, Double or Triple Tone; 1 VRMS Output; Wide choice of Frequencies - 5 Hz to 100 KHz

Power Supplies — Primary - 117 VAC; Output - 24 VDC, .050A continuous

SPECIAL SPEED CONTROLS — Accuracy ±1% - Temperature Range 0°C to 75°C.

®Registered Trade Mark of Douglas Randall Frequency Responsive Switch

Douglas Randall offers a complete line of tone controls, available with plug in headers for octal sockets or with terminals for Printed Circuit board mounting. In addition, assemblies of Fritches® and Oscillators can be made for complete signal systems. The wide range of frequencies available, low power requirement and fast operating times make these units ideal for central station alarms, TOUCH-TONE transmission and decoding, speed controls and telemetry. In addition to the above units, the following accessories are also available in modular form.

ACCESSORY DEVICES

MODEL FA-1 DRIVER AMPLIFIER AND COUPLING NETWORK

Designed to couple tone signals to telephone lines the Model FA-1 provides a variable gain (0-30 db) and can drive a 600 ohm balanced telephone line at 0 dbm. Clipping circuits eliminate excessive signals. The unit includes a balanced line transformer and coupling capacitors. Output impedance is 600 ohms. Frequency response is 200 Hz to 3800 Hz.

MODEL FA-2 PASSIVE MIXER

A resistive summing network for use with the Model FA-1. Can accept up to six tone oscillator inputs and provide a single output.

MODEL FA-3 RECEIVER AMPLIFIER AND COUPLING NETWORK

Provides up to 20 db gain for signals from balanced telephone lines. Includes isolation transformer to bridge telephone line and D.C. blocking capacitor. Frequency response: 200 Hz to 3800 Hz. Output impedance 600 ohms, single ended. Requires 24V DC @ .012A.

MODEL FA-4 AGC AMPLIFIER

Maintains constant output level of 0 dbm ±2 db from any signal between 40 dbm and +10 dbm. Input impedance 50K ohms. Output impedance 600 ohms. Frequency Response: 250 Hz to 10 KHz. Requires 24V DC @ .025A.

MODEL FA-5 TONE FILTERS

For use where separation of signal tones is required. Frequencies from 10 Hz to 10KHz. Input impedance 10K ohms. Output impedance 600 ohms. Typical bandpass levels: −3 db at ±3% fo; −20 db @ ±25% fo.

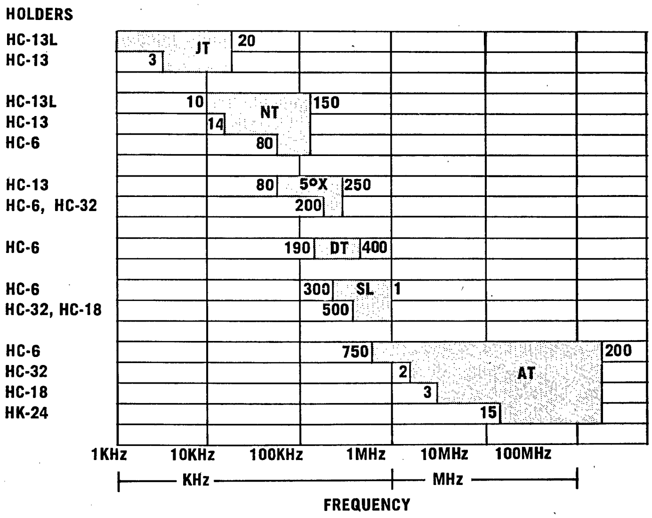
ERIE
TECHNOLOGICAL
PRODUCTS, INC.

Erie Frequency Control
Division of Erie Technological Products, Inc.

453 Lincoln Street • Carlisle, Pennsylvania 17013
Phone (717) 249-2232 • Telex 084-2328

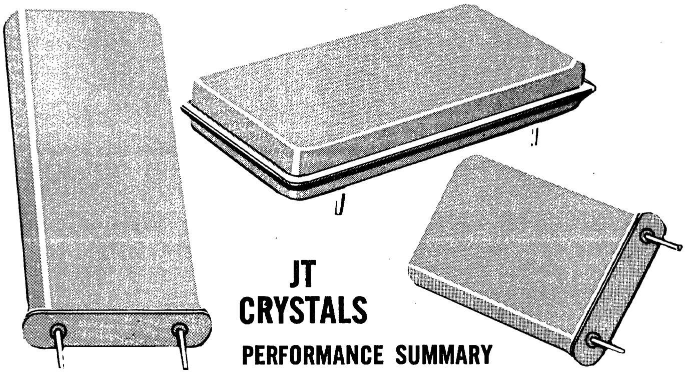
QUARTZ CRYSTALS

MAJOR CRYSTAL TYPES—FREQUENCY vs. HOLDERS



The JT Cut and the Reverse JT manufactured by Erie Frequency Control covers the frequency range from 400 Hz to 20 KHz providing low resonant frequencies and a small temperature coefficient making this product extremely important to the stability of audio frequency controls. Crystals are manufactured to full compliance with CR-88A/U specifications covering this frequency range.

Erie is proud that one of the predecessor firms to the Erie Frequency Control Division was Hill Electronics, Inc., with specialized capabilities in the manufacture of JT crystals, both for their own use in single and very narrow multiple frequency filters, stable regulation of sonar frequency oscillators and for use in military communication gear. Erie believes it is the leading producer of audio frequency crystals. Many thousands of these units have been made for military as well as tight commercial requirements. Erie has made over 100,000 units in the 4.000 KHz to 4.4057 KHz range alone and has unique capabilities in their application to filter design.



JT CRYSTALS

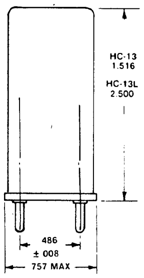
PERFORMANCE SUMMARY

General — A length thickness flexure type crystal, manufactured by Duplexing two 5° x cut crystals into one bar.

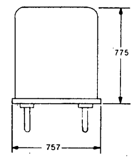
Frequency Range	400 Hz - 3 KHz	3 KHz - 20 KHz
Holder Type	HC 13 Long	HC 13/U
Height	2½″	1½″
Seal	Solder	Solder
Type Coldweld	Not Available	CW 13

Nominal Frequency Tolerance	±.015% −40°C to +70°C
Best Frequency Tolerance	±.010% −40°C to +70°C
Zero Temperature Coefficient	25°C
Resistance	See graph
Q Range	25000
Aging	≤ 1 x 10^6/day initial and ≤ 2 x 10^7/day after 3 months.

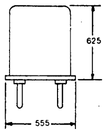
CRYSTAL HOLDERS



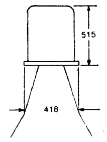
HC-13
1 KHz - 250 KHz
PIN DIA. .050
SPACING .486
THICKNESS .350



HC-6
80 KHz - 200 MHz
PIN DIA. .050
SPACING .486
THICKNESS .350

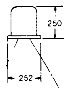


HC-32
200 KHz - 1 MHz
2 MHz - 200 MHz
PIN DIA. .040
THICKNESS .225
SPACING .275



Variations in lead length, diameter, ground pins and mounting available in all holder sizes upon request.

HC-25/HC-18
500 KHz - 1 MHz
3 MHz - 200 MHz
LEAD DIA. .017
SPACING .192
THICKNESS .166

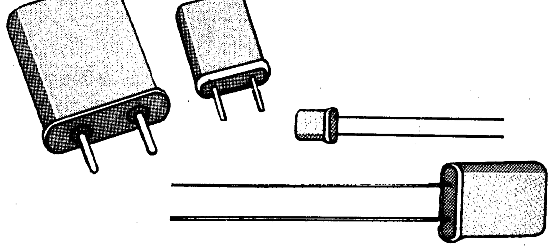


HK-24
15 MHz - 200 MHz
LEAD DIA. .015
SPACING .080
THICKNESS .124

PERFORMANCE SUMMARY

General — A Thickness — shear type crystal, manufactured by controlled lapping of miniature substrates to exact thickness dimensions.

AT CRYSTALS

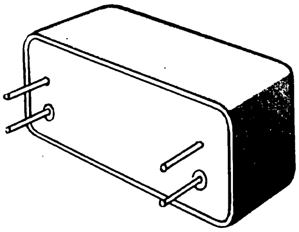


Frequency Range	750 KHz	2 MHz	3 MHz	15 MHz
	200 MHz	200 MHz	200 MHz	200 MHz
Holder Type			HC-18	
	HC-6	HC-32	HC-25	HK-24
Height	.775″	.625″	.515″	.250″
Seal	Solder	Solder	Solder	Solder
Type Coldweld			HC-25C.W.	
	HC-6C.W.	N/A	HC-18C.W.	N/A

Nominal Frequency Tolerance	±.005% from −55°C to +105°C
Best Frequency Tolerance	±.0025% from −55°C to +105°C ±.0005% from − 5°C to + 60°C
Zero Temperature Coefficient	Per customer spec between +25°C and +100°C
Q Range	50 K to 500 K (function of frequency range)
Aging	≤ 2 x 10^{-8}/day initial ≤ 5 x 10^{-9}/day after 3 months

ERIE CRYSTAL FILTERS

Erie offers a complete line of crystal Bandpass and Reject Filters. Modern computerized designs are available to synthesize any of the following types: Butterworth, Chebyshev Elliptic Function, Bessel Function and Gaussian. 1-10 pole designs are standard with higher order types available. Comb set, multiple channel or BW and matched sets are also readily available. Units are rugged, compact and most can be designed to meet the environmental requirements of Mil-F-18327.



GENERAL SPECIFICATIONS

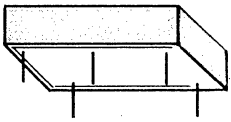
Center Frequency: 1 Khz to 50 Mhz
Bandwidth: .005% to 10%
Shape Factor: As steep as 1/1.4 (6db/60db)
Ripple: Generally less than 0.5db
Insertion Loss: Usually less than 3.0 db
Ultimate Attenuation: 100db Max.
Max. Operating Temp: −55°C to +125°C

ERIE COMPONENT OVENS

Erie's line of ovens includes both thermostatically and proportional controlled units. Many different sizes and configurations are available as standard designs. Voltages from 6.3VDC to 115VAC and stabilities as tight as .01°C are available. Crystal-oven combinations are of particular interest. Total in-house capability allows maximum latitude in designs of both items and reduces compatibility problems thereby keeping cost and lead time to a minimum.

OSCILLATORS STANDARDIZED & CUSTOM DESIGNS

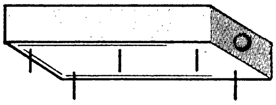
20A01014



Freq.	Stab. 0 to 70°C	Size
10 MHz 100 Khz	±0.01%	2″ x 2″ x .5″
100 Khz 500 Khz	±0.005%	2″ x 2″ x .5″
500 Khz 1 Mhz	±.005%	1.5″ x 1.5″ x .5″
1 Mhz 20 Mhz	±0.003%	1.5″ x 1.5″ x .5″

Specifically designed for Micrologic Applications:
Singles less than $50.00

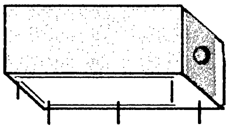
20V01021 VCXO



- True F-M
- Supply Regulation
- Oscillator Buffering
- Linearization
- Small Size
- Low Cost
- Aging Adjust.

Freq.: 40 Khz to 80 Mhz
Power: +12 Vdc @ 20 MA max.
Output: 1 mw or logic
Stab.: ±0.005% 0°C to +50°C
Dev.: ±0.05%
FM Linearity: 3% max.
Response: ±3 db D.C. to 20 Khz 0 db ref @ 1 Khz

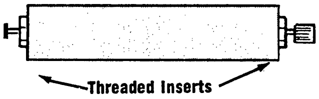
20B01020



- Low Power
- High Stability
- Small Size
- Low Cost
- Voltage Control Option
- Machined Aluminum Cavity

Freq.: 1 Mhz to 10 Mhz
Stab.: ±5 x 10^{-9}/24 hrs.
±1 x 10^{-8} 0 to 70°C
Power: +12 Vdc @ 3 Watts max. @ 0°C
Size: 1.5″ x 1.5″ x 3″ Long

20T01027 TCXO



Freq.: 1 Mhz to 20 Mhz
Stab.: ±5 x 10^{-7}
Temp.: 0°C to 70°C
Power: +10 to +30 Vdc <10 ma
Aging: <1 x 10^{-8}/24 hrs.
Harmonics: <−30 db

Output Power: −30 dbm ±2 db Optional Power: to 10 mw
ERIE Filter Feed-thru Capacitors for RFI
Miniature Output Connector Shock & Vib.: 10'G's to 2000 Hz

ERIE Technological Products' oscillator experience could very well fill hundreds of EEM sheets, so for your specific oscillator needs, call ERIE

Don't Buy Another Oscillator Without First Checking ERIE's Capabilities, Prices and Deliveries

FOR OSCILLATORS AND FILTERS CHECK

ERIE'S CAPABILITIES, PRICES, DELIVERIES

Erie Frequency Control
DIVISION OF ERIE TECHNOLOGICAL PRODUCTS, INC.
453 Lincoln Street • Carlisle, Pennsylvania 17013
Phone (717) 249-2232 • Telex 084-2328

erc

OSCILLATORS, Total Capability—1 Hz to 12 GHz

TCXO • VCXO • TC/VCXO • Precision Standards • Microwave Sources

EROS NO.	TYPE	FREQUENCY	STABILITY	TEMP. °C	MISC.	SIZE
600 EC-23	TCXO	5 mHz	1 ppm	−55 to +85	aging 1 ppm/yr	2.0 x 1.0 x 0.6
600 RA-35	TCXO	100 mHz	3 ppm	−55 to +95	aging 3 ppm/yr	2.5 x 3.5 x 1.1
600 R46	TCXO	10.0 kHz	0.5%	0 to 50	aging 0.5%/yr	1.5 x 1.5 x .34
400 7	VCXO	10 mHz	1 ppm	−55 to +110	dev. ±5 ppm Sens. −2 ppm/v	1.5 x 1.5 x 2.5
400 SL 47	VCXO	4.6 mHz	.002%	−35 to +85	dev. ±85 ppm Sens. ±22 ppm/v	3.0 x 1.75 x 1.0
800 CM 26	STD.	1.0 mHz	2.5 x 10^{-9}	0 to 55	aging 5 x 10^{10}/day	2 x 2 x 4
800 DL 8	STD.	10.0 mHz	5 x 10^{-9}	0 to 50	aging 1 x 10^{9}/day	2 x 2 x 4
MO-RA 34	MICRO	1.369 GHz	± .05% w/o phase lock	−55 to +85	phase lock to crystal	2.5 x 5.0 x 1.2

OVENS, AC or DC • Solid State • Snap Action • Proportional Control

Custom designs in excess of 5000 for either component or crystal applications. Ovens for precision oscillators, yig filters, delay lines or 1 to 18 crystals.

ERO NO.	TYPE	CAVITY	TEMPERATURE	SET TOL.	WARM-UP	VOLTS	SIZE
480	Snap-Action	Eight HC-25	60, 75, 85°C	±2.5°C	10 min.	6 to 120v dc or ac	1.32 x 1.32 x 1.13
710	Solid State Adjust	One HC-6	50 to 95°C	±0.1°C	30 min. from − 30°C	12 to 28 vdc, 6 to 120 vac	1.44 x 1.88 x 3.44
160	SCR	One HC-6	60, 75, 85°C	±2.5°C	15 min.	6 to 120 vac	1.50D x 2.75

CRYSTALS, Glass • Coldweld • Metal Can

Complete frequency range from 2kHz to 200mHz with total QPL approval on nearly all Military crystals to Mil. 3098E. Precision glass and coldweld crystals for applications needing superior long term aging, maximum reliability and crystal Q. Aging rates of 5 x 10^{-10}/day now being achieved on precision time base crystals. Improved process techniques provide for production of tight tolerance temperature crystals for use in Temperature Compensated Crystal Oscillators. (TCXO's)

FILTERS, Complete Design Capability

CRYSTAL • 2 kHz to 100 mHz; Bandpass, Sideband, Rejection, Linear Phase, Monolithic
L C • dc to 150 mHz; Bandpass, Lowpass, Highpass, Rejection
ACTIVE • DC to 1 mHz; Bandpass, Lowpass, Highpass
R F COAXIAL • 100 mHz to 1 gHz; Bandpass, Lowpass, Highpass

ER NO.	TYPE	FREQUENCY	BANDWITH	TEMP. °C	SIZE
23600 BANDPASS	CRYSTAL	20.0 mHz	6 db 35 kHz 60 db 60 kHz	−55 to +100	0.625 x 1.312 x 0.5
11500 BANDPASS	CRYSTAL	75.0 mHz	6 db ±12 kHz 70 db ±400 kHz	−55 to +90	1.0 x 2.19 x 0.75
AI-3 LOWPASS	RF COAXIAL	400.0 mHz	0.3 db 200 to 400 mHz 58 db 520 mHz to 900 mHz	−55 to +125	1.266 x 3.380 x 0.75
1079 BANDPASS	LC	500 kHz	6 db 90 kHz 60 db 150 kHz	−55 to +125	3.19 x .82 x .82
1187 LOWPASS	LC	80.0 mHz	0.5 db dc to 80.0 mHz	−45 to +80	1 x 2.25 x 3.0
AF-SA-6 TUNEABLE	ACTIVE	340 Hz	Lowpass 340 Hz Highpass 2-100 Hz	0 to 70	2.5 x 3.5 x 0.75

erc **electronic research co.** — a textron company
P. O. Box 913 • Shawnee Mission, Kansas 66202 • Phone 913/631-6700

W H FERWALT, INC.

LAPWAI, IDAHO 83540
PHONE: (208) 843-2463
(208) 843-2631

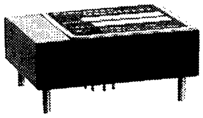
PRECISION OSCILLATORS

.0005 Hz TO 75 MHz

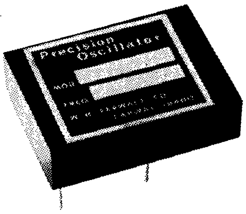
OVEN & NON-OVEN • VOLTAGE CONTROLLED
CRYSTAL CONTROLLED • LC & RC • PHASE LOCK
TEMPERATURE COMPENSATED • DRIVES INTEGRATED CKTS
MOS TTL DTL RTL ECL & OTHERS

GENERAL CHARACTERISTICS AVAILABLE—

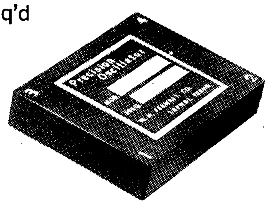
- Square-wave or Sine-wave output
- Manual trim or preset to ±.001% or better
- Supply voltages to suit customer requirements
- Internal dividing and gate control
- Special logic gating or memory
- Shock and vibration specifications
- Mil approved parts when req'd



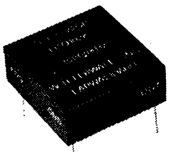
PKG STYLE C
7-pin plug-in
Encapsulated
1.5" x 2.0" x .56"



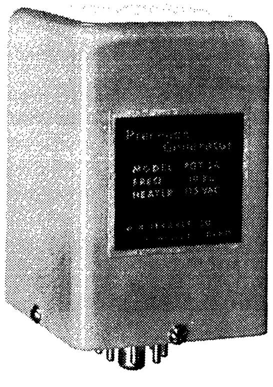
PKG STYLE A
Printed ckt mount
Encapsulated
1.5" x 2.0" x .56"
(AX: Without mtg. hole)



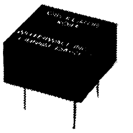
PKG STYLE B
Printed ckt mount
Encapsulated
1.9" x 2.5" x .5"
(BY: 1.9" x 2.5" x 1.0")



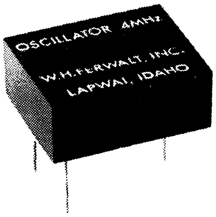
PKG STYLE J
Printed ckt mount
Encapsulated
1.25" x 1.25" x .5"
(JX: 1.25" x 1.25" x .32")



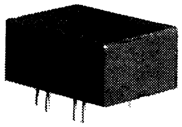
PKG STYLE D
Octal plug-In
Removable cover
2.0" x 2¼" x 3⁵⁄₁₆"



PKG STYLE H
Printed ckt mount
Encapsulated
.875" x .875" x .5"



PKG STYLE F
Printed ckt mount
Encapsulated
1.0" x 1.25" x .5"



PKG STYLE G
I.C. plug-in
Encapsulated
.78" x 1.125" x .5"
(GX: .75" x 1.5" x .5")

MODEL SERIES	FREQUENCY RANGE	STABILITY	TEMPERATURE RANGE	PK-to-PK OUTPUT	LOAD	SUPPLY VOLTAGE	PKG. STYLE	1-9 PRICE RANGE[4]
CRYSTAL OSCILLATORS — NO OVEN REQUIRED								
X032	12.5KHz to 5.99MHz	±.004 to ±.01%[4]	0°C to +75°C[2]	3V Square[3]	25 DTL	+5V	A	$72 to $106
X032C	6MHz to 30MHz	±.004%	" "	"	9 TTL	"	"	$82 to $92
X033	.001Hz to 30MHz	±.004%	0°C to +75°C[2]	3V Square[3]	9 DTL/TTL	+5V	B	$74 to $190
X045	1MHz to 5MHz	±.001%	+10°C to +50°C	.63V Sine	50 ohms	+15V	C	$109.20
X062	4KHz to 16MHz	±.01 to ±.025%[4]	−20°C to +70°C	5V Square	1.5K ohms	+12V	AX	$44 to $69
X071/81[4]	12.5KHz to 30MHz	±.004%	0°C to +75°C[2]	3V Square	9 DTL/TTL	+5V	G/GX[4]	$70 to $115
X082	190KHz to 16MHz	±.004%	0°C to +75°C[2]	3V Square	9 DTL/TTL	+5V	F	$58 to $78
X094	190KHz to 16MHz	±.003%	0°C to +75°C[2]	3V Square	9 DTL/TTL	+5V	H	$65 to $84
X096	10MHz to 16MHz	±.005%	0°C to +70°C	1V Square	3 ECL	−5V	JX	$62.07
X0100	.005Hz to 10MHz	±.007%	−40°C to +85°C[2]	10V Square[5]	50 MOS[5]	+10V	A	$75 to $150
TCX034	.0005Hz to 30MHz	±.0001%[1]	0°C to +50°C	3V Square[3]	9 DTL/TTL	+5V	B	$158 to $348
TCX056	100KHz to 30MHz	"	"	"	"	"	A	$158 to $177
TCX0101	.005Hz to 10MHz	±.0001%[1]	0°C to +50°C	12V Square[5]	50 MOS[5]	+12V	B	$160 to $235
TCX0101A	" "	±.0005%[1]	−55°C to +75°C	"	"	"	"	$175 to $275
PG049	800Hz to 1MHz	±.01%	0°C to +75°C	8V Square[3]	3.9K ohms	−12V	D	$90 to $165
ULF55	7.5Hz to 30KHz	±.01%	0°C to +50°C	3V Sine	10K ohms	+12V	D	$147 to $182
CRYSTAL OSCILLATORS — OVEN VOLTAGES: 115VAC, 28VDC, 6.3VAC, OR OTHERS								
PGX50	65KHz to 17MHz	±.1PPM	0°C to +50°C	3V Sine	1K ohm	+28V	D	$189 to $245
PGX63	1Hz to 30MHz	±.1PPM	0°C to +50°C	3V Square[3]	1.5K ohms	+12V	D	$208 to $330
PGX99	1MHz to 5MHz	±.5PPM	−55°C to +80°C	8V Sine	470K ohms	+27V	—	$170
VOLTAGE CONTROLLED OSCILLATORS — (±50PPM TO ±10% CONTROL FOR 0V TO +6V TYPICAL INPUT)[4]								
VCX0103	1Hz to 1MHz	±.0001 to ±.1%[4]	0°C to +50°C	3V Square[3]	9 DTL/TTL	+5V	BY	$257 to $337
VCX0255	1Hz to 30MHz	±.004%	0°C to +75°C	3V Square[3]	9 DTL/TTL	+5V	B	$99 to $176
VC047	1Hz to 75MHz	±3%	0°C to +75°C	3V Square[3]	9 DTL/TTL	+5V	B	$82 to $159
VC068	5Hz to 15KHz	±.5%	0°C to +75°C	3V Square[3]	270Ω to +5V	+15V	B	$73 to $94
LC AND RC OSCILLATORS								
LC035	75KHz to 5MHz	±.5%	0°C to +85°C	2V Sine	10K ohms	+12V	A	$34.90
LC01028	733KHz to 5MHz	±1%	−50°C to +100°C	2V Sine	1K ohm	+12V	J	$51.21
PS057	10Hz to 40KHz	±2%	0°C to +50°C	6V Sine	10K ohms	+12V	A	$39 to $46
RC036A	2Hz to 1MHz	±2%	−20°C to +85°C	3V Square[3]	8 DTL/TTL	+5V	A	$34 to $59
RC036B	" "	±1%	0°C to +75°C	"	"	"	"	$29 to $52
UJ039A	.1Hz to 100Hz	±2%	0°C to +50°C	3V Square	1.5K ohms	+12V	A	$25.50

[1] ±2 in 10^8 per day at constant ambient.
[2] For ±.01% over −55°C to +125°C add "A" to model no. (Price increases)
[3] Sine wave filter options available. Add desired "S" version below to model number: (many others available too).
[4] Depending on frequency.
[5] TTL option available.

S11/12[4]	10KHz to 30MHz	5% Distortion	0°C to +75°C	1 mw into 50 ohms	+12V	May be Combined with Oscillator Voltage[4]	Add $15
S13	5Hz to 100KHz	5% Distortion	−55°C to +75°C	1.75V RMS into 600 ohms	+15V		Add $20
S14	10KHz to 1MHz	3% Distortion	0°C to +75°C	2V pk-to-pk into 10K ohms	None		Add $10
S17	20Hz to 200KHz	5% Distortion	0°C to +50°C	3V pk-to-pk into 10K ohms	+5V		Add $15
S18	5Hz to 100KHz	3% Distortion	−55°C to +75°C	2.5V pk-to-pk into 600 ohms	+15V		Add $20

W. H. FERWALT, INC.

WEBB ROAD LAPWAI, IDAHO 83540 PHONE (208) 843-2463

Frequency Control, Inc.

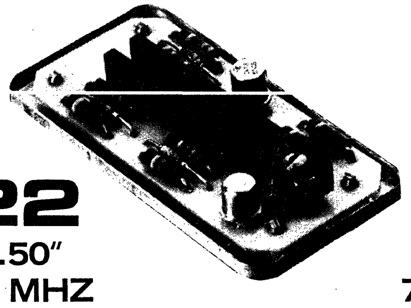
Audio Oscillators

Computer Clocks

- P.C.B. MOUNTING
- TTL COMPATIBLE
- LOW POWER LESS THAN ONE Ma
- ±0.2% TO ±.001%

FROM $16^{\underline{25}}$ EACH

1000 PIECES SCHEDULED OVER 12 MO.



TFO-22
1.00" x 2.00" x .50"
100 HZ TO 10 MHZ

TFO-46
1.30" x .60" x .40"
7 KHZ TO 10 MHZ

FCI HAS REDUCED YOUR OSCILLATOR SEARCH TO SELECTING ONE OF TWO

WRITE OR CALL FOR COMPLETE SPECIFICATIONS

Frequency Control, Inc.
P. O. BOX 1565 AUSTIN, TEXAS 78767
512 - 444-7401

Precision Oscillators

OFF THE SHELF
OR
TO YOUR SPECS

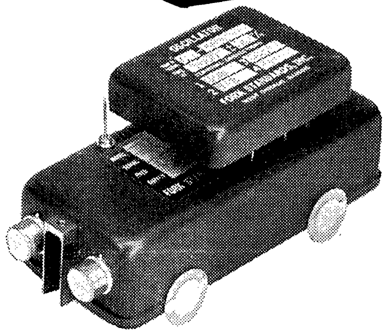
FORK STANDARDS

Fork Standards tuning fork and crystal oscillators provide high-accuracy outputs at frequencies from sub-audio through RF. Case sizes range from miniature PC board-mount types to plug-in, oven-stabilized frequency standards. Both square wave and sine wave outputs are available.

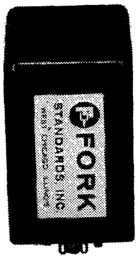
Tuning forks are limited to frequencies up to about 15 kHz, and are generally preferred for low-frequency applications because they require less frequency-division circuitry than an equivalent crystal unit. A low-frequency tuning fork oscillator is thus more compact, draws less current, and is usually less expensive and more reliable than a low-frequency crystal unit. However, for highest accuracy or for higher frequencies, crystals are preferred.

Accuracy and stability of both types of oscillators is a function of temperature; this is shown graphically on page 1390, along with descriptions of the various output options and an explanation of how a Fork Standards oscillator is specified. Specifications for Fork Standards most popular oscillators are summarized below. They are described in more detail on the following pages.

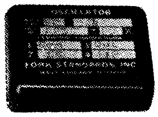
- .1 Hz sine wave
- modular frequency dividers
- modular oscillator power supplies
- precise frequency power inverters



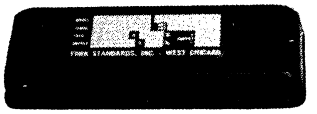
YOUR SOURCE FOR INSTANT HERTZ!



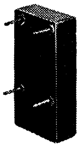
Model G, GQ
(base 1½" Sq.)



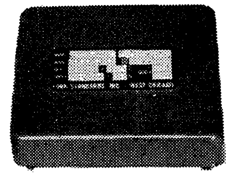
Model FO, FT
(base 1½" Sq.)



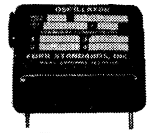
Model P, PQ
(base 1½" x 3½")



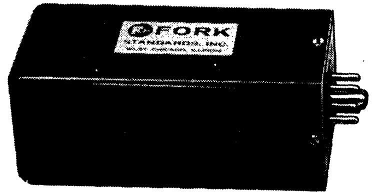
Model LO
(base 1½"x¾")



Model R, RQ
(base 3$\frac{3}{16}$" Sq.)



Model UQ
(base 1½" Sq.)



Model DQ
(base 2" Sq.)

MODEL G: Plug-in general purpose unit with very-low-frequency capability. Also available with studs and solder hooks.

MODEL FO, FT: Very compact, designed for PC board applications where space is at a premium. Low cost FT for high volume users.

MODEL LO: Smallest oscillator available, with square wave output only. PC board mount.

MODEL P: Larger printed circuit board unit than Model FO. Increased capabilities and slightly lower unit cost. Can be chassis mounted.

MODEL R: Largest PC board mount model, with lowest case profile at sub-audio frequencies.

MODEL AQ: Compact (1⅛" x 1⅝" base) economical epoxy encapsulated crystal oscillator for high volume applications.

MODEL CQ: Plug-in-card crystal oscillator, readily accessible for field modification or service.

MODEL GQ: General-purpose plug-in crystal oscillator, with output frequencies down to .125 Hz. Can be supplied with studs and solder hooks.

MODEL UQ: Compact crystal unit, for PC board mounting PC pins hold unit to board. Vernier frequency adjustment available.

MODEL PQ: General-purpose flat case unit for PC board or chassis mounting. Larger case volume than UQ.

MODEL RQ: Largest board-mounted crystal model, with lowest profile in sub-audio frequency range.

MODEL DQ: Available with either snap-action or proportional control oven, plug-in or stud-mounted base with solder hooks.

TUNING FORK OSCILLATORS

Model	Frequency Range	Output	Height	Price
G	.0001 Hz to 15 kHz	Square	2½"	$ 65 up
	100 Hz to 15 kHz	Sine	2½"	80 up
	25 Hz to 100 Hz	Sine	3½"	131 up
FO	1 kHz to 15kHz	Square	⅜"	$ 72 up
	.25 Hz to 1 kHz	Square	.6"	88 up
	1 kHz to 15 kHz	Sine	½"	97 up
FT	1 to 10 kHz	Square	½"	$37.50 (100 quant)
LO	1 kHz to 15 kHz	Square	⅜"	$ 82 up
P	.006 Hz to 15 kHz	Square	$\frac{17}{32}$"	$ 72 up
	60 Hz to 15 kHz	Sine	$\frac{15}{16}$"	92 up
R	.25 Hz to 15 kHz	Square	.6"	$ 72 up
	20 Hz to 15 kHz	Sine	.85"	97 up

CRYSTAL OSCILLATORS

Model	Frequency Range	Output	Height	Price
AQ	180 kHz to 40 MHz	Square	½"	$ 22.50 up (100 quant.)
CQ	40 Hz to 15 MHz	Square	½"	$ 54 up
GQ	.0001 Hz to 20 MHz	Square	2½"	$ 59 up
	800 Hz to 40 MHz	Sine	2½"	74 up
	25 Hz to 800 Hz	Sine	3½"	141 up
UQ	.006 Hz to 20 MHz	Square	½" or	$ 59 up
	50 kHz to 40 MHz	Sine	.6"	74 up
PQ	.006 Hz to 20 MHz	Square	$\frac{17}{32}$"	$ 59 up
	800 Hz to 40 MHz	Sine	$\frac{15}{16}$"	74 up
RQ	.0001 Hz to 20 MHz	Square	.6"	$ 59 up
	400 Hz to 40 MHz	Sine	.85"	74 up

OVEN-STABILIZED CRYSTAL OSCILLATOR

Model	Frequency Range	Output	Height	Price
DQ	.0001 Hz to 20 MHz	Either	4"	$134 up

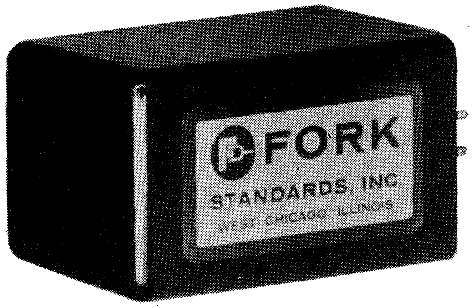
TCXO, VCXO: Most of the crystal oscillators described above can be supplied in both temperature compensated and voltage controlled versions. Contact Fork Standards to discuss your specific requirements.

SPECIALS: Fork Standards has built and delivered a very wide variety of special oscillators. Unique packaging for restricted space; ruggedized designs for difficult environments; and special output capabilities can all be accommodated by Fork Standards' engineering department. Consult Fork Standards for all your oscillator needs.

See our full page of inverter data under "Inverters," page 718

Fork Standards, Inc. • 213 Main Street, West Chicago, Illinois 60185 • (312) 231-3511

PLUG-IN OSCILLATOR **G, GQ**



With their convenient octal plug bases, the Models G and GQ were designed for use in applications where space is not restricted. Either is also available with solder hooks and studs. Circuits use all silicon semiconductors and cases are hermetically sealed, assuring reliable operation under the most extreme environmental conditions. Most models can be supplied to meet MIL Spec requirements.

Size: 1½" sq. x 2½" or 3½" h.
Weight: 4-7 oz. (120-210 gm), depending on frequency
Supply: 5 or 12 VDC standard; others available
Accuracy: (See Table, Page 1390, for detailed information)
  Tuning Fork (Model G): to .005% (Classes 2-5)
  Crystal (Model GQ): to .001% (Classes 6, 7)

OUTPUT/FREQUENCY RANGE

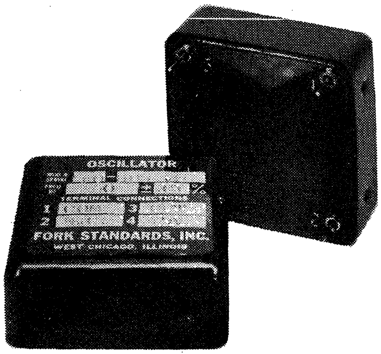
(Complete definitions on Page 1390)

OUTPUT / MODEL	SINE WAVE TYPE AA: 25 Hz up AT, DT: 200-20000 Hz	SQUARE WAVE TYPES B, BL, BN, BB (some restrictions above 1 MHz)
G (Tuning Fork)	25-800 Hz, 3½" h. 800-15000 Hz, 2½" h.	.012-2 Hz, 3½" h. 2-15000 Hz, 2½" h.
GQ (Crystal)	25-800 Hz, 3½" h. 800 Hz-20 MHz, 2½" h.	.0001 Hz-20 MHz, 2½" h.

MINIATURE OSCILLATOR **FO, UQ**

The Models FO and UQ occupy the least board area of any low profile Fork Standards' oscillator. Typically the Model FO has a lower profile at a given frequency, though either is capable of subaudio outputs.

Because of their compact size and rugged construction, both models have seen use in various aerospace and military projects. The Model FO is also available as a tuning fork resonator **only,** without driving circuits, as the Model FR.



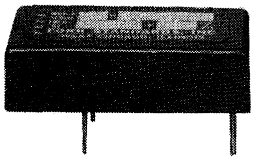
OUTPUT/FREQUENCY RANGE

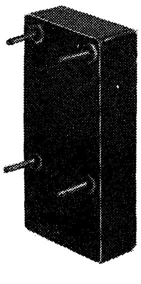
(Complete definitions on Page 1390)

OUTPUT / MODEL	SINE WAVE TYPE AA only	SQUARE WAVE Types: B, BL, BN (some restrictions above 1 MHz)
FO (Tuning Fork)	1000-15000 Hz. .5" h.	.25-250 Hz, .6" h. 250-15000 Hz, ⅜" h.
UQ (Crystal)	50 kHz-40 MHz, .6" h.	.006 Hz-20 MHz, .5"

Size: 1½" sq. x ⅜", .5" or .6" h.
Weight: 1.75 oz. (49 gm) max., either model
Supply: 5 VDC preferred; to 15 VDC available
Accuracy: (See Table, Page 1390, for detailed information)
  Tuning Fork (Model FO): to .005% (Classes 2-5)
  Crystal (Model UQ): to .001% (Classes 6, 7)

ULTRA-COMPACT OSCILLATOR **LO**





Size: 1½" x ¾" x ⅜" h.
Weight: .66 oz. (17.5 gm)
Supply: 5 or 12 VDC (specify)

With a volume of less than ½ cubic inch, the Model LO is Fork Standards' smallest model. It is rugged and reliable, and has seen extensive use in applications where space is at a premium.

Frequency Range/Accuracy (See Table, Page 1390)
  Accuracy: .05% (Class 2): 1000 to 15000 Hz.
  Accuracy: to .01% (Class 3, 4): 1920 to 10000 Hz.
Output: Square wave (Type B) only

Fork Standards, Inc. • 213 Main Street, West Chicago, Illinois 60185 • (312) 231-3511

AQ, FT

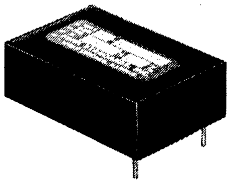
LOW COST OSCILLATORS

Model AQ

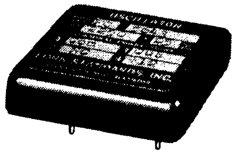
Size: 1⅛″ x 1⅝″ x .4″ h.
Weight: 1 oz. (30 gm) max.
Supply: 5 VDC
Accuracy (−55 to +85°C):
1-10 MHz: .005%
.18-1 MHz: .01%

Model FT

Size: 1½″ sq. x .4″ h.
Weight: 1 oz. (30 gm)
Supply: 5 VDC
Accuracy: .1%, 0-65°C
Frequency Range: 1-10 kHz
Output: Square wave (Type B) only



Model AQ



Model FT

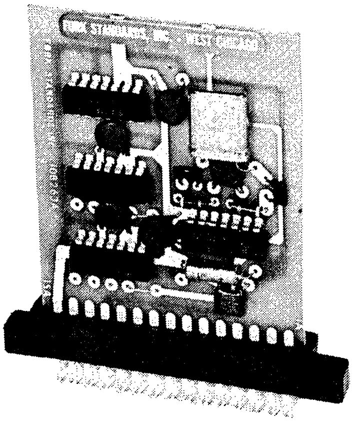
Fork Standards' AQ and FT oscillators provide the benefits of crystal or tuning fork performance at minimum cost. Neither contains frequency division circuitry, and their low unit cost is based on the savings realized by quantity production.

CQ

PLUG-IN-CARD CRYSTAL OSCILLATOR

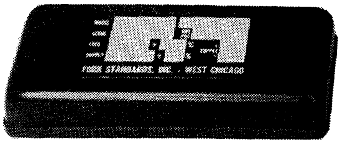
The Model CQ is designed for use as a plug-in-card unit, for applications where quick oscillator change or field modification is desired. Because of its multi-pin connector, the Model CQ can readily provide multiple outputs. Field modification can be accomplished by means of easily accessible strapping points.

Size: 3¼″ x 2½″ card
Weight: 1 oz. (30 gm)
Supply: 5 VDC
Accuracy: (See Table, Page 1390, for detailed information)
To .001% (Classes 6, 7)
Frequency Range: 40 Hz-15 MHz
Output: Type BL standard
Connector: Type 143-015



P, PQ

STANDARD BOARD–MOUNT OSCILLATOR



Size: 1.55″ x 3.55″ x 17/32″ or 15/16″ h.
Weight: 3½ oz. (100 gm) max.
Supply: 5 or 12 VDC standard
Accuracy: (See Table, Page 1390, for detailed information)
Tuning Fork (Model P): to .005% (Classes 2-5)
Crystal (Model PQ): to .001% (Classes 6, 7)

The Models P and PQ are general purpose flat package oscillators that can be printed circuit board or chassis mounted. Their nominal base area is economical of board space, which necessitates a rather high profile for lower frequency units.

OUTPUT/FREQUENCY RANGE

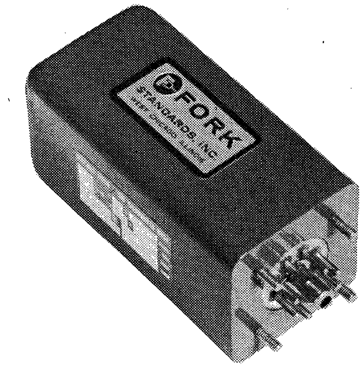
(Complete definitions on Page 1390)

OUTPUT MODEL	SINE WAVE Type AA: 60 Hz up AT, DT: 120-20000 Hz	SQUARE WAVE TYPES B, BN, BL (some restrictions above 1 MHz)
P (Tuning Fork)	60-120 Hz, 15/16″ h. 120-15000 Hz, 15/16″ h.	.125 Hz-60 Hz, 15/16″ h. 60 Hz-15 kHz, 17/32″ h.
PQ (Crystal)	800-64000 Hz, 15/16″ h. 64 kHz-40 MHz, 17/32″ h.	.006 Hz-20 MHz, 17/32″ h.

Fork Standards, Inc. • 213 Main Street, West Chicago, Illinois 60185 • (312) 231-3511

HIGH STABILITY CRYSTAL OSCILLATORS

DQ



Low Drift Models (Class 7R)
Any Fork Standards crystal oscillator can be supplied with a premium cold-weld sealed, low-drift crystal. Minimum frequencies available are higher than those shown in the specifications for a standard unit; unit cost is higher.

Standard accuracies are:
.0005%, 10 to +60°C; .002%, −25 to +85°C.

To assure best long-term accuracy a Class 7R oscillator receives four weeks testing before shipment.

Oven-Stabilized Oscillators (Model DQ)
Oven stabilization is recommended for maximum stability over temperature extremes. Two types of oven are available from Fork Standards; snap action and mercury switch. Snap action ovens are less expensive and operate from either AC or DC; 12 to 115 V models are available. Mercury-switch models are DC only, in 6, 12, 24, or 28 V inputs. However, a mercury switch thermostat has a temperature hysteresis only 1/10 that of the snap action type, providing best short term stability.

Both types consume 10 VA (on); cases are 2″ square and 4″ high, with octal plug and hold-down studs.

Oscillators with proportional-control ovens are also available. Consult factory for further information.

SPECIFYING; ACCURACY VS TEMPERATURE

Specifying a Fork Standards Oscillator:
A Fork Standards specification number completely describes the oscillator to which it refers. Conversely, a specification number may be determined whenever an oscillator requirement is completely defined. The parameters required are:

1. Frequency
2. Accuracy
3. Temperature Range
4. Output Waveform
5. Supply Voltage
6. Case Size
7. Mounting and Terminals

The first step is to select a model that satisfies the output waveform requirement at the needed frequency. Then select the proper accuracy/temperature code from the table at the right. For example:

G - 3C - 4K - BL - 5
5 = 5 VDC Power Supply
BL = Square Wave Output for Micrologic Drive
4K = 4 kHz Output Frequency
3C = .05% Accuracy, 0 - 65°C
G = Model G Case

CLASS NUMBERS INDICATING OSCILLATOR ACCURACY VS. OPERATING TEMPERATURE

TEMPERATURE RANGE

Accuracy (%)	+15° to +35° C	0° to +65° C	—25° to + 65° C	—40° to + 65° C	—55° to + 85° C
.2	2A	2C	2F	2N	2J
.1	2A	2C	3F	3N	4J
.05	2A	3C	4F	4N	5J
.01	4A	5C	6F	6N	7J
.005	5A	6C	6F	7N	7J
.0025	6A	7C	7F	8N	*
.001	7A	8C	8F	8N	*
.0005	8A	8C	8F	8N	*
.0001	9A	9C	9F	9N	*

☐ Tuning fork, Classes 2-5
▩ Crystal without oven, Classes 6-7
☐ Special crystal without oven. Accuracy .0005% from +10° to +60°C. Specify Class 7R.
░ Crystal with oven, Classes 8-9. Specify Model DQ.
* Special oven unit. Consult factory.

STANDARD OUTPUTS

Most Fork Standards oscillators can be supplied with any of several standard outputs. Buffered outputs are available with most models. Transformer coupled sine wave, types AT or DT, can be provided with most tuning fork and Model GQ oscillators; minimum frequency is restricted.

The most popular output types (referenced to 12 V supply) are:

Square Wave:
B: 8 V p-p min. into 1,0 k ohm resistive load.
BN: Same as B except rise time under 1 μs and equal symmetry from binary divider.
BB: Same as BN except has two outputs, 180° out of phase.
BL: To drive micrologic. Specify manufacture and type.

Sine Wave:
AA: 3 V rms into 10 k ohm resistive load. Harmonic distortion 1 to 10%, depending on frequency.
AT: Like AA except transformer isolated output.
DT: 1 mW into 600 ohms, transformer isolated.

Consult FORK STANDARDS regarding many special outputs available

Fork Standards, Inc. • 213 Main Street, West Chicago, Illinois 60185 • (312) 231-3511

FREQUENCY PRODUCTS

INSTRUMENTS

- High Stability Frequency Standards
- Digital Phase Comparators
- High Performance Distribution Amplifiers
- High Stability Portable Clocks
- High Precision Low Frequency Variable Oscillators

OSCILLATORS

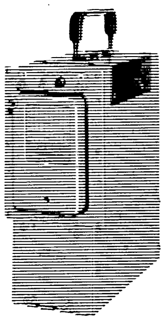
- High Stability Crystal Oscillators
  - Oven Proportionally Controlled
- Sub-Miniature Crystal Oscillators
  - No Ovens Utilized
- High Stability Crystal Oscillators
  - Low Power Oven
- High Precision Crystal Oscillators
  - Frequency Voltage Controlled
- Temperature Compensated Oscillators
- High Stability Proportional Ovens
- Linear Discriminators

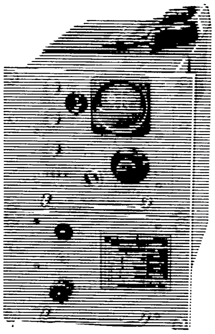
SEND FOR COMPLETE CATALOG E

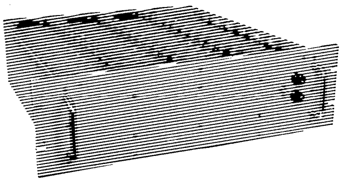
FREQUENCY ELECTRONICS, INC.

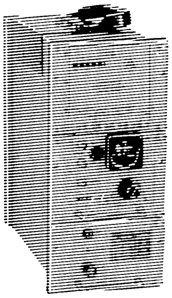
3 Delaware Drive
Lake Success, New York 11040
(516) 328-0100

INSTRUMENTATION

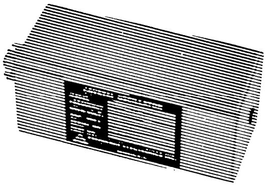

DIGITAL PHASE COMPARATORS

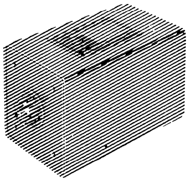

HIGH STABILITY FREQUENCY STANDARDS

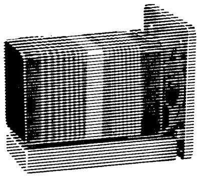

DISTRIBUTION AMPLIFIERS


PORTABLE DIGITAL CLOCKS

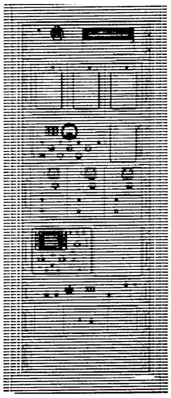
COMPONENTS


CRYSTAL OSCILLATORS


LINEAR DISCRIMINATORS


PROPORTIONAL OVENS

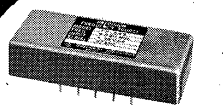
SYSTEMS


FREQUENCY-TIME STANDARD

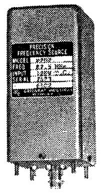
PRECISION QUARTZ CRYSTAL FILTERS

VOLTAGE CONTROLLED OSCILLATORS

Through continuous research and specialization, Greenray Industries offers the most complete and advanced line of Frequency Standards and Oscillators in the industry.

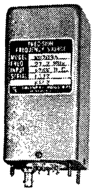


TV-245
Temperature Compensated Voltage Controlled Crystal Oscillator — High stability without the use of an oven.



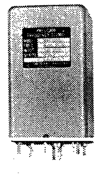
PH-229 & PH-230

L-C Voltage Controlled Oscillator— Proportional oven units offer stabilities of ±.001% and frequency deviations to ±10%.



NH-203A

Voltage Controlled Crystal Oscillator— Proportional oven unit for FM and phase locked loop applications.



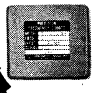
NH-314

Voltage Controlled Crystal Oscillator— High frequency 60 MHz to 300 MHz.

Model No. and Type	Center Frequency Range	Maximum Range of Frequency Swing	Stability over Temp. Range (at a fixed frequency)	Temperature Range	Output Wave Form and Minimum Voltage	Input	Size	Unit Price 1-3 (each)
Q-200 R-C VCO	20 Hz to 100 kHz	±10% or ±30%	±.5% ±2%	0 to 50°C −40°C to +60°C	Pulse, Square or Sine	+28V D.C.	2″ x 2″ x 4″ high	$275.00 to $375.00
P-200 L-C VCO	1 kHz to 99.99 kHz	±1% or ±4%	±.5% ±1%	0 to 50°C −40°C to +70°C	Sine 2V RMS	+28V D.C.	1¾″ dia. x 3⅝″ high	$489.00
P-201 L-C VCO	100 kHz to 19.99 MHz	±1%, ±5%, ±10% or ±20%	±.2% ±.5%	0 to 50°C −40°C to +70°C	Sine 2V RMS	+28V D.C.	1½″ dia. x 3 5/16″ high	$389.00 to $485.00
P-202 L-C VCO	20 MHz to 200 MHz	±10% or ±20%	±.4% ±1%	0 to 50°C −40°C to +70°C	Sine 1 Milliwatt into 50 ohms	+28V D.C.	2″ x 2″ x 4″ high	$389.00
PH-229 L-C VCO	100 kHz to 20 MHz	±10%	±.01%/hr. ±.02%/day	0°C to +50°C	Sine 1 mw into 50 ohms	+28V D.C. for oscillator and proportional oven	2″ x 2″ x 4″	$525.00
PH-230 L-C VCO	100 kHz to 20 MHz	±2%	±.001%/hr. ±.01%/day	0°C to +50°C	Sine 1 mw into 50 ohms	+28V D.C. for oscillator and proportional oven	2″ x 2″ x 4″	$795.00
N-200 VCXO	4 kHz to 999.9 kHz	±.01%, ±.05% or ±.1%	±.015%	−20°C to +60°C	Sine 1V RMS	+28V D.C.	2″ x 2″ x 4″ high	$525.00 to $675.00
N-201 VCXO	1 MHz to 60 MHz	±.01%, ±.05% ±.1%	±.008%	0°C to +60°C	Sine 1V RMS	+28V D.C.	1½″ dia. x 3 5/16″ high	$385.00 to $485.00
N-330 VCXO	50 kHz to 250 kHz	±1% ±.05%	±.01%/day	0 to +60°C	Square to drive T^2L micrologic	+5V D.C.	2 9/16″ x 2 15/16″ x ⅞″	$545.00
N-331 VCXO	250.1 kHz to 999 kHz	±.1% ±.05%	±.01%/day	0 to +60°C	Square to drive T^2L micrologic	+5V D.C.	2 9/16″ x 2 15/16″ x ⅞″	$475.00
N-332 VCXO	1 MHz to 25 MHz	±.1% ±.05%	±.01%/day	0 to +60°C	Square to drive T^2L micrologic	+5V D.C.	2 9/16″ x 2 15/16″ x ⅞″	$385.00
NH-203A VCXO	1 MHz to 60 MHz LOW NOISE	±.01% or ±.05% or ±.1%	±.0001%	0 to 50°C	Sine 1 Milliwatt into 50 ohms	+28V D.C. for oscillator and proportional oven	2″ x 2″ x 4″ high	$565.00 to $645.00
NH-314 VCXO	60.1 MHz to 300 MHz LOW NOISE	±.01% ±.05% ±.1%	±.0005%/day	0°C to +50°C	Sine 1 mw into 50 ohms	+28V D.C. for oscillator and proportional oven	2¾″ x 2¾″ x 4⅝″	$748.00 to $975.00
SH-219 Wide Band VCXO	500 kHz to 60 MHz LOW NOISE	±.25% or ±.5% or ±1%	±.001% ±.0025% ±.005%	0 to 50°C	Sine 1 Milliwatt into 50 ohms	+28V D.C. for oscillator and proportional oven	2¾″ x 2¾″ x 4⅝″ high	$975.00 to $1450.00
TEMPERATURE COMPENSATED VOLTAGE CONTROLLED OSCILLATORS								
TV-245	4 to 19.999 MHz	±.005% to ±.1%	±.0005% to ±.01%	0 to +50°C	1V RMS	+28V D.C.	1⅝″ x 3¾″ x ⅞″	$425.00 to $525.00
TV-246	20 to 70 MHz	±.005% to ±.1%	±.0005% to ±.01%	0 to +50°C	1 mw into 50 ohms	+28V D.C.	2 9/16″ x 2 15/16″ x ⅞″	$495.00 to $595.00

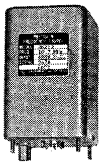
Typical control voltage input: 2V RMS up to 15 kHz rate or ±3V D.C. for full modulation at 1000 ohm input impedance.—**Standard modifications available.**

NEW
N-330, N-331 & N-332



Voltage Controlled Crystal Oscillator— Designed to direct-drive all popular types of micrologic. 25 nanosecond maximum rise and fall time.

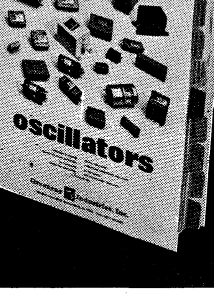
TV-246
VHF Temperature Compensated Voltage Controlled Crystal Oscillator— Ideal for use with mixers or receivers high stability, low power consumption



SH-219

Wide Band Voltage Controlled Crystal Oscillator — Uses special techniques for ±1% frequency deviation.

CALL OR WRITE FOR OUR COMPLETE 1971-72 CATALOG



Call or write for a FAST quotation.

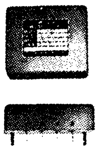
Greenray GRI Industries, Inc.

840 West Church Road, Mechanicsburg, Pa.
Phone — (Area Code 717) 766-0223

OSCILLATORS and FREQUENCY STANDARDS

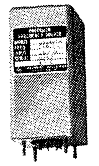
OVER 120 STANDARD MODELS IN OUR GIANT CATALOG

Model No.	Frequency (Fixed)	Accuracy over Temp. Range	Temperature Range	Minimum Output	Input	Size	Price 1-3 (each)
L-217 L-C	100 Hz to 1 MHz	±.5%	−40°C to +70°C	Sine 1.5V RMS	28V D.C.	2 9/16″ x 2 15/16″ x ⅞″ (P-C Mount)	$89.50
61000 L-C	400 Hz to 10 MHz ± 10% Adj.	±.5%	−30°C to +60°C	Sine 2.5V RMS	28V D.C.	1½″ D x 3 11/16″ H	$114.50
Y313A Crystal	1 MHz to 350 MHz	±.005%	0°C to +50°C	Sine .1 watt to 1 watt	+28V D.C.	2″ x 2″ x 4″	$345.00 to $745.00
Y-283-3 Crystal	70 kHz to 150 MHz	±.005% or ±.025%	−55°C to +90°C	Square 0 to 6V P to drive micrologic	+3V D,C, to +6V D.C.	1⅝″ x 2¼″ x ¾″ H	$149.00 to $249.00
28100, Y-656 & Y-657 Crystal	800 Hz to 600 MHz	±.012% or ±.005%	−40°C to +70°C	Sine 1V RMS or 1 milliwatt	28V D.C.	2″ × 2″ × 4″ H maximum	$95.00 to $356.00
Y-367 Crystal	3000 Hz to 150 MHz	±.015% or ±.005%	−40°C to +70°C	Sine 1V RMS or 1 milliwatt	28V D.C. or +12V D.C.	2″ x 2″ x ¾″ H (P-C Mount)	$111.00 to $156.00
T-224A (TCXO)	3 MHz to 20 MHz	Up to ±5 x 10^{-7}	−40°C to +70°C 0°C to +65°C	1 MW 50 ohms	+28V D.C.	2 9/16″ x 2 15/16″ x ⅞″ height	$219.00 to $485.00
78000 Crystal	3200 Hz to 100 MHz	±1 x 10^{-6} to ±1 x 10^{-7}	0°C to +50°C	Sine 1V RMS	28V D.C. & 6V A.C. or 28V D.C.	1¾″ D x 3¾″ H	$269.00 to $282.00
YH-320 Crystal	100 kHz to 90 MHz LOW NOISE	Up to ±.00005%	0°C to +50°C	Sine 1 Milliwatt	28V D.C. for oscillator and proportional oven	2 9/16″ x 2 15/16″ x ⅞″ H (P-C Mount)	$370.00 to $399.00
356000C Crystal	1 MHz to 10 MHz LOW NOISE	±1 x 10^{-9}	+20°C to +55°C	Sine 1V RMS	28V D.C. for oscillator & proportional oven	2¾″ x 2¾″ x 4⅝″ H	$690.00
228200C 1 to 20 Crystals	5 MHz to 50 MHz	±.0001%	0°C to +55°C	Sine 1V RMS	28V D.C. for oscillator & oven	2 9/16″ x 2 15/16″ x 3 1/16″ deep	$490.00 for 10 channels
T-290, T-291 & T-292 (TCXO)	10kHz to 30 MHz	±4 x 10^{-6}	0°C to +50°C	Square 0 to 6V P to drive micrologic	+5V D.C.	1″ x 2″ x ½″ H	$178.00 to $271.00
Y912 Crystal	5-25 MHz	±.005%$^{-6}$	0°C to +70°C	Square wave to drive logic	+5 Volts	Inline Mounting .29″ x .49″ x .55″	$89.50
T316 Crystal (TCXO)	12 MHz to 600 MHz	±5 x 10^{-6}	−10°C to +60°C	Sine 1 MW	+28V D.C.	1½″ x 1½″ x 3¾″ H	$164.00 to $416.00
Y819 Crystal	1 Hz to 20 MHz	±.005%	− 0°C to +70°C	Square wave to drive TTL	+5 Volts	2″ x 2″ x ½″	$69.50 to $219.50
YH-522-1 Crystal	1 MHz to 10 MHz	±1 x 10^{-8}	0°C to +55°C	1V RMS	+28V D.C. for oscillator & proportional oven	2¼″ x 2¼″ x 4¼″ H	$489.00
MH-211 1 to 12 Crystals	5 MHz to 75 MHz	±5 x 10^{-7}	+10°C to +50°C	1 MW	+28V D.C. for oscillator & proportional oven	3 5/16″ W x 3⅞″ x 4″ D	$890.00



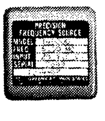
L-217

L-C Oscillators for printed circuit board mounting. Ideal where an AUDIO TONE or an RF signal is required. Used widely in test equipment.



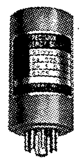
313100A

General Purpose Oscillator—Crystal controlled. For very low frequency, high stability requirements.



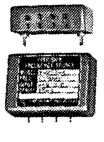
Y-367

Crystal Oscillators for printed circuit mounting—3 kHz to 150 MHz.



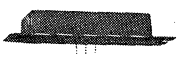
28100, Y-656 & Y-657

Crystal Oscillators for general application with excellent stability. 800 Hz to 600 MHz.



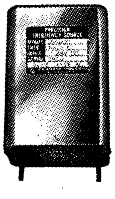
Y283-3

Crystal Oscillators—designed to direct-drive all popular types of micrologic.



T-224A

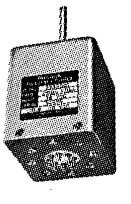
Temperature Compensated Crystal Oscillators—High stability over wide temperature range. No Oven used. Features instant warm-up.



356000C

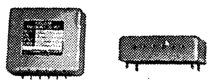
Frequency Standard—Ultra stable. Uses proportional type oven.

±1 part in 10^9



228200C

Multiple Channel Crystal Oscillator—Up to 20 output frequencies in the 5 MHz - 50 MHz Range (Rotary Switch Selection).



YH-320

Frequency Standard—Low noise, for printed circuit board mounting.

Greenray Industries, Inc.

840 West Church Road, Mechanicsburg, Pa. Phone — (Area Code 717) 766-0223

COMPONENT OVENS

Cavity Size	Case Size	Temperature Degrees C. Cavity	Temperature Degrees C. Stability	Temperature Degrees C. Ambient	Power Supply volts	Model Number	Price Quantities (1-3 units)
(12) HC6/U Crystals	2.562 x 3.000 x 2.00	65	±1.5	−30 +60	12.6	1019-4	$ 54.00
1.375 x 1.375 x 2.375	1.750 x 1.750 x 3.500	85	±2.0	−55 +70	117	1024-A	41.75
1.375 x 1.375 x 2.875	1.750 x 1.750 x 4.000	65	±1.5	−20 +50	117	1025-A	49.00
3.900 x 5.150 x 3.000	5.000 x 7.000 x 4.500	65	±3.0	−40 +60	117	1030-3	82.50
5.100 x 3.900 x 3.000	7.000 x 5.000 x 4.500	65	±2.0	0 +50	115	1030-8	82.50
.960 x 1.560 x .500	1.437 x 2.312 x 1.040	60	±1.0	0 +50	32	1075	35.00
(2) HC6/U Crystals	1.500 dia x 2.000	75	±1.5	−40 +60	6.3	1131-1	19.50
(2) 1¾" Long Crystals	1.500 dia x 3.000	40	±0.2	room	6.3	1133-1	44.00
1.950 x 1.950 x 1.000	2.562 x 2.937 x 1.500	75	±1.5	0 +65	28	1147-1	55.00
.962 x .962 x 1.187	1.500 x 1.500 x 2.500	65	±1.0	−20 +50	117	1250	39.50
.962 x .962 x 1.187	1.500 x 1.500 x 2.500	85	±1.0	+21 +60	230	1250-6	30.80
.960 x .960 x 2.187	1.500 x 1.500 x 3.500	65	±1.0	−20 +55	117	1270	46.50
.960 x .960 x 2.187	1.500 dia x 3.500	65	±1.0	−20 +50	117	1279	37.50
3.062 x 1.218 x 3.328	2.250 x 4.187 x 5.000	65	±1.0	−30 +50	100 to 130	1600	115.00
1.950 x 1.950 x 1.750	2.56 x 2.94 x .880	65	±2.0	0 +50	117	1765	58.00
(1) HC6/U Crystal	1.296 dia x 2.500	75	±4	0 +50	117 VAC	2117	125.00
1.462 x 1.462 x 1.875	2.000 x 2.000 x 3.000	65 adj.	±0.25	0 +50	115 VAC	2893	129.95
2.187 x 3.178 x 3.860	2.705 x 4.203 x 5.141	70	±1.0	+10 +35	28 VDC	3063-9	156.00
2.485 x 2.485 x .625	3.062 x 3.062 x 1.375	80	±0.50	0 +65	28 VDC	3081-1	188.50
0.962 x 0.962 x 1.000	2.000 x 2.000 x 4.000	65	±0.50	0 +50	28 VDC	3126-1	129.00
1.950 x 1.950 x 1.000	2.562 x 2.937 x 1.500	55	±0.80	0 +45	28 VDC	3147-1	109.25
1.950 x 1.950 x 1.000	3.000 x 3.500 x 2.500	75	±0.1	+15 +65	12 VDC	3147-16	133.00
0.700 x 2.200 x 2.200	1.900 x 3.000 x 3.500	65	±0.50	0 +50	28 VDC	3157-3	154.00
1.524 x 2.306 x 3.037	2.141 x 2.891 x 5.000	90	±3.0	−55 +70	28 VDC	3161-1	260.00
2.920 x 2.920 x 5.000	5.000 x 7.000 x 5.000	50	±0.25	−15 +35	24 VDC	3176-3	227.52
1.462 x 1.462 x 2.675	1.875 x 1.875 x 4.000	65	±1.0	0 +50	28 VDC	3211	165.00
3.875 x 3.875 x 3.500	5.090 x 5.090 x 4.500	Adj. 30-52	±1.0	room	28 VDC	3225	140.00
.962 x .962 x 1.187	1.500 x 1.500 x 2.500	65	±0.25	0 +50	28 VDC	3250	115.00
.962 x .962 x 1.187	1.500 x 1.500 x 2.500	80	±0.50	0 +65	28 VDC	3250-1	165.00
.962 x .962 x 1.187	1.500 x 1.500 x 2.750	65	±0.25	0 +50	28 VDC	3250-3	104.00
.962 x .962 x 1.187	1.500 x 1.500 x 2.750	65	±0.25	0 +50	29 VDC	3250-5	99.50
1.950 x 1.950 x 2.250	2.750 x 2.750 x 3.500	50	±0.25	0 +35	29 VDC	3251-14	130.00
1.950 x 1.950 x 2.625	2.750 x 2.750 x 4.000	75	±1.0	+10 +50	28 VDC	3252-5	175.00
1.950 x 1.950 x 3.250	2.750 x 2.750 x 4.625	70	±0.25	0 +50	28 VDC	3253	160.25
1.950 x 1.950 x 2.000	2.562 x 2.937 x 2.625	65	±1.0	−54 ±50	28 VDC	3261	129.50
1.950 x 1.950 x 2.000	2.562 x 2.937 x 2.625	75	±0.25	0 +50	28 VDC	3261-4	129.50
(10) HC6/U Crystals	2.937 x 2.562 x 2.000	75	±0.50	0 +50	28 VDC	3319	147.00
5.000 x 7.500 x 3.500	6.140 x 9.140 x 5.000	75	±1.0	0 +65	28 VDC	3332	575.00
.3000 x .1820 x .7500	2.000 x 2.000 x .531	80	±1.0	0 +70	30 VDC	3358-2	120.00
7.320 x 11.820 x 6.000	13.250 x 9.180 x 7.750	65	±0.05	room	28 VDC	3382-2	250.00
(4) HC6/U Crystals	2.000 x 2.000 x 3.000	75	±.02	+20 +30	28 VDC	3500	160.00
2.250 x 2.625 x 3.500	3.000 x 3.500 x 5.000	75	±.75	0 +25	26 VDC	3526	140.00
6.125 x 2.875 x .3300	4.125 x 9.125 x 4.437	60	±2.0	−25 +40	28 VDC	3527	270.00
.8810 x 1.175 x .3780	1.437 x 1.875 x .7500	70	±1.0	0 +60	−12 VDC	3530	93.75
(1) HC13/U Crystal	1.437 x 3.032 x .7500	75	±2.0	−20 +60	−25 VDC	3531-3	97.50
(1) HC13/U Crystal	1.437 x 3.032 x .7500	60	±2.0	−20 +45	12 VDC	3531-4	99.50
3.062 x 1.218 x 4.000	2.225 x 4.188 x 5.000	75	±1.0	−30 +50	28 VDC	3600-A	185.00
1.218 x 3.062 x 3.328	2.250 x 4.187 x 5.000	65	±0.5	−30 +50	28 VDC	3600-5	185.00
(1) HC13/U Crystal	1.500 dia x 2.562	75	±0.50	0 +50	28 VDC	3700	89.50
1.950 x 1.950 x .5000	2.937 x 2.562 x .8750	65	±.50	0 +50	28 VDC	3765-1	99.50
1.950 x 1.950 x 0.500	2.562 x 2.937 x 1.250	35	±.01	+20 +30	26 VDC	3765-12	119.50
3.250 x 5.000 x .5000	4.250 x 6.500 x 1.875	65	±0.25	+15 +30	28 VDC	3766	195.38
1.700 x 1.700 x 0.500	2.562 x 2.937 x 1.000	105	±0.5	0 +95	22.5 VDC	3767	109.50
(1) HC6/U Crystal	1.437 x 1.437 x 2.130	75	±1.0	0 +50	22-30 VDC	4000	49.00
(1) HC25/U Crystal	1.437 x 1.437 x 2.130	75	±1.0	0 +50	22-30 VDC	4100	49.00
TO-5 Crystal	1.250 dia x 3.156	75	±1.0	0 +50	22-30 VDC	4132	49.00
3.900 x 5.150 x 3.000	5.000 x 7.000 x 4.500	65	±1.0	0 +50	28 VDC	5030	125.00
2.187 x 3.178 x 3.860	2.750 x 4.203 x 5.141	70	±1.0	+10 +35	117 VAC	5063	156.00
.9620 dia x 2.330	1.297 dia x 2.330	85	±0.5	0 +70	28-135 VAC	5169	116.00
2.920 x 2.920 x 5.000	5.000 x 7.000 x 5.000	50	±0.25	−15 +35	24 VDC	5767-2	227.52
1.875 x 2.875 x 1.187	2.500 x 4.000 x 2.500	75	±.01	−40 +60	117 VAC	7008	195.00
.8750 x .8750 x 1.000	4.000 x 4.000 x 4.000	150 adj.	±.01	room	117 VAC	7079	524.00
1.218 x 3.062 x 3.328	2.225 x 4.188 x 5.000	65	±.50	−30 +50	117 VAC	7600	185.00
(1) HC6/U Crystal	1.500 dia x 1.700	75	±0.75	+10 +50	117 VAC	7701-2	86.50

TEMPERATURE CONTROLLERS

28 VDC Power	Temperature °C Control Range	Temperature °C Prop. Band	Temperature °C Environment	Package Size	Package Mount Style	Control Mode	O.I. Probe Series	Model Number	Price (1 to 5)
Load Amps.	°C.								
2.0	−10 +425	1	0 +65	1.50 x 1.50 x 1.00	chassis	prop.	TP	3C2-50	$ 79.50
2.0	−10 +425	1	0 +65	2.00 x 2.00 x 1.00	chassis	prop.	TX	3C2X-50	79.50
2.0	0 +400	1	0 +65	2.00 x 2.00 x 1.00	chassis	prop.	TL	*3C2L-50	89.50
2.0	−10 +425	1	−55 +85	1.50 x 1.50 x 1.25	chassis	prop.	TP	3C2-51	141.35
2.0	−10 +425	1	−55 +85	1.50 x 1.50 x 1.00	chassis	prop.	TP	3C2-52	165.00
1.0	−10 +425	1	0 +50	1.5 sq. board plus TO66 & heat sink	chassis	prop.	TP	3C4-20	55.00
4.0	−10 +425	1	0 +50°C	3.00 x 4.65 x 2.25	chassis	prop.	TP	3C4-100-1	119.50
8.0	−10 +425	1	0 +65°C	4.75 x 5.50 x 5.00	chassis	prop.	TP	3C4-200	189.00
12.5	−10 +425	0.5	0 +50	4.00 x 4.63 x 2.00	chassis	dead	TP	3C16-350-1	350.00
117 VAC Load Amps.									
1.0	−10 +425	0.25	0 +50	2.00 x 2.00 x 1.125	chassis	zero cr.	TP	5C1-100	53.00
1.0	0 +400	1.5	0 +50	2.00 x 2.00 x 1.125	chassis	zero cr.	TL	*5C1L-100	63.00
1.0	−10 +425	0.25	−55 +85	1.75 x 1.75 x 1.00	chassis	zero cr.	TP	5C1-101	82.50
1.0	0 +400	1.5	−55 +85	1.75 x 1.75 x 1.00	chassis	zero cr.	TL	*5C1L-101	92.50
15	−10 +425	1-15	0 +45 +45 +90 drtd.	3.00 x 3.00 x 1.00	chassis	zero cr.	TX	5CX-15	39.20
15	0 +400	0.5 15	0 +45 +45 +90 drtd.	3.00 x 4.00 x 2.00	chassis	zero cr.	TL	*5CL-15	79.00
15	0 +400	0.5 15	0 +45 +45 +95 drtd.	3.00 x 3.50 x 5.00	panel	zero cr.	TL	5CL-15P	92.70
8	−10 +425	0.25	0 +50	2.07 x 3.07 x 1.03	chassis	zero cr.	TP	5C2-1000	65.00
15	−10 +425	0.25	0 +50	3.00 x 3.00 x 1.03	chassis	zero cr.	TP	5C2-1500	77.00
1.5	0 +400	1	0 +65°C	2.06 x 2.06 x 5.16	plug in	dead	TL	5C5-100	79.50
6.0	−10 +425 0 +400	1	−55 +65 +65 +90 drtd.	2.5 x 2.5 x 1.25	chassis	zero cr.	TX TL	*5C5-600	135.00
10 3	−10 +425	0.25	0 +50	8.00 x 4.00 x 3.25	chassis	dead zero cr.	TP	2ZC3-3000-3	210.00
.5	−10 +425	1	0 +50	3.00 x 4.65 x 2.25	chassis	AC Full Prop.	TP	7C6-50	105.00

* Units are also available with external 10 turn precision pot. and counter assembly with lock at $24.60 each.

STANDARD PROBES

Probe #	Range °C	Price Coated	Price Rect.	Price Metal Plate	Price SS Tube
TP 10	−20 +10	$ 8.00	$16.00	$11.60	$11.60
TP 20	0 +30	$ 8.00	$16.00	$11.60	$11.60
TP 30	+20 +50	$ 8.00	$16.00	$11.60	$11.60
TP 40	+40 +70	$ 8.00	$16.00	$11.60	$11.60
TP 50	+60 +90	$ 8.00	$16.00	$11.60	$11.60
TP 60	+80 +110	$ 8.00	$16.00	$11.60	$11.60
TP 200	+100 +250	$10.00	$20.00	$15.00	$15.00
TP 300	+200 +350				$30.00
TP 400	+300 +425				$30.00
TX 1	−10 +150	$ 8.40	$16.00	$12.00	$ 8.40
TX 2	+80 +260	$20.00	$28.00	$24.00	$20.00
TX 3	+200 +425				$30.00
TL 1	0 +100	$12.00	$20.00	$17.00	$15.00
TL 2	+50 +150	$17.00	$25.00	$22.00	$20.00
TL 3	+120 +260	$22.00	$30.00	$27.00	$25.00
TL 4	+200 +350				$35.00
TL 5	+300 +400				$40.00

Write for our NEW Catalog.

OVEN INDUSTRIES

A Division of Greenray Industries, Inc.

East Simpson Road, PO Box 229
Mechanicsburg, Pa. 17055
Phone (717) 766-0721

GIBBS
MANUFACTURING
& RESEARCH
CORPORATION
ANOTHER HAMMOND CO.

CALL (608) 756-1261 FOR DETAILED SPECIFICATIONS
or Write GIBBS at 450 North Main Street, Janesville, Wis. 53545

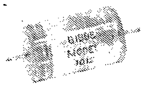
TIME in a package

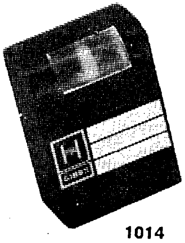
- *LABORATORY*
- *INDUSTRIAL*
- *MILITARY*
- *COMMERCIAL*
- *AEROSPACE*
- *OEM*

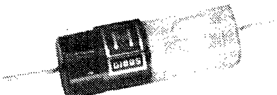
CUSTOM MOLDED IN FORM FACTOR TO YOUR END USE

ELAPSED TIME INDICATOR
30 DAY — 1 YEAR

Instruments, Computer Modules, Industrial Equipment, Storage and Shipment of Perishables — Food, Chemicals, Pharmaceutical.


1012


1014


1013

LOW COST - SMALL SIZE - LOW POWER

Electro Chemical Elapsed time indicator. 1 to 12 month elapsed time period with visual indicator at end of time.

Model 1012: 12 VDC to 500 VDC — 30 days to 1 year
Model 1013: 12 to 220 VAC — 30 days to 1 year
Model 1014: Self Powered — 30 days to 1 year

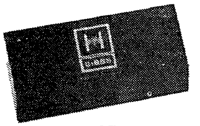
Suitable for warranty or maintenance interval monitoring. Available in axial lead or ferrule type mounting. DC size approximately .5″ diameter x .75″ long. AC size approximately .5″ diameter x 1.5″ long. Self powered type B mounted with magnetic, screw, or adhesive backing can be used to monitor storage time or shelf life of perishable products. Temperature range from 0°C to 75°C.

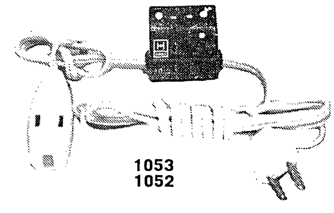
OEM MAINTENANCE AND WARRANTY MONITORS

The elapsed time indicators, ETI, is a self-contained electro-chemical module that can be operated directly from AC or DC voltages. It can be supplied as a self-contained unit with its own battery power supply. Various form factors can be supplied to customer specifications for special applications to provide front panel mounting, clip-in, pigtail wiring or others. The device provides a visual indication of the time period end by changing from a clear to a purple color. Accuracies up to 1% may be obtained.

SOLID STATE TIME DELAY
1 SECOND — 2,000 HOURS

Modular approach to long interval Timer Application — Office Machines, Controls, Instruments.


1054


1053
1052

Available in ranges from 1 second to 2,000 hours. 10:1 time range adjustment. Available in various mounting configurations including printed circuit board or supplied with line cord as shown. Can be supplied in lower voltages with logic output.

Model 1054: 120 VAC — 100 Watts output on during time delay
Model 1053: 120 VAC — 100 Watts output off during time delay
Model 1052: 6-12 VDC with Lamp Indicators

New developments in electro-chemical timing based upon coulometric technology makes possible time delay periods ranging from 1 second to 2,000 hours or more in small low cost modules. Typical applications are office machines, burglar alarms, and process controls.

SOLID STATE TIME DELAYS

The solid state time delay module can also be provided in special packages and mountings to specific customer applications. The three models above are standard configurations that can be readily modifed for volume usage. Printed circuit board mountings or plug-in configurations as well as various voltages can be provided. Accuracies up to 1% may be obtained.

GIBBS

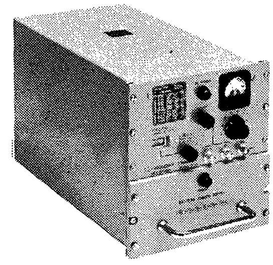
ULTRA HIGH STABILITY FREQUENCY STANDARDS

FOR LABORATORY STANDARDS, NAVIGATION SYSTEMS, TIME BASES

STABILITY 1×10^{-6} to 1×10^{-11}

100KHz to 5MHz

GIBBS Model 570

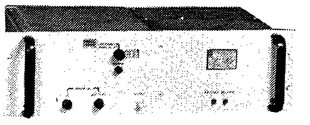


The ultimate in high stability Frequency Standards. **LONG TERM STABILITY:** 1×10^{-11} per day. **OUTPUT FREQ.:** 5 MHz, 1 MHz and 100 KHz. **POWER REQUIREMENTS:** 115 V ±10%, 60 Hz, 18 watts nominal. Automatically recharged internal battery maintains output frequency without interruption during transport or power failure. **DIMENSIONS:** 8¼″ high; 8″ wide; 16″ deep.

ULTRA-STABLE

5MHz

GIBBS Model 1047



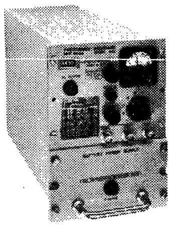
Rack mounted 5 MHz frequency standard utilizing a crystal manufactured to the latest techniques to obtain the ultimate in stability. Long term stability is 1×10^{-10} per day. The absolute frequency stability is 5×10^{-12} RMS average of 100 consecutive 1 second measurements.

Power requirements 115 V ±10% 60 Hz 20 watts nominal. An automatically recharged internal battery is built into the unit to maintain operation and crystal stability during transport or power failure for periods up to 8 hours. Standard 19″ rack mounting 5¼″ height, 12″ depth.

ULTRA-STABLE

100KHz to 5MHz

GIBBS MODEL 568

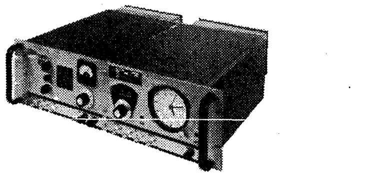


A portable Frequency Standard of high stability manufactured to Mil-F-21584C (Ships) specs. Military designation AN/URQ-10. **FREQ. STABILITY:** 5×10^{-10} per day (long term); 5×10^{-12} rms average of 100 consecutive 1 second periods (short term). **OUTPUT FREQ.:** 5 MHz, 1 MHz and 100 KHz. **POWER REQUIREMENTS:** 115 V ±10%, 50 to 400 Hz; 12 watts, nominal. Automatically recharged battery maintains output frequency without interruption during transport or power failure. **DIMENSIONS:** 7¹³⁄₁₆″ high, 5½″ wide; 12½″ deep.

MILITARY HIGH STABILITY AN/URQ-10

1Hz to 5MHz

GIBBS MODEL 572



A rack mounted 5 MHz Frequency Standard combined with analog-type 24 hour clock with sweep second hand. **FREQ. STABILITY:** 5×10^{-10} per day. **OUTPUT FREQ.:** 5 MHz, 1 MHz, 100 KHz, 10 KHz, 1 KHz, 100 PPS and 1 PPS. **POWER REQUIREMENTS:** 115 V ±10%, 50 to 400 Hz; 28 watts, nominal. Automatically recharged battery maintains clock operation without interruption during power failures. **DIMENSIONS:** 5¼″ panel, 19″ rack; 15¼″ deep behind panel; 16¾″ overall depth.

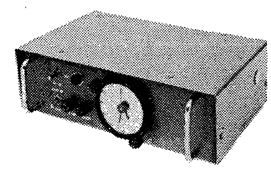
MODEL 571

Same as MODEL 572 above except without clock but with redundant circuitry and outputs.

PRECISION MASTER TIME SYSTEM

1Hz to 400Hz

GIBBS MODEL 438



The Gibbs Model 438 Frequency Standard Clock is a completely transistorized, quartz crystal-controlled clock, timer, and frequency standard.

Some applications are: aircraft terminals and bases, air traffic control timing systems, time clock checks and updating, recorders laboratory standards, slave clocks, and seismographic use.

SUPPLY VOLTAGE:

110 VAC 60 Hz or 12 VDC battery @ 20 watts max.

FEATURES:

Time Indication: Front panel 24 hour clock with sweep second hand. All hands can be instantaneously reset to zero using a simple ¼ turn reset knob.

Mechanical Programmer: Cam operated contacts that close at 12 hours, 1 hour, and 1 minute intervals.

Accuracy: Better than 0.0001% with a drift rate of less than .0004% per year.

Auxiliary Power Output: 60 Hz square @ approx. 150 V PP into a 2K load.

LOW COST PORTABLE MASTER TIME SYSTEM

FREQUENCY STANDARDS, OSCILLATORS AND TIMER MODULES:

Models illustrated are available as catalog items built to required frequencies from 1 Hz through 30 MHz. Designs to specific specifications can be created using stock design module concept. GMRC maintains capability to provide complete government documentation consistent with aerospace and military requirements. Full white room facilities controlled to NASA specifications; environmental test chambers with full temperature humidity and vibration test facilities; frequency standards laboratory monitored with WWVB, keeping rigid schedules of calibration as well as high volume commercial product capability is maintained to serve our customers.

GIBBS

GIBBS MANUFACTURING & RESEARCH CORPORATION

SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

CRYSTAL OSCILLATORS SYSTEM CLOCK

STABILITY .01% to .002%

1kHz to 30MHz

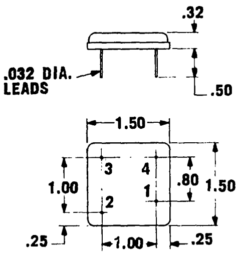
FEATURES

- Mil Approved
- Logic Compatibility
- Excellent Stability
- Digital Dividers

APPLICATIONS

- Computer Clock
- Reference Oscillator
- Facsimile
- Hi-Rel Applications

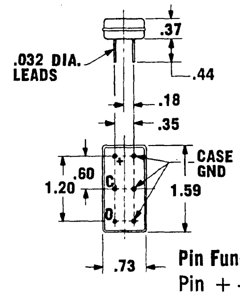
MODEL 599



Pin Functions
Pin #1 — Common
#2 — +5VDC
#3 — Output
#4 — Case

FIGURE 1

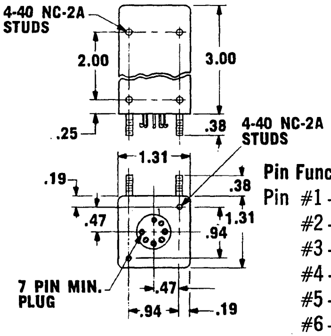
MODEL 606



Pin Functions
Pin + — +5VDC
C — Common
O — Output

FIGURE 2

MODEL 439
OPTIONAL
Horiz. or Vert. Mounting



Pin Functions
Pin #1 — Common
#2 — N/C
#3 — +12VDC
#4 — Case
#5 — Output
#6 — N/C
#7 — Also Common

FIGURE 3

SPECIFICATIONS

Model	599		606		439	
Part Number	AG11-29P	JK11-29P	AG01-29P	JK01-29P	LG09-21U	LG09-12U
Frequency Range	2.5MHz to 20MHz	2.5MHz to 20MHz	2.5MHz to 30 MHz	2.5MHz to 30 MHz	1kHz to 100kHz	1kHz to 100kHz
Frequency Tolerance	±.02%	0.002%	±.02%	0.002%	±0.01%	±0.01%
Temperature Range	−55°C to +125°C	0°C to +50°C	−55°C to +125°C	0°C to +50°C	−40°C to +60°C	−40°C to +60°C
Supply Voltage	+5VDC ±5%	+5VDC ±5%	+5VDC ±5%	+5VDC ±5%	+24VDC ±5%	+24VDC ±5%
Current Drain	<30MA	<20MA	<20MA	<20MA	<40MA	<40MA
Waveform	Square	Square	Square	Square	Square	Sine
Source Voltage	>2.5V peak	>2.5V peak	>2.5V peak	>2.5V peak	—	—
Sink Voltage	0.0V ±0.4 @ 20MA	0.0V ±0.4 @ 4MA	0.0V ±0.4 @ 4MA	0.0V ±0.4 @ 4MA	—	—
Output Voltage	—	—	—	—	>8V P/P	>1VRMS
Rise & Fall Time	<20 Ns	<20 Ns	<20 Ns	<20 Ns	<10 μsec	—
Distortion	—	—	—	—	—	<5%
Load Resistance	IC Logic	IC Logic	IC Logic	IC Logic	10 KΩ	10 KΩ
Size	Figure 1	Figure 1	Figure 2	Figure 2	Figure 3	Figure 3

ORDERING INFORMATION

To order, specify Model/Part No. plus frequency. (Example 606-AG01-29P-13MHz)

GIBBS

GIBBS MANUFACTURING & RESEARCH CORPORATION
SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

COMPUTER CLOCK
Model CX

STABILITY to .002%

1MHz to 30MHz

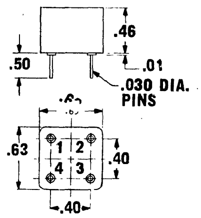
FEATURES

- **Low Cost**
- **Plastic Case**
- **Logic Compatibility**
- **P.C. Mounting**
- **Crystal Controlled**
- **Custom Designed Packages**

APPLICATIONS

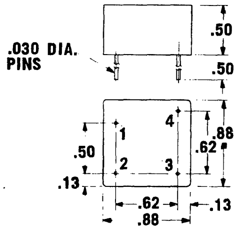
- **Time Reference**
- **Data Transmission**
- **Facsimile**
- **Marker Generators**
- **Stable Frequency Source**

Style A


.46
.50
.01
.030 DIA.
PINS
.63
.63
.40
.40
1
2
4
3

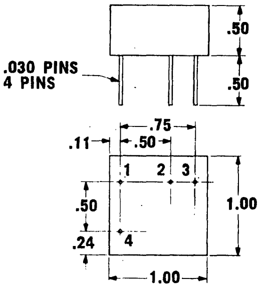
Pin Functions
Pin #1 — Output
#2 — No Connection
#3 — +5VDC
#4 — Common

Style B


.030 DIA.
PINS
.50
.50
.50
.88
.62
.13
1
2
3
4
.62
.88
.13

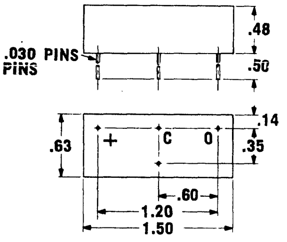
Pin Functions
Pin #1 — Output
#2 — N/C
#3 — +5VDC Input
#4 — Common

Style C


.030 PINS
4 PINS
.50
.50
.75
.11
.50
1
2
3
4
.50
.24
1.00
1.00

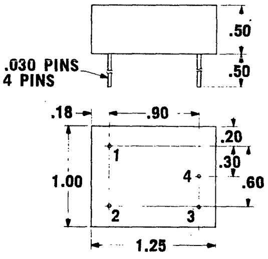
Pin Functions
Pin #1 — Output
#2 — Common
#3 — Spare N/C
#4 — +5VDC

Style D


.030 PINS
PINS
.48
.50
.14
.63
+
C
0
.35
.60
1.20
1.50

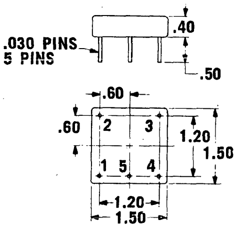
Pin Functions
Pin + — +5VDC
C — Common (−)
0 — Output

Style E


.030 PINS
4 PINS
.50
.50
.18
.90
.20
.30
.60
1.00
1
4
2
3
1.25

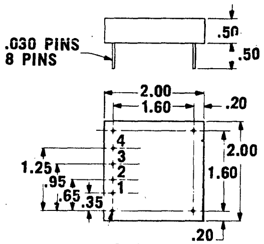
Pin Functions
Pin #1 — Common
#2 — +5VDC
#3 — Output
#4 — Spare N/C

Style F


.030 PINS
5 PINS
.40
.50
.60
.60
2
3
1
5
4
1.20
1.50
1.20
1.50

Pin Functions
Pins #1 & #2 — Common
#2 & #4 — +5VDC
#5 — Output

Style G


.030 PINS
8 PINS
.50
.50
2.00
1.60
.20
4
3
2
1
1.25
.95
.65
.35
2.00
1.60
.20

4 MOUNTING PINS
(NO CONNECTION)

Pin Functions
Pin #1 — +5VDC
#2 — Output
#3 — Output
#4 — Common

SPECIFICATIONS

Model	CX						
Part Number	PK02-28A	PK02-28B	PK32-28C	PK02-28D	PK02-28E	PJ11-28F	PL22-28G
Frequency Range (MHz)	1.25 to 15	.75 to 15	.6 to 15	.6 to 15	.75 to 15	.75 to 15	50Hz to 15MHz
Frequency Tol. Percent (%)	±.002	±.002	±.002	±.002	±.002	±.002	±.002
Temp. Range	All 0°C to 50°C						
Supply Voltage	All +5 ±0.5VDC						
Input Power (Milliwatts)	100	150	100	100	200	200	400
Waveform	Square Compatible with IC Logic All TTL. Logic "1", 2.4V Min., Logic "0", 0.5V Max.						
Symmetry	All 50/50 ±5%. R_t & F_t, 10 Nanosec. typical						
Sink Current	All 10 ma. typical (Fan out)						
Style	A	B	C	D	E	F	G
Height (Max.)	.500	.500	.500	.475	.500	.400	.500

Closer frequency tolerances available in all styles upon request. Frequencies up to 30MHz available with relaxed symmetry.

ORDERING INFORMATION

To order, specify Model/Part No. plus frequency. (Example CX-PK02-28D-1 MHz)

GIBBS

GIBBS MANUFACTURING & RESEARCH CORPORATION
SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

CRYSTAL OSCILLATORS PROPORTIONAL OVEN CONTROLLED

STABILITY .001 to .0001%

1Hz to 10MHz

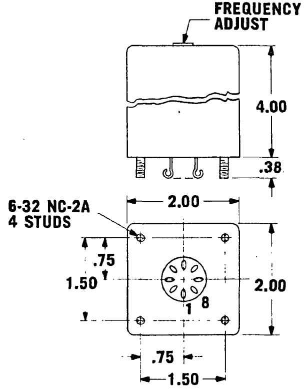
FEATURES

- Ultra High Stability
- Proportional Control
- White Room Assembled
- Logic Compatibility

APPLICATIONS

- Mobile Seismograph Equipment
- Synchronus Motor Drive
- 60Hz for Inverter/Converter
- Audio Frequency Generators

MODEL 427

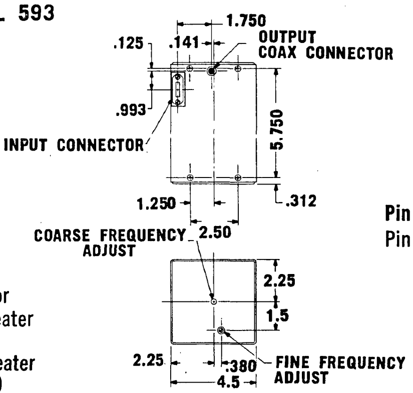

FREQUENCY ADJUST
4.00
.38
6-32 NC-2A 4 STUDS
2.00
.75
1.50
2.00
1
8
.75
1.50

Pin Functions

Pin #1 — + Oscillator Supply
#2 — Com. Osc. Return
#3 — N/C
#4 — Output
#5 — Case
#6 — N/C
#7 — + Oven Supply
#8 — Comm. Oven Return

FIGURE 3

MODEL 593


1.750
.125
.141
OUTPUT COAX CONNECTOR
.993
5.750
INPUT CONNECTOR
1.250
.312
COARSE FREQUENCY ADJUST
2.50
2.25
1.5
2.25
.380
4.5
FINE FREQUENCY ADJUST

Pin Function

Coax. Con. Output
Pin #1 — Common
#4 — 20VAC
#7 — 20VDC
#10 — Output Monitor
#13 & 4 — Inner Oven Heater Monitor (DC V)
#14 & 7 — Outer Oven Heater Monitor (DC V)

Weight — 2.2 pounds

FIGURE 2

MODEL 518

Pin Functions

Pin #1 — Output
#2 — Output
#3 — 115VAC Input
#4 — 115VAC Input
#5 — Common
#6 — Case
#7 — + Oven Input*
#8 — N/C

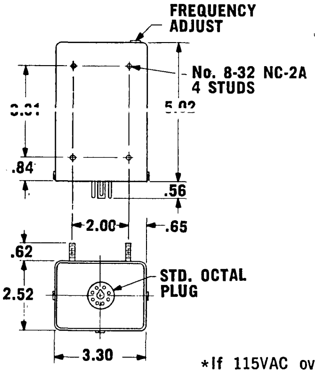

FREQUENCY ADJUST
No. 8-32 NC-2A 4 STUDS
5.02
.84
.56
2.00
.65
.62
2.52
STD. OCTAL PLUG
3.30

FIGURE 1

*If 115VAC oven is used it will be internally connected to Pins #3 & #4. Pin #7 will have N/C.

SPECIFICATIONS

Model	518		593	427	
Part Number	PN09-21Y	PN09-12Y	NV08-15K	FM20-22Q	FM20-12Q
Frequency Range	30Hz to 100kHz	30Hz to 100kHz	4.5 to 6MHz	1Hz to 100kHz	1Hz to 100kHz
Frequency Tolerance	$\pm 1 \times 10^{-6}$	$\pm 1 \times 10^{-6}$	$\pm 1 \times 10^{-10}$	$\pm 5 \times 10^{-6}$	$\pm 5 \times 10^{-6}$
Temperature Range	0°C to +50°C	0°C to +50°C	−20°C to +55°C	−20°C to +75°C	−20°C to +75°C
Supply Voltage	115VAC ±10%	115VAC ±10%	12 or 24VDC ±1VDC	+28VDC ±2VDC	+28VDC ±2VDC
Current Drain	15 Watts Peak 4 Watts @ 25°C	15 Watts Peak 4 Watts @ 25°C	15 Watts Peak 4 Watts @ 25°C	15 Watts Peak 4 Watts @ 25°C	15 Watts Peak 4 Watts @ 25°C
Waveform	Square	Sine	Sine	Square	Sine
Output Voltage	>8V p/p	>2VRMS	>1VRMS	>5V p/p	>1VRMS
Rise & Fall Time	<10 μsec	—	—	<5 μsec	—
Distortion	—	<5%	<1%	—	<5%
Load Resistance	5KΩ	5KΩ	50Ω	10KΩ	10KΩ
Size	Figure 1	Figure 1	Figure 2	Figure 3	Figure 3

ORDERING INFORMATION

To order, specify Model No. plus frequency. (Example 518-PN09-21Y-30Hz)

GIBBS

GIBBS MANUFACTURING & RESEARCH CORPORATION
SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

CRYSTAL OSCILLATORS SYSTEM CLOCK

STABILITY .01% to .002%

1KHz to 30MHz

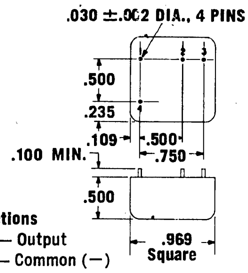
FEATURES

- Mil Approved
- Logic Compatibility
- Excellent Stability
- Digital Dividers

APPLICATIONS

- Computer Clock
- Reference Oscillator
- Facsimile
- Hi-Rel Applications

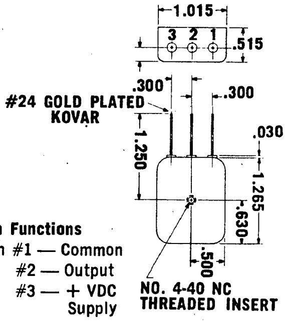
MODEL 1002


.030 ±.002 DIA., 4 PINS
.500
.235
.109
.500
.750
.100 MIN.
.500
.969
Square

Pin Functions
Pin #1 — Output
#2 — Common (−)
#3 — Case Ground
#4 — +5VDC Input

FIGURE 1

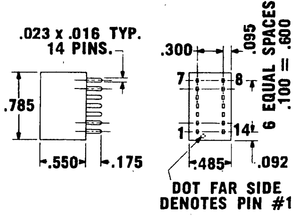
MODEL 1003


1.015
3 2 1
.515
.300
.300
#24 GOLD PLATED KOVAR
.030
1.250
1.265
.630
.500
NO. 4-40 NC THREADED INSERT

Pin Functions
Pin #1 — Common
#2 — Output
#3 — + VDC Supply

FIGURE 2

MODEL 1051


.023 x .016 TYP. 14 PINS.
.785
.550
.175
.300
.095
6 EQUAL SPACES .100 = .600
7
8
1
14
.485
.092
DOT FAR SIDE DENOTES PIN #1

Pin Functions
Pin #1 & 7 — Common
#8 — Output
#14 — + 5 VDC Supply
Remainder N/C

FIGURE 3

CRYSTAL OSCILLATORS TEMPERATURE COMPENSATED

STABILITY .002% to .0005%

60Hz to 16MHz

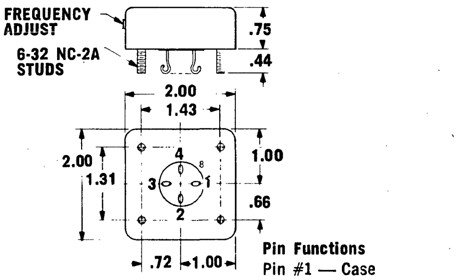
FEATURES

- No Warmup
- Small Size
- PC Mounting
- Excellent Stability
- Low Power

APPLICATIONS

- Computer Time Base
- Spaceborne Use
- Navigation Systems
- Communications System

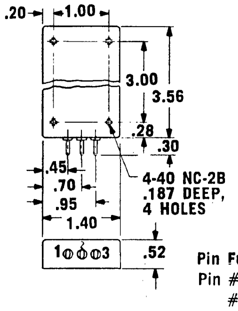
MODEL 520


FREQUENCY ADJUST
6-32 NC-2A STUDS
.75
.44
2.00
1.43
2.00
1.31
4
3
1
2
8
1.00
.66
.72
1.00

Pin Functions
Pin #1 — Case
#2 — Common
#3 — Output
#4 — + Osc. Supply

FIGURE 4

MODEL 494


.20
1.00
3.00
3.56
.28
.30
.45
.70
.95
1.40
4-40 NC-2B .187 DEEP, 4 HOLES
1 2 3
.52

Pin Functions
Pin #1 — + Supply
#2 — Common
#3 — Output

FIGURE 5

SPECIFICATIONS

Model	1002	1003		1051	520	494	
Part Number	AJ32-29K	EK3A29K	EK3A19K	P2AB-29J	S124-29U	TL02-27H	LM02-27H
Frequency Range	3 to 30MHz	3 to 30MHz	3 to 30MHz	.187 to 5MHz	4MHz to 30MHz	500kHz to 10MHz	500kHz to 10MHz
Frequency Tolerance	±.005%	±.0025%	±.0025%	±.002%	$\pm 2 \times 10^{-6}$	$\pm 10 \times 10^{-6}$	$\pm 5 \times 10^{-6}$
Temperature Range	−55°C to +125°C	−10°C to +125°C	−10°C to +125°C	0°C to 50°C	−55°C to +95°C	−55°C to +85°C	−40°C to +60°C
Supply Voltage	+5VDC ±10%	+5VDC ±10%	+5VDC ±10%	+5VDC ±10%	+24VDC ±1%	+12VDC ±1%	+12VDC ±1%
Current Drain	<20MA	<20MA	<20MA	50MA Typ.	<12MA	<40MA	<40MA
Waveform	Square	Square	Sine	Square	Square	Square	Square
Source Voltage	—	—	—	—	>2.5V	—	—
Sink Voltage	—	—	—	—	0.0V ±0.4V @ 4MA	—	—
Output Voltage	>2.5V	>2.4V	>1.5V p/p	>2.4V	—	>4V p/p	>4V p/p
Rise & Fall Time	<25 Ns	<25 Ns	—	<150 Ns	<20 Ns	<100 Ns	<100 Ns
Load Resistance	IC Logic	IC Logic	IC Logic	IC Logic	IC Logic	2.2KΩ	2.2KΩ
Size	Figure 1	Figure 2	Figure 2	Figure 3	Figure 4	Figure 5	Figure 5

ORDERING INFORMATION

To order, specify Model/Part No. plus frequency. (Example 520-S124-29U-4MHz)

GIBBS

GIBBS MANUFACTURING & RESEARCH CORPORATION

SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

ANTI DISTURBANCE SWITCHES - Model 604

SPECIFICATIONS

PHYSICAL

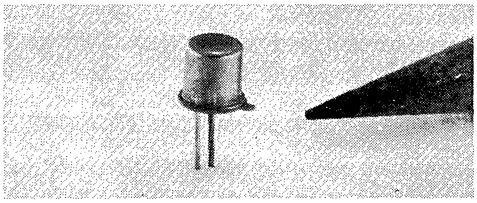
- Housed in standard TO-18 transistor package measuring only .213″ in diameter by .190″ length, nominal
- 3 "G" nominal sensitivity
- Other sensitivities special

ELECTRICAL

- Normally open contact configuration closes upon being subjected to accelerative disturbances beyond its rated sensitivity level in all planes
- Contacts rated up to 10 MaDC at 5VDC
- Repeatability better than 20%
- Temperature effect on sensitivity is better than 1%

APPLICATIONS

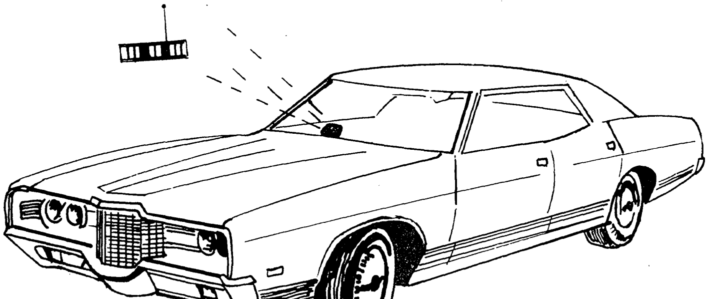
- Seismic intrusion detection systems
- Burglar Alarms
- Wherever a building or device must be safe guarded against intruders
- Out of balance detector



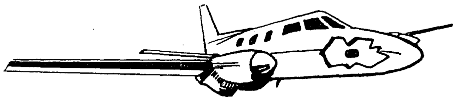
Shown Actual Size

• Micro-miniature • Ultra-Sensitive • Low cost

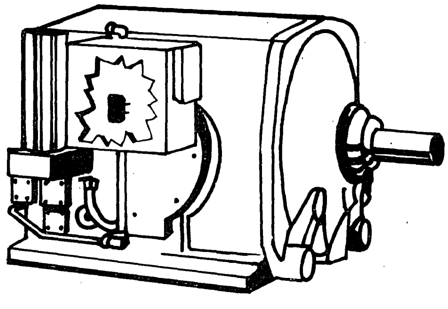
The Model 604 represents a significant step forward in acceleration sensitive switches for those involved in anti-intrusion devices and the burglary protection business. Operating over a wide temperature range, the Model 604 series can be easily concealed in doors, floors, window frames, ceilings, filing cabinets, safes, etc. Its sensitivity to acceleration can even be used to detect footsteps from an intruder.



Motion and Disturbance Detection Transducer for Anti-Theft System



Automatic Impact Actuator for Downed Aircraft Beacon



Out-of-Balance Vibration Detector

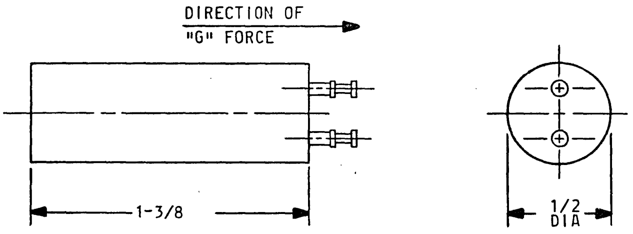
INERTIA SWITCH - Model 625

SPECIFICATIONS

- Sealed plastic housing
- ½″ dia. x 1⅜″ long
- Single pole normally open contacts
- Available from 5 "G" to 50 "G"
- Operating threshold ±5% or 1 "G" whichever is greater
- Contacts — Gold plated Type 2, Class I
- Rated 12 volts @ 100 ma.
- Storage temperature −45°C to +100°C
- Humidity — 95%, 48 Hours

APPLICATIONS

- Centrifugal force detection
- Acceleration detector
- Shock detector
- Out of balance detector



The Gibbs Model 625 Inertia Switch utilizing a magnetic principal can be furnished to operate at any discrete threshold between 5 "G"s and 50 "G"s. The switch will respond to forces acting only along its axis in the direction indicated and is insensitive to radial forces. Response time of the Gibbs Model 625 inertia switch is nominally 10 milliseconds.

GIBBS

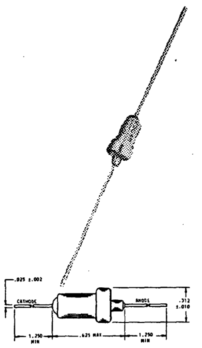
GIBBS MANUFACTURING & RESEARCH CORPORATION

SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

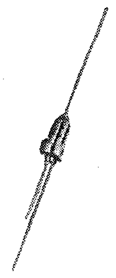
GIBBS

COUL-CELLS™

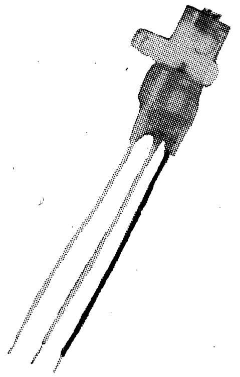
ELECTROLYTIC TIMERS & INTEGRATORS



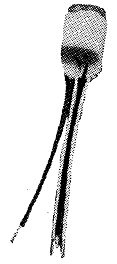
MODEL 589



MODEL 590



MODEL 597



MODEL 601

MODEL 603

SPECIFICATIONS — GIBBS ELECTROLYTIC CELLS

	Model Number	Capacity Microamp. Hours	Time Hours	Accuracy	Size, Inches (body)	Operating Temperature	Application — Operation
IMPEDANCE CHANGE	589-50	50	1-10	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	Cell voltage triggers semiconductor circuit at end of timing period. Impedance-change type. Characteristic Z = 100 ohms before time-out, 50K after.
	589-100	100	2-20	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
	589-500	500	4-50	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
	589-1000	1000	8-100	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
	589-1500	1500	12-150	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
	589-2500	2500	20-250	±5%	0.310″ dia. x 0.550″	−55°C to +76°C	
	589-2650	2650	100-720	±5%	0.310″ dia. x 0.550″	−23°C to +76°C	
	589-3200	3200	100-800	±5%	0.310″ dia. x 0.550″	−23°C to +76°C	
	590-75-2650	75-Anode #1 2650-Anode #2	1.5-15.0 100-720	±5% ±5%	0.310″ dia. x 0.550″	−23°C to +76°C	Dual anode cell—combines long, short times same unit.
MECHANICAL SWITCHING	597	5350	30 sec.-10 days	±15%	.625″ dia. x 1.50″	−20°C to +38°C	Operates mechanical switch — Close circuit at end of time period.
	601	5350	1-240	±10%	.812″ dia. x 1.125″	−40°C to +76°C	Operates mechanical switch — Close circuit at end of time period.
	603	5350	1-240	±10%	.812″ dia. x .812″	−40°C to +76°C	Operates stab detonator.

A MAJOR BREAKTHROUGH IN TIMING

Now available from GIBBS — two unique types of Timing Devices called Electrolytic CELLS or COULOMETERS. The timing capability of these units range from thirty seconds to many months. For the first time, the Design Engineer can specify just one type of timing device that is **infinitely variable** to accommodate a truly wide range of timing intervals, and meets all military environmental requirements.

GIBBS Electrolytic CELLS are available in two classifications; **mechanical switching** and **impedance-change switching.** Both classifications are dependent on a simple current/time relationship for their operation, and are specified in terms of "ampere-hour" capacity. The mechanical switching devices mechanically close (or open) switch contacts at the end of the timing period. The impedance change cells exhibit approximately a 10 to 1 change in impedance at the end of the timing period, sufficient to trigger an SCR or Transistor. Input currents range from 5 μA to 2.7 Ma.

GIBBS Electrolytic Cells are ideal for use where a predetermined time action is required. **Applications include:** Signal when maintenance is due; Indicate conclusion of warranty; End-of-life Indicator; Sonobuoy scuttling; Airframe Inspections, Ordnance Safety and Arming; or any timing function ranging from 30 seconds to many months where small size, low cost, ruggedness, accuracy and low current consumption are desirable.

GIBBS Electrolytic CELLS are almost perfect current/time integrators and respond accurately to any input — steady state, pulse, square wave, triangular, etc. Because of this unique integration capability, the designer can successfully work with almost any number of inputs to accurately monitor system operating conditions. SEND FOR FREE DATA AND ENGINEERING APPLICATION NOTES.

GIBBS

GIBBS MANUFACTURING & RESEARCH CORPORATION

SUBSIDIARY OF HAMMOND CORPORATION | JANESVILLE, WISCONSIN 53545 | (608) 756-1261

HUGHES

FREQUENCY CONTROL DEVICES

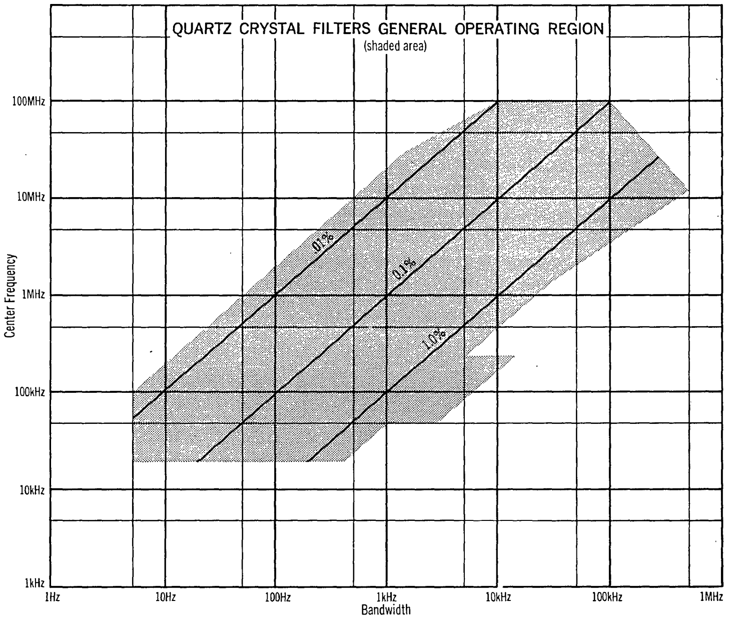
CRYSTAL FILTERS

As the nation's leading supplier of precision crystal filters, Hughes offers years of technical experience backed by the industry's most advanced production and test facilities. Thousands of Hughes crystal filters are currently in use in missiles, space vehicles, radar systems and communications equipment. Available in various frequencies, sizes and environmental standards, Hughes filter types include bandpass, single sideband, band rejection, contiguous comb doppler and thin-film monolithic.

Bandpass & Single Sideband Filters. Narrow passbands, steep shape factors and low insertion losses are characteristic of all Hughes bandpass and single sideband filters. General specifications include:

Center Frequency Range	250kHz to 100MHz
Fractional Bandwidth Range	0.002% to 6%
Shape Factor (60 db/3 db ratio)	As low as 1.15 to 1
Insertion Loss	Down to 0.1 db
Passband Ripple	Down to ±0.1 db

Note: Refer to the General Operating Regions Chart (right) to determine producible design combinations of bandwidth and center frequency.

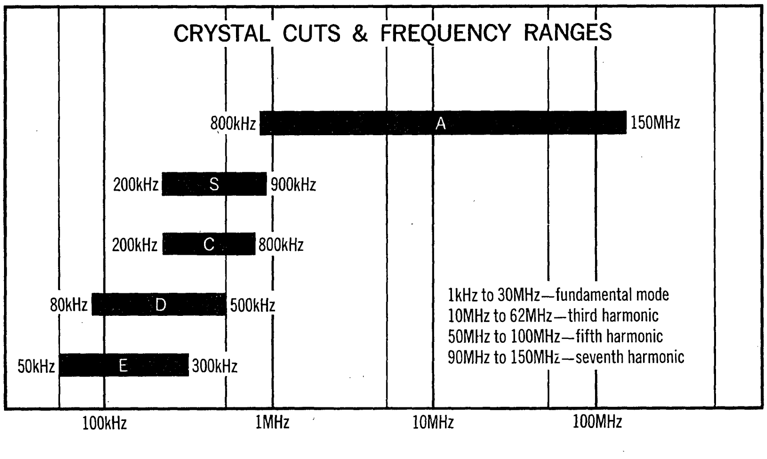


QUARTZ CRYSTALS

Hughes supplies a full range of low and high frequency quartz crystals from 250kHz up to 150MHz. Both standard and custom units in prototype or production quantities can be supplied for a variety of precision, frequency control applications.

Military Standard Crystals. Manufactured to MIL-C-3098E, Hughes military standard quartz crystal units are offered in a full range of low and high frequencies.

Coldweld Sealed Crystals. For applications requiring exceptionally high reliability and long term frequency stability, Hughes employs the Coldweld process for hermetically sealing the crystal enclosure. Only pressure is used in welding the cover to the base, thereby eliminating all possibility of contamination from fluxes, sparking or heating. Hughes Coldweld quartz crystals are available in 250kHz to 150MHz frequencies and in TO-5, HC-6 or HC-18 Coldweld holders.



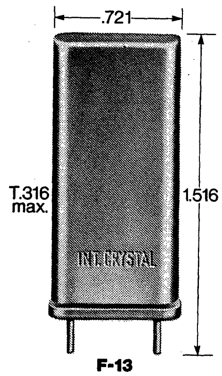
Hughes is the country's leading supplier of precision crystal filters and related frequency control devices. A partial list of major programs using these products includes BMEWS, Apollo, Pioneer, Syncom, Surveyor, Mauler, Hawk, Minuteman, Talos, Phoenix and Standard Missile. A staff of competent engineers backed by the industry's most advanced quality control and test facilities, stands ready to handle your toughest assignment. Call collect or contact your nearest Hughes representative for assistance.

Hughes Aircraft Company
Microelectronic Products Division
Frequency Control Devices Department
500 Superior Avenue, Department E1
Newport Beach, California 92663
Telephone (714) 548-0671
TWX 910-596-1374

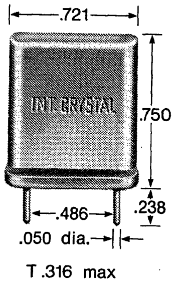
HUGHES

HUGHES AIRCRAFT COMPANY
FREQUENCY CONTROL DEVICES
NEWPORT BEACH, CALIFORNIA

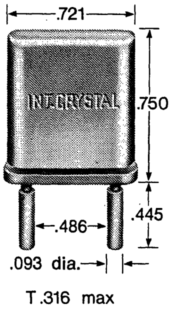
Crystals



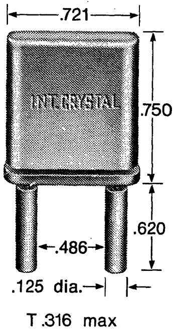
F-13



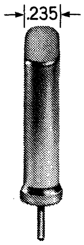
F-605



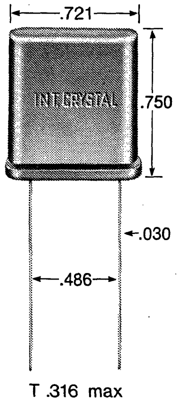
F-609



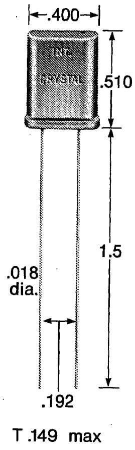
F-612



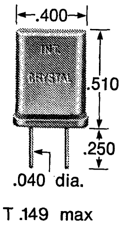
F-605SL



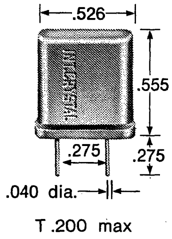
F-700



FM-1



FM-2



FI-4

Low frequency 70 KHz—999 KHz

On this page we present our four* most popular crystal mountings and the data for the crystals available in these mountings according to the various frequency ranges.

mode of oscillation

70-184 KHz	Length shear 5°X
185-599 KHz	Edge shear CT & DT
600-999 KHz	Face shear AT

shunt capacitance 7 pf (Max.)

70-200 KHz	10000- 7000 ohms
200-500 KHz	6500-11000 ohms
800-999 KHz	625 ohms

drive (Max.)

70-499 KHz	2 milliwatts
500-999 KHz	10 milliwatts

REMEMBER: Just any crystal and just any oscillator will not combine to produce designated spot frequencies!

DESCRIPTION AND DATA: All of these crystals are of the plated, wire-mounted type. Low drift AT-cut blanks are used in these units above 600 KHz, and low drift CT cut blanks are used in units below 600 KHz; any crystal can be supplied for operation with or without an oven.

TYPE SPECIFICATIONS

1. **General Purpose** (GP) crystals will be calibrated to within ±.02% of frequency when operated into the customer's specified fundamental load capacitance only (32 pf will be used when none is specified). GP crystals 500-000 KHz will hold temperature tolerance of ±.005% from −30° to 60°C and ±.02% for frequencies below 500 KHz.
2. **Commercial Standard** (CS) crystals will be calibrated as noted below, as specified for operation in customer's load. CS crystals will hold temperature tolerance ±.003% −30° to 60°C above 500 KHz and ±.02% below 500 KHz.
   CIRCUIT: As specified by customer. Crystals are available for all major two-way equipment and in most cases the necessary correlation data is on file. Where circuit is not specified, the crystal will be calibrated for operation into a load capacitance of 32 mmf. Typcal circuits for the different frequency ranges are shown on the following page.
   The CS series of crystal units is available to commercial or military specifications demanding tight frequency tolerance, long term stability and low frequency response.

WHEN ORDERING—SPECIFY THE FOLLOWING FOR EACH CRYSTAL

A. Crystal frequency
B. Type GP or CS
C. Calibration temperature (Room Temperature or Over 60°C)
D. Holder (see above)
E. Circuit load and correlation data
Note: For GP specify 10, 20 or 32 pf. Do not specify equipment types in the case of GP crystals. These are made only to 10, 20 or 32 pf load. When circuit load is not specified crystals will be correlated for a 32 pf load.
F. Special holder markings (not available on GP type)

Consult our crystal sales engineers for special applications.

	TYPE				
	GENERAL PURPOSE (1)	COMMERCIAL STANDARD (2)			
Frequency	Calibration Tolerance .01%	Calibration Tolerance As Noted			
70- 99 KHz	$20.00	.01%	$22.25		
100-199 KHz	13.25	.01%	15.25	.0025%	$17.25
200-499 KHz	13.25	.005%	15.25	.0025%	17.25
500-849 KHz	37.25	.0025%	39.25		
850-999 KHz	13.25	.0025%	15.25		

*F-13, F-605, F-609, F-612.

INTERNATIONAL
CRYSTAL MFG. CO., INC.
10 NO. LEE • OKLA. CITY, OKLA. 73102

Medium frequency crystals 1,000 KHz — 22,000 KHz

FUNDAMENTAL TYPE

TYPE SPECIFICATIONS

1. **General Purpose** (GP) crystals will be calibrated to within ±.01% of frequency when operated into 10, 20 or 32 pf load capacitance only (32 pf will be used when none is specified).

   GP crystals will hold temperature tolerance of ±.005% from −30° to 60°C.
2. **Commercial Standard** (CS) crystals will be calibrated to either .0025% or .001% as specified for operation in customer's load. CS crystals will hold temperature tolerance ±.003% −30° to 60°C.
3. A calibration tolerance of ±.001% (or special) can only be obtained when a definite circuit load capacitance and drive level are specified. Where a definite load capacitance is not specified and correlation is required from a copy of the intended circuit a tolerance of ±.01% should be expected.
4. **High Accuracy** (HA) crystals are for use in circuits where tolerances better than ±.002% −30° to 60°C are required. Tolerances of .0005% over the range −30° to 60°C will require circuit compensation. Without compensation the range will be limited to −10° to 60°C. Compensators are not included with the crystals and tolerance is for crystals only and does not allow for any change in circuit parameters over the temperature range.

mode of oscillation
1,000-22,000 KHz Face shear AT

shunt capacitance 7 pf (Max.)
7 pf (Max.)

resistance

1,000- 1,499 KHz	490 ohms
1,500- 1,999 KHz	375 ohms
2,000- 2,999 KHz	270 ohms
3,000- 3,999 KHz	150 ohms
4,000-22,000 KHz	75 to 25 ohms

drive (Max.)

1,000- 9,999 KHz	10 milliwatts
10,000-22,000 KHz	4 milliwatts

WHEN ORDERING — SPECIFY THE FOLLOWING FOR EACH CRYSTAL

A. Crystal frequency
B. Type — GP, CS, or HA
C. Calibration tolerance — .0025% or .001% / Special (not required for GP as this type is supplied only in .01%).
D. Calibration temperature (room temperature or over 60°C, 75°C, 85°C)
E. Holder (see above)
F. Circuit load and correlation data
Note: For GP specify 10, 20 or 32 pf. Do not specify equipment types in the case of GP crystals. These are made only to 10, 20 or 32 pf load. When circuit load is not specified crystals will be correlated for a 32 pf load.
G. Special holder markings (not available on GP type)

	TYPE				
	GENERAL PURPOSE (1)	COMMERCIAL STANDARD (2)		HIGH ACCURACY (4)	
	Calibration Tolerance .01%	Calibration Tolerance		Temperatur eTolerance −10° to +60°	
Frequency		.0025%	.001%/CS-1 Special (3)	.002%	.0005%
1,000- 1,499 KHz	$8.25	$10.25	$12.25		
1,500- 2,999 KHz	6.15	7.15	8.15	$ 8.25*	
3,000-10,999 KHz	4.50	5.10	6.15	6.30	$ 9.50**
11,000-19,999 KHz	6.15	7.15	8.15	8.25	9.50
20,000-22,000 KHz	8.25	10.25	11.25	11.25	12.50

* Available 2,000-2,999 KHz ** FM Holder Available 6,000 to 22,000 KHz

High frequency crystals 10 MHz — 160 MHz

Crystals for use in military equipment can be supplied to conform to specifications of MIL-C-3098E

mode of oscillation

10- 60 MHz	Face shear third mechanical overtone AT
61-110 MHz	Face shear fifth mechanical overtone AT
111-140 MHz	Face shear seventh mechanical overtone AT
141-160 MHz	Face shear ninth mechanical overtone AT

shunt capacitance
7 pf (Max.)

resistance (Max.)

10- 14.9 MHz	60 ohms
15- 60 MHz	40 ohms
60-110 MHz	60 ohms
110-140 MHz	80 ohms
140-160 MHz	100 ohms

drive (max.)
2 milliwatts

TYPE SPECIFICATIONS

1. **General Purpose** (GP) crystals will be calibrated to within ±.01% of frequency when operated into the customer's specified circuit load only. When none is specified resonance will be used.

   GP overtone crystals will hold temperature tolerance of ±.005% from −30° to 60°C.
2. **Commercial Standard** (CS) crystals will be calibrated to either .0025% or .001% as specified for operation in customer's load. CS crystal will hold temperature ±.003% −30° to 60°C.
3. A calibration tolerance of ±.001% (or special) can only be obtained when a definite circuit load and drive level are specified. Where a definite load is not specified and correlation is required from a copy of the intended circuit a tolerance of .01% should be expected.
4. **High Accuracy** (HA) crystals are for use in circuits where tolerances better than ±.002% −30° to 60°C are required. Tolerances of .0005% over the range −30° to 60°C will require circuit compensation. With compensation the range will be limited to −10° to 60°C. Compensators are not included with the crystals and tolerance is for crystals only and does not allow for any change in circuit parameters over the temperature range.

WHEN ORDERING — SPECIFY THE FOLLOWING FOR EACH CRYSTAL

A. Crystal frequency
B. Type — GP, CS, or HA
C. Calibration tolerance — .0025% or .0001% / Special (not required for GP as this type is supplied only in .01%)
D. Calibration temperature — Room temperature or oven 85°C
E. Holder (see above)
F. Circuit load and correlation data — normal series resonate or anti-resonate
Note: Do not specify equipment types in te case of GP crystals.
G. Special holder markings (not available on GP type)

	TYPE				
	GENERAL PURPOSE (1)	COMMERCIAL STANDARD (2)		HIGH ACCURACY (4)	
	Calibration Tolerance .01%	Calibration Tolerance (3)		Calibration Tolerance (3)	
Frequency MHz		.0025%	CS-1 .001%/Special	.0025%	.001%/Special
10- 60 (3rd)	$ 4.90	$ 7.15	$ 8.25	$9.50	$11.00
61- 79 (5th)	6.10	11.25	12.25		
80-110 (5th)	8.15	15.25	16.25		
111-139 (7th)	10.15	15.25	16.25		
140-160 (9th)	15.25	18.25	19.25		

* Other dimensions same as F-605 ** Not supplied below 15 MHz † Available in FM-1 and FM-2 holder only above 20 MHz

how to order

Mail: International Crystal Mfg., Inc., 10 North Lee, Oklahoma City, Oklahoma 73102
Phone: Area Code 405 236-3741
Cable: INCRYSTAL
Western Union TELEX: 071-347
Bell System TWX: 910-831-3177

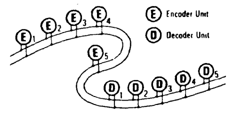
INTERNATIONAL
CRYSTAL MFG. CO., INC.
10 NO. LEE • OKLA. CITY, OKLA. 73102

BRAMCO TONE OSCILLATORS . . . TONE DETECTORS . . . RESONANT REED COMPONENTS AND MODULES . . . TONE TELEPHONE DECODERS . . . TONE TELEMETRY SYSTEMS

An audio tone can be generated by an electronic oscillator or resonant reed encoder circuit, then transmitted by wire or radio. The tone activates a resonant reed or LC tone detector to perform a control function.

Bramco reeds permit over 60 selective control frequencies within the 67 to 3000 Hz spectrum. This is assured by: (1) the narrow response bandwidth of about 1% for decoders and (2) the high accuracy of Bramco reed encoders (1/10 of 1% of design frequency). Temperature stability is .002% per °C.

Bramco also designs and produces LC and RC filters (see sec. 2700). When does an engineer consider Bramco resonant reeds over Bramco LC and RC filters? For applications in which he needs high temperature stability and high Q at relatively low cost.



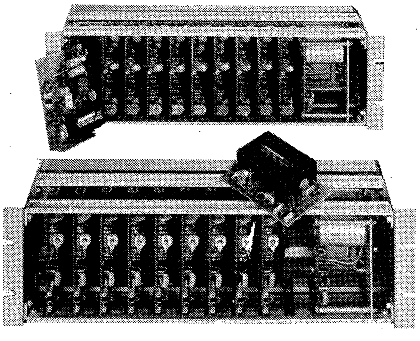
A single pair of wires, or a leased telephone line, can carry the audio signals for a complete control system.

For inaccessible areas or mobile installations, a radio transmitter and receiver system can carry the signals.

.310" x .310" x 1.26"

RF30 PIEZOELECTRIC TUNING FORK FILTER

Smallest, most economical of Bramco audio tone family. **Frequency Range:** 300 to 3000 Hz. **Impedance:** approx. 300K (input and output). **Drive Level:** 2 VRMS. **Temperature Stability:** approx. 0.0035% per °C. Ideal when shock and mounting characteristics of RF20 are not required.



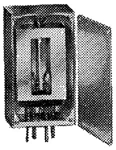
BRAMCO 40/20 AM TONE TELEMETRY SYSTEMS

Just one of several readily available standard packages.

Bramco solid state tone telemetry systems are completely modular. Tone transmitters, receivers and power supplies conveniently plug into pre-wired card cages. Add modules as your system expands. Receivers available for both simultaneous and non-simultaneous systems. Non-simultaneous receivers have built-in circuitry to prevent noise and voice falsing. Choice of outputs include DC, 1 or 5 amp. relay, or reed relay. Prices, depending on design and size, only $200 to $222 per channel. For complete specifications on versatile Bramco tone telemetry systems, ask for Catalog 606. We'll include a useful 4-page check list to help you compare systems and compute the price for the one that best meets your requirements.

MD47C TONE TELEPHONE DECODER 12-DIGIT

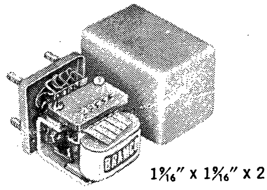
One-half of a Bramco tone telemetry system may already be on your desk. Use the Bell System Touch-Tone* Telephone as your complete encoder. Bramco tone telephone decoders respond to the two simultaneous tones generated by Touch-Tone telephones. Single digit models, for selective control at different locations, have form C relay outputs. Multi-digit, for control of several functions at one location, have 12 form A contacts or optional DC outputs. Cost per function, depending on system size, from $98 to low of only $38.



.395" x .620" x 1.10"

RF20 CONTACTLESS RESONANT REED FILTER

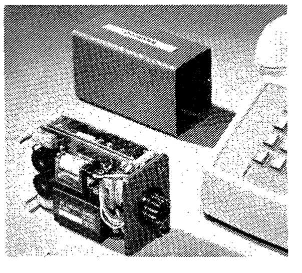
Works as audio tone filter with sharp selectivity or as frequency source for stable audio tone generator. ***Frequency range:** 80 to 3000 Hz. **Frequency tolerance:** ±0.15%. **Impedance:** approx. 1000 ohms at resonance (input and output). **Input signal:** 0.1 VRMS. **Transfer ratio:** 30 to 60% at resonance (varies inversely to frequency). **Bandpass (typical):** ±0.35% at −12 db. ±2.5% at −18 db. **Price:** 1-9 qty., $20. A major state-of-the-art advance. Contactless concept makes it ideal for continuous tone fail-safe applications. Twin coil design with isolated input and output. Ideal for use as either encoder or decoder. Internally shock mounted, plug-in design.



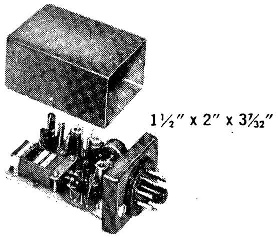
1 9/16" x 1 9/16" x 2 1/4"

RD5S MULTI-CHANNEL FREQUENCY SENSING RESONANT REED

***Frequency range:** 200 to 600 Hz. **Nominal bandwidth:** ±1% at 6 VRMS. **Coil resistance:** 530 ohms. **Contact rating:** 100 ma peak at 50 VDC. **Price:** RD5S (housed) 1-9 qty., $21. RD5 (open) 1-9 qty., $12.50. Compact low cost, multi-frequency tone detector. It controls five switching circuits, individually or simultaneously.



MD42C TONE TELEPHONE DECODER



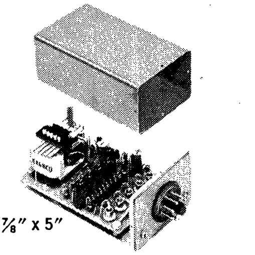
1 1/2" x 2" x 3 7/32"

ME201C SINGLE CHANNEL RESONANT REED ENCODER MODULE

***Frequency range:** 80 to 3000 Hz. **Frequency tolerance:** ±0.15%. **Output:** Sine wave, adjustable to 2 VRMS into 600 ohms. **Power required:** 15 ma at 12 or 24 VDC. **Price:** 1-9 qty., $59. A complete transistorized fixed frequency oscillator circuit with plug-in, dual coil, RF20 resonant reed. Features independent feedback and output level adjustments. Standard octal tube base.

MD201C SINGLE CHANNEL RESONANT REED DECODER MODULE

***Frequency range:** 80 to 3000 Hz. **Nominal bandwidth:** ±0.75%. **Input signal:** 0.1 to 2.0 VRMS. **Output function:** 50 ma maximum. **Power required:** 15 ma at 12 VDC or 24 VDC plus external load. **Price:** 1-9 qty., $59. A complete transistorized high gain amplifier, contactless RF20 reed filter and secondary switching circuit. Standard octal tube base. Designed for continuous tone fail-safe applications. Ideal for systems with up to 20 simultaneous tones over phone lines.



2 1/8" x 2 7/8" x 5"

MD5C FIVE CHANNEL RESONANT REED DECODER MODULE

***Frequency range:** 200 to 600 Hz. **Nominal bandwidth:** ±1% (constant above 2.0 VRMS input). **Input signal:** 1.5 to 5.0 VRMS (into 0.2 megohms). **Output functions:** 5 with 50 ma at 24 VDC. **Power required:** 30 ma at 24 VDC plus external loads. **Price:** 1-9 qty., $79. A complete transistorized high gain, constant output amplifier, multi-channel decoder with 5 secondary transistor switching circuits. Standard octal tube base. Designed for non-simultaneous tone systems.

BRAMCO CONTROLS DIVISION, LEDEX INC.
550 South College Street, Piqua, Ohio 45356 • phone (513) 773-8271

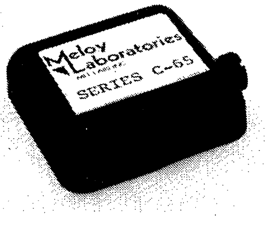
TO BE PRECISE

Meloy
Laboratories
MEL-LABS INC

Specify Meloy Oscillators

CRYSTAL CONTROLLED OSCILLATORS

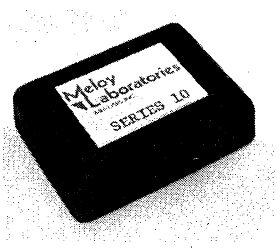
Frequency Range: 25K Hz to 50M Hz



SERIES	ACCURACY	INPUT	OUTPUT	SIZE	TERMINALS
C15	±0.05% (−30°C to 105°C)	5 to 28 VDC	Square Wave	1 1/8″ x 3/4″ x 5/8″	Solder Pin
C35	±0.005% (−55°C to 105°C)			1 17/64″ x 1 17/64″ x 1 3/4″	Octal Plug
C65	TCXO (3 MHZ to 20 MHZ) ±0.005% (−55°C to 105°C)			1 19/32″ x 1 19/32″ x .4″	Solder Pin
	VCXO (3 MHZ to 10 MHZ) (−20°C to 80°C)			1 19/32″ x 1 19/32″ x .5″	Solder Pin
C80	±0.005% (−55°C to 105°C)			2″ x 2″ x .4″	Solder Pin

TUNING FORK OSCILLATORS

Frequency Range: 1Hz to 25000Hz



SERIES	ACCURACY	INPUT	OUTPUT	SIZE	TERMINALS
10	±0.005% @ 25°C ±0.02% (0 to 60°C) ±0.1% to .05% (−55° to 125°)	3 to 32VDC	Sine or Square Wave	1 29/32″ x 1 15/32″ x .4″	Loop or Solder Pin
10H				1 29/32″ x 1 15/32″ x 15/16″	
10HD				1 29/32″ x 1 15/32″ x 1 21/32″	
30	±0.1% (−55°C to 125°C) ±0.05% (−55°C to 85°C) ±0.02% (15°C to 35°C)	12 to 32VDC		1 17/64″ x 1 17/64″ x 1 3/4″	Solder Loop
31				1 5/8″ x 1 3/4″ x 7/8″	Solder Pin
50	±0.1% (−55°C to 125°C) ±0.05% (−55°C to 125°C) ±0.01% (0 to 50°C) ±0.005% @ 25°C			1 1/2″ x 1 1/2″ x 3/8″	Solder Pin
50H				1 1/2″ x 1 1/2″ x 1 1/2″	Octal Plug
51 52				1 1/2″ x 1 1/2″ x 3/8″	Solder Pin
80				2″ x 2″ x .4″	Solder Pin

TUNING FORKS

Frequency Range: 240Hz to 25000Hz

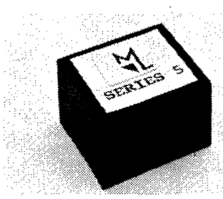
Meloy
Laboratories
MEL-LABS INC
SERIES 24

SERIES	ACCURACY	SIZE	TERMINALS
22	±0.05% (−55°C to 125°C) ±0.02% (15°C to 35°C)	1 1/32″ x 3/4″ x 1 17/32″	Wire Leads
23	±0.02% (−55°C to 125°C) ±0.01% (−55°C to 85°C) ±0.005% (20°C to 30°C)	1 5/16″ x 1 5/16″ x 3/8″	Solder Pin
24	±0.05% (−55°C to 125°C) ±0.03% (−55°C to 85°C) ±0.01% (0 to 65°C)	1 1/2″ x 1 1/2″ x 3/8″	Solder Pin
27	Low Cost — 1000 pcs — Price less than $10.00 each. ±.1% 25°C ±10°	1″ x 1.5″ x .6″	Solder Pin

SOLID STATE OSCILLATORS

Frequency Range: 1Hz and up

SERIES 5



ACCURACY	INPUT	OUTPUT	SIZE	TERMINALS
±0.05% (25°C ±10°C) ±0.1% (−25°C to 85°C) ±0.5% (−40°C to 85°C)	6 to 28VDC	Square Wave	1″ x 1″ x 1″ or 1.6″ x 1.6″ x 1.5″	Solder Pin

Our units are ideally suited for use in ground, shipboard, airborne, and satellite equipment. Many variations of these and other series are available for both military and industrial applications. Our applications engineers would appreciate the opportunity of assisting you in selecting a model to meet your specific requirements.

For price and delivery information contact

Meloy
Laboratories
MEL-LABS INC

Instruments & Systems Division
6631 Iron Place, Springfield, Virginia 22151
Telephone: (703) 354-4450

Biosciences • Environmental Sciences • Instruments & Systems

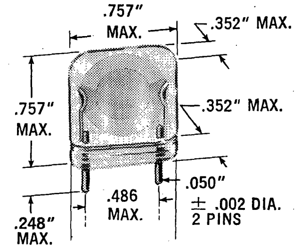
McCOY ELECTRONICS COMPANY a subsidiary of OAK ELECTRO/NETICS CORP
MT. HOLLY SPRINGS, PENNSYLVANIA 17065 - Tel. 717—486-3411 - TWX: 510—650-3548

Quartz crystals are produced over the frequency range of 700 Hz to over 250 MHz, with development effort to 400 MHz. McCoy Electronics manufactures solder seal, glass, and cold weld crystals for oscillator and filter applications. A vast amount of knowledge of design capability in spurious suppression, temperature compensation, and pullability has been developed over the years, and benefits our customers by assuring that the industry's finest technology is at their disposal with every order. Crystals are available to tolerances as tight as ±.0025% over −55 to +105°C. TC charts shown on the opposite page may be used as a guide in determining the types of temperature curves that can be obtained.

PRECISION GLASS CRYSTALS

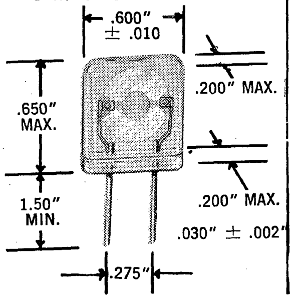
HOLDER SERIES G-1

Frequency Range:
2000 KHz to 250 MHz


.757" MAX.
.352" MAX.
.757" MAX.
.352" MAX.
.050" ± .002 DIA. 2 PINS
.486 MAX.
.248" MAX.

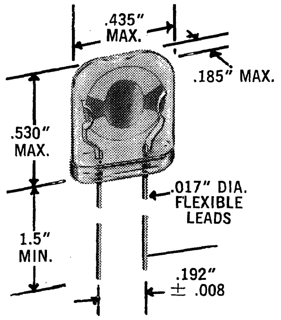
HOLDER SERIES G-30

Frequency Range:
3 MHz to 250 MHz


.600" ± .010
.200" MAX.
.650" MAX.
1.50" MIN.
.200" MAX.
.030" ± .002"
.275"

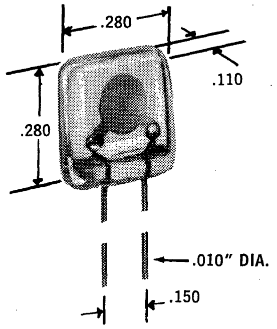
HOLDER SERIES G-20

Frequency Range:
5000 KHz to 250 MHz


.435" MAX.
.185" MAX.
.530" MAX.
.017" DIA. FLEXIBLE LEADS
1.5" MIN.
.192" ± .008

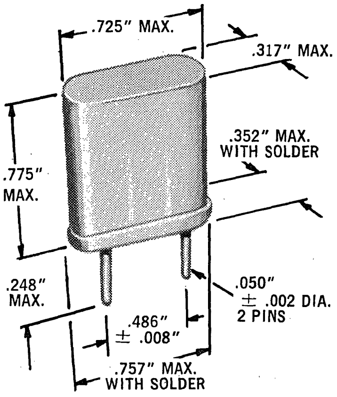
HOLDER SERIES MM

Frequency Range:
10 MHz to 250 MHz

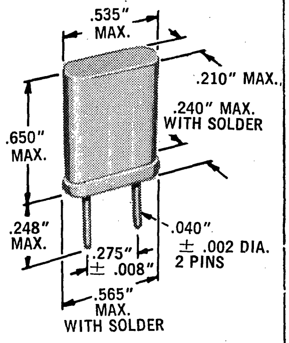

.280
.110
.280
.010" DIA.
.150

QUALITY METAL CRYSTALS

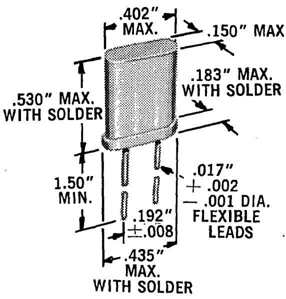
HOLDER SERIES M-1


.725" MAX.
.317" MAX.
.352" MAX. WITH SOLDER
.775" MAX.
.248" MAX.
.050" ± .002 DIA. 2 PINS
.486" ± .008"
.757" MAX. WITH SOLDER

HOLDER SERIES M-25


.535" MAX.
.210" MAX.
.240" MAX. WITH SOLDER
.650" MAX.
.248" MAX.
.040" ± .002 DIA. 2 PINS
.275" ± .008"
.565" MAX. WITH SOLDER

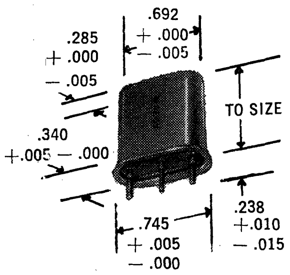
HOLDER SERIES M-20


.402" MAX.
.150" MAX.
.183" MAX. WITH SOLDER
.530" MAX. WITH SOLDER
.017" + .002 − .001 DIA. FLEXIBLE LEADS
1.50" MIN.
.192" ±.008
.435" MAX. WITH SOLDER

HIGH FREQUENCY CLEANSEAL CRYSTALS

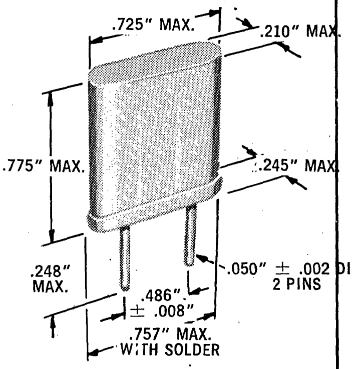
HOLDER SERIES W-1

Frequency Range:
1 MHz to 250 MHz


.692 + .000 − .005
.285 + .000 − .005
TO SIZE
.340 +.005 − .000
.238 +.010 − .015
.745 + .005 − .000

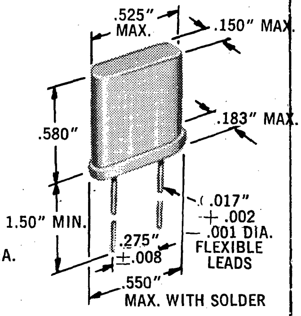
HOLDER SERIES M-35

Frequency Range:
500 KHz to 250 MHz


.725" MAX.
.210" MAX.
.775" MAX.
.245" MAX.
.248" MAX.
.050" ± .002 DIA. 2 PINS
.486" ± .008"
.757" MAX. WITH SOLDER

HOLDER SERIES M-40

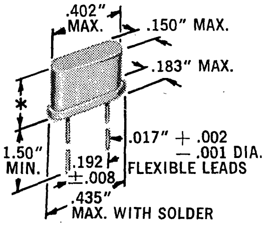
Frequency Range:
2 MHz to 250 MHz


.525" MAX.
.150" MAX.
.183" MAX.
.580"
1.50" MIN.
.017" + .002 − .001 DIA. FLEXIBLE LEADS
.275" ±.008"
.550" MAX. WITH SOLDER

M-41 — Dimensions as shown, with .040" diam. pins, .238" long.

HOLDER SERIES M-20A

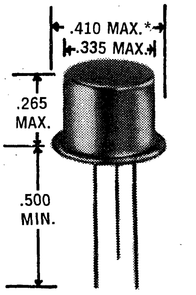
Frequency Range:
2.5 MHz to 250 MHz


.402" MAX.
.150" MAX.
.183" MAX.
*
1.50" MIN.
.017" + .002 − .001 DIA. FLEXIBLE LEADS
.192 ±.008
.435" MAX. WITH SOLDER

*Dimensions as shown with seated height as follows:
M-20A — .460" M-20D — .315"
M-20B — .425" M20E — .250"
M-20C — .360"
(M-20A and B — optional above 5MC)

HOLDER SERIES W-6

Frequency Range:
10 MHz to 250 MHz


.410 MAX.*
.335 MAX.
.265 MAX.
.500 MIN.

*Available at additional cost with flange trimmed to .370" maximum.

CONTINUED

McCOY ELECTRONICS COMPANY a subsidiary of OAK ELECTRO/NETICS CORP
MT. HOLLY SPRINGS, PENNSYLVANIA 17065 - Tel. 717—486-3411 - TWX: 510—650-3548

CRYSTAL FILTERS

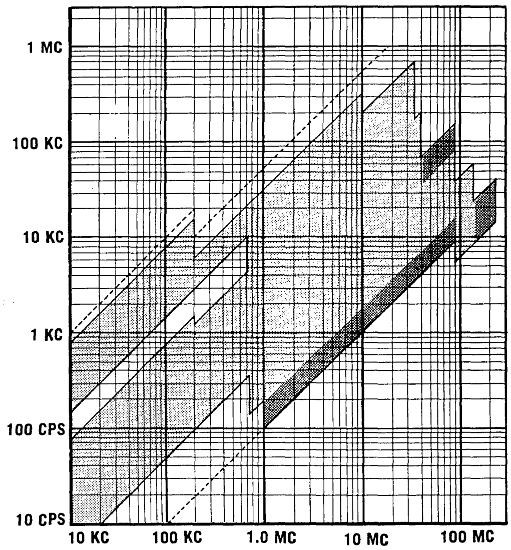
It is most difficult indeed to cover McCoy's capability in crystal filters in a few pages. Conventional narrow, mid, and wide band filters from 1 KHz to over 250 MHz, and monolithic devices utilizing modern computer-assisted designs are produced to demanding specifications in miniature packages. Linear phase, switchable bandwidths, single side band, and notch filters are designed under the auspices of professional design engineers possessing years of experience, thus permitting maximum latitude in meeting difficult requirements.

Listed below is a brief cross section of the devices recently produced at McCoy Electronics, along with charts establishing guidelines for bandwidths available over the center frequency ranges produced.

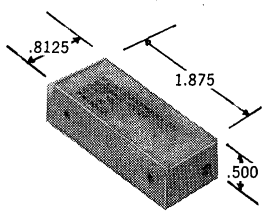
TYPICAL FILTERS AVAILABLE

Center Freq.	BW 3 db	BW 60 db	I L	Ripple	Impedance	Configuration
1.0000 KHz	10 Hz	40 Hz	6 db	1 db	10K ohms	FM-3954
5.0000 KHz	2 Hz	6 Hz	8 db	.5 db	10K ohms	FM-2877
55.0000 KHz	10 Hz	25 Hz	7 db	1 db	1K ohms	FM-1115
100.0000 KHz	2.7 Hz	3.4 KHz	3 db	.5 db	600 ohms	FM-3954
100.0000 KHz	10 Hz	100 Hz	3 db	.5 db	5K ohms	FM-1922
455.0000 KHz	300 Hz	1200 Hz	2 db	1 db	600 ohms	FM-1029
500.0000 KHz	3 KHz	5.4 KHz	4 db	1 db	1K ohms	FM-1590
1.0000 MHz	100 Hz	400 Hz	6 db	1 db	50 ohms	FM-1719
1.7500 MHz	3.05 KHz	3.90 KHz	5 db	1 db	500 ohms	FM-2873
1.7500 MHz	(BW 1 db) +300 to 3100 Hz (BW 15 db down) 1750 KHz (BW 40 db) —270 to —10 KHz		3 db	—	1000 ohms	FM-2853
2.0000 MHz	40 KHz	44 KHz	3 db	1 db	500 ohms	FM-1115
10.0000 MHz	30 KHz	75 KHz	3 db	1 db	50 ohms	FM-1029
17.0000 MHz	±115 KHz	±600 KHz	4 db	—	50 ohms	FM-2856-1
20.5000 MHz	50 KHz (6 db)	200 KHz	3 db	—	50 ohms	F-1007
25.5000 MHz	±24.5 KHz (6 db)	±30.6 KHz	4 db	—	500 ohms	FM-3318
30.0000 MHz	±22.5 KHz (6 db)	±45 KHz	2.5 db	1 db	2K ohms	F-1139
30.0000 MHz	5 KHz	20 KHz	5 db	1 db	50 ohms	FM-1058
39.0000 MHz	100 KHz	220 KHz	4 db	1 db	50 ohms	FM-1029
50.0000 MHz	25 KHz	62 KHz	6 db	1 db	50 ohms	FM-1029
60.0000 MHz	±50 KHz (6 db)	±600 KHz	4 db	1 db	(50 Ω in, 600 Ω out)	FM-2874
68.0000 MHz	30 KHz	300 KHz 30 db	6 db	± .5 db	50 ohms	FM-3956-1
75.0000 MHz	±5 KHz (.5 db)	±50 KHz	2 db	.5 db	500 ohms	FM-2562
77.0000 MHz	65 KHz	350 KHz	8 db	±.5 db	50 ohms	FM-4956-2
91.0000 MHz	±7 KHz	±50 KHz	2.5 db	± .5 db	50 ohms	FM-1513
109.0000 MHz	15 KHz	70 KHz 20 db	6 db	.5 db	200 ohms	FM-3922
125.0000 MHz	25 KHz	100 KHz	6 db	1 db	50 ohms	FM-1036
149.988 MHz	30 KHz	100 KHz 40 db	8 db	1 db	50 ohms	FM-1029
175.0000 MHz	30 KHz	300 KHz 40 db	4 db	1 db	50 ohms	FM-1948
200.0000 MHz	30 KHz	150 KHz 40 db	8 db	1 db	50 ohms	FM-2204

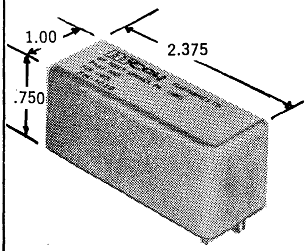
This logarithmic chart indicates the practical and theoretical possibilities in crystal filters. Read center frequency along X axis, bandwidth along Y axis. As a rule, filters selected near the middle of the "narrow and intermediate" band can be produced with the greatest variety of characteristics. Darkest areas show new bandwidths and higher frequencies available now.



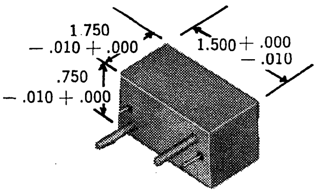
FM-1007



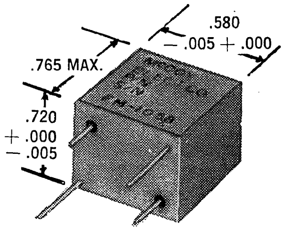
FM-1029



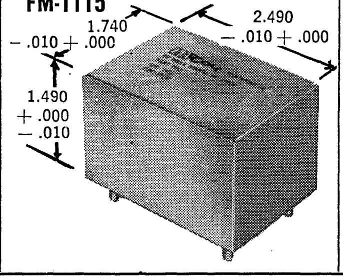
FM-1036



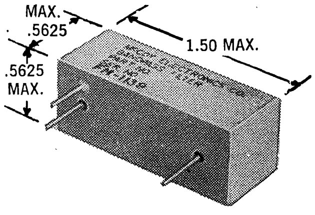
FM-1058



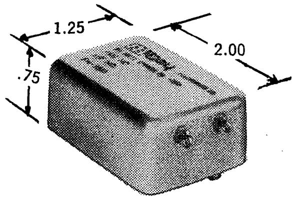
FM-1115



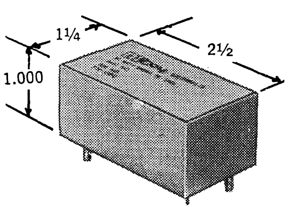
FM-1139



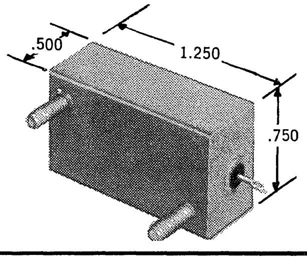
FM-1513



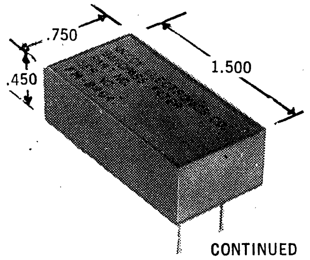
FM-1590



FM-1948



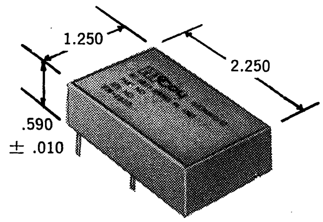
FM-2204



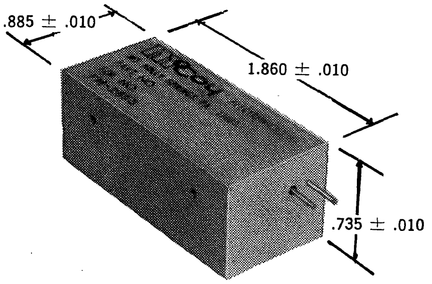
CONTINUED

CRYSTAL FILTERS CONTINUED

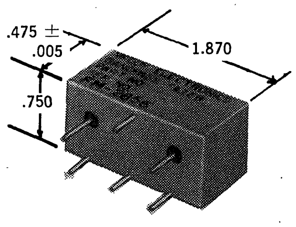
FM-2220



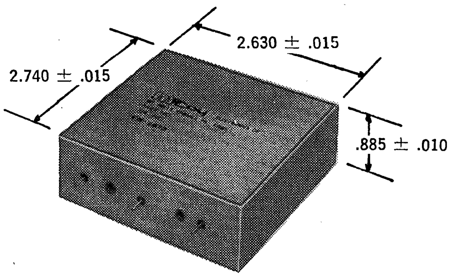
FM-2853



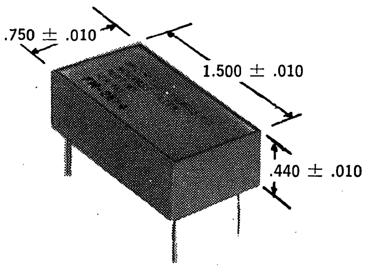
FM-2856



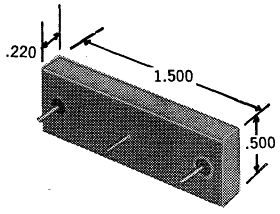
FM-2873



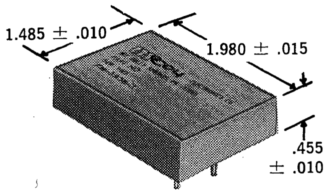
FM-2874



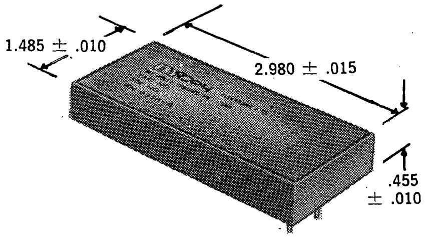
FM-3919



FM-3956-1



FM-3956-2



QUARTZ MECHANICAL FILTERS

Quartz mechanical filters, or monolithic as they are sometimes termed, have been designed and fabricated at McCoy Electronics for the past several years. These acoustically coupled resonators replace many of the conventional crystal filters with improved reliability, lower aging rates, smaller size, and superior temperature characteristics. McCoy Electronics is now producing custom-designed QMF's in a wide variety over the range of 5 MHz to over 200 MHz. Listed herein are typical quartz mechanical filters available from McCoy Electronics.

TYPICAL DEVICES

Center Frequency	% Bandwidth	3 db Bandwidth	Shape Factor	No. Poles	Insertion Loss	Max. Ripple	Nominal Impedance	Ultimate Attenuation	Package Configuration
11.5 MHz	0.180	21 KHz	2.8:1, 40/3 db	4	2.5 db	1.0 db	2700Ω	60 db	FM-2885, W-11
12.8 MHz	0.180	22 KHz	3.6:1, 30/3 db	2	1.0 db	1.0 db	1000Ω	50 db	W-20
14.5 MHz	0.124	18 KHz	4.4:1, 30/3 db	2	1.5 db	.5 db	1000Ω	50 db	W-20
14.5 MHz	0.100	15 KHz	4.5:1, 30/3 db	2	1.0 db	.5 db	400Ω	50 db	W-20
22.8 MHz	0.220	50 KHz	2.4:1, 40/3 db	4	1.0 db	.5 db	2700Ω	60 db	FM-2893
30.0 MHz	0.070	21 KHz	3.6:1, 30/3 db	2	1.5 db	.5 db	1000Ω	50 db	W-20
60.0 MHz	0.120	70 KHz	3.0:1, 30/3 db	2	2.5 db	.5 db	2000Ω	50 db	W-20
75.0 MHz	0.047	35 KHz	3.0:1, 30/3 db	2	2.0 db	.5 db	2000Ω	50 db	W-6, W-20
75.0 MHz	0.043	32 KHz	2.7:1, 40/3 db	4	3.5 db	.5 db	1800Ω	60 db	FM-2898, FM-2895
110.0 MHz	0.018	20 KHz	2.5:1, 40/3 db	4	4.0 db	.7 db	2000Ω	60 db	FM-2895
148.0 MHz	0.007	11 KHz	4.5:1, 30/3 db	2	2.0 db	1.0 db	2500Ω	40 db	W-6, W-20
150.0 MHz	0.010	16 KHz	3.6:1, 30/3 db	2	2.0 db	.5 db	1500Ω	40 db	W-6, W-20
156.0 MHz	0.009	15 KHz	3.6:1, 30/3 db	2	1.0 db	.5 db	1500Ω	40 db	W-6, W-20
75.0 MHz	0.047	35 KHz	3.0:1, 30/3 db	2	2.0 db	.5 db	75Ω	50 db	FM-1058
75.0 MHz	0.047	35 KHz	3.0:1, 30/3 db	2	2.0 db	.5 db	in 50Ω, out 2000Ω	50 db	FM-1058
21.4 MHz	.084	18 KHz	4.4:1, 30/3 db	2	1.5 db	.5 db	in 50Ω, out 1000Ω	50 db	FM-1058

CONTINUED

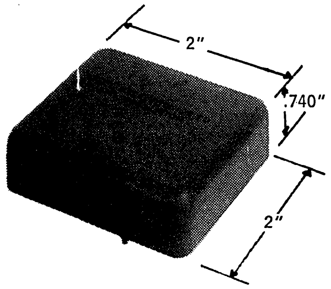
OSCILLATORS CONTINUED

MODEL MC162C2 Temperature Compensated Crystal Oscillator

Frequency Range: 12 KHz to 75 MHz

Temperature Range	Frequency Stability
0° to + 50°C	±0.5 PPM
0° to + 70°C	±1.0 PPM
−30° to + 60°C	±0.5 PPM
−40° to + 70°C	±1.0 PPM
−55° to +105°C	±5.0 PPM

Input Voltage: +12 VDC ± 2% and +5 VDC ± 5%
Output:
Sine Wave: 12 KHz to 75 MHz: 1 MW Minimum
Square Wave: 12 KHz to 25 MHz: TTL or DTL Compatible
Outside Trim: Available on Request
Package Size: 2″ × 2″ × .740″ High
Mounting: 4 ea., 6-32 Threaded Inserts
Seal: Hermetic

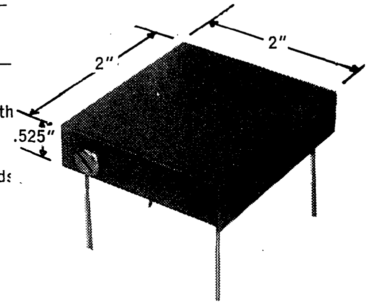


MODEL MC163X2 Temperature Compensated Crystal Oscillator

Frequency Range: 8.0 KHz to 28.0 MHz

Temperature Range	Frequency Tolerance
−30° to + 60°C	±0.5 PPM
−40° to + 70°C	±1.0 PPM
−55° to +105°C	±5.0 PPM

Input Voltage: +12 VDC ± 2% and +5 VDC ± 5%
Output: Square Wave Compatible with TTL or DTL Logic
Outside Trim: Available on Request
Package Size: 2″ × 2″ × .525″ High
Mounting: 5 ea., .030″ Dia. Wire Leads for PC Board Mounting
Seal: Hermetic

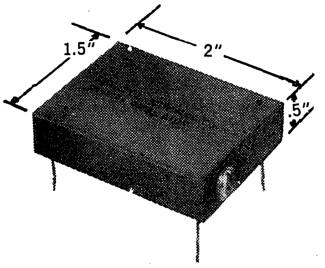


MODEL MC380A2 Temperature Compensated Crystal Oscillator

Frequency Range: 187.5 KHz to 25 MHz

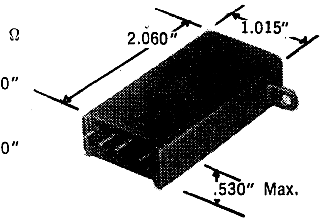
Temperature Range	Frequency Stability
0° to + 50°C	±0.5 PPM
−10° to + 70°C	±1.0 PPM
−30° to + 70°C	±2.0 PPM
−40° to + 85°C	±5.0 PPM

Input Voltage: +5 VDC ± 1%
Output: Square Wave Compatible with TTL or DTL Logic
Outside Trim: Available on Request 5 PPM Min. Total Pull
Package Size: 2″ × 1.5″ × .5″ High
Mounting: Printed Circuit Mounting via 4 ea., .030″ Dia. Wire Leads
Seal: Hermetic



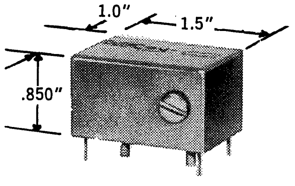
MODEL MC200X1 Temperature Compensated Crystal Oscillator

Frequency Range: 10 MHz to 25 MHz
Temperature Range: −30° to +75°C
Frequency Tolerance: ±5 PPM
Frequency Accuracy at RT: 1 PPM Max.
Outside Frequency Trim Capability: ±20 PPM Minimum
Input Voltage: +9 VDC ± 1%
Output: 72 MV ± 2.0 db into a 50 Ω Load
Output Waveform: Sine
Package Size: 1.015″ × .530″ × 2.060″ High Maximums
Mounting: Optional (Unit shown has mounting bracket)
Terminals: 4 ea., .040″ Dia. Pins, .200″ Long
Weight: 1.5 Ounces Maximum



MODEL MC260X2 Temperature Compensated Crystal Oscillator

Frequency Range: 2.0 MHz to 25 MHz
Frequency Tolerance: ±0.5 PPM
Temperature Range: −20° to +55°C
Input Voltage: +12 VDC ± 5%
Output Waveform: Sine
Output Power: 1 MW Minimum into a 50 Ω Load
Outside Trim: Available on Some Models
Package Size: 1.0″ × 1.5″ × .850″ High
Mounting: 2 ea., 4-40 Studs
Terminals: 4 ea., .030″ Dia. Wire Leads
Seal: Hermetic
Weight: Less than 2 Ounces



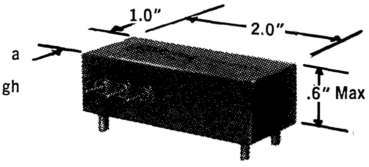
MODEL MC301X2 Temperature Compensated Crystal Oscillator

Frequency Range: 12.0 MHz to 85 MHz

Temperature Range	Frequency Tolerance
−10° to + 60°C	± 1.0 PPM
−55° to +105°C	±10.0 PPM

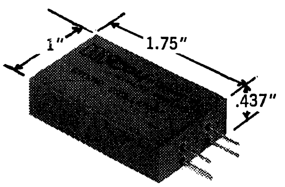
Input Voltage: +12 VDC ± 5% at 25 MA Max.
Output Waveform: Sine
Output Power: Typically 5 MW into a 50 Ω Load
Package Size: 1.0″ × 2.0″ × .6″ High Maximum
Mounting: 4 ea., 4-40 Studs
(1) Terminals: 3 ea., .030″ Dia. Wire Leads
Weight: Less than 3 Ounces
Seal: Hermetic

Note 1: The leads of the MC301X2 are brought out the side of the case. Another version (MC302X2) is available with the leads coming out the bottom of the case.



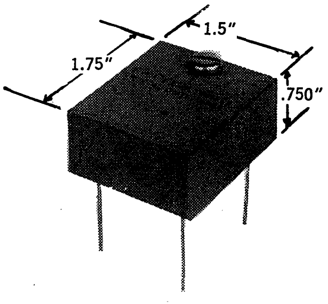
MODEL MC275X2 Temperature Compensated Crystal Oscillator

Frequency Range: 15 MHz to 25 MHz
Temperature Range: −40° to +70°C (Typical)
Frequency Stability: ±4 PPM (Typical)
Input Voltage: +17 VDC ± 1 VDC at 20 MA Maximum
Output: 1 VRMS ± 2 db into a 100 Ohm Load Sine Wave
Package Size: 1″ × 1.75″ × .437″ High
Package Volume: .77 Cubic Inch
Termination: 4 ea., .030″ Dia. Wire Leads
Mounting: 4 ea., #2-56 Inserts on 1″ × 1.75″ Surface
Seal: Hermetic



MODEL MC550C7 Temperature Compensated Voltage Controlled Crystal Oscillator (TCVCXO)

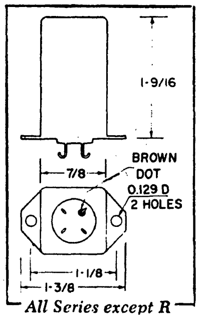
Frequency: 3.579545 MHz
Temperature Stability: ±0.0002%
Temperature Range: 0° to +50°C
Mechanical Trim: ±0.0003% @ 0 Volts on AFC
Input: +12 V ± 0.1% at 5 MA Max.
Output: 1.5 VP-P Min. Sine Wave
Load Impedance: 3.3K Ω Shunted by 22 Pf Capacitance
AFC Characteristics:
Pull Range: ±20 Hz Min. to ±40 Hz Max.
AFC Voltage: ±0.5 Volts
Package Size: 1.75″ × 1.5″ × .750″ High
Seal: Hermetic



OSCILLATORS

FIXED OR SLIGHTLY VARIABLE FREQUENCY AND/OR AMPLITUDE

- **Sine wave frequencies from 50 Hz to 80 KHz**
- **Temperature: −25 to +55°C**
- **Size: ⅞″ sq. x 1 9/16″ high**
- **Each oscillator may be adjusted for your requirements of load, voltage output and input, etc.**
- **600 ohm balanced output available**
- **Extremely low distortion units available**



All Series except R

ELECTRICAL SPECIFICATIONS:

Series 101 and 102 are fixed frequency and amplitude units to be used as a signal source into a light load. These should be used where no field adjustments are required. Series 101 and 102 usually supplied with 4 pin solder hook terminals. If desired, specify NOVAL plug.

	Series 101	**Series 101A**	**Series 102**	**Series 102A**
Input Volts, DC	10.5-13.5	24-32	10.5-13.5	24-32
Input Current, ma.	10	10	10	10
Output Frequency	Fixed. Any frequency from 50 cycles to 80 KC			
Initial Frequency Accuracy per cent	±2½	±2½	±½	±½
Frequency Drift, maximum per cent	±2½	±2½	±1½	±1½
Maximum Load, kilohms	10	20	10	20
Output Voltage, VRMS, minimum	1	2	1	2
Change in Amplitude, maximum db.	±1	±½	±1	±½
Distortion, maximum, per cent	1	1	1	1

Series 103 thru 105 are similar to Series 102 except adjustment of amplitude and frequency may be made with an external variable resistor. They may be used as signal source into a light load where exact voltage or frequency is required. Series 103 and 104 are supplied with 4 pin solder hook terminals and Series 105 oscillators are supplied with 7 pin solder hook terminals. If a plug-in unit is required, specify NOVAL plug.

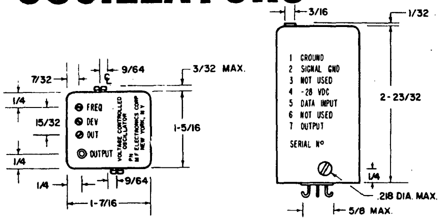
	Series 103	**Series 103A**	**Series 104**	**Series 104A**	**Series 105**	**Series 105A**
Input Volts, DC	10.5-13.5	24-32	10.5-23.5	24-32	10.5-13.5	24-32
Input Current, ma.	10	10	10	10	10	10
Output Frequency	Variable ±3% around any specified frequency from 50 cy. to 80 KC.		Fixed. Any frequency from 50 cy. to 80 KC.		Variable ±3% around any specified frequency from 50 cy. to 80 KC.	
Initial Frequency Accuracy per cent	0	0	±1	±1	0	0
Frequency Drift, maximum per cent	±1½	±1½	±1½	±1½	±1½	±1½
Maximum Load, kilohms	10	20	10	20	10	20
Output Voltage, VRMS, Minimum	1	2	Variable, from 0.5 to 1 VRMS or greater	Variable, from 1 to 2 VRMS or greater	Variable, from 0.5 to 1 VRMS or greater	Variable, from 1 to 2 VRMS or greater
Change in Amplitude, maximum db.	±1	±½	±1	±½	±1	±½
Distortion, maximum, per cent	1	1	1	1	1	1

Series 106 through 110 are for use into a lower impedance load. All require a 600 ohm resistive termination except Series 110 which requires a 220 ohm termination. Since these units are capable of a small power output, they are recommended for ground support use in temperatures from −25° to +50°C. Series 106 oscillators are supplied with 4 pin solder hook terminal and Series 107 through 110 are supplied with 7 pin solder hook terminals. If a plug-in unit is required, specify NOVAL plug.

VOLTAGE CONTROLLED OSCILLATORS

SERIES 300

- **Modular construction — easily repairable in the field**
- **MIL-E-16400E, Class 4, with temperature to 60°C**
- **High reliability; high MTBF; parts from MIL-STD-242**
- **Frequency stability 0.15% of frequency**
- **High deviation**



VOLTAGE TO FREQUENCY CONVERTERS

Series 321 (Positive Input Polarity, only); 322 (Negative Input Polarity, only); 323 (Positive or Negative Input).

Linearity: ±.1%; Temperature Coefficient: ±50ppm/°C. F.S., 0 to 65°C; Maximum Frequency: 10 KHz.

M F Electronics Corp.
118 East 25th Street, New York, N.Y. 10010 • (212) 674-5360

CRYSTAL OSCILLATORS
AND TCXO'S (5 VOLT INPUT)

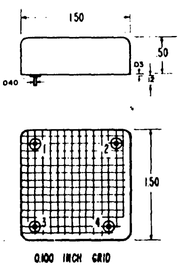
Series 5401 thru 5403 are crystal oscillators in the frequency range of 1 KHz to 20 MHz, intended for PC boards. They are specified in three stability grades of ±1, ±1.5 and ±10 ppm from 0 to 65°, and are available in choice of two packages — either flat pack (½" high) or compact (.81" high).

GENERAL SPECIFICATIONS:

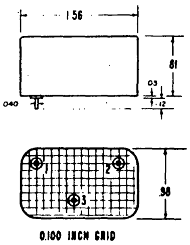
Input Voltage: +5 VDC
Frequency: 1 KHz to 20 MHz
Load: 10 TTL loads

Stability: 5401: ±1 ppm
5402: ±1.5 ppm
5403: ±10 ppm

5401-1


150
50
03
12
040
150
0.100 INCH GRID

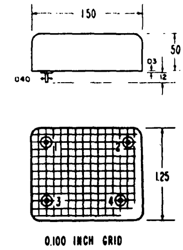
5401-2


156
81
03
12
040
.98
0.100 INCH GRID

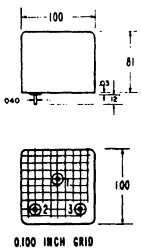
ASK FOR DETAILED LITERATURE

Economical OEM units may be modified to your equipment specifications.

5403-1


150
50
03
12
040
125
0.100 INCH GRID

5403-2


100
81
03
12
040
100
0.100 INCH GRID

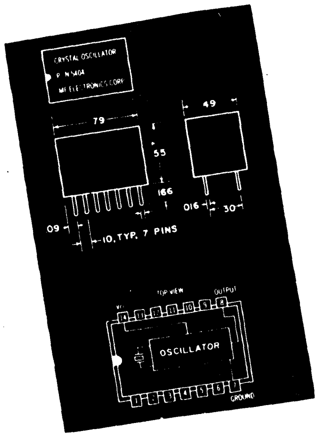
PLUG IN CRYSTAL OSCILLATORS (DIP) 5404 AND 5405
FREQUENCIES FROM 80 KHZ TO 35 MHZ

The 5404 and 5405, oscillator modules in the frequency range of 80 KHz to 35 MHz, are socket pluggable. Operating from +5 volts, they deliver outputs for DTL/TTL, and with the use of filters, can provide sine waves.

The 5404 generates a specified frequency from 5 to 35 MHz with an accuracy of ±.005% over a 0 to 65°C temperature range The 5405 generates a specified frequency from 80 KHz to 4.99 MHz, with an accuracy of ±.02%. All units can drive 10 TTL loads (7400 TTL). Units above 10 MHz can drive 10 TTL loads (74H00 TTL).

The higher frequency 5404 takes only the socket space of one IC DIP package, so it can be used to plug into standard sockets, such as those made by Barnes, Elco, Augat, etc. The 5405, which generates the lower frequencies, is approximately twice the size of the 5404, and occupies the space of two DIP packages, fitting directly into two DIP sockets which are spaced 0.5" apart. Both units will mate into the Augat High Density Packaging panels (8136).

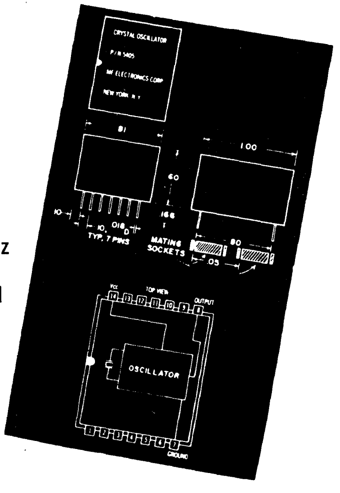
Both 5404 and 5405 are economically priced, with inherent reliability. The accuracy specifications of ±.005 and ±.02% for the 5404 and 5405 respectively is probably adequate for 95% of all applications, and removes the requirement for an adjustment control. This realistic frequency tolerance is a contributing factor in lowering the price and increasing the reliability through parts reduction.


CRYSTAL OSCILLATOR
P/N 5404
MF ELECTRONICS CORP
79
55
166
49
09
.10, TYP. 7 PINS
016
30
TOP VIEW
OUTPUT
VCC
14
13
12
11
10
9
8
OSCILLATOR
1
2
3
4
5
6
7
GROUND

INPUT VOLTAGE: +5 VOLTS
CURRENT: 20 MA, MAX.
TEMPERATURE: 0 TO 65°
OUTPUT: 10 TTL LOADS

Frequency:	Frequency:
5 MHz to 35 MHz	80 KHz to 4.99 MHz
Stability:	**Stability:**
50 ppm, standard	±.02%, standard
25 ppm, special	±.01%, special

UNITS AVAILABLE WITH EXTENDED TEMPERATURE RANGE, EXTERNAL TUNING, ETC.


CRYSTAL OSCILLATOR
P/N 5405
MF ELECTRONICS CORP
NEW YORK N.Y.
81
60
166
1.00
10
.10, 018 TYP. 7 PINS
MATING SOCKETS
80
.05
VCC
TOP VIEW
OUTPUT
14
13
12
11
10
9
8
OSCILLATOR
1
2
3
4
5
6
7
GROUND

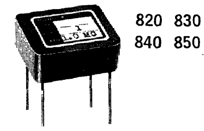
M F Electronics Corp.
118 East 25th Street, New York, N.Y. 10010 • (212) 674-5360

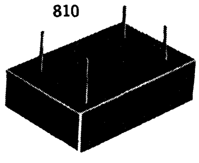
ECONOMY "INTEGRATED CIRCUIT" OSCILLATORS

OFF THE SHELF DELIVERY STANDARD FREQUENCIES:

Monitor's Integrated Circuit Oscillators make it uneconomical to buy crystals (even ours) and design your own oscillator. Why are they so economical? They were designed specifically for the less stringent temperature and stability requirements found in commercial and industrial EDP and digital control applications. Monitor stocks its 800 Series and standard frequencies for off the shelf delivery. That's right — off the shelf, directly to you for the first time, complete crystal oscillators. Not just one or two but 36 of the most commonly manufactured frequencies. Naturally, we are not going to have all the items you need, but in addition to our standard oscillator inventory, we have thousands of crystals to satisfy your unique frequency requirements.

800 SERIES: ECONOMICAL DIGITAL CLOCKS 50HZ — 40MHZ



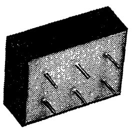


Series	Frequency Range	Output	OSC Input VDC	Typical OSC Current Drain MA	Dimension (Inches) L W H	★ Typical Stability (0° - 60°C)	PRICING							
							Series	1	5-9	10-24	25-49	50-99	100	1000
805	50 HZ - 900 KHZ	Logic 0:+.2V±.2V	5 ± 10%	150	1.5x1.5x.750	±30 PPM	805	119.00	59.50	47.60	41.65	35.70	29.75	20.82
810	16 KHZ - 80 KHZ	Logic 1:+2.8V Min.		15	1.87x1.25x.5	±80 PPM	810	90.00	45.00	36.00	31.50	27.00	22.50	15.75
815	25 KHZ - 80 KHZ			75	1.25x1.0x.5	±60 PPM	815	102.00	51.00	40.80	35.70	30.60	25.50	17.85
820	80 KHZ - 900 KHZ			15		±60 PPM	820	86.00	43.00	34.40	30.10	25.80	21.50	15.05
830	900 KHZ - 1.5 MHZ			25		±30 PPM	830	70.00	28.50	22.80	19.95	17.10	14.25	9.95
840	1.5 MHZ - 3.5 MHZ			15			840	51.00	25.50	20.40	17.85	15.30	12.75	8.92
845	3.5 MHZ - 10.0 MHZ						845	59.00	29.50	23.60	20.65	17.70	14.75	10.32
850	10.0 MHZ - 40.0 MHZ						850	68.00	34.00	27.20	23.80	20.40	17.10	11.90

★ Nominal Calibration: ±50 PPM @ 25°C
Available to —55°C as type 750 series.
STOCK DELIVERY: 50 HZ, 60 HZ, 400 HZ, 1 KHZ, 10 KHZ, 100 KHZ, 500 KHZ, 1 MHZ, 1.024 MHZ, 1.5 MHZ, 2.0 MHZ, 2.5 MHZ, 3.0 MHZ, 4.0 MHZ, 5.0 MHZ, 10 MHZ, 20 MHZ.
MONITOR HAS HUNDREDS OF OTHER FREQUENCIES AVAILABLE FOR 72 HOUR DELIVERY:
CHECK WITH US FOR YOUR REQUIREMENT.

* Pricing subject to change:
Quantity pricing based on units as specified — For applications of more rigid or looser specifications, consult representative or factory

900 SERIES: .350 TALL DIP PLUG IN: 50HZ — 125MHZ

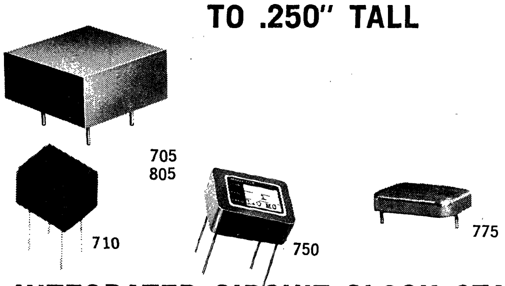


900 Series

Series	Frequency Range	Output	OSC Input VDC	OSC Current Drain MA	Dimension (Inches) L W H	★ Typical Stability (0° - 60°C)	PRICING							
							Series	1	5-9	10-24	25-49	50-99	100	1000
900	50 HZ - 7.9 KHZ	Logic 0:+.2V±.2V	5 +10%	150	2.0x1.0x.5	±100 PPM	900	154.00	77.00	61.60	53.90	46.20	38.50	26.98
905	8 KHZ - 999 KHZ	Logic 1:+2.8V Min.		90	1.5x1.0x.5	±60 PPM	905	130.00	65.00	52.00	45.50	39.00	32.50	22.75
910	1 MHZ - 10 MHZ			50	1.x.75x.5	±30 PPM	910	79.00	39.50	31.60	27.65	23.70	19.80	13.82
915	10 MHZ - 25 MHZ						915	78.00	39.00	31.20	27.30	23.40	19.50	13.65
920	25 MHZ - 75 MHZ						920	98.00	49.00	39.20	34.30	29.40	24.50	17.15
925	75 MHZ - 125 MHZ						925	108.00	54.00	43.20	37.80	32.40	27.00	18.90
930	1 MHZ - 10 MHZ			50	1.0x.75x.350	±30 PPM	930	107.28	53.64	47.65	41.72	35.76	29.80	18.17
935	10 MHZ - 25 MHZ			50	1.0x.75x.350	±30 PPM	935	106.20	53.10	47.20	41.30	35.40	29.50	18.58
940	25 MHZ - 75 MHZ			70	1.0x.75x.350	±30 PPM	940	109.80	54.90	48.80	42.70	36.60	30.50	19.22
945	75 MHZ - 125 MHZ			70	1.0x.75x.350	±30 PPM	945	111.60	55.80	49.60	43.40	37.20	31.10	19.53

★ NOMINAL CALIBRATION: I 50 PPM @ 25°C
FULL AMBIENT DEVICES AVAILABLE AT ADDITIONAL COST
STOCK DELIVERY: 1 MHZ, 2 MHZ, 4 MHZ, 5 MHZ, 10 MHZ, 20 MHZ.

700 SERIES: FULL AMBIENT DIGITAL CLOCKS: 50HZ — 40MHZ TO .250" TALL

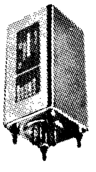


Series	Frequency Range	Output	OSC Input VDC	OSC Current Drain MA	★★ Dimension (Inches) L W H	★ Typical Stability (0° - 60°C)	—55 - 90°C
705	50 HZ - 2 KHZ	Logic 0:+.2V±.2V	5 ±10%	150	1.5x1.5x.75	±30 PPM	±50 PPM
716	400 KHZ - 1 MHZ	Logic 1:+2.8V Min.		15	.515x.625x.5	±75 PPM	±200 PPM
746	500 KHZ - 125 MHZ			25	.8x.4x.8	±75 PPM	±200 PPM
750	2.5 MHZ - 50 MHZ			15 60 Below 75 KHZ	1.25x1.0x.5	±30 PPM	±50 PPM
770	1.0 MHZ - 10 MHZ			25	1.25x.75x.25	±30 PPM	±50 PPM
775	300 KHZ - 5 MHZ			60	1.234x.984x.250	±30 PPM	±50 PPM

★ NOMINAL CALIBRATION: ±50 PPM @ 25°C
★★ Dimensions are standard for most frequencies; lower frequencies are slightly larger in size.

INTEGRATED CIRCUIT CLOCK STANDARDS

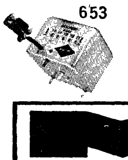
New Model 613 1 MHZ IC Oscillator with parts in 10^{-9} stability after 30 days of aging. Approximately $60 each in 100 quantity.



613

Series	Frequency Range	Output	Input VDC		Current Drain MA		LWH Dimensions	Typical Stability (0-50°C)	Typical Stability (25°C±2°C)	Typical** aging (per/day)
			OSC	Oven	OSC	Oven				
613	40-120 MHZ	Logic 0:+.2V±.2V Logic 1:2.8V min. Square Wave TTL	+5±1% +12±1% +28±1%	115 VAC	30	350	1.5x1.5x2.75	.005 PPM/°C	±.003 PPM	.005 PPM
761				28 VDC	30	500	2x2x4.2	.002 PPM/°C	±.002 PPM	.005 PPM
762				28 VDC	30	350	2x2x4.2	.002 PPM/°C	±.001 PPM	.005 PPM
720				28 VDC	28	75	2x1.06x.7	.01 PPM/°C	±.005 PPM	.08 PPM
624		2 VPP min. 50 ohm load	−20±1%	28 VDC	50	500	2x2x4.4	.5 PPM	.05 PPM	.05 PPM

SPECIAL OSCILLATORS: MULTICHANNEL, VCXO ETC



Whatever your requirements for Multichannel Oscillators, VCXO's and other special oscillators, Monitor has either the product available or the inherent capability to meet your need. Reliability, accuracy and size criteria can be quickly met, with appreciable savings in engineering time and production costs. Each product is founded on the same design experience that has made MONITOR a by-word of precision and accuracy.

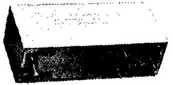
MONITOR PC

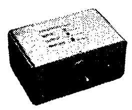
MONITOR PRODUCTS COMPANY, INC.

815 FREMONT AVE. / SOUTH PASADENA, CALIFORNIA 91030 / (213) 682-3761

see our data in
VSMF
VISUAL SEARCH MICROFILM FILE

CRYSTAL FILTERS

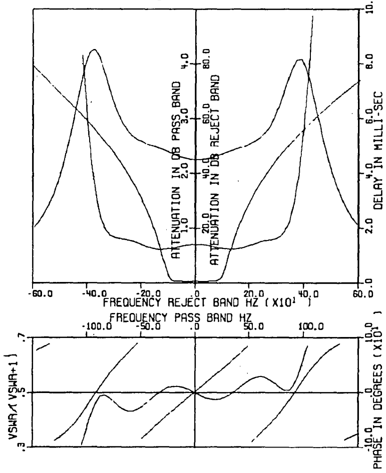




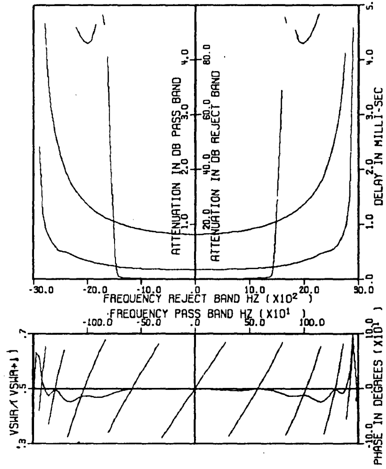
As one of the nation's leading suppliers of quartz crystal filters in the 20-1000 KHz region, Monitor is developing more networks based on computer-aided design to better satisfy customer requirements. An example of computer-graphic analysis is shown below. The figures are in themselves somewhat unique in that all of the pertinent characteristics of the network are available to the customer with a single graphic presentation. While these are theoretical curves, it can be noted that they are not the common textbook variety, and the physical losses of both crystals and coils are included in the analysis. In the majority of these cases where a computer-graphic analysis is presented, the characteristics far exceed the specifications. If the design in any way appears borderline, element perturbations are made and a sensitivity projection indicated to justify or eliminate the design.

The crystal is the heart of the crystal filter, and our 40 years of experience and capabilities are well known. We can guarantee that we will not lead you into production delays by a faulty or unrealistic design.

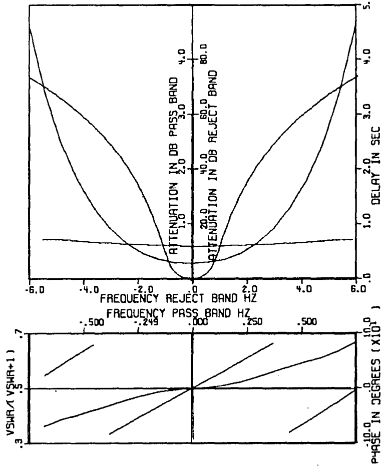
FOUR POLE — FOUR ZERO
200 HZ BANDWIDTH
100 KHZ Q = 200,000



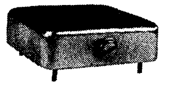
100 KHZ SSB FLTR
2.97 KHZ BANDWIDTH
XTAL Q = 15,000



FOUR POLE — NO ZERO
1.5 HZ BANDWIDTH 100 KHZ Q = 200,000
LOSS CORRECTION 7.5 DB



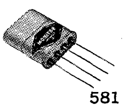
TCXO OSCILLATORS



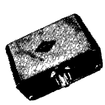
Monitor's Temperature Compensated Crystal Oscillators provide precise frequency management without the use of ovens. The units are designed for use in aerospace, military and industrial applications where power, space and weight restrictions preclude the use of an oven for temperature stabilization. These units, featuring low power drain and instant warm-up, are available with either sine or square wave output. All circuit values are computer optimized. Following are typical specifications. Let us know your exact requirements.

Series	Temp. Range	Freq. Range	Output	Wave Shape	Input VDC	Dimension	Stability	Pin Length
X01	0 - +50°C	2-10 MHZ	Fanout 10	TTL	12-24	1.5x1.5x.5	$\pm1 \times 10^{-6}$	.250
X02	0 - +50°C	2-10 MHZ	0 DBM	SINE	12-24	1.5x1.5x.5	$\pm1 \times 10^{-6}$	.250
X03	0 - +50°C	2-10 MHZ	Fanout 10	TTL	12-24	1.5x1.5x.5	$\pm5 \times 10^{-6}$	.250
X04	0 - +50°C	2-10 MHZ	0 DBM	SINE	12-24	1.5x1.5x.5	$\pm5 \times 10^{-6}$	.250
X05	—30 - +70°C	2-10 MHZ	Fanout 10	TTL	12-24	1.5x1.5x.5	$\pm5 \times 10^{-6}$	.250
X06	—30 - +70°C	2-10 MHZ	0 DBM	SINE	12-24	1.5x1.5x.5	$\pm5 \times 10^{-6}$	.250
X07	—55 - +125°C	2-10 MHZ	Fanout 10	TTL	12-24	1.5x1.5x.5	$\pm25 \times 10^{-6}$	.250
X08	—55 - +125°C	2-10 MHZ	0 DBM	SINE	12-24	1.5x1.5x.5	$\pm25 \times 10^{-6}$	.250

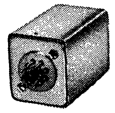
CRYSTAL AND COMPONENT OVENS



581



504



531

Monitor produces a complete line of miniature ovens — some for use in the extreme environment of missiles — ovens containing as many as 99 crystals and rack mounted ovens to accommodate many circuit cards. Ovens can be built with stabilities to ±.003°C. Monitor has well over 100 designed units; the odds are we have a standard unit that will meet your need. Call/write the factory or Monitor representative in your area for engineering assistance for your unique application.

Oven Type	Cavity Accommodations	Stability °C		Heater Voltage	Watts	** Std. Set Temp. ±2°C	Outside Dimensions L x W x H (inches)	Cavity Dimensions L x W x H (inches)	Oper. Temp. Range
		Constant Ambient	Per °C Ambient Change						
523	Component	±.007	.01	28VDC 115VAC	15 Max	85°C	1.5 x 1.5 x 3.25	1.12 x 1.12 x 2.25	—55 to +75°C
512	MC-4 Crystal or Component	±.01	.005	115VAC 28VDC	15 Max	75°C	1.437 x 1.875 x 7	.81 x 1.34 x 2	—55 to +70°C
535	5 MC-6 or 13A	±.02	.007	28VDC 115VAC	20 main 85 booster	85°C	2.25 x 2.1 x 3.31	1.71 x 1.34 x 1.68	—55 to +75°C
530	Components	±.02	.007	115VAC	15	75°C	2.26 x 2.1 x 3.42	1.75 x 1.35 x 2.37	—55 to +65°C
531	Components 1.75"x2"x.031" Board	±.02	.007	28VDC	8	75°C	2.26 x 2.1 x 3.42	1.75 x 1.35 x 2.37	0 to +65°
520* 521*	Crystal or Components	±.005	.005	115VAC 28VDC	15	75°C	2 x 2 x 4.5	1.25 dia x 1.87	—55 to +70°C
581*	KX-18 Crystal or Components	±.03	.02	28VDC 115VAC	5 Max	75°C	1.2 x .4 x 1.4	.5 x .18 x .5	—55 to +70°C
504	Components	±.3	.03	6.3 115VAC	15	75°C	4.37 x 2.87 x 2.68	3.4 x 1.7 x 1.95	—55 to +75°C
514	Components (complex elec net)	±.15	.04	24VDC 32VDC	55 at 28VDC	75°C	3.31 x 6.56 x 4.5	2.15 x 5 x 3.80	—55 to +70°C
526	Components	±1	.03	28VDC 115VAC	30	75°C	3.5 x 3 x 5	2.62 x 2.25 x 3.5	—55 to +70°C

*Units marked are Proportional Control. All other units SS/M (Solid State Mercury).

MONITOR PC

MONITOR PRODUCTS COMPANY, INC.

815 FREMONT AVE. / SOUTH PASADENA, CALIFORNIA 91030 / (213) 682-3761

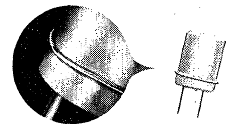
WRITE FOR A COPY OF OUR NEW 40 PAGE CATALOG

"KOLDWELD" CRYSTALS

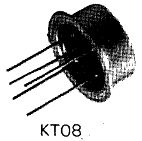
SPECIFICATIONS—Monitor's KTO Series Frequency Control Crystals are an extension of Monitor's capability in applying KOLDWELD techniques to crystal packaging. These high reliability, low aging crystals offer precision frequency control in a subminiature package (TO-5 transistor package).

The KX type crystals conform to the dimensions and requirements of standard military type HC holders and are ideally suited to extreme environments. The KX type can be used as replacements for standard HC-6, HC-18 and HC-13 mil-spec units.

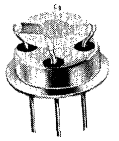
The KBM types are designed for printed circuit applications with the leads acting as both electrical connection and mounting device. Monitor recommends this crystal for printed circuit board applications and where height is critical.



MC18

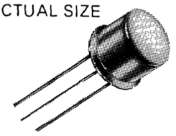


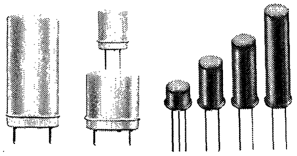
KT08



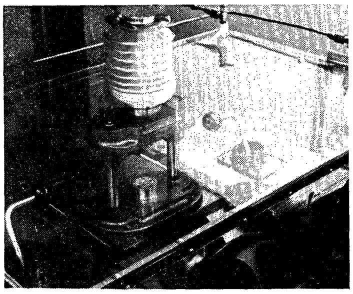
KTO5 SHOWN WITH CASE

KTO5 ACTUAL SIZE

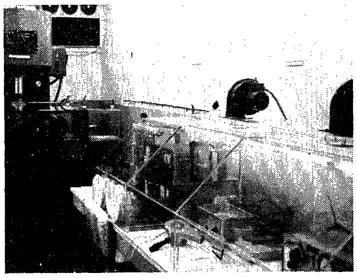




KOLDWELD CRYSTALS



Close-up of Koldweld process showing dust-proof sealing chamber.



Koldweld sealing and calibration room showing press in background and dust-proof processing chambers at right.

Helium leak testing area. Equipment is capable of testing crystals for leakage to 1 x 10⁻⁹ cc/sec of Helium.

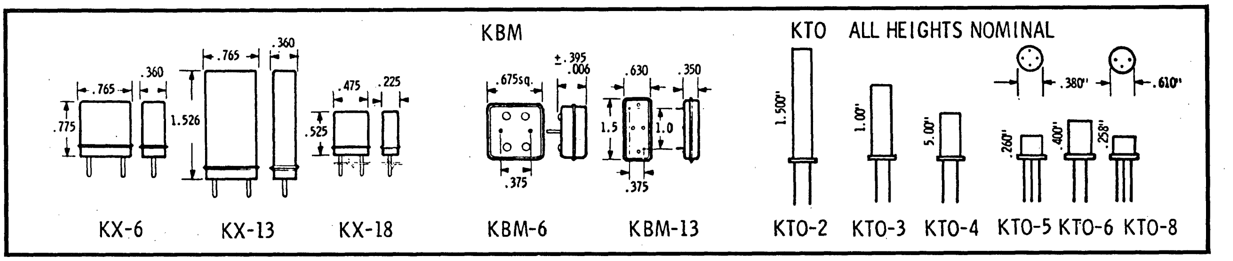
Monitor takes a giant step in the elimination of crystal degradation caused by contamination, leakage, aging, frequency shift and extreme environments with our Koldweld crystals. The sealing method eliminates the need for heat and contaminating solder flux used in sealing solder-seal and glass crystals. Following this process, Monitor's Quality Assurance Program can supply complete in-process and final test results on each crystal, at additional cost.

The written data consists of all Monitor in-process and final Quality Assurance Tests, including leak testing and any additional customer required tests. With the exception of out of the ordinary testing, such as X-Ray, Salt Spray, etc., all of Monitor's testing is done in-plant. This assures accurate recording, more rapid processing and better Quality Assurance control.

	Cut Type	Nominal Freq. TCL Available #STD	Series Resistance Range in Ohms	Typical L in henries	Typical C_0 in pf	Typical C_1 in pf	Average Capacity Ratio	Recommended Drive Level in mw	Aging Typical x 10^{-8} per day after:		
									1 Wk.	5 Wks.	10 Wks.
KX-13 Series											
16-100KC	NT	6	5-100K	1000	7.0	.007	900	.05	40		7
90-200KC	E	7	.4-5K	30	8.0	.05	130	.1	50		8
200-300KC	DD	3	.2-5K	28	8.0	.018	450	.1	50		8
KX-6 Series											
90-200KC	NT	6	5-50K	270	6.0	.006	900	.05	40		7
200-250KC	E	7	1-5K	25	3.0	.02	130	.1	60		9
200-500KC	DT	5	1-8K	30	3.0	.007	350	.1	50	30	9
300-700KC	DD	3	1-5K	10	4.0	.01	350	.1	50		8
400-900KC	CT	9	1-8K	8	4.0	.009	400	.1	50		8
1.5-3.0MC	AT	4	10-300	.45	4.0	.01	300	.05	5	1	.4
3-150MC	AT	4	3-80	—	5.0	—	*	.05	7	2	.6
KX-18 Series											
5-11.9MC	AT	4	3-50	.03	4.0	.015	300	.05	7	3	.6
12-150MC	AT	4	3-80	—	5.0	—	*	.05	7	3	.8
KTO-8 Series											
16-100KC	NT	6	5-80K	800	8.0	.009	900	.05	50	30	9
KTO-3 Series											
60-200KC	NT	6	5-60K	550	7.0	.007	900	.05	50	30	9
120-350KC	E	7	.5-5K	10	8.0	.07	130	.1	50	30	9
325-600KC	DD	3	.2-5K	25	4.0	.009	450	.1	50		8
KTO-4 KTO-8 Series											
350-455KC	E	7	1-5K	16	2.0	.015	130	.1	50	30	9
600-700KC	DD	2	.5-5K	9	3.0	.017	450	.1	50		8
KTO-5 Series											
455-524KC	E	9	1-5K	7	2.0	.015	130	.1	60	40	9
525-649KC	DT	7	1-10K	12	2.0	.005	400	.1	60	40	9
650-1000KC	CT	9	1-8K	8	2.0	.005	400	.1	60		9
9-11.9MC	AT	4	3-40	.025	5.0	.016	300	.05	7	3	.6
12-150MC	AT	4	3-80	—	5.0	—	*	.05	7	3	.8
KTO-8 Series											
2-8MC	AT	4	3-300	—	4.0	.015	300	.05	5	1	.5

TYPE	Weight Nominal (Grams)	Volume Nominal (Cubic Inch)	Holder Material	Base Material	Lead Material	Pin Length Nominal	Pin Size Nominal Diameter	Pin Spacing Nominal
KX-6 (HC-6/U)	2.5	.160	OFHC Copper	OFHC Copper	52 alloy	.238	.050	.486
KX-13 (HC-13/U)	3.7	.310	Same as KX-6 except 1.5" height					
KX-18 (HC-18/U)	.51	.031	OFHC Copper	OFHC Copper	52 alloy	.5	.018 wires	.192
KBM-6	3.3	.140	OFHC Copper	OFHC Copper	52 alloy	.205	.020 wires	.375
KBM-13	7.2	.280	OFHC Copper	OFHC Copper	52 alloy	.205	.020 wires	1.07
KTO-5	.8	.018	OFHC Copper	Copper clad Kovar	Kovar	1.500	.017	.200 dia.
KTO-4	1.4	.036	OFHC Copper	Copper clad Kovar	Kovar	1.500	.017	.200 dia.
KTO-3	2.4	.072	OFHC Copper	Copper clad Kovar	Kovar	1.500	.017	.200 dia.
KTO-2	3.2	.108	OFHC Copper	Copper clad Kovar	Kovar	1.500	.017	.200 dia.
KTO-8	2.5	.052	OFHC Copper	Copper clad Kovar	Kovar	1.00/.280	.017/.030	.280 dia.

MONITOR ALSO MANUFACTURES A COMPLETE LINE OF CRYSTALS (HC-6/U, HC-18/U, HC-13/U, HC-25/U) TO MIL C 3098 (4 KHz - 200 MHz). WRITE FOR OUR 40 PAGE CRYSTAL SPECIFICATION HANDBOOK.



MONITOR PRODUCTS COMPANY, INC.

815 FREMONT AVE. / SOUTH PASADENA, CALIFORNIA 91030 / (213) 682-3761

see our data in
VSMF
VISUAL SEARCH MICROFILM FILE

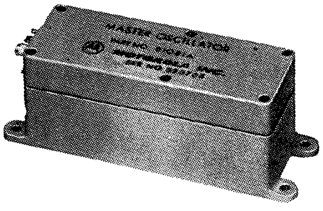
MOTOROLA FREQUENCY PRODUCTS

MOTOROLA COMMUNICATIONS AND ELECTRONICS INC.
A Subsidiary of Motorola Inc.
Dept: Component Products
4501 W. Augusta Blvd.
Chicago, Illinois 60651
Phone (312) 772-6500

CRYSTAL OSCILLATORS

PRECISION OVEN CONTROLLED OSCILLATORS

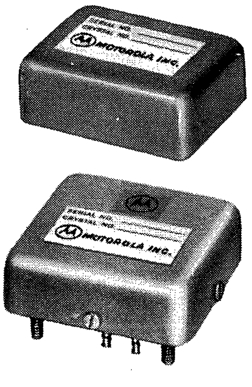
Motorola has pioneered the field in the design and manufacture of ultra-precision, oven controlled, crystal oscillators. Meeting both military and commercial standards, and designed for both mobile and laboratory use, they are ideally suited for the generation and control of precise frequency and time signals. Both standard and custom designs are offered.



HIGH STABILITIES: To parts in 10^{-10} vs: environmental factors.
WIDE FREQUENCY RANGE: From 60 KHz to 20 MHz normal. Extended ranges available on special order.
FAST WARMUP: The industry's fastest. Meets all military requirements.
WIDE TEMPERATURE RANGE: From —55°C to + 125°C. Extended ranges available on special order.
LOW AGING: Less than 5×10^{-10}/day.
OTHER FEATURES: All silicon solid state design. Proportionally controlled ovens. Excellent spectral purity designs with output filters available.

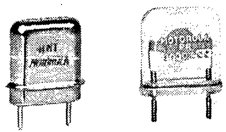
TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS

A complete line of TCXO oscillators is available for applications where compactness, minimal power drain, and instant operation is needed. Established designs are supported by high production rate capabilities.



FREQUENCY RANGE: 4 MHz to 30 MHz normal. Extended ranges available to order.
STABILITIES: 1.0, 2.0, 3.5, 5.0 and 10.0 PPM standard designs over temperature ranges extending from —30°C to +85°C. Others on special order.
OUTPUTS: Sine, square, and logic drivers.
OTHER FEATURES: All silicon solid state construction. Cold weld low aging rate crystals. Compact, space saving packaging.

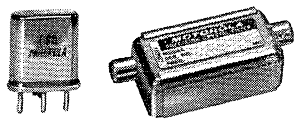
PRECISION CRYSTALS



Motorola is the world's largest manufacturer of precision grade high frequency crystals. High volume facilities at multiple plants.

FREQUENCY RANGE: 2.0 MHz to 60 MHz normal. Standard designs to 250 MHz available.
HOLDERS: Glass HC-27/U, HC-6/U, HC-25/U, and HC-18/U cold weld and solder seal.
LOW AGING: Rates as low as 1×10^{-6}/yr.
OTHER FEATURES: Gold plated electrodes exclusively. All manufacturing in Class 100 Clean Room facilities. Tight tolerance designs for TCXO and filter applications are standard.

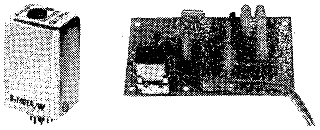
CRYSTAL FILTERS



Motorola has a wide range of designs employing both monolithic and discrete component techniques. Special designs readily produced on a production level basis.

DESIGNS: Band pass, band reject, symmetrical, asymmetrical, contiguous comb.
FREQUENCY RANGE: 1.0 MHz to 250 MHz.
SIZE: As small as ½" square.
TYPES: Monolithic and discrete designs.

TONE MODULES



Motorola offers a line of tone modules especially designed for selective switching, signalling and similar applications. Modules are operating devices based on Motorola's time proven contactless resonant reeds combined with solid state circuitry.

MOUNTING: Plug in custom circuit board modules.
CIRCUITRY: Solid state combined with contactless resonant reeds.
FREQUENCY RANGE: 67 Hz to 3000 Hz.
OTHER FEATURES: Highly selective, extremely stable, low operating power.

CUSTOM DESIGNS

Motorola now offers its extensive design and production facilities in the frequency components field to other OEM manufacturers in the electronics industry. Both standard designs and your custom designs are available, at multiple plant facilities, for production level deliveries. For further information address all inquiries to: Marketing Manager, at the above address.

LOW FREQUENCY FILTER?

SPECIFY MURATA *MICROFORK*®

a unique piezoelectric tuning fork.

MICROFORK MODEL EFM ...

...... a new subminiaturized tuning fork suitable for paging systems, selective calling, remote control and tone control in compact electronic music instruments.

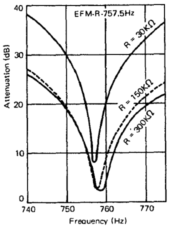
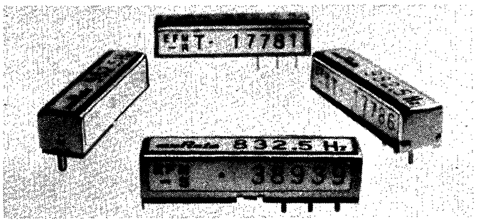
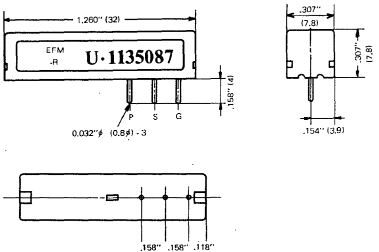


Fig. 1





DESIGN

- maximum voltage 10 Vrms
- neither mutually coupled nor affected magnetically
- if oscillating at higher harmonics use high pass capacitor shown in figure 4
- EFM-R adjusted according to figure 3, actual oscillating frequency of circuit in figure 4 lower by about 0.2%
- EFM-S adjusted by circuit in figure 4 –
- resistance values in figure 3 determine maximum band-width
- band-width and resonant frequency decrease according to figure 1
- nickel plated brass case on plastic base for printed circuit.
- the typical characteristic of EFM-RU is shown in figure 2.

Fig. 2

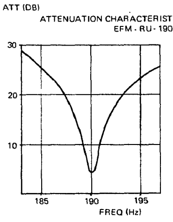
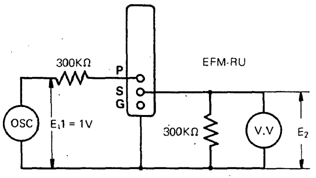
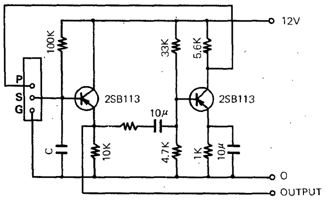


Fig. 3



OSC OUTPUT IMPEDANCE : 600 Ω

INSERTION LOSS : 20 LOG $\frac{E_1}{E_2}$ · 6 (DB)



C = 0.005μF (under 1000Hz)
C = 0.001μF (1000Hz and over)

Fig. 4

STANDARD FREQUENCY (Hz)

367.5
382.5
397.5
412.5
427.5
442.5
457.5
472.5
487.5
502.5
517.5
532.5
547.5
562.5
577.5
592.5
607.5
622.5
637.5
652.5
667.5
682.5
697.5
712.5
727.5
742.5
757.5
772.5
787.7
802.5
817.5
832.5
847.5
862.5
877.5
892.5
907.5
922.5
937.5
952.5
967.5
982.5
997.5
1000
1500
1700
1900
2100
2300
2500
2700
2900

SPECIFICATIONS

ITEMS	EFM-RU	EFM-RG	EFM-R	EFM-S
	For Receiver			For Sender
Frequency Range	150～360 Hz	500～1500 Hz	360～2900 Hz	360～2900 Hz
Frequency Tolerance	±0.1% max	±0.1% max	360～999 Hz±0.5Hz 1000～2900 Hz±1.0Hz	360～999 Hz±1.0Hz 1000～2900 Hz ±1.0Hz
Insertion Loss	10 DB max	14 DB max	10 DB max	
Band Width (at-3DB)	0.4% min	0.2% min	0.2% min	
Attenuation (at ±15Hz)	30 DB min	16 DB min	18 DB min	
Input Output Impedance	300 K Ω			
Temperature Range	Operating –20～60°C Allowable -40～80°C			
Temperature Coefficient of Frequency	3.5×10^{-5}/°C			

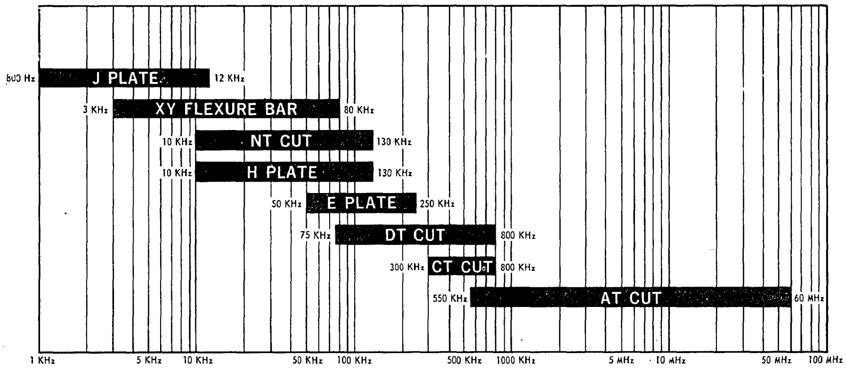
muRata

Murata Manufacturing Co., Ltd.
Nagaoka, Kyoto, Japan
Telex: 05429-901 MURATA KTN
Cable Address: MURATAKYOTO

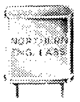
Murata Corp. of America
2 Westchester Plaza, Elmsford,
New York 10523
Telex: MURATA EMFD 23-0137332
Phone: 914-592-9180

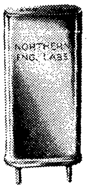
FREQUENCY CONTROL DEVICES

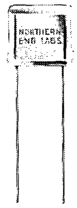
CRYSTALS

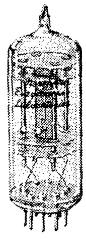


Leadership in the design and manufacture of low frequency crystals enables us to provide the widest variety in choosing the proper crystal for your application. Dependable quality and producible specifications help you to keep your production schedules. Complete spectrum coverage from under 1 KHz to over 50 MHz means one source that can handle most applications. For technical information, see our catalog.

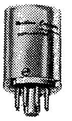

NE-6

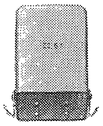

NE-13


NE-14

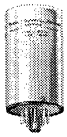

T-7

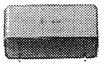
OVENS


NE-62

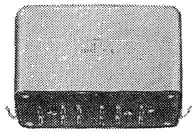

EC-62

CRYSTAL OVENS **COMPONENT OVENS**

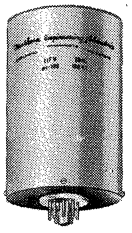

NE-461

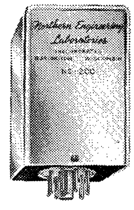

EC-461

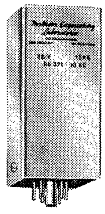
Crystal and component ovens that employ dynamic thermal design and utilize the best components and construction techniques. Either standard or custom designs to provide optimum performance for your application. Contact us for details.


EC-66

Electronic or Thermostatic Control

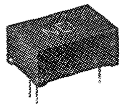

NE-100

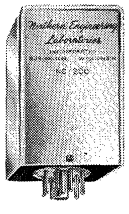

NE-200

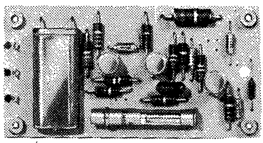

NE-300

OSCILLATORS

Time base for TV, navigation, clocks, computers, fax, calibration, counters and numerous other applications. Standard and custom designs for digital or linear requirements. Optional temperature or voltage control. Several forms of packaging. Complete design and production capability. We supply the most compatible combination of crystal and circuitry because both are our specialties.


TO-2110


NE-200TO


TO-118

SERVICE

Complete application assistance followed by prompt, dependable delivery of reliable frequency control devices will help ensure the success of your product. Contacting our sales representative or factory will bring a rapid, useful response. The value of our service is enhanced by allowing us to work with you early in the design stage.

Write for catalog and pamphlet on "Writing Crystal Specifications".

SEE OUR SPECIFICATIONS IN VSMF MICROFILM CATALOG FILE

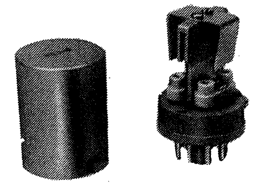
Northern Engineering Laboratories Incorporated

357 Beloit Street. Burlington, Wisconsin 53105 Phone: Area Code 414 763-3591

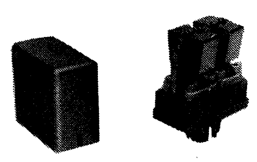
OVENS

PROPORTIONAL CONTROL CRYSTAL OVENS

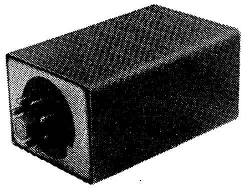
New technology in circuit design now provides low cost proportional control crystal ovens. High reliability, low sustaining power consumption, noiseless operation and precise temperature control. A representative few of many available models are shown below.



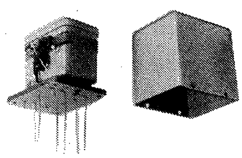
MODEL PC2
For 2 HC-6/U crystals 12 or 24 VDC. 75°C or 85°C.
PROPORTIONAL CONTROL



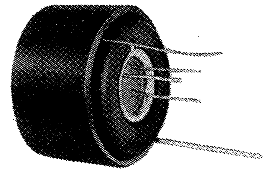
MODEL PC4
For 4 HC-6/U crystals 12 or 24 VDC. 75°C or 85°C.
PROPORTIONAL CONTROL



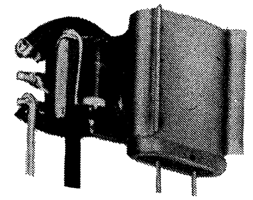
MODEL PC2-20
For 2 HC-6/U crystals 115 VAC. 75°C.
PROPORTIONAL CONTROL



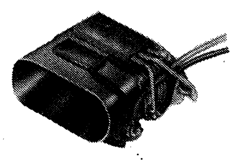
MODEL ADP4-12
For 4 HC-6/U crystals 12 VAC/VDC. 75°C.
PROPORTIONAL CONTROL



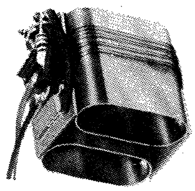
MODEL TO5P
For TO5 crystal 12 or 24 VDC. 75°C.
PROPORTIONAL CONTROL



MODEL PCL1-25
For HC-25/U crystal 12 or 24 VDC. 75°C or 85°C.
PROPORTIONAL CONTROL



MODEL PCL1-6
For HC-6/U crystal 12 or 24 VDC. 75°C or 85°C.
PROPORTIONAL CONTROL

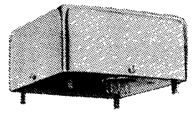


MODEL PCL2-6
For 2 HC-6/U crystals. 12 or 24 VDC. 75°C or 85°C.
PROPORTIONAL CONTROL

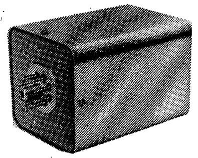
COMPONENT OVENS

featuring solid state PROPORTIONAL CONTROL

Ovenaire's line of proportional control component ovens completely covers the field, from PCB mount mini-ovens for dual inlines and micro circuits to large cavity area ovens; from low cost models for competitively priced equipment to fully qualified units for military programs. Two typical models that have found many applications are shown below.



MODEL DPC28-10
28 VDC or 115 VAC.
PROPORTIONAL CONTROL.
Temp. 60°C to 95°C factory set. Heated cavity 2.485″ sq. x 6.25″ high. 14 pin header with 12 color coded leads to cavity.



MODEL CO-1126
28 VDC.
PROPORTIONAL CONTROL.
Temp. 60°C to 95°C factory set. Heated cavity 2.05″ sq. x 2.75″ high. 7 pin internal socket. 8 pin octal base.

THERMOSTAT CONTROLLED OVENS TOO! For more than a decade, Ovenaire has been recognized as the leader in thermostat controlled ovens. This proud reputation continues with a full line of crystal and component ovens featuring the reliable snap action thermostat.

For complete catalog, information or technical assistance— Call, TWX or write:

ovenaire INC.
CHARLOTTESVILLE, VA.
703-293-5148 / TWX 510-587-5461

subsidiary of
Walter Kidde & Company, Inc.

Kidde

FREQUENCY CONTROL DEVICES

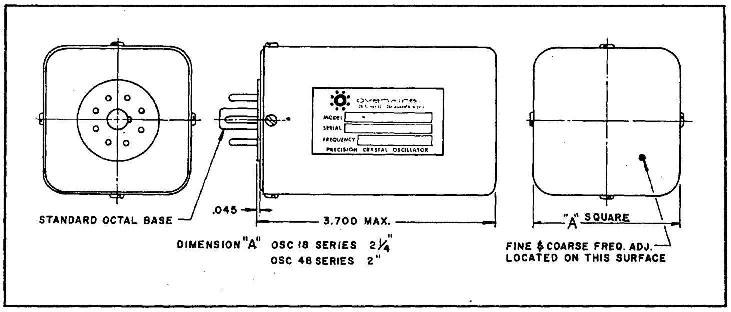
Ovenaire, Inc. for many years recognized as one of the world leaders in the design and manufacture of crystal and component ovens has utilized this experience and capability to establish an equally high reputation for oven stabilized crystal oscillators. Our specialized knowledge of crystal specifications coupled with production line techniques for matching crystal turn points to oven control temperatures make Ovenaire a logical choice for economical oscillators meeting any specified level of stability.

Ovenaire is versatile. With instrumentation capable of measuring frequency deviations of parts in 100 billion we can meet the most exacting requirements of a high precision Military nagivational system. At the same time, our volume production techniques enable us to supply competitively priced oscillators for such applications as commercial computer data transmission systems. Consult the tables on these pages. Select one of our standard design series or contact us for special requirements.

OSC 18 SERIES

HIGH STABILITY CRYSTAL OSCILLATORS FEATURING:

Precision Glass Enclosed Crystals
High Gain DC Proportional Oven
Low Power – 3 Watts at +25°C
Designed for Hi-Impact Shock
Now in 3rd Year of Production
Unbeaten for Price and Performance
Options — Logic Output
VCXO Control
Supply Voltage:
+12 VDC, +15 VDC, +28 VDC


ovenaire
MODEL
SERIAL
FREQUENCY
PRECISION CRYSTAL OSCILLATOR
STANDARD OCTAL BASE
.045
3.700 MAX.
"A" SQUARE
DIMENSION "A" OSC 18 SERIES 2¼"
OSC 48 SERIES 2"
FINE & COARSE FREQ. ADJ. LOCATED ON THIS SURFACE

STABILITY CLASS		HIGH PRECISION	PRECISION	HIGH	HIGH	EXTENDED FREQUENCY
FREQ. RANGE		1 or 3 MHz	1 MHz	0.5 to 2 MHz	1 to 5 MHz	5 to 30 MHz
PART NO.		OSC 18-6	OSC 18-2	OSC 18-1	OSC 18-5	OSC 18-7
OUTPUT		1 VOLT RMS MINIMUM SINE WAVE INTO 500 OHMS				0.7v RMS INTO 50 Ω
STABILITY	LONG TERM	$1x10^{-8}$/WK	$3x10^{-9}$/DAY	$7x10^{-9}$ PER DAY		$3.5x10^{-6}$/YR
	SHORT TERM	$2x10^{-10}$RMS	±$5x10^{-10}$P-P	$5x10^{-10}$RMS	±$5x10^{-9}$P-P	——
	AMBIENT	0 to +55°C <$1x10^{-8}$	−20 to +55°C $2x10^{-10}$/°C	−20 to +55°C $1x10^{-9}$/°C	−20 to +65°C <$5x10^{-7}$	−20 to +65°C $5x10^{-9}$/°C
	VOLTAGE	$5x10^{-10}$/1%	$5x10^{-10}$/1%	$5x10^{-9}$/1%	$2x10^{-8}$/1%	$3x10^{-8}$/1%
	LOAD	$5x10^{-10}$/1%	$1x10^{-9}$/1%	$2x10^{-9}$/1%	$2x10^{-8}$/5%	$5x10^{-8}$/5%
WARM-UP FROM +25°C		$1x10^{-7}$ IN < 20 MIN	$1x10^{-7}$ IN < 30 MIN	$2x10^{-7}$ IN < 30 MIN	$5x10^{-7}$ IN < 30 MIN	$5x10^{-7}$ IN < 20 MIN
FREQ. ADJUSTMENT		COARSE AND FINE PISTON TRIMMERS		SINGLE PISTON TRIMMER		
INPUT POWER		24 VDC WITH 10 WATTS MAXIMUM DURING WARM-UP				

Technical data subject to change

For complete catalog, information or technical assistance— Call, TWX or write:

ovenAire INC.
CHARLOTTESVILLE, VA.
703-293-5148 / TWX 510-587-5461

subsidiary of
Walter Kidde & Company, Inc.

Kidde

FREQUENCY CONTROL DEVICES

OVEN STABILIZED OSCILLATOR SERIES

Ovenaire produces many types of ovenized crystal oscillators to meet widely varying performance needs. Your ovenized oscillator requirement can be customized from one of these proportionately controlled standards.

FIG. 1

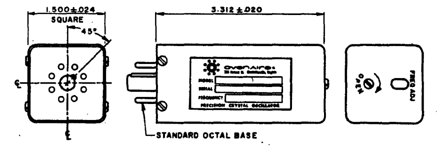

1.500±.024
SQUARE
45°
3.312±.020
STANDARD OCTAL BASE

FIG. 2

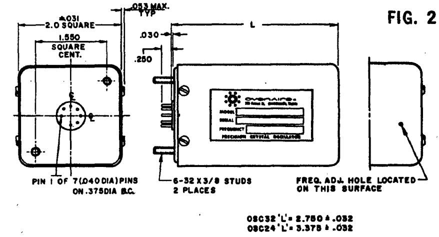

±.031
2.0 SQUARE
1.550
SQUARE
CENT.
.053 MAX.
TYP
L
.030
.250
PIN 1 OF 7(.040 DIA)PINS
ON .375DIA B.C.
6-32 X 3/8 STUDS
2 PLACES
FREQ. ADJ. HOLE LOCATED
ON THIS SURFACE
OSC32 'L'= 2.750 ± .032
OSC24 'L'= 3.375 ± .032

FIG. 3

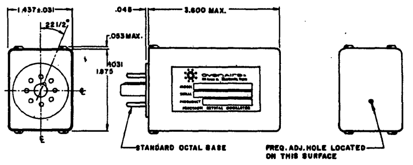
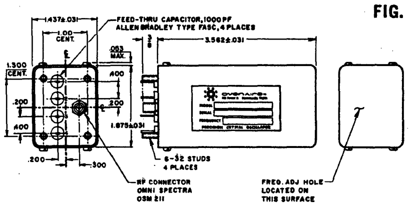

1.437±.031
22 1/2°
.048
3.600 MAX.
.053 MAX.
±.031
1.875
STANDARD OCTAL BASE
FREQ. ADJ. HOLE LOCATED
ON THIS SURFACE

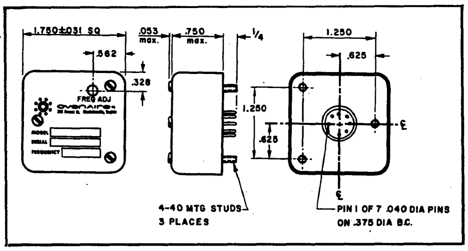
FIG. 4


1.437±.031
FEED-THRU CAPACITOR, 1000 PF
ALLEN BRADLEY TYPE FASC, 4 PLACES
1.00
CENT.
.053
MAX.
3/8
3.562±.031
1.300
CENT.
.400
.200
.200
.400
1.875±.031
.200
.300
6-32 STUDS
4 PLACES
RF CONNECTOR
OMNI SPECTRA
OSM 211
FREQ. ADJ HOLE
LOCATED ON
THIS SURFACE

SERIES		OSC 11	OSC 24	OSC 32	OSC 29	OSC 70
MAJOR FEATURE		AC or DC SMALL SIZE	FAST WARM-UP	LOW OVEN POWER	EXTENDED FREQ. COMPACT SIZE	
FREQUENCY		1 to 22 MHz	1 to 10 MHz	2 to 10 MHz	5 to 25 MHz	22 to 150 MHz
OUTPUT		1 VOLT RMS INTO 500 OHMS			1v RMS 300 Ω	+10 dbM 50 Ω
OPTIONAL OUTPUT		LOGIC	LOGIC	LOGIC	LOGIC	NONE
AMBIENT RANGE °C		−20° to +60°	−30° to +55°	0° to +55°	−20° to +60°	−10° to +60°
AMBIENT STABILITY		$5x10^{-9}$/°C	$5x10^{-10}$/°C	$1x10^{-9}$/°C	$1x10^{-8}$/°C	$2x10^{-8}$/°C
WARM-UP FROM 0°C		$\pm1x10^{-6}$ IN 30 MIN	$\pm5x10^{-7}$ IN 5 MIN	$\pm5x10^{-7}$ IN 45 MIN	$\pm1x10^{-6}$ IN 30 MIN	$\pm1x10^{-6}$ IN 30 MIN
POWER	COLD START	10 to 15W	25 WATTS	3.6 WATTS	8 WATTS	8 WATTS
	STEADY STATE +25°	APPROX. 3.5W	2 WATTS	1 WATT	APPROX 2.5 WATTS	
	SUPPLY VOLTAGE	115V AC 24V DC	24V DC	24V DC	28V DC	28V DC
OSCILLATOR SUPPLY		12 to 24V DC	24V DC	24V DC	15V DC	15V DC
TRIM RANGE		MECHANICAL AND/OR ELECTRICAL TRIM AVAILABLE				
SIZE		FIG 1	FIG 2	FIG 2	FIG 3	FIG 3 or FIG 4

TCXO SERIES

Logic Compatible Output –


1.750±.031 SQ
.053
max.
.750
max.
1/4
.562
.328
FREQ ADJ
1.250
.625
1.250
.625
4-40 MTG STUDS
3 PLACES
PIN 1 OF 7 .040 DIA PINS
ON .375 DIA B.C.

Supply Voltage +12 VDC. (+5 VDC to +20 VDC Optional)

PART NO.	OSC 37-1-1	OSC 37-2-1	OSC 37-3-1	OSC 37-1-2	OSC 37-2-2
FREQUENCY	1 to 5 MHz	5.01 to 10 MHz	1 to 5 MHz		5.01 to 10MHz
AMBIENT RANGE	0°C to +55°C		−5°C to +60°C	−10°C to +65°C	
AMBIENT STABILITY	$\pm2x10^{-6}$ REF +25°C		$\pm1x10^{-6}$ REF +25°C	$\pm1.5x10^{-6}$ REF +25°C	
AGING RATE	$1x10^{-6}$/YR	$2.5x10^{-6}$/YR	$1x10^{-6}$/YR		$2.5x10^{-6}$/YR
TRIM RANGE	$\pm5x10^{-6}$	$\pm8x10^{-6}$	$\pm4x10^{-6}$	$\pm5x10^{-6}$	$\pm8x10^{-6}$

VCXO SERIES AVAILABLE IN VARIOUS PHYSICAL CONFIGURATIONS

- Frequency Range 5 to 50 MHz
- ±0.005% to ±0.03% Deviation
- ±100 PPM to 0.2 PPM Stabilities
- Low Distortion F.M. Oscillators
- Oven and Non-Oven Models
- Compact Size

Technical data subject to change

For complete catalog, information or technical assistance– Call, TWX or write:

ovenaire INC.
CHARLOTTESVILLE, VA.
703-293-5148 / TWX 510-587-5461

subsidiary of
Walter Kidde & Company, Inc.

Kidde

FREQUENCY CONTROL DEVICES

PRINTED CIRCUIT MOUNT 1MHz to 150MHz CRYSTAL OSCILLATORS

● EXTENDED CAPABILITY

- LOGIC LEVELS TO 60 MHz
- SINE COVERAGE TO 150 MHz
- FAST PROTOTYPE SERVICE
- LOW COST
- SMALL SIZE
- RELIABLE

Pin Connections
PIN 1 +VSUP
PIN 2 OVDC
PIN 3 OVDC
PIN 4 OUTPUT

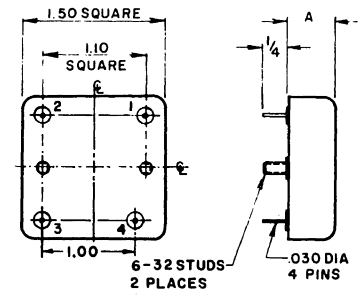


FIG 1

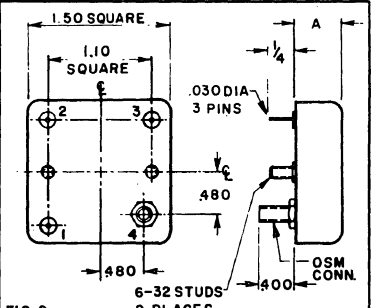


FIG 2

Pin Connections
PIN 1 +VSUP
PIN 2 OVDC
PIN 3 OVDC
OSM OUTPUT

FREQUENCY RANGE (MHz)		1 to 6	>6 to 10	>10 to 25	>25 to 60	>60 to 150
TOLERANCE		±0.001%			±.0012%	±.0015%
TEMP. RANGE		0°C to +60°C				
SERIES NO.	LOGIC	OSC 51-1-1	OSC 51-1-2	OSC 51-1-3	OSC 51-1-4	——
	SINE	OSC 51-2-1	OSC 51-2-2	OSC 52-2-1	OSC 52-2-2	OSC 52-2-3
LOGIC	SUPPLY VOLTAGE	+5V DC ±5%				
	SYMMETRY	50/50 ±20%	50/50 ±20%	50/50 ±20%	50/50 ±30%	——
	LOGIC HIGH	3VP @3Ma	3VP @3Ma	3VP @5Ma	3VP @5Ma	——
	LOGIC LOW	±0.4V @5Ma				——
	RISE TIME	<50 NS	<15 NS	<10 NS	<5 NS	——
	FALL TIME	<50 NS	<15 NS	<10 NS	<4 NS	——
	CONFIGURATION	FIGURE 1				——
	HEIGHT DIM A	.625	.50			——
SINE	SUPPLY VOLTAGE	+12V DC ±5%				
	OUTPUT VOLTAGE	1 VRMs ±30%		+10 DBM ±3db		
	LOAD	1 KΩ Resistive		50Ω Resistive		
	HARMONIC LEVEL	−30 DB		−25 DB		
	CONFIGURATION	FIGURE 1		FIGURE 2		
	HEIGHT DIM A	.625	.50	1.00		

ORDERING INFORMATION

Specify Series Number and Desired Frequency
Example: 8.3 MHz Logic Unit would be OSC 51-1-2 (8.3 MHz)

For complete catalog, information or technical assistance— Call, TWX or write:

OVENAIRE INC
CHARLOTTESVILLE, VA.
703-293-5148 / TWX 510-587-5461

subsidiary of
Walter Kidde & Company, Inc.

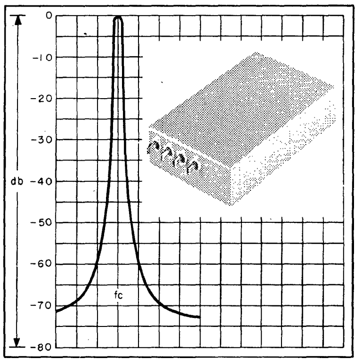
Kidde

ISO-FORK® OSCILLATORS

Output frequencies from 1.0 to 20,000 Hz. Absolute frequency accuracies from ±.10% to ±.001%. Operating temperature ranges up to from −55°C to +100°C depending upon accuracy. Wide choice of DC inputs from 5 to 28 volts and output waveshapes such as logic-clock, square or sine. Full MIL shock and vibration environmental capability, hermetically-sealed designs. Also ultra low current versions, miniature sizes, specials to suit either your performance or packaging requirements.

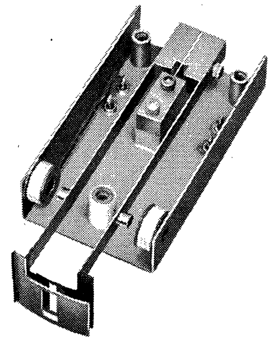
ISO-FORK® FILTERS

Narrow-band, band-pass, frequencies from 1,000 to 20,000 Hz. Butterworth 3 db bandwidths from .04% to .40% of center frequency, 60 db to 3 db shape factor 32 to 1, center frequency stability better than ±.001%/°C. 2 pole or 4 pole stagger-tuned with active circuitry to stabilize bandwidth and provide insertion gain of 100 (40 db) at center frequency. 1K input Z, up to 1.0 volt rms output into 10K, dynamic range greater than 72 db, +15 VDC input at 20 Ma. Specials to suit your requirements.



ISO-FORK® OPTICAL MODULATORS

Frequencies from 40 to 1,000 Hz...for modulating or chopping either light or energy beams. May often be used to replace motor driven choppers, offering weight and power savings plus no need to lubricate. Particular design and construction provides exceptional fork balance and high resistance to shock and vibration for most MIL specs. Tine ends may be fitted with shutters, lenses, or mirrors to suit your special requirements, various drive circuits available.



The Iso-Fork® is a modern, unique, high-performance concept of the conventional tuning fork. Our products are widely used in designs ranging from test sets to computers to electro-optical systems...from laboratory to satellites... for commercial, industrial, or military applications.

Philamon® INCORPORATED

90 HOPPER STREET / WESTBURY, NEW YORK 11590 / PHONE: (516) 333-1700 / TWX: 510-222-4749

monolithics: the facts and the proof

Monolithic crystal filters are becoming a popular topic of discussion these days. Since we've been making them longer (since 1967) and making more of them (over a quarter-million last year), we'd like to clear up a few misconceptions about the state-of-the-art.

1. **Monolithics are expensive**—Wrong. They cost less than conventional crystal filters. And, their low cost/high performance has brought reality to many "someday" applications.

2. **There are no standard models**—Wrong again. PTI has over 20 standards at the 10.7 MHz frequency alone. Plus a big selection of standards at other popular frequencies.

3. **There isn't enough variety of packaging**—PTI offers several models in flatpack, upright mount and P.C. assembly. We've got more on the drawing board.

If you're now using standard crystal filters, or if you've been holding off because of cost, size or performance, we'd like to show you how monolithics can do the job better for less. Drop us a line and we'll send our new fact sheet.

For off-the-shelf or custom models, if you have questions about monolithics, we've got the answers.

STANDARD MODELS

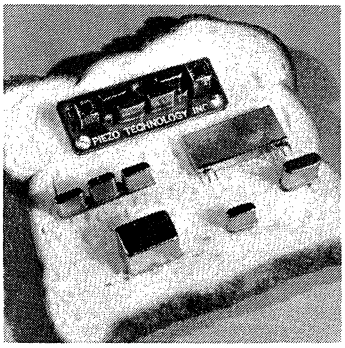
For low cost, take our 10.7 MHz integrated crystal filters. All models are available off-the-shelf. All feature tandem monolithic construction for minimum size and high stopband performance. Our 10.7's are available in upright, flatpack, p.c. assemblies or sets of monolithic units for assembly on your own board.

Guide to Standard 10.7 MHz Models

13 kHz Bandwidth	15 kHz Bandwidth	30 kHz Bandwidth	No. Poles (Resonators)	Dimensions WxLxH
2194F	2195F	2196F	2	.185x.432x.450
1463	1464	1465	4	.47x.59x.59
1466	1467	1468	4	.61x.89x.22
1469	1470	1471	6	.47x.59x.59
1472	1473	1474	6	.61x1.31x.22
1475	1476	1477	8	.47x.73x.59
1478	1479	1480	8	.61x1.75x.22
1433	1434	1435	8	1.02x2.39x.52

Other bandwidths to come.

Models 1433-35 interchange with commonly used conventional crystal filters. PTI also offers standard models at many other popular frequencies including 5.26, 6.46, 8.0, 16.9, 20.0, 21.4, 30.0, 32.0, 75 and 156 MHz.



CUSTOM MODELS

The same cost saving techniques of PTI standard integrated crystal filters can be applied to your high volume custom requirements in I-F filtering, spectrum clean-up, parametric up-conversion and front end filtering, just to name a few. PTI engineers will work with you from start to finish to meet your specific requirements from 5 to 300 MHz. Special packaging, too. Prototypes are usually available within 4 weeks. Give us a call on your next project.

Piezo Technology Inc.
2400 Diversified Way
Orlando, Florida 32804
305-425-1574

REEVES-HOFFMAN

Described are typical units of commonly used types. Descriptive data, including measured capabilities, furnished on request. If your need concerns types and parameters not shown, please contact our plant.

Available with special C_0, C_1, and L_1 for filter applications • temperature coefficients to your specifications • pre-aging to guarantee stability of high precision units • special designs for high shock and vibration. All units meet mil-3098 requirements. Special high precision units, with aging characteristics up to 2 × 10^{-11} per day, are available in standard frequencies of 1, 2.5 and 5 MHz.

CRYSTALS

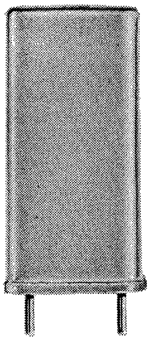
Frequency Range	Frequency Tolerance/Temperature Range			Holder Size (Military)*
	−55°C to +105°C	−40°C to +85°C	0°C to +50°C	
.85 to 50 kHz	±0.02%	±0.015%	±0.01%	HC-6, HC-13, HC-14
1 to 14 kHz	±0.02%	±0.015%	±0.01%	HC-13
14 to 150 kHz	±0.015%	±0.010%	±0.008%	HC-6, HC-13, HC-14, HC-17
90 to 300 kHz	±0.025%	±0.018%	±0.01%	HC-6, HC-13, HC-17
200 to 500 kHz	±0.012%	±0.008%	±0.003%	HC-6, HC-14, HC-17, HC-21(**)
200 to 800 kHz	±0.009%	±0.005%	±0.003%	HC-6, HC-13, HC-14, HC-17
250 to 800 kHz	±0.018%	±0.015%	±0.008%	HC-6, HC-14, HC-17
500 to 1,400 kHz	±0.005%	±0.004%	±0.0025%	HC-6, HC-14, HC-17
1.4 to 20 MHz	±0.004%	±0.004%	±0.002%	HC-6, HC-14, HC-17, 511, 512
10 to 200 MHz	±0.004%	±0.003%	±0.002%	HC-6, HC-13, HC-14, HC-17, HC-18

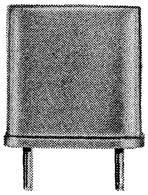
* All units listed are also available in T-5 ½ glass holder.

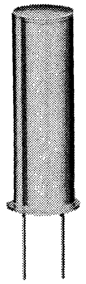
** Also available in T-9 glass bulb.

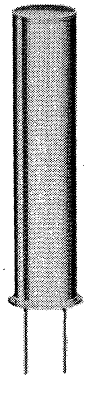
QUARTZ CRYSTAL HOLDERS

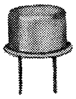
CW—Coldweld
SS—Solderseal

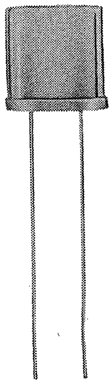

RH-13 (SS)

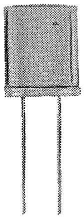

RH-6 (SS)

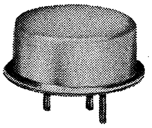

A-3 (CW)

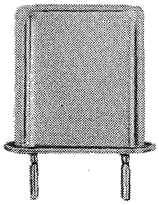

A-2 (CW)

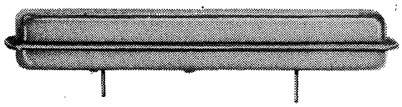

A-5 (CW)

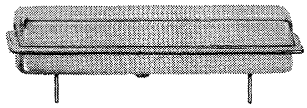

RH-512 (SS)

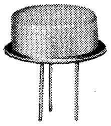

RH-18 (SS)

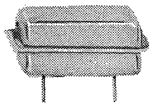

C (CW)


DA (CW)


E-1 (CW)


E-2 (CW)


B-5 (CW)


E-3 (CW)

Illustrations show actual sizes

REEVES-HOFFMAN

DIVISION OF DCA
400 WEST NORTH STREET, CARLISLE, PA. 17013

REEVES-HOFFMAN CRYSTAL FILTERS

Note: The frequencies and bandwidths indicated are not to be considered production limitations. Variations of these filters can be made over the frequency range of approximately 10 kHz to 30 MHz (or higher).

BAND PASS

Center Frequency	3 dB Bandwidth	Shape Factor	Impedance (Ohms)	Size (in.) (L x W x H)
8 kHz	4 Hz	50:1 @ 40 dB	600	1.82 x 1.5 x 5.0
100 kHz	2 Hz	4:1 @ 60 dB	3K	4.25 x 2.0 x 3.82
250 kHz	100 Hz	3:1 @ 60 dB	8K	2.0 x 2.0 x 3.5
455 kHz	200 Hz	10:1 @ 60 dB	2K	3.5 x 1.5 x 2.0
700 kHz	1000 Hz	10:1 @ 80 dB	2.5K	1.5 x 1.5 x 3.5
1.75 MHz	400 Hz	5:1 @ 60 dB	1K	1.0 x 1.5 x 1.5
1.75 MHz	110 Hz	2:1 @ 60 dB	200	3.75 x 1.75 x 1.25
3.0 MHz	400 Hz	6:1 @ 60 dB	5K	3.0 x 2.0 x 1.5
4.0 MHz	1200 Hz	10:1 @ 70 dB	50	3.5 x 1.5 x 1.5
* 9.0 MHz	5400 Hz	2:1 @ 60 dB	470	1.5 x .75 x .32
*10.7 MHz	2700 Hz	2:1 @ 60 dB	470	1.5 x .75 x .32
*10.7 MHz	13 kHz	2:1 @ 60 dB	470	1.5 x .75 x .32
10.7 MHz	800 Hz	1.5:1 @ 60 dB	600	2.0 x 2.0 x 1.0
11.5 MHz	120 kHz	4:1 @ 40 dB	2K	1.5 x 1.5 x 1.0
20.0 MHz	30 kHz	1.7:1 @ 60 dB	1K	1.5 x 1.5 x 1.0
*25.0 MHz	26 kHz	3:1 @ 50 dB	2K	1.75 x .70 x .50
30.0 MHz	25 kHz	3:1 @ 60 dB	2K	1.5 x 1.5 x 1.0

* "MINILITH," Reeves-Hoffman monolithic design.
† Reeves-Hoffman "Hi-Fidelity" SSB design.

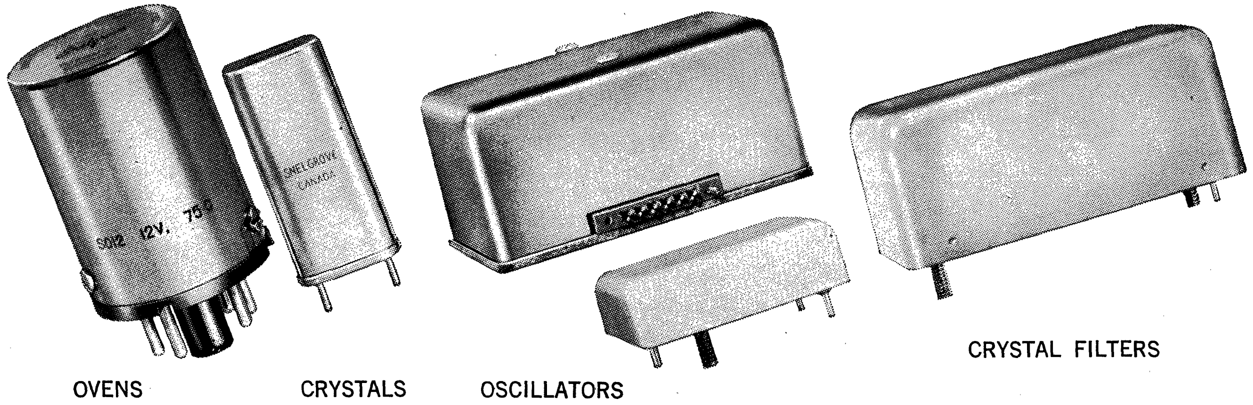
SINGLE SIDE BAND

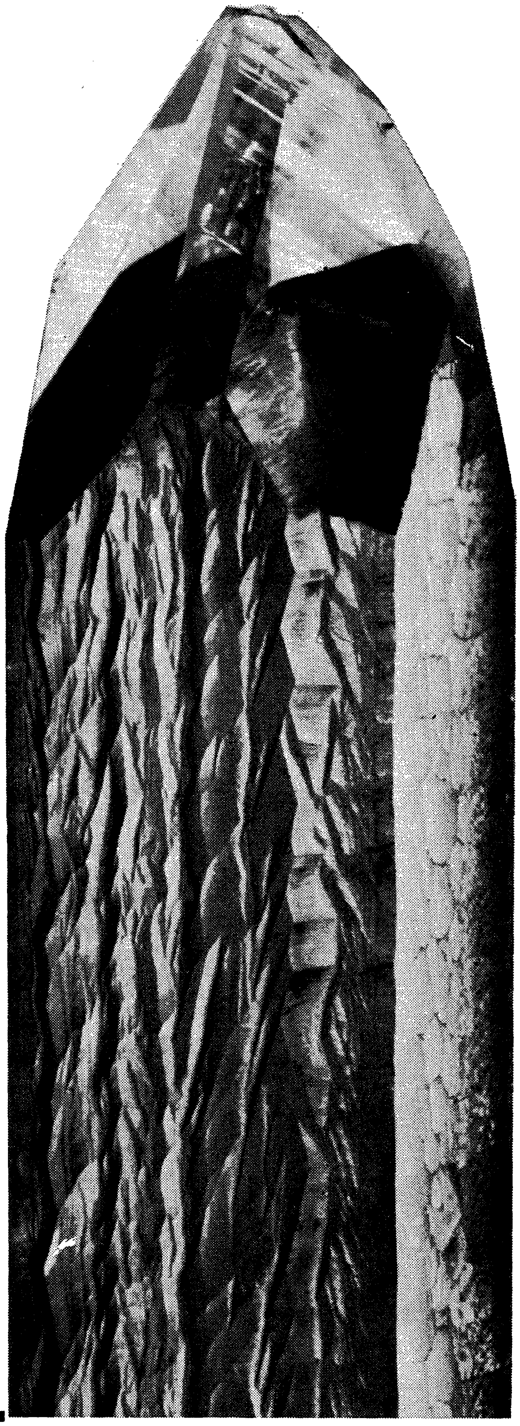
Center Frequency	3 dB Passband	Min. Attenuation	Insertion Loss	Passband Variation	Impedance (Ohms)
250 kHz	–230 to –7730 Hz	60 dB	6.0 dB	3 dB max.	3K
250 kHz	+240 to +7740 Hz	60 dB	6.0 dB	3 dB max.	3K
1750 kHz	–350 to –3040 Hz	70 dB	6.0 dB	1.5 dB	3K
1750 kHz	+350 to +3040 Hz	70 dB	6.0 dB	1.5 dB	3K
†1743.71 kHz	–3255 to –5935 Hz	70 dB	3.0 dB	.5 dB	220
†1750.00 kHz	–255 to –3035 Hz	70 dB	3.0 dB	.5 dB	220
†1750.00 kHz	+255 to +3035 Hz	70 dB	3.0 dB	.5 dB	220
†1756.29 kHz	+3255 to +5935 Hz	70 dB	3.0 dB	.5 dB	220
* 9.0 MHz	(6 dB) +500 to +3000 Hz	60 dB	3.0 dB	1.5 dB	470
* 9.0 MHz	(6 dB) –500 to –3000 Hz	60 dB	3.0 dB	1.5 dB	470
*10.7 MHz	+500 to +3200 Hz	60 dB	2.0 dB	2.0 dB	470
*10.7 MHz	–500 to –3200 Hz	60 dB	2.0 dB	2.0 dB	470

REEVES-HOFFMAN CRYSTAL OSCILLATORS

Note: Parameters shown are not production limitations. Custom designing is available from 1 Hz to 200 MHz. Stability, aging, output voltage, waveform, and environment to your specifications.

Frequency	Aging	Output	Supply Voltage	Temp. Range	Size in.) (L x W x H)
60 Hz	3 x 10^{-8}/day	1v, rms	12v, ac	10°C to 60°C	4 x 4.7 x 4.9
400 Hz	25 x 10^{-6}/yr.	sq. wave	24v, dc	–32°C to +52°C	1.75 x 1.75 x 4.33
100.000 kHz	3 x 10^{-8}/day	1v, rms	28v, dc	–40°C to +70°C	1.88 x 1.44 x 3
90-650 kHz	25 x 10^{-6}/yr.	1v, rms	30v, dc	–30°C to +55°C	1.290 dia. x 4.062
1000.000 kHz	1 x 10^{-9}/day	1v, rms	28v, dc	0°C to 65°C	2 x 2 x 4.75
2500.000 kHz	2 x 10^{-11}/day	100 kc 1.0 mc 5.0 mc 1v, rms	24v, dc	0°C to 40°C	Rack mount 5¼" panel
5000.000 kHz	1 x 10^{-8}/wk	55mv	12v, dc and 26v, dc	0°C to 60°C	8.5 x 5 x 5





a snelgrove special

Now — custom-built oscillators and monolithic filters

Longtime leaders in the research and development of quartz crystal filters, C. R. Snelgrove offers a new custom-design service . . . for temperature compensated crystal oscillators and monolithic crystal filters . . . another plus in Snelgrove's range of quartz crystals, crystal ovens, filters and oscillators.

And Snelgrove now offers extended production facilities—more than doubling previous capacity . . . assuring the maximum performance at minimum cost.

Snelgrove's expert technical consultants are ready to help you at any time. Toronto (416) 447-8531 is the number to call with your quartz problems.

C. R. SNELGROVE
COMPANY LIMITED

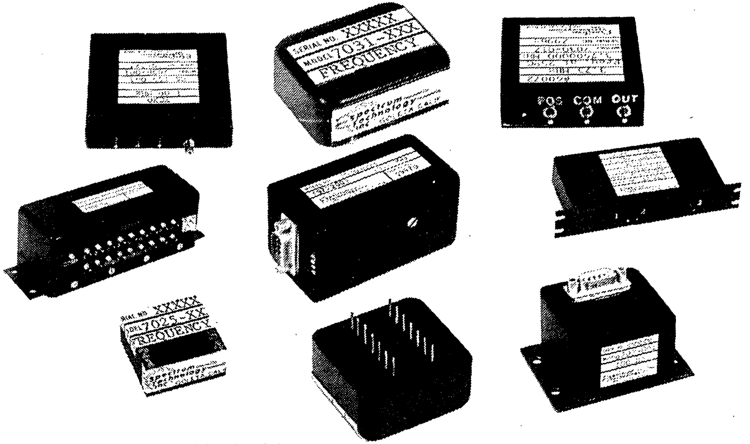
141 BOND AVENUE, DON MILLS, ONTARIO
Tel: (416) 447-8531 Telex: 02-21598
Twx: 610-492-1354 Cables: Snelcrstl

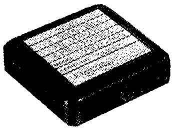
"A Member of the Leigh Group of Companies"

C R S

Oscillators...XTAL...Fork...Logic Clock... TCXO...Custom or Standard...

We know all oscillator requirements are a little bit different. Our "SPECTRUM" of standard frequency control devices is continually growing and we can adapt existing designs to exactly satisfy your requirement. Some more popular designs are described below. Write or call for complete specification information, or help with your requirements.





TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS

Designed for applications where no warm-up time or oven power is available, and minimal size and weight are important to the user. Thermistor-varactor compensation networks and Silicon IC active devices provide optimum performance. Excellent long-term stability results from use of glass-enclosed or cold weld quartz crystal.

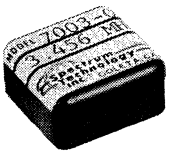
PCB Mounting, hermetically sealed

Accuracy: ±1 x 10^{-6} at +25°C
Stability: To ±3 x 10^{-7} at 0° to 50°C

SERIES 7000
Frequency: 10 kHz to 20 MHz, TTL, DTL output
Package: 2" x 2" x .63"

SERIES 7001
Frequency: 100 kHz to 20 MHz, TTL, DTL or sine wave output
Package: 2" x 2" x .75"

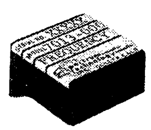
SERIES 7002
Frequency: 2.7 MHz to 20 MHz, TTL, DTL output
Package: 2" x 2" x ½"



SUB-MINIATURE CRYSTAL OSCILLATOR I.C. LOGIC CLOCK

This tiny oscillator supplies a clocking signal for use in digital computer applications where space and power are limited. Simple design allows use of premium quality components to attain high reliability. Can be used in high shock, high vibration environments, including aircraft, shipboard, oceanographic, missile, or mobile.

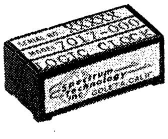
SERIES 7003
Frequency: 3 MHz to 100 MHz
Accuracy: ±10 ppm at 25°C
±50 ppm, −55°C to +125°C
Stability: ±1 x 10^{7}/24 hours at 25°C
Package: .88" x .88" x .45" Can be mounted on printed circuit board. Hermetically sealed.



SUB-MINIATURE TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR

Designed for applications where no warm-up time or oven power is available, this series represents the smallest TCXO known. Employing state-of-the-art technology, these subminiature devices dissipate less than 80 mW of power. Excellent long-term stability results from the use of glass enclosed, or cold-weld quartz crystals.

SERIES 7013
Frequency: 8 MHz to 20 MHz
Accuracy: ±1 x 10^{-6} at +25°C
Stability: To ±1 x 10^{-6}, −40 to +70°C
Package: 1" x 1" x ½" Can be mounted by terminals on PCB. Hermetically sealed.



CRYSTAL OSCILLATOR I.C. LOGIC CLOCK

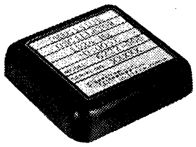
This series of high reliability, low power consumption I.C. Logic Clocks provide complimentary outputs for computer systems requiring both Q and $\bar{Q}$ logic levels. Low profile makes printed circuit mounting practical for high density packaging. This design has been found appropriate in high shock and vibration environments.

SERIES 7017
Frequency: 187.5 kHz to 20 MHz
Stability: ±.005%
Output: Q Logic "0" = +0.5V Max. Sink 5 mA
Q Logic "1" = +3.0V Min. Source 1 mA
$\bar{Q}$ Logic "1" = +3.0V Min. Source 1 mA
$\bar{Q}$ Logic "0" = +0.5V Max. Sink 5 mA
Temp. Range: −55°C to +125°C
Input: 5Vdc ±10%, 7 to 20 mA
Package: 1.2" x .6" x .5"

SUB-MINIATURE TUNING FORK OSCILLATOR

Tiny eleven-gram package combines the advantages of ceramic transducers and modern integrated circuitry. Unit mounts by leads directly on printed circuit board. Tuning fork element is mounted in silicon-rubber which provides isolation from shock and vibration.

SERIES 6205
Frequency: 4 kHz to 40 kHz
Output: Logic "0", <+0.5 volts
Logic "1", +4.0 ±0.5 volts
Waveshape: Square
Rise-Fall Time: Less than 5% of total period measured from 10% to 90% of maximum.
Package: 7/8" square. Only 7/16" high when seated. Hermetically sealed.



PRECISION OSCILLATOR

Sub-miniature tuning fork oscillator. Combines advantages of ceramic transducers and modern integrated circuitry for high performance in a small package. Resonator element is mounted in silicon-rubber to provide isolation from shock and vibration.

SERIES 6222
Frequency: 1 kHz to 40 kHz without multipliers.
Output: 1 volt rms minimum to 10,000 ohm load, sine.
Package: 2" x 2" x ½" seated height. Lead mounted directly to printed circuit board. Hermetically sealed.

Spectrum Technology Inc

BLDG. 240, SANTA BARBARA AIRPORT • P.O. BOX 948
GOLETA, CALIFORNIA 93017 • PHONE (805) 964-7791
FEDERAL STOCK CODE NO. 32464

T.M.C. SYSTEMS (ARIZ.) INC.
930 W. 23rd ST. • TEMPE, ARIZONA 85281
PHONE (602) 967-7874
TWX 910-950-1943

CREATIVE LEADERS IN COMPONENTS FOR COMMUNICATION TECHNOLOGY

CRYSTAL FILTERS

DCA and/or MIL-STD-188 Type Crystal Filters that provide required amplitude and envelope delay characteristics without use of separate equalizers are available at Carrier Frequencies of 100KHz through 1750KHz for both two and four channel applications.

Standard and custom designs for bandpass, band reject, phase matched filters plus discriminators are available at frequencies of 10KHz through 30MHz.

CRYSTAL OSCILLATORS

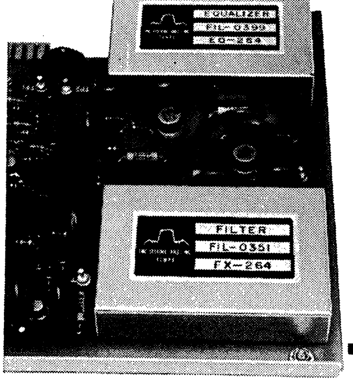
Fixed frequency, voltage controlled, temperature compensated or ovenized. Standards, miniaturized and custom designs available from 5Hz through 100MHz.

MAGNETIC COMPONENTS AND RESONATORS

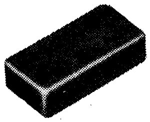
Lowpass, highpass, bandpass, band reject and prescribed transfer function characteristics available from 1Hz to 150MHz.

Custom resonator design and production is available for frequencies from 10KHz through 30MHz.

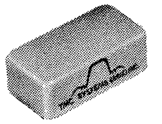
BANDPASS FILTERS & DELAY EQUALIZERS FOR VOICE, RTTY MULTI-PLEX OR DATA TRANSMISSION.



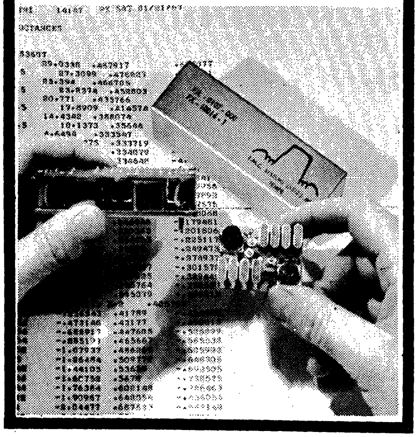
MINIATURIZED CRYSTAL OSCILLATOR



MINIATURIZED 8 POLE CRYSTAL FILTER



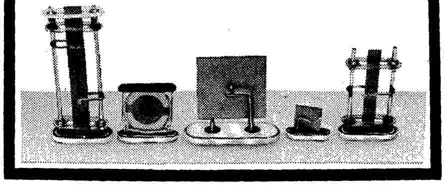
COMPUTER OPTIMIZED DESIGNS OF CRYSTALS, OSCILLATORS AND FILTER NETWORKS.



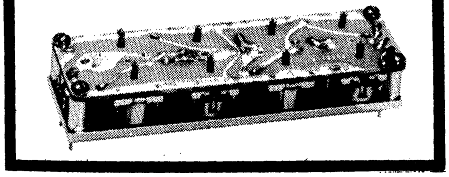
TEMPERATURE COMPENSATED VOLTAGE CONTROLLED CRYSTAL OSCILLATOR:

OSCILLATOR
TC-VCXO-250
A0124

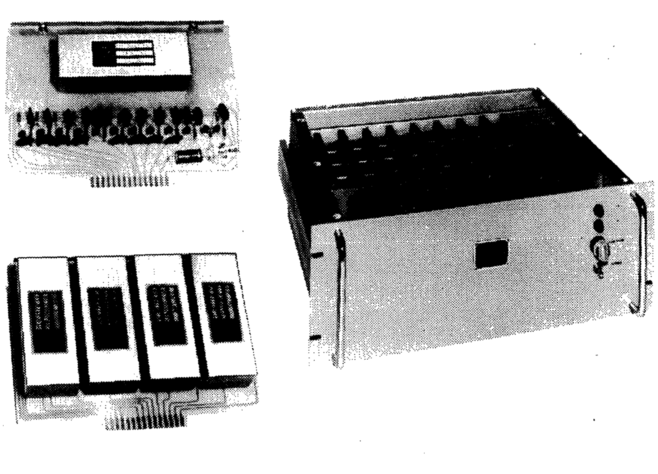
10 KHz TO 60 MHz STANDARD OR CUSTOM CRYSTAL RESONATORS



LC BANDPASS FILTERS



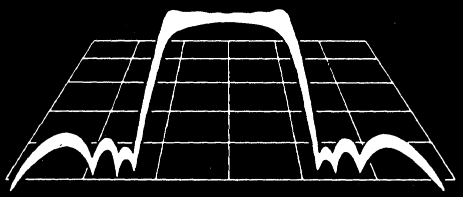
COMB FILTER ASSEMBLY 32 CHANNELS



A Subsidiary of **THE TECHNICAL MATERIEL CORPORATION**

T.M.C. SYSTEMS (ARIZ.) INC.

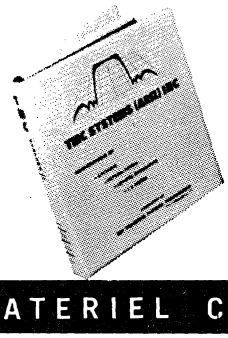
930 W. 23rd ST. • TEMPE, ARIZONA 85281
PHONE (602) 967-7874
TWX 910-950-1943



This is a partial listing of available designs. Modified or Custom designs are available for your specific application. Contact our local representative (see yellow section) for technical or sales assistance.

Center Frequency	Passband	Stopband Bandwidth	Case Size in Inches	Insertion Loss (dB)	Source & Load Z (Ω)	Part Number
10.000 KHz	75 Hz USB	250 Hz at 40 dB	1.5 x 4 x 3	10	1K	FIL-0228
16.000 KHz	40 Hz	2 KHz at 30 dB	2 x 2 x .80	4.5	600	FIL-0055
19.275 KHz	217 Hz	1120 Hz at 20 dB	1.75 x 1.75 x 3.5	10	10K	FIL-0030
27.700 KHz	50 Hz	250 Hz at 50 dB	2.25 x 4 x 1.5	1	12K x 10K	FIL-0244
61.150 KHz	600 Hz	2300 Hz at 70 dB	1 x 2 x 3.5	4	1.8K-8.2K	FIL-0273
100.000 KHz	10 Hz	120 Hz at 40 dB	1.25 x 1 x 1.75	5	1500	FIL-0283
100.000 KHz	250 Hz	1 KHz at 60 dB	2 x 3.5 x .75	3	330	FIL-0099
100.000 KHz	2790 Hz USB	4790 Hz at 70 dB	2.5 x 3.5 x 2	3	330	FIL-0095
100.000 KHz	2790 Hz LSB	4790 Hz at 70 dB	2.5 x 3.5 x 2	3	330	FIL-0097
125.000 KHz	±10 Hz at 3 dB	3 Hz at 50 dB notch	2 x 6 x 2.5	3	1K	FIL-0131
250.000 KHz	400 Hz at 1 dB	30 Hz at 30 dB notch	2.9 x 2 x 2.5	2	12K	FIL-0008
250.000 KHz	2780 Hz USB	3500 Hz at 60 dB	1.875 x 2.75 x .65	4	500	FIL-0127
455.000 KHz	300 Hz at 6 dB	1700 Hz at 60 dB	.5 x 2.75 x .76	14	100K	FIL-0063
455.000 KHz	Dual 6 dB 100 Hz & 1000 Hz	1 KHz & 5 KHz Dual 60 dB	1.45 x 3.5 x 1	4 & 7	2.5K	FIL-0100
455.000 KHz	10 KHz at 6 dB	50 KHz at 60 dB	1 x 3.5 x 1	8	500-2K	FIL-0274
500.000 KHz	2 KHz at 6 dB	5 KHz at 40 dB	.6 x 4.66 x 1.5	7	50-500	FIL-0317
500.000 KHz	6 KHz at 6 dB	35 KHz at 60 dB	1 x 1 x 3.5	8	2K	FIL-0345
500.000 KHz	12 KHz at 6 dB	30 KHz at 60 dB	1 x 1 x 3.5	8	2K	FIL-0344
500.000 KHz	22 KHz at 6 dB	75 KHz at 60 dB	1 x 1 x 3.5	8	2K	FIL-0343
1.000 MHz	900 Hz at 6 dB	24 KHz at 50 dB	1 x 2.8 x 1.07	3	50K	FIL-0043
1.250 MHz	12 KHz at 6 dB	72 KHz at 60 dB	.8 x 1.25 x 3.5	10	500	FIL-0366
1.600 MHz	750 Hz at 6 dB	4 KHz at 60 dB	1 x 2.8 x 1.07	6	9K	FIL-0031
1.600 MHz	2800 Hz at 6 dB	15.2 KHz at 60 dB	1 x 2.8 x 1.07	6	9K	FIL-0005
1.750 MHz	2750 Hz USB	6 KHz at 60 dB	1 x 1.12 x 3.38	3	3.3K-500	FIL-0107
1.750 MHz	2750 Hz LSB	6 KHz at 60 dB	1 x 1.12 x 3.38	3	3.3K-500	FIL-0108
2.500 MHz	12 KHz	72 KHz at 60 dB	.8 x 1.25 x 3.5	10	500	FIL-0367
5.000 MHz	12 KHz	72 KHz at 60 dB	.8 x 2.5 x 1.25	10	500	FIL-0368
5.000 MHz	50 KHz	250 KHz at 50 dB	1 x 2.37 x 1.03	8	50	FIL-0377
5.750 MHz	3000 Hz at 3 dB	450 Hz at 60 dB notch	1 x 3.5 x 1	2	50	FIL-0230
6.290 MHz	500 Hz	20 KHz at 60 dB	.625 x 2⅛ x .750	6	470	FIL-0044
6.400 MHz	8000 Hz	20 KHz at 60 dB	.825 x 3 x .562	3	2.8K-150	FIL-0003
8.242 MHz	7500 Hz	17.5 KHz at 60 dB	1.75 x 3.75 x 1.25	2	50	FIL-0134
10.000 MHz	6300 Hz	63 KHz at 40 dB	1 x 1.77 x .88	6	50-500	FIL-0039
10.000 MHz	36 KHz	160 KHz at 60 dB	1 x 2.5 x 1	3	100	FIL-0035
10.125 MHz	40 KHz	80 KHz at 50 dB	.7 x 2.2 x .7	4	50	FIL-0375
10.700 MHz	70 KHz	140 KHz at 60 dB	1.31 x 2.35 x .782	8	50	FIL-0231
11.500 MHz	50 KHz	450 KHz at 60 dB	½ x 1.27 x .718	4	1K	FIL-0288
12.300 MHz	3200 Hz	52 KHz at 20 dB	.93 x 1.68 x .75	2	470	FIL-0113
13.418 MHz	7500 Hz	17.5 KHz at 60 dB	1.75 x 3.75 x 1.25	2	50	FIL-0295
15.542 MHz	7500 Hz	17.5 KHz at 60 dB	1.75 x 3.75 x 1.25	2	50	FIL-0296
16.533 MHz	7500 Hz	17.5 KHz at 60 dB	1.75 x 3.75 x 1.25	2	50	FIL-0314
21.400 MHz	20 KHz	40 KHz at 60 dB	1.2 x .6 x .4	3	700	FIL-0511
21.400 MHz	40 KHz	80 KHz at 60 dB	1.2 x .6 x .4	2	1400	FIL-0512
21.400 MHz	60 KHz	120 KHz at 60 dB	1.2 x .6 x .4	1	2100	FIL-0513
21.953 MHz	1600 Hz	20 KHz at 50 dB	1 x 1.5 x .875	5	2K	FIL-0028

If you need Custom Designs at Standard Prices — you need the experience of TMC working for you. Our Computerized Techniques provide you with Optimum Designs and Rapid Response at Cost Savings.



Complete sales and technical information available, contact Factory or Sales Rep. See Yellow section for local representative.

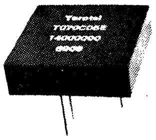
A Subsidiary of THE TECHNICAL MATERIEL CORPORATION

TOROTEL INC.

13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030
PHONE: 816-761-6314 TWX-910-7777037

CRYSTAL CONTROLLED CLOCK OSCILLATORS

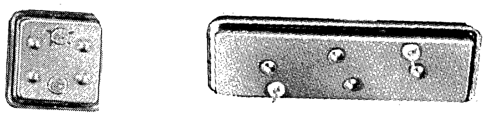
- **1 HZ to 25 MHZ Fixed Frequency Crystal Oscillator**



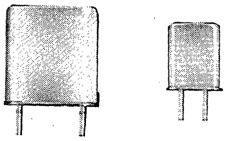
- **Available in Encapsulated P/C Mount or Hermetic Seal**
- **Excellent Rise/Fall Time, Square Wave**
- **Compatible with T^2L Logic**
- **Minimum Power Required, All Solid State**
- **Economically Priced for Industrial Applications**

TYPE	*FAN OUT	FREQUENCY RANGE	TEMP. RANGE DEG. C.	TOLERANCE	POWER REQUIREMENT
T070E10E	10	7 KHZ to 100 HKZ	−20 to + 70	±200 PPM (.02%)	Operating Voltage 3.5 to 5.5 V DC
T070G10E	10	7 KHZ to 100 HKZ	−20 to + 70	±300 PPM (.03%)	Nominal Power 30 MW 100 KHZ Up
T070F10E	10	7 KHZ to 100 KHZ	−20 to + 70	±500 PPM (.05%)	Special Order for other operating voltage.
T070E05E	5	100 KHZ to 500 KHZ	−20 to + 70	±200 PPM (.02%)	Logic Out:
T070G05E	5	100 KHZ to 500 KHZ	−20 to + 70	±300 PPM (.03%)	1 = 2.4 V Minimum
T070F05E	5	100 KHZ to 500 KHZ	−20 to + 70	±500 PPM (.05%)	0 = 0.4 V Maximum
T070D05E	5	500 KHZ to 2.5 MHZ	−20 to + 70	±100 PPM (.01%)	*1.6 MA Maximum per Unit
T070E05E	5	500 KHZ to 2.5 MHZ	−20 to + 70	±200 PPM (.02%)	Duty Cycle 40% to 60%
T100F05E	5	500 KHZ to 2.5 MHZ	−55 to + 100	±500 PPM (.05%)	RISE/FALL TIME (10% to 90% Points)
T070D05E	5	2.5 MHZ to 25 MHZ	−20 to + 70	±100 PPM (.01%)	20 Nanoseconds or less — 2.5 MHZ and Up
T070C05E	5	2.5 MHZ to 25 MHZ	−20 to + 70	± 50 PPM (.005%)	50 Nanoseconds or less — .1 MHZ to 2.5 MHZ
T105D05E	5	2.5 MHZ to 25 MHZ	−55 to + 105	±100 PPM (.01%)	Size 1.5" x 1.5" x 0.45" Max.
T105C05E	5	2.5 MHZ to 25 MHZ	−55 to + 105	± 50 PPM (.005%)	For Metal Case Hermetic Seal Use H
T070J05E	5	2.5 MHZ to 25 MHZ	−20 to + 70	± 20 PPM (.002%)	Suffix in Place of E Suffix.

QUARTZ CRYSTALS



COLD WELD



RESISTANCE WELD

Frequencies from 15 KHz to 100 MHz manufactured to the highest tolerances and hermetically sealed with the latest methods.

Torotel's cold welding process provides crystals to the most severe tolerances in the HC-38/U, HC-39/U and HC-41/U crystal holders. These holders are checked for helium leaks at parts in 10^{-9} CC per second. Crystals packaged in this manner are especially suited for PC board mounting.

Resistance weld sealing is available **at no extra cost** in the HC-6/U, HC-18/U, HC-25/U and HC-33/U standard holders. This process uses an electrical weld to seal the crystal unit in a helium-nitrogen atmosphere. Solder balls and aging due to flux contamination are completely eliminated.

QPL-3098

In house laboratory facilities can perform testing to MIL-C-3098E. Many standard types are QPL approved and custom designs are available on request.

CRYSTAL FILTERS

Crystal filters from 10 KHz to 30 MHz are computer designed for maximum performance. Custom designs are considered a challenge. Contact Torotel's engineering staff for assistance. See EEM Section 2700 for LC and Modem Filters.

VECTRON

CRYSTAL OSCILLATORS Frequency Stds.

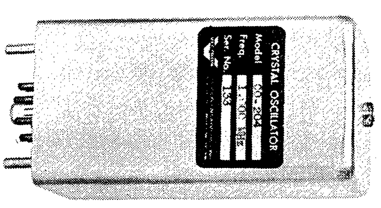
High Stability Crystal Oscillators (Oven Controlled)

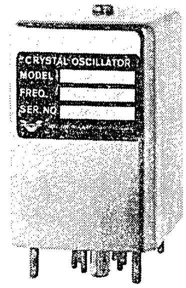
MODEL	CO-204	CO-203	CO-202	CO-201
AGING RATE	1x10^{-9}/day	3x10^{-9}/day	5x10^{-9}/day	1x10^{-8}/day
TEMPERATURE	0°C to +50°C: ±5x10^{-9} −20°C to +70°C: ±1x10^{-8} −55°C to +85°C: Optional			
FREQUENCY	1-15 MHz (lower and higher frequencies with inclusion of dividers or multipliers; have delivered units with output as low as 1 KHz)			
INPUT VOLTAGE	Oscillator: 5-32 VDC Oven: 5-32 VDC			
OVEN CONTROL	Proportional (integrated circuit)			
SIZE	2"x2"x4"; octal plug-in (Other configurations available)			

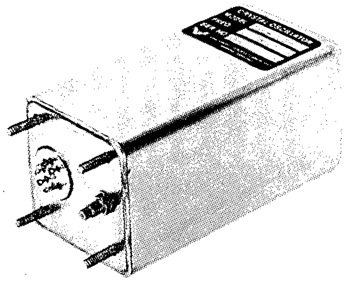
MODEL	CO-214	CO-213	CO-212	CO-211
AGING RATE	1x10^{-8}/day	3x10^{-8}/day	5x10^{-8}/day	1x10^{-7}/day
TEMPERATURE	0°C to +50°C: ±5x10^{-8} −55°C to +85°C: Optional			
FREQUENCY	500 KHz to 50 MHz (lower frequencies with inclusion of dividers)			
INPUT VOLTAGE	Oscillator: 5-32 VDC Oven: 5-32 VDC			
OVEN CONTROL	Proportional			
SIZE	2"x2"x3"; octal plug-in (Other configurations available)			

VHF

MODEL	CO-224	CO-222	CO-221
AGING RATE	1x10^{-8}/day	5x10^{-8}/day	1x10^{-7}/day
TEMPERATURE	0°C to +50°C: ±5x10^{-8} −55°C to +80°C: Optional		
FREQUENCY	Up to 150 MHz		
INPUT VOLTAGE	Oscillator: 20-32 VDC Oven: 20-32 VDC		
OVEN CONTROL	Proportional (integrated circuit)		
SIZE	2"x2"x4"; 7 pin header and rf connector		

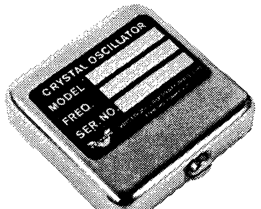

CRYSTAL OSCILLATOR
Model CO-204
Freq.
Ser. No.


CRYSTAL OSCILLATOR
MODEL
FREQ.
SER. NO.


CRYSTAL OSCILLATOR

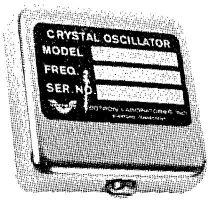
TCXOs (Temperature Compensated Crystal Oscillators)

MODEL	CO-251	CO-252	CO-252-3	CO-252-4
TEMPERATURE	0°C to 50°C ±1x10^{-6}	−20°C to +70°C ±1x10^{-6}	0°C to +50°C ±2x10^{-7}	−55°C to +85°C ±5x10^{-6}
INPUT	5-30V, 5ma	12-30V, 10ma	12-30V, 10ma	12-30V, 10ma
OUTPUT	1 VRMS into 1K (DDT/TTL compatible output optional)			
AGING	Better than 1x10^{-8}/day and 1x10^{-6}/year			
FREQUENCY	1-10 MHz (Higher and lower frequencies optional)			
SIZE	2"x2"x¾" (smaller size and other configurations available)			


CRYSTAL OSCILLATOR
MODEL
FREQ.
SER. NO.

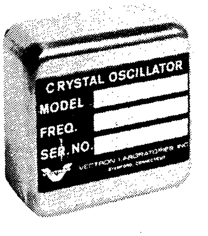
VCXOs (Voltage Controlled Crystal Oscillators)

MODEL	CO-271V	CO-273V	CO-220V
FREQUENCY	10 MHz	1 MHz	100 MHz
VCXO RANGE	±0.1%	±0.5%	±.05%
LINEARITY	±1%	±5%	±1%
STABILITY	0-50°C ±.001%	0-50°C ±.025%	0-50°C ±1x10^{-6}
OVEN	NONE	NONE	PROPORTIONAL
SIZE	2"x2"x¾"	2"x2"x¾"	2"x2"x4"


CRYSTAL OSCILLATOR
MODEL
FREQ.
SER. NO.
VECTRON LABORATORIES, INC.

Clock Oscillators

MODEL	CO-231	CO-232	CO-237†	CO-233M
OUTPUT	TTL/DTL	TTL/DTL	TTL/DTL	ECL
INPUT	5 VDC	5 VDC	5 VDC	−15 VDC
FREQUENCY	4 KHz-100 MHz	3-30 MHz	3-30 MHz	1-125 MHz
SIZE	1½"x1½"x½"*	1"x1"x½"	1½"x¾"x⅜"	1½"x1½"x⅝"
TEMPERATURE	Standard: 0°C to +70°C: ±.0025% Option -1: −55°C to +85°C: ±.005% Option -2: −55°C to +105°C: ±.005% Option -3: 0°C to +50°C: ±.0003%			

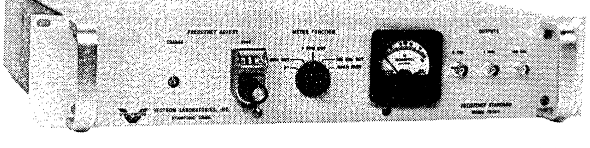

CRYSTAL OSCILLATOR
MODEL
FREQ.
SER. NO.
VECTRON LABORATORIES INC

† CO-237 plugs into 14 pin dual in-line socket.

* For 0.3" height in 200 KHz - 30 MHz range, specify CO-231L

Frequency Standards

MODEL	FS-323	FS-321A	CO-243
AGING	1x10^{-10}/day typical 30-60 days after turn-on		
WARM-UP	5x10^{-10}/day, four hours after turn-on following 24 hour off period		
FREQUENCY	5, 1 & 0.1 MHz	5, 1 & 0.1 MHz	5 MHz
LEVEL	1 VRMS/50 ohms	1 VRMS/50 ohms	1 VRMS/50 ohms
0-50°C	±5x10^{-10}	±3x10^{-10}	±3x10^{-10}
INPUT	115/230 VAC	115/230 VAC	22-30 VDC
SIZE	3½"Hx19"Wx14"D	5¼"Hx19"Wx14"D	4"x4"x10"

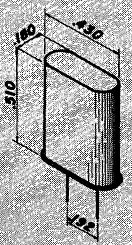

FREQUENCY ADJUST
METER FUNCTION
OUTPUTS
VECTRON LABORATORIES, INC.
FREQUENCY STANDARD

VECTRON LABORATORIES, INC. 121 WATER STREET, NORWALK, CONNECTICUT 06854 • TEL: 203-853-4433

X-tron- Electronics Inc.

QUALITY CRYSTAL PRODUCTS SINCE 1952

X-18

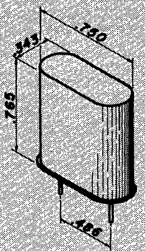


PIN OPTION
D or E

HC-18/U & HC-25/U Holder
(Pin E) (Pin D)

250 KHz to 625 KHz
3 MHz to 20 MHz fundamental.
15 MHz to 60 MHz 3rd overtone.
50 MHz to 100 MHz 5th overtone.

X-6

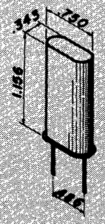


PIN OPTION
A, B or C

HC-6/U & HC-17/U Holder
(Pin A) (Pin B)

130 KHz to 625 KHz fundamental.
.990 MHz to 20 MHz fundamental.
10 MHz to 60 MHz 3rd overtone.
50 MHz to 100 MHz 5th overtone.

X-13

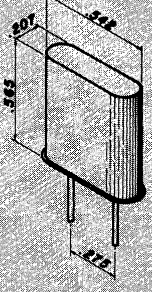


PIN OPTION
A, B or C

HC-13/U Holder

80 KHz to 200 KHz and down to
60 KHz with 2″ can fundamental cut.

X-12



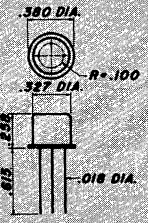
PIN OPTION
D or E

HC-12/U Holder

3 MHz to 20 MHz fundamental.
15 MHz to 60 MHz 3rd overtone.
50 MHz to 100 MHz 5th overtone.

Pin A	.050″ dia. pin .238″ long		**Pin D**	.040″ dia. pin .238″ long
Pin B	.093″ dia. pin .375″ long		**Pin E**	.017″ dia. wire 1.5″ long
Pin C	.030″ dia. wire 1.5″ long			

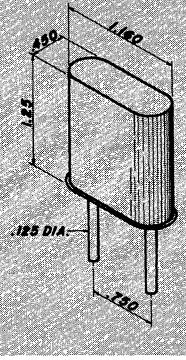
X-05



TO-5 Holder

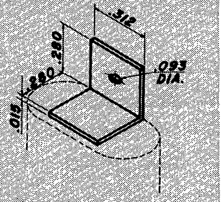
5 MHz to 20 MHz fundamental.
20 MHz to 60 MHz 3rd overtone.
50 MHz to 100 MHz 5th overtone.

X-11

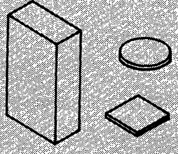


HC-11/U Holder

Metal holder to replace type
CM-1, DC-11 and DC-34/35.
.990 MHz to 20 MHz fundamental.
10 MHz to 60 MHz 3rd overtone.



Bracket for mounting type X-6 and
X-13 crystals on circuit board.



All sizes and shapes quartz crystals
cut to specifications.
Prime plating of gold or silver
available.

Manufactured to customer's specifications or to government and or manufacturer's specifications, with tolerances of 1% to .0005%.

GT cut crystals available in Type X-6 holder, 285 KHz to 335 KHz.

Many obsolete parts and holders in stock. FT-243, CR-1, CR-24/U, CM-1 and FT-171B.

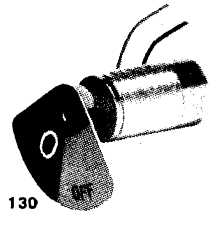
Regrinding and replacement service available.

X-tron-Electronics Inc. 1869 NATIONAL AVENUE HAYWARD, CALIFORNIA 94545 TELEPHONE (415) 783-2145

ELECTROMAGNETIC INDICATORS

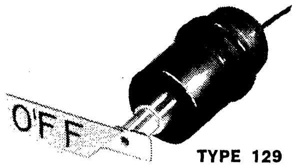
ALLARD INSTRUMENT CORP.

Designed for compact instrument and control panels, Allard miniature electromagnetic indicators provide positive visual signaling, are not subject to burnout, assure high readability in strong incident light. One-piece balanced rotor for dependable performance under shock and vibration. Models for momentary or latching operation, from DC or rectified AC. All models can be supplied to meet particular requirements for operating voltage, type of display and mounting, to commercial or MIL specifications.



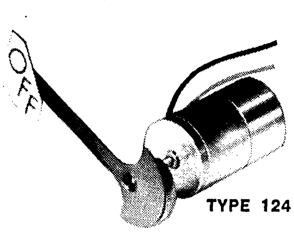
TYPE 130

Tiny indicator, totally enclosed structure. Rotation up to 60°. CW or CCW. For use with plug-on flags. Operates in any position. Case size: 7/16" O.D. x 25/32" L.



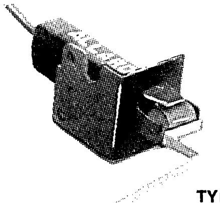
TYPE 129

Short, powerful semaphore indicator for CW or CCW rotation using demountable flag arms. Rotational anges to 60°. Works in any position. 7/16" diam. x 3/4" long.



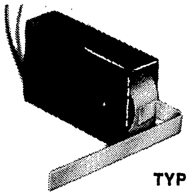
TYPE 124

Miniaturized semaphore indicator with rotation up to 60°. Available with CW or CCW rotation. For use with plug-on flags. Operates in any position. Case size: 3/8" O.D. x .575" long.



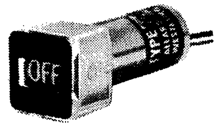
TYPE 219

Relatively inexpensive version of our highly successful instrument and panel mount indicator. Can display legends on the drum face or rotate a flag arm CW or CCW. 2 or 3 position momentary or 2 position latching operation. Indicator drum is .300" wide x .300" diam. Total length is 1 5/8".



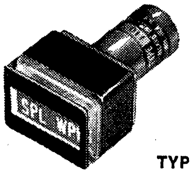
TYPE 109

2 or 3 position slim indicator for narrow locations. Can supply power to rotate a flag arm up to 60° or can display a legend directly on rotor face. CW or CCW for two position operation. .270" x .562" x 1".



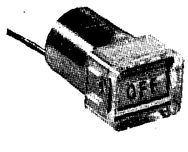
TYPE 108

Small indicator for 2- or 3-position momentary or 2-position latching (memory) indication. Prism-cut plastic lens in head can focus external light on indicator face. Colors or legends as required. 1 1/8" long, 3/8" dia., 7/16" square head.



TYPE 110

Extended face indicator, permits display of complete words or multiple symbols. For 2- or 3-position momentary, or 2-position latching indication. Plastic capped for dust and moisture protection. Length 1 3/4", head 1" by 3/4".



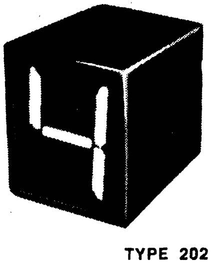
TYPE 120

Tiny broad faced indicator available with 2- or 3-position momentary or 2-position latching indication. Shows colors or legends. Head is 9/16" wide by 7/16" high. Body 1/2" dia. Overall length 15/16".

Types	130	129	124	219	109	108	110	120
D.C. VOLTAGES	To 28	To 40	To 40	To 40	To 40	To 90	To 50	To 40
OPERATING POWER (WATTS)	0.8	0.9	1.0	0.9	1.0	1.0	0.5	0.5
NO. OF CONNECTIONS	2	2	2	2, 3, 4	2, 3, 4	2, 3	2, 3, 4	2, 3
WEIGHT (GRAMS)	10	10.5	5	15	9.	10.6	35	9.5

ELECTROMECHANICAL READOUTS

High Visibility! Inherent Memory!



TYPE 202

A wide variety of other sizes available in single and multi-unit packages.

Compact digital indicating modules for instrument, data presentation and other display systems. Seven electromagnetic indicating segments can be operated in any desired combination by low power DC signals. Momentary or latching types. Windings available from 1 to 30 V, 1 15/16" h. x 1 7/16" w. x 2 1/4" d. Digit size 1 1/2" h. x 1" w. Other digit sizes up to 4" and custom units with as many lines as necessary, also available. Operating time less than 0.03 sec. Units also supplied with packaged encoders and decoders.

Complete readout display operating as remote repeater of cash register readings. Contains readouts, encoding matrices, pulsing and cycling circuitry and its own power supply. Use of latching (memory) type readouts makes average power consumption negligible. Packaged for all-weather, outdoor use. Uses 4 Type 218 readouts, 4" high.

TYPE 1218

Other sizes available

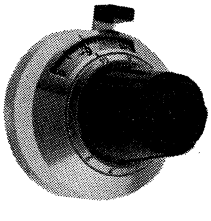
For literature or quotations on electromagnetic instruments and controls, call or write -

ALLARD INSTRUMENT CORP.

770 MAIN STREET, WESTBURY, L. I., N. Y. 11590 • (516) 334-8742

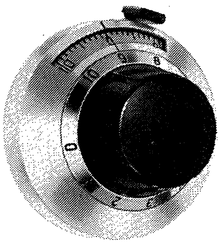
MICRODIAL® COUNTING DIALS BUNKER RAMO **AMPHENOL**

Specify AMPHENOL Concentric and Digital Dials for precise potentiometer control



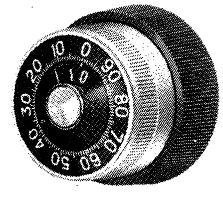
1370 Series, Concentric

Only ⅞" diameter (1" with finger brake), this 10-turn Microdial® projects 29/32" from panel. Don't let the small size of this dial fool you. It has the same silent gear action of the conventional size Amphenol dials. It indicates angular position of potentiometers and multiturn devices of 10 turns and less with 1000:1 indexing accuracy. Inner dial counts turns, outer dial counts hundredths. Locks rigidly onto shaft to eliminate backlash. Epicyclical internal gearing assures readout accuracy. Finger-tip lever offers positive brake action without disturbing critical settings.



1350 Series, Concentric

The 1350, 1 13/16" diameter, indicates angular position of potentiometers and multiturn devices of ten turns and less with 1000:1 indexing accuracy. Inner dial counts turns, outer dial counts off hundredths. Locks rigidly onto shaft to prevent backlash. Internal gearing is epicyclical type so you always know exact reading. Fingertip brake holds shaft position until reset.

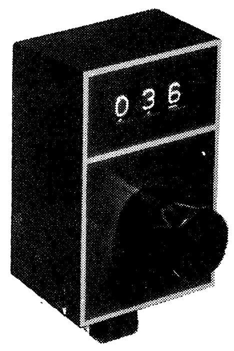


3000 Series, Concentric

Only 1-inch diameter (1 5/32" with finger brake), this 10-turn Microdial projects 15/16" from your panel. Without brake, array of these units can be mounted on 1¼" centers. And the digits are as large and as easy to read as some dials twice the size.

Clear plastic dial face is sealed and angled to prevent reflections. You can color-key dial functions by choosing from 5 standard brake knob colors and different combinations of numeral and background colors.

Don't let the small size of this Microdial fool you. It has the same silent gear action of the conventional size Amphenol Microdials.

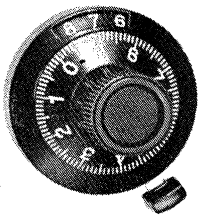


1380 Series

FEATURES . . .

- **Precision digital dial designed for precision potentiometers up to ten turns — yet exceptionally low cost.**
- **Zinc die cast housing and rear cover for demanding applications.**
- **Indexing accuracy is 1 part in 1,000.**
- **Modern styling and small size.**
- **Easy mounting . . . A single set screw mounts dial to potentiometer shaft.**

Amphenol's new 1380 Series miniature digital dial is available in a black finish model 1381 or a fine black-grey hammer finish model 1385. The 1380 accepts a ¼" shaft diameter and modification for a ⅛" shaft diameter is available as a special option. Fingertip brake assures maintenance of critical dial settings. And the 1380 offers you ultra-modern styling to compliment any panel layout.



DFA Series, Concentric

- **1 Part in 1000 Reading Accuracy.**
- **Up to 99 Dials Per Square Foot of Panel Space!**
- **Satin Chrome on Black Finish.**

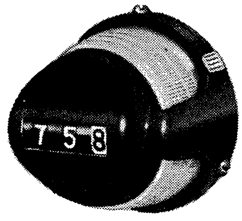
The DFA is an excellent answer to the need for a precision setting and indicating device for use with multi-turn potentiometers, particularly in control-console and computer applications, where the multiplicity of control elements is a significant factor in the total investment, and panel space is often at a premium.

The dial control knob couples directly to the potentiometer shaft, hence there is no backlash in the control of the actual resistance setting. A single numeral in the window above the knob indicates the number of completed turns of the shaft, and the graduated dial integral with the knob indicates in tenths and hundredths the percent of partial turn of the shaft enabling an accuracy in setting of one part per 1000.

Two standard models are available in this control series: The Model DFA-N with satin chrome finish and Model DFA-NB with white numbers on black finish. They feature constant torque that allows easy adjustment, yet maintain settings under conditions of extreme vibration. Both models include a flip-lock lever that applies 25 inch-ounces of torque against accidental displacement, in the locked position, yet allows high-speed rotation and setting when unlocked. The units are only 1.06 inches wide, with a body height of 1.25 inches (1.63 inches including lock lever) enabling grouping of miniature ten-turn potentiometers in control banks of up to 99 elements per square foot of panel space.

MICRODIAL® COUNTING DIALS

BUNKER RAMO AMPHENOL



1300 Series, Digital

Gives you fast, accurate indication of shaft position up to 1,000 turns. All models (3-digit 10-turn, 4-digit, 100-turn, and 5-digit 1,000-turn) mount directly on shaft to be controlled, eliminating backlash. Speed: up to 6,000 counts per minute.

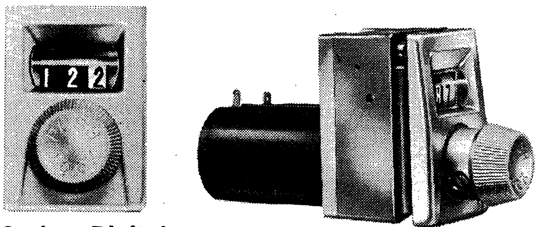
Large, contrasting numerals readable even from angular view because convex windows reduce glare, reflections. Rugged, dust-sealed construction includes Cycolac[1] counter wheels, Nylatron[2] GS gear assemblies, knurled aluminum control knobs. Brake optional. Special readouts are also optional. All models conform to military requirements.

[1] Reg. TM Borg-Warner Corp.
[2] Reg. TM Borg-Warner Corp.

1330 Series, Digital

You get straight-on or angular readout with this illuminated turns-counting Microdial. One-piece lens/window magnifies numerals 1.5x. In exactly 10 turns, unit counts from 000 through 999. Fingertip brake locks settings in place.

This Microdial is sealed against dust yet its snap-on cap makes lamp replacement easy. Standard finishes for color coding: dark or light gray, red, white, and black; other colors and special read outs available on request.



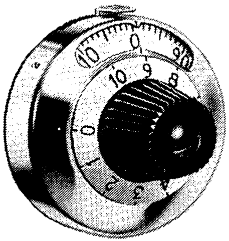
3100 Series, Digital

Remarkably accurate (1000:1 indexing accuracy) miniature 3100 Series dial almost makes a standard circular dial look gigantic by comparison. This Microdial measures only $1\frac{1}{8}$ x $1\frac{21}{32}$ inches and protrudes only $\frac{25}{32}$" from a panel.

Digits (with illumination optional) are magnified by a convex lens in recessed window. Three-digit, ten-turn dial rotates continuously clockwise or counter clockwise with push-pull fingertip brake to lock settings. This 3100 miniature Microdial will mount on panels from $\frac{1}{16}$" through $\frac{3}{16}$" thick.

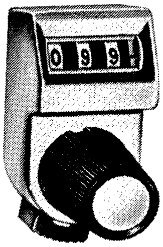
Standard color: natural brushed aluminum finish.

Amphenol's Dial-Pot assembly saves you time and money... eliminates costly mounting and phasing. If you now buy pots and dials separately, but for the same application, Amphenol can prephase and pre-assemble the 3100 dial to any potentiometer at no extra cost. You simply mount the assembly from rear of panel and wire into your circuit.



1320 Series, Concentric

The 1320 series is a 1¾ inch diameter 10 turn concentric scale dial with extra large numerals and a wide variety of color combinations including gloss and dull black, satin chrome, and bright chrome. Incorporating Amphenol's exclusive continuous inner dial movement, the 1320 is offered with or without brake. This dial is a rugged, long lasting, highly accurate unit which will meet your most demanding requirements.



DFD Series, Digital

- **250 PPM Reading Accuracy.**
- **High-Density Packaging — Up to 72 Per Sq. Foot!**

The DFD is a precision mechanism that provides a direct manual drive for a panel-mounted ten-turn potentiometer and an associated 3-digit readout that registers the drive-shaft rotation in turns, to three significant figures, a vernier wheel providing four graduations intermediate between adjacent digits on the least significant digit counter wheel permits interpolating to 250 parts per million, or less — fully compatible with the resolution and linearity of the average ten-turn precision potentiometer.

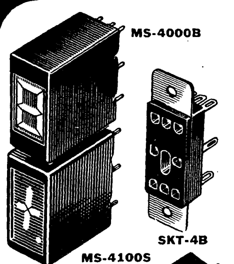
The entire assembly is less than one inch wide and less than two inches high, making it feasible to mount up to 72 controls per square foot of panel space, yet the digital display is comfortably readable at all times. It is not hidden by the operator's hand during adjustment and is equipped with a magnifying window that significantly enlarges the numerals and vernier scale for easy viewing from all positions.

Special Options

Amphenol, with the broadest and most versatile concentric scale and digital dial lines in the industry, offers you more than standard units. An example is the 1300 and 1330 series digitals which can be modified to give you such special features as index lines, internal illumination and special readouts. Contact your Amphenol area representative for full details on these and other optional features available to solve your design problems.

Microdial® — Trademark Reg. U.S. Patent Office.

ALCO-DISPLAY DIV. OF ALCO ELECTRONIC PRODUCTS, INC



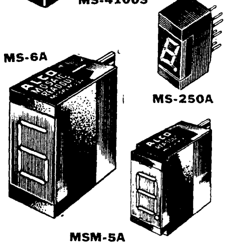
INCANDESCENT READOUT INDICATORS

MS-4000B — 7-segment readout has bright, single plane display allowing wide angle view. Character size: .325″ x .600″. Case: .552″ x 1.18″ x 1.18″, one-piece black metal matte. Long-life #683 T-1 lamps are separately lit by use of an external decoder-driver. Lamps: 3-5V @ 40-60 ma per segment. Current drain: 420 ma max. (numeral "8"). Power: .24W (min.), 2.1W (max.). Order socket separately.

MS-4100B — as above, but has decimal point and slightly smaller figures, 0-to-9. External dimensions above.

MS-4100S — symbol indicator with + − 1 and decimal, to match either MS-4000B or MS-4100B readout.

MS-250A — smaller version of above, 0-to-9. Socket, plastic housing. Lamps: 2.5V @ 20 ma per segment. Current drain: 40 ma (min.), Consumption: 160 ma (max.), 0.4W (max.).



INCANDESCENT MOSAIC READOUT INDICATORS

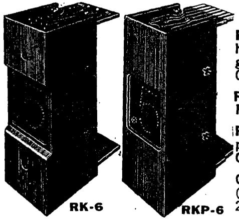
MS-6A & MS-14A — single plane 0-to-9 and some alphabet. Decimal points used as colon. Segment bars are closely linked. Figures: .800″ high. Body size: .834″ w. x 1.750″ h. x 2.104″ d. Lamp life: 20,000 hrs. Plug-in at rear of case. Supplied less socket, order separately.

MS-6S & MS-14S — mates with above MS series, but has symbol indicators for +, 1 and figure "one".

MSM-5 — miniature readout is same as above, except smaller. Lamps: 5V @ 60 ma. Figure: .475″ h. Body: .475″ w. x .985″ h. x 1.562″ d. Lamp life: 50,000 hrs. Plug-in thru standard 10-terminal PC connector. Supplied less socket, order separately.

MSM-5AL — as above, but has 10″ flat cable connection.

MSM-5S — mates with above MSM series, but has symbol indicators for +, 1 and figure "one". Plug-in.



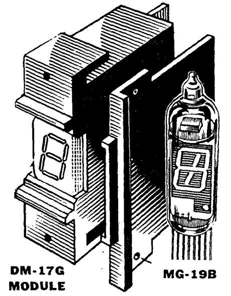
INCANDESCENT EDGE-LIT READOUT INDICATORS

RK — 0-9 numeric readout with 1-pc. machined aluminum lamp housing which also serves as heat sink. Solder terminals. Engraved acrylic plates are tightly packed, edge-lit. Numeral size: 0.566″ h. Case size 2.56″ x 0.78″ x 0.83″.

RKP — as above, with edge board terminals used with RK-SKT P.C. sockets.

RKF — is larger with 1.06″ h. numerals. Uses two lamps per plate for higher light output. Use with RK-SKT P.C. sockets. Case size: 3.30″ x 1.19″ x 1.19″.

Current drain: 6.3V @ 200 ma, 14V @ 80 ma, 24V @ 50 ma (RK, RKP). 6.3V @ 400 ma, 14V @ 160 ma, (RKF). T-1 3/4 20,000-50,000 hr. lamps: #2181-6.3V, #2182-14V, #A-24-24V.



NEON ELFIN READOUTS

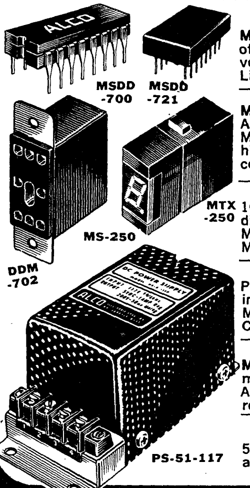
MG-17G — gas-filled, cold cathode, ultra-miniature display indicator 1.220″ h. x .385″ dia., character height .378″. 7-segments display 0-to-9 and one decimal on flat ceramic base plate. For DC and pulsed operations.

MG-17F — 7-segmented display indicator has 2 decimals. Size 1.6″ h. x .385″ dia., character height .433″.

MG-19B — 9-segmented display indicator has 1 decimal and 2 diagonal cathodes placed in the center of the numeric 8.

ELFIN COMPLETE MODULES

DM-17G — factory-assembled plug-in module includes MG-17G Elfin indicator mounted on P.C. board which contains the decoder-driver and logic. Limiting resistors included. The Elfin tube is front mounted and modules can be stacked together in multiples. End plates available to provide a completed bezel look. -721 and -722 accept 4-line BCD inputs, -723 accepts count input. Optical filter integrates display appearance.



HYBRID BCD-TO-7 SEG. DECODER DRIVERS

MSDD-720 Series — with active low oututs to drive the cathodes of the ELFIN to display numeric characters 0 thru 9. Supply voltage: 7V; Input: 5.0V. Plastic/epoxy package with Dual-In-Line (DIP) configurations.

MSDD-320 Series — 120 mA/Segment; designed to drive the Alco segmented displays MS-4000B, MS-4100B, MS-250A, MS-6, MS-14, MSM-5A, or other devices requiring low voltages and high-current-sinking capabilities. Circuits are T²L and DTL compatible and have uncommitted collector outputs.

MONOLITHIC BCD-TO-7 SEG. DECODER DRIVERS

16-Lead Dual-In-Line packages to drive 7-segment incandescent display devices. **MSDD-700** and **MSDD-701** for use with Alco MS-250A. **MSDD-702** and **MSDD-703** for MS-4000B, MS-4100B, MS-6, MSM-5A.

PLUG-IN DECODER DRIVER MODULES

Packaged module includes decoder-driver and plugs directly into mating readout. **DDM-702** for MS-4100B and **DDM-703** for MS-4000B. **MTX-4000** for MS-4000B and **MTX-250** for MS-250A. Completely assembled. Color coded leads.

PANEL MOUNTING ACCESSORIES

MS-4FB — for MS-4000 or MS-4100 readouts; use up to 5 modular digits. Bezel has top and bottom aluminum extrusion. Assembly comes complete with red filter; use with clear readouts.

LOGIC POWER SUPPLY

5V section is compatible to MSDD-700 Series decoder drivers, and 200 VDC section will fire the ELFIN neon displays.

Model	Volt	Description	One-24	25-99	100-499
MS-4000BR	3-5	Num. Red w/o socket	6.45	5.48	4.84
MS-4000BC	3-5	Num. Clear w/o socket	6.45	5.48	4.84
SKT-4B	—	Socket for MS-4000B	.48	.41	.36
MS-4100BR	3-5	Num. Red w/o socket	7.45	6.33	5.59
MS-4100BC	3-5	Num. Clear w/o socket	7.45	6.33	5.59
MS-4100SR	3-5	Symbol Red w/o socket	7.45	6.33	5.59
MS-4100SC	3-5	Symbol Clear w/o socket	7.45	6.33	5.59
SKT-41B	—	Socket for MS-4100	.48	.41	.36
MS-250AR	2.5	Num. Red w/socket	8.25	7.01	6.19
MS-250AC	2.5	Num. Clear w/socket	8.25	7.01	6.19
MS-250SR	2.5	Symbol Red w/socket	8.25	7.01	6.19
MS-250SC	2.5	Symbol Clear w/socket	8.25	7.01	6.19
MS-6A	6.3	0-to-9 & 2 Dec.	8.25	7.01	6.19
MS-14A	14	0-to-9 & 2 Dec.	8.25	7.01	6.19
MS-6S	6.3	Symbol +, −, 1	8.25	7.01	6.19
MS-14S	14	Symbol +, −, 1	8.25	7.01	6.19
MSM-5AL	3-5	Num. 0-to-9 & 1 Dec.	9.95	8.46	7.46
MSM-5A	3-5	Num. 0-to-9 & 1 Dec.	8.25	7.01	6.19
MSM-5S	3-5	Symbol +, −, 1	8.25	7.01	6.19
MS-SKT-R		Right angle Socket For MS	1.55	1.32	1.16
MS-SKT		Socket For MS	1.15	.98	.92
MSM-SK		Socket For MSM	1.15	.98	.92
MS-FLV		Violet Filter For MS	.40	.34	.30
MS-FLR		Red Filter For MS	.40	.34	.30
MS-FLG		Green Filter For MS	.40	.34	.30
RK-6*	6.3	0-to-9 & Dec.	8.25	7.01	6.19
RK-14*	14	0-to-9 & Dec.	8.25	7.01	6.19
RK-24*	24	0-to-9 & Dec.	8.75	7.44	6.56
RKF-6*	6.3	0-to-9 & Dec.	15.75	13.39	11.81
RKF-14*	14	0-to-9 & Dec.	15.75	13.39	11.81
RKP-6*	6.3	0-to-9 & Dec.	8.25	7.01	6.19
RKP-14*	14	0-to-9 & Dec.	8.25	7.01	6.19
RKP-24*	24	0-to-9 & Dec.	8.75	7.44	6.56

*Available as Symbol Indicator (+ — Ω V %) at same price. Add suffix S for symbols.

Model	Volt	Description	One-24	25-99	100-499
RKA-2-8		Mtg. Bracket RK-RKP	1.65	1.40	1.24
RK-FLV		Violet Filter RK-RKP	.40	.34	.30
RK-SKT		Pr. Sockets RKP-RKF	1.65	1.40	1.24
RK-SKT-C		Pr. Sockets w/Cover RKP-RKF	2.45	2.08	1.84
RKF-FLV		Violet Filter RKF	.50	.43	.38
MG-17F		Neon, 7-Seg., 2 Dec.	4.95	4.25	3.75
MG-17G		Neon, 7-Seg., 1 Dec.	4.95	4.25	3.75
MG-19B		Neon, 9-Seg., 1 Dec. Pt.	4.95	4.25	3.75
DM-17G-721		w/Decoder-Driver, Tube	19.75	17.00	•15.04
DM-17G-722		w/Dec-Dvr-Memory, Tube	23.00	19.90	17.46
DM-17G-723		w/Dec-Dvr-Counter, Tube	23.35	20.20	17.81
DM-17G-CC		Clock/Colon Module	3.95	3.42	3.05
DM-17G-SM		Over-range/Symbol Module	16.60	13.79	12.81
DM-17G-EP		Finished End Plate (Pr.)	1.80	1.53	1.35
DM-17FL3		Filter for 3 Modules	.90	.78	.68
DM-17FL4		Filter for 4 Modules	1.20	1.02	.90
DM-17FL4-1C		Filter, 4 Mod, 1 Colon	1.40	1.19	1.05
DM-17FL5		Filter for 5 Modules	1.50	1.28	1.13
DM-17FL6		Filter for 6 Modules	1.80	1.53	1.35
DM-17FL6-2C		Filter, 6 Mod, 2 Colon	2.00	1.70	1.50
DM-3S		Pr. Assy Studs for 3 Modules	.30	.256	.226
DM-4S		Pr. Assy Studs for 4 Modules	.30	.256	.226
DM-5S		Pr. Assy Studs for 5 Modules	.30	.256	.226
DM-6S		Pr. Assy Studs for 6 Modules	.30	.256	.226
DM-6SA		Pr. Studs, 6 Mod, 2 Colon	.30	.256	.226
MSDD-721		BCD-to-7 Seg. Decoder-Driver	9.90	8.65	7.65
MSDD-722		BCD-to-7 Seg. Dec-Dvr w/Mem	13.15	11.52	10.18
MSDD-723		With Decade Counter	13.50	11.82	10.43
MSDD-724		W/Decade Counter, Memory	17.95	15.70	13.86
MSDD-728		With Up/Down Counter	20.75	18.25	16.10
MSDD-729		W/Up/Down Counter, Memory	24.95	21.81	19.25
MSDD-321		Decoder-Driver, 120 mA/Seg.	9.30	8.15	7.20
MSDD-322		W/Memory, 100 mA/Seg.	12.00	10.50	9.25
MSDD-323		W/Decade Counter	12.35	10.80	9.55
MSDD-324		W/Decade Counter, Memory	16.75	14.70	12.95
MSDD-328		W/Up-Down Counter	19.65	17.25	15.20
MSDD-329		W/Up-Down Counter, Memory	22.75	20.40	18.35
MSDD-700		30 mA/Seg. w/Dec. Pt.	6.65	6.65	5.15
MSDD-701		30 mA/Seg. w/Ripple Blank	6.65	6.65	5.15
MSDD-702		80 mA/Seg. w/Dec. Pt.	9.00	9.00	6.75
MSDD-703		80 mA/Seg. w/Ripple Blank	9.00	9.00	6.75
DDM-702		Plug-in 80 mA/Seg. w/Dec.	19.95	17.25	14.75
DDM-703		Plug-in 80 mA/Seg. w/Ripple	19.95	17.25	14.75
MTX-4000		Decimal-to-7 Plug-in Decoder	12.85	10.92	9.64
MTX-250		Decimal-to-7 Plug-in Decoder	12.85	10.92	9.64
MS-4FBA		Mounting Module Kit, Natural	4.95	4.25	3.75
MS-4FBB		Mounting Module Kit, Black	4.95	4.25	3.75
MS-4BA		Bezel Only, Natural (pair)	1.25	1.06	.94
MS-4BB		Bezel Only, Black (pair)	1.25	1.06	.94
PS-51-117		Elfin Logic Power Supply	39.95	33.96	29.96

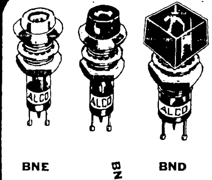
ALCO® ELECTRONIC PRODUCTS, INC.
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

AREA CODE 617
686-3887

ALCOLITE

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.

NEON LAMP ASSEMBLIES

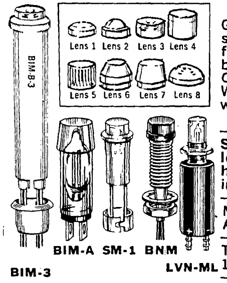


Series BNE Neon Assemblies, Compact Lens — protrudes slightly above the panel. Operating voltage: 75 VDC without resistor; for 115 VAC operations use external resistors (150K for standard intensity, 33K for high intensity) not supplied. Temperature range: −10°C to 70°C. Mounts with single 5⁄16-32 nut. BNE-4R comes with built-in resistor for 115 VAC.

Series BNF Neon Assemblies, Long Lens — Similar to the BNE Series except that the lens system extends a greater distance beyond the panel for a brighter illumination.

Series BND Neon Assemblies, Square Lens — Combines an entirely new look in a space-saving pilot assembly. The BND is available with or without built-in series resistor.
Specify Color: Red, Amber, Clear, White.

Model	Type Description	One-24	25-99	100-499	500-999
BNE-2	Std. Intensity Neon Lite	.59	.39	.35	.29
BNE-3	Hi Intensity Neon Lite	.69	.46	.41	.35
BNE-4R	With Internal Resistor	.79	.53	.48	.40
BNF-2	Std. Intensity Neon Lite	.59	.39	.35	.29
BNF-3	Hi Intensity Neon Lite	.69	.46	.41	.35
BNF-4R	With Internal Resistor	.79	.53	.48	.40
BND-2	Neon Lite Assembly, Std. Int.	.59	.39	.35	.29
BND-2R	Neon Lite Assembly, w/Res.	.69	.46	.41	.35
BND-3	Hi Intensity Neon Lite	.69	.46	.41	.35
BND-3R	Hi Intensity Neon Lite w/Res.	.79	.53	.48	.40



SERIES BIM 110V NEON LIGHT INDICATORS

General purpose panel indicators have more versatility than similar models. 8 Lens Styles: Allow a greater variety to choose from. NE2H High Intensity Lamp is incorporated and contains built-in series resistors for 110V operation. Flexible 6″ leads. Color of wire: Black, high temperature grade insulation 105°C. Wire size: solid 22 AWG. Polypropylene indicator housing (white) with acrylic lens. Panel mounting hole for 11⁄32″ dia. body.
Specify Color: Red, Amber, Clear.

BIM-1	With Resistor, #1 Lens	.59	.39	.35	.29
BIM-2	With Resistor, #2 Lens	.59	.39	.35	.29
BIM-3	With Resistor, #3 Lens	.59	.39	.35	.29
BIM-4	With Resistor, #4 Lens	.69	.46	.41	.35
BIM-5	With Resistor, #5 Lens	.69	.46	.41	.35
BIM-6	With Resistor, #6 Lens	.69	.46	.41	.35
BIM-7	With Resistor, #7 Lens	.69	.46	.41	.35
BIM-8	With Resistor, #8 Lens	.69	.46	.41	.35

Series BIM-A — truncated cone, single lens style; height of lens is ¼″. Incorporates NE2H high intensity lamp. Acrylic housing, tin-plated solder terminals. For 11⁄32″ dia. panel mounting hole. Retainer included. Specify Color: Red, Amber, Clear.

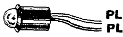
BIM-A-1	Without Resistor	.69	.46	.41	.35
BIM-A-4	With Resistor for 110 VAC	.79	.53	.48	.40
BIM-R	Metal Retainer for BIM-A	.03	.02	.018	.015

Miniature T-1¼ neon. Wire leads. 100K resistor recommended. Approx. ½″ size. Specify Color: Red, Amber, Clear. SM-1

SM-1	Without Resistor for 110VAC	.89	.59	.54	.45
BNM-2R	With Internal Resistor	1.29	.88	.77	.65

T-1⅜ neon lamp in black phenolic case, for ¼″ hole, 10″ leads. 100K resistor required. See MNE-4 story for lamp description.

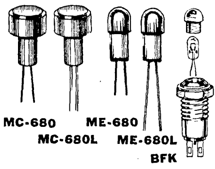
PLN-100A	Neon Pilot, Clear	.89	.59	.54	.45



Miniature, transistorized neon lite operates from low voltage. Mounts in ⅜″ hole. Size 2.086″. Specify: Red, Amber, Clear.

LVN-ML	4-6 Volt Neon Lite	4.85	3.30	2.91	2.43

INCANDESCENT LAMP ASSEMBLIES



Ultraminiaturized series has cylindrical appearance and fits in 3⁄16″ hole. Has 5V 60 ma rating, 100,000-hr. life. Contains #683 T-1 lamp. Mounting ring supplied. ME-680L & MC-680L have solder tin dipped, hi-temp leads, 24 AWG wire.
†Specify Color: Red, Green, Amber, Blue, White
*Specify Color: Red, Green, Yellow, Blue, White

ME-680(†)	With Pin Contacts	.89	.59	.54	.45
ME-680L(†)	With 6″ Insulated Leads	.89	.59	.54	.45
MC-680(*)	With Pin Contacts	.99	.67	.60	.49
MC-680L(*)	With 6″ Insulated Leads	.99	.67	.60	.49

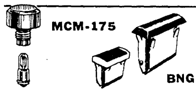
T-1 #680: 5VDC 60 ma, 100,000-hrs. For ¼″ hole, 10″ leads.

PL-105	5V Lamp Assembly, Clear	.79	.53	.48	.40

Lens unscrews, T-1 lamp is exposed. Specify: Red, Green, Blue, Yellow, White. #680 lamp 5V @ 60 ma, supplied.

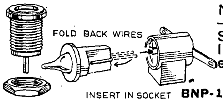
BFK-5	5V Lamp Assembly w/Lamp	1.29	.88	.77	.65

LAMP HOLDERS



Relampable miniature holders have ⅜″ dia. lens and small size. **MCM-100** has 0.7″ length, mounts with 5⁄16-32 nut. **MCM-175** has 1″ length, mounts with ⅜-32 nut.
Specify Lens Colors; Red, Green, Amber, Blue, White

MCM-100	Submidget Flange Lamp	.99	.67	.60	.49
Order T-1 lamps separately: 685, 718, 1112, 856 (see below).					
MCM-175	Midget Flange Lamp	.99	.67	.60	.49
Order T-1¾ lamps separately: 815, 381, 330, 382, 327, 387					



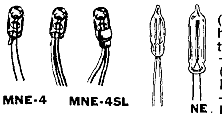
NE-2 neon and holder snap together. Ideal for P.C. Less lamp.

BNP-1	White Nylon Holder For NE-2	.18	.12	.108	.09

Simplified, low-cost, snap-type lamp holders for miniature lamps, such as NE-2, etc. 5 different size holders are available, each adaptable to particular panel thickness. Less lamps.
Specify Color: Red, Amber, or Clear

BNG-51	Holder For Neon Lamp	—	—	.09	.08
BNG-52	Holder For Neon Lamp	—	—	.09	.08
BNG-53	Holder For Neon Lamp	—	—	.09	.08
BNG-54	Holder For Neon Lamp	—	—	.09	.08
BNG-55	Holder For Neon Lamp	—	—	.09	.08

BRITE GLOW NEON LAMPS



(T-1⅜). MNE-4A/-4LA/-4SLA have straight electrodes. MNE-4B has the electrodes bent on the ends. MNE-4SL has metal base to increase light output. 100K resistor required for 115V.

MNE-4A	Short Bare Leads	.45	.30	.27	.23
MNE-4B	Short Bare Leads	.49	.33	.29	.24
MNE-4LA	10″ Insulated Leads	.53	.35	.31	.27
MNE-4SLA	10″ Insul. Leads, Metal Base	.59	.39	.35	.29

(T-1⅛). Ignition voltage 75 VAC or 95 VDC. Current should be limited to 800 μA. 150K resistor recommended for 115V.

MNE-3	Short Bare Leads	.69	.46	.41	.35
MNE-3H	Short Bare Leads, Hi Int.	.79	.53	.48	.40

Longer than conventional NE-2. Breakdown: 90 VDC; maintained V: 65 VDC; design current: 1.3 mA.

NE-211	11 mm Glow, Bare Leads	.39	.27	.24	.20
NE-214	14 mm Glow, Bare Leads	.44	.30	.27	.22

SUB MINIATURE INCANDESCENT LAMPS

T-1

FIG. A

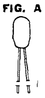
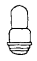


FIG. B



All lamps are aged and selected to meet specification MIL-L-6363.

T-1¾

FIG. C

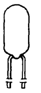


FIG. D

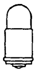


FIG. E

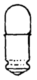
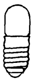


FIG. F



Inquiries are invited for special and standard types not listed. Production quantity price quotations are available on request.

Lamp Model	Fig.	Type	Description	Volts	Amps	†±15% MSCP	One-9	10-99	100-499	500-999
680AS15	A	T-1	Wire Terminals	5.0	.060	.032†	1.25	.83	.62	.58
680AS25	A	T-1	Wire Terminals	5.0	.060	.032	.83	.55	.42	.39
683AS15	A	T-1	Wire Terminals	5.0	.060	.053†	1.25	.83	.62	.58
683AS25	A	T-1	Wire Terminals	5.0	.060	.053	.83	.55	.42	.39
713AS15	A	T-1	Wire Terminals	5.0	.075	.088†	1.25	.83	.62	.58
713AS25	A	T-1	Wire Terminals	5.0	.075	.088	.83	.55	.42	.39
715AS15	A	T-1	Wire Terminals	5.0	.115	.147†	1.25	.83	.62	.58
715AS25	A	T-1	Wire Terminals	5.0	.115	.147	.83	.55	.42	.39
RM3-5V30	A	T-1	Wire Terminals	5.0	.030	.030	.88	.59	.44	.41
685	B	T-1	Sub-Midget Flange	5.0	.060	.050	1.44	.96	.72	.67
718	B	T-1	Sub-Midget Flange	5.0	.115	.147	1.38	.92	.69	.64
856	B	T-1	Sub-Midget Flange	28.0	.024	.150	3.06	2.04	1.53	1.43
1112	B	T-1	Sub-Midget Flange	14.0	.065	.150	2.16	1.44	1.08	1.01
2181	C	T-1¾	Wire Terminals	6.3	.200	.40	.79	.52	.39	.37
2182	C	T-1¾	Wire Terminals	14.0	.080	.30	.79	.52	.39	.37
327	D	T-1¾	Midget Flange Base	28.0	.040	.34	.90	.60	.45	.42
330	D	T-1¾	Midget Flange Base	14.0	.080	.50	.96	.64	.48	.45
381	D	T-1¾	Midget Flange Base	6.3	.200	.40	.85	.57	.43	.40
382	D	T-1¾	Midget Flange Base	14.0	.080	.30	.90	.60	.45	.42
387	D	T-1¾	Midget Flange Base	28.0	.040	.30	.95	.63	.47	.44
815	D	T-1¾	Midget Flange Base	5.0	.115	.147	.90	.60	.45	.42
379	E	T-1¾	Midget Grooved Base	6.3	.200	.40	.85	.57	.43	.40
386	E	T-1¾	Midget Grooved Base	14.0	.080	.30	.90	.60	.45	.42
388	E	T-1¾	Midget Grooved Base	28.0	.040	.30	.95	.63	.47	.44
362	F	T-1¾	Midget Screw Base	14.0	.080	.30	.90	.60	.45	.42
378	F	T-1¾	Midget Screw Base	6.3	.200	.40	.85	.57	.43	.40
399	F	T-1¾	Midget Screw Base	28.0	.040	.30	.95	.63	.47	.44

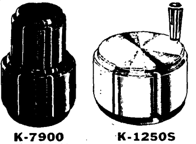
ALCO® ELECTRONIC PRODUCTS, INC.
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

AREA CODE 617
686-3887

ALCOKNOB

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.

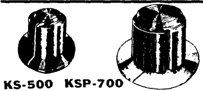
MACHINED ALUMINUM — STANDARD SERIES



"K" Series knobs are a completely matched family in four basic diameters to enhance equipment appearance. Each knob is machined from one-piece aluminum and then anodized in either natural, black or gold. ALCO's 1¼″ dia. K-1250-S Spinner Knobs are part of this "K" Series family and have the addition of a knurled handle. The K-5700 and K-7900 matched knobs for concentric shaft controls consist of two separate knobs: an upper knob for the inner control shaft (⅛″ dia.), and lower knob for the outer control shaft (¼″ dia.).

Model	Finish — See Box Below	O.D.	One-99	100-249	250-499	500-999
K-500	A, B, G	.500″	.50	.45	.43	.40
K-700	A, B, G	.750″	.55	.50	.47	.44
K-900	A, B, G	.937″	.65	.59	.56	.52
K-1250	A, B, G	1.250″	.75	.68	.64	.60
K-1250( )-S	A, B	1.250″	1.55	1.40	1.33	1.24
K-5700	A, B	.500 & .750″	1.20	1.08	1.03	.96
K-7900	A, B	.750 & .937″	1.35	1.22	1.16	1.08

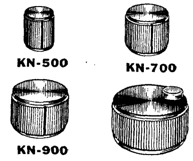
SKIRTED ANODIZED KNOBS FOR ¼″ SHAFTS



The "KS" and "KSP" Skirted Series offer an excellent matching knob group to the ALCO "K" Series described above. You may choose between a solid aluminum skirt (KS Series), or the clear acrylic plastic skirt (KSP Series). The "KS" Series is available in three body sizes, and the "KSP" is available in two sizes.

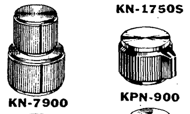
		O.D.	Skirt Dia.				
KS-500	A, B	.500″	.750″	.65	.59	.56	.52
KS-700	A, B	.750″	1.125″	.70	.63	.60	.56
KS-900	A, B	.937″	1.406″	.90	.81	.77	.72
KSP-700	A, B	.750″	1.125″	.65	.59	.56	.52
KSP-900	A, B	.937″	1.406″	.70	.63	.60	.56

STRAIGHT KNURL SERIES



ALCO's new "KN" Series of straight knurl knobs with hairline indicators includes the lustrous solid anodized color types and the decorative two-tone models. The straight knurl knobs have clean, precision serrations of the highest quality. The anodized two-tone knob is available in two variations: (AB) natural aluminum body with black top, or (BA) black anodized natural with natural top. KN-1750 series have 1¾″ dia. size with two 6/32 set screws spaced 120° apart. KN-1750-S, Spinner Knob, has a .512″ "finger-tip" aluminum disc on top. Straight knurl, ¼″ shaft.

KN-500	A, B	.500″	.60	.54	.51	.48
KN-700	A, B	.750″	.65	.59	.56	.52
KN-900	A, B	.937″	.80	.72	.68	.64
KN-1250	A, B	1250″	.95	.85	.82	.76
KN-1750	A, B	1.750″	1.85	1.67	1.59	1.48
KN-1750( )-S	A, B	1.750″	2.20	1.98	1.90	1.76
KN-500	AB, BA	.500″	.75	.68	.64	.60
KN-700	AB, BA	.750″	.85	.77	.73	.68
KN-900	AB, BA	937″	1.00	.90	.86	.80
KN-1250	AB, BA	1.250″	1.20	1.08	1.03	.96
KN-1750	AB, BA	1.750″	2.15	1.94	1.85	1.72
KN-1750( )-S	AB, BA	1.750″	2.50	2.25	2.15	2.00

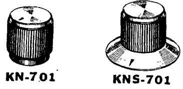


Mating concentric sets, bottom knob ¼″ shaft, top ⅛″ shaft. Complete with four 6/32 set screws. Knurl body.

KN-5700	A, B	.500 & .750″	1.40	1.26	1.20	1.12
KN-7900	A, B	.750 & .937″	1.60	1.44	1.38	1.28

One-piece aluminum pointer and knurled knob body. (¼″ shaft). Also features contrasting colored tops for 2-tone effect.

KPN-700	A, B	.750″	1.40	1.26	1.20	1.12
KPN-700	AB or BA	.750″	1.60	1.44	1.38	1.28
KPN-900	A, B	.937″	1.75	1.57	1.50	1.40
KPN-900	AB or BA	.937″	1.95	1.75	1.67	1.56

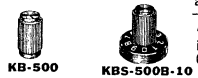


Black ARROWHEAD indicator engraved on top of straight knurl body in contrasting black. ¼″ shaft, also ⅛″ shafts too.

KN-501	BA only	.500″	.80	.72	.68	.64
KN-701	BA only	.750″	.85	.77	.73	.68

Engraved ARROWHEAD on natural aluminum skirt. Knob body has straight knurl matching other KN series knobs. ¼″ shaft, also available in ⅛″ shafts.

		O.D.	Skirt Dia.				
KNS-501	BA only	.500″	.750″	1.00	.90	.86	.80
KNS-701	BA only	.750″	1.125″	1.15	1.04	.99	.92



"KB" Series decorative knurl knobs have standard type with indicator, and skirted models with or without engraved numerals 0-9. ¼″ shafts.

		O.D.				
KB-500	A, B	.500″	.65	.59	.56	.52
KBS-500	A, B	.500″	.80	.72	.68	.64
KBS-500-10	A, B	.500″	.95	.85	.82	.76

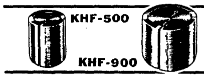
DIAMOND KNURL SERIES

KD-700
KD-900

The conical top of this series adds a new dimension to knob styling. The nonslipping diamond knurl knobs feature precision machining, unbreakable strength, and uncompromising anodized colors of natural, black or gold finish with hairline.

KD-500	A, B, G	.500″	.60	.54	.51	.48
KD-700	A, B, G	.750″	.65	.59	.56	.52
KD-900	A, B, G	.937″	.80	.72	.68	.64
KD-1250	A, B, G	1.250″	.95	.85	.82	.76

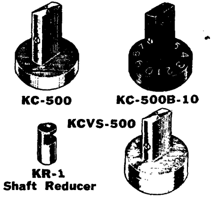
DELUXE SERIES



The unique, saw-cut indicator brings about the mod-trend in a family of knobs. ¼″ shafts only; single set screws. Model KHF-1250 is supplied with 2 set screws, and has 120° spacing.

KHF-500	A, G	.500″	.50	.45	.43	.40
KHF-700	A, G	.750″	.55	.50	.47	.44
KHF-900	A, G	.937″	.65	.59	.56	.52
KHF-1250	A, G	1.250″	.75	.68	.64	.60

MINIATURE — MACHINED ALUMINUM

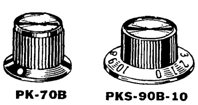


With the development of solid state circuitry and the "squeeze" on the instrument panel, ALCO has created a mating series for miniature switches and controls having a ⅛″ diameter shaft. The "KC" Series is designed for the MRA Series Alcoswitch, but usable with other components. "KCVS" Knobs provide the need for setting a predetermined stop position on controls or rotary switches with a ⅛″ shaft. KC-500-10 has engraved numerals 0 through 9. KR-1 Knob Reducing Adapter can convert any knob having a ¼″ shaft hole to fit a ⅛″ shaft.

The "KB" Series is a new family of straight knurl knobs having a custom look, and used with miniature rotary switches and controls.

K-500( )-⅛	A, B, G	Standard	.50	.45	.43	.40
KN-500( )-⅛	A, B	Straight Knurl	.60	.54	.51	.48
KN-500( )-⅛	AB, BA	Straight Knurl	.75	.68	.64	.60
KN-501( )-⅛	BA	Knurl-Arrowhead	.80	.72	.68	.64
KNS-501( )-⅛	BA	Knurl-Skirted	1.00	.90	.86	.80
KB-500( )-⅛	A,B	Straight Knurl	.65	.59	.56	.52
KBS-500( )-⅛	A,B	Knurl Skirted	.80	.72	.68	.64
KBS-500( )-10-⅛	A,B	0-9 Numerals	.95	.85	.82	.76
KD-500( )-⅛	A, B, G	Diamond Knurl	.60	.54	.51	.48
KS-500( )-⅛	A, B	Skirted	.65	.59	.56	.52
KC-500( )	A, B	Skirted	.65	.59	.56	.52
KC-500( )-10	A, B	0-9 Numerals	.80	.72	.68	.64
KCVS-500( )	A, B	Adj. Stop	1.10	.99	.94	.88
KR-1	Shaft Reducer ¼-⅛		.06	.045	.04	.036

PLASTIC KNOBS WITH ALUMINUM TOPS



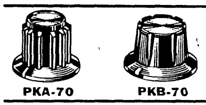
Available in black plastic, each knob features an attractive spun aluminum cap plate thereby offering a pleasing two-tone effect. Equipped with molded-in brass bushing and standard 6/32 set screw. Indicating dot or hair line provided.

Model	Knob O.D.	Skirt O.D.	Shaft Dia.	One-99	100-249	250-499	500-999
PK-50B-⅛	.500″	.750″	⅛″	.25	.23	.22	.20
PK-50B	.500″	.750″	¼″	.25	.23	.22	.20
PK-70B	.750″	1.000″	¼″	.30	.27	.26	.24
PK-90B	.937″	1.250″	¼″	.35	.32	.30	.28

PKS dial skirt is natural anodized aluminum. Aluminum spun plate on top. Black. Indications: black arrow or 0 through 10.

PKS-90B	.937″	1.437″	¼″	.50	.45	.43	.40
PKS-90B-10	.937″	1.437″	¼″	.55	.50	.47	.44

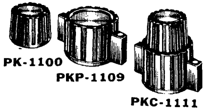
STANDARD KNOBS FOR ⅛″ AND ¼″ SHAFTS



This new ALCO series has the advantage of slip-proof construction and still maintains maximum comfort which is important in the smaller size knobs. Extended plastic skirt and aluminum spun plate give this series a similar appearance to the other series listed. Color: black. Brass insert and 6/32 set screw.

PKA-50B-⅛	.500″	.812″	⅛″	.30	.27	.26	.24
PKA-50B	.500″	.812″	¼″	.30	.27	.26	.24
PKA-70B	.750″	1.000″	¼″	.35	.32	.30	.28
PKB-70B	.750″	1.125″	¼″	.35	.32	.30	.28
PKB-90B	.937″	1.500″	¼″	.40	.36	.34	.32

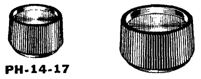
PLASTIC CONTROL KNOBS



Matched family includes two ½″ miniature knobs (with ⅛″ & ¼″ shafts), bar pointer model, and concentric combination. Knobs have hex-head cup point, self-locking 6/32 set screws, aluminum spin plate, brass insert, white dot indicator. Standard black color (except for knobs indicated with * which are available in red). PKP-194B is a bar pointer, PK-1108B unskirted.

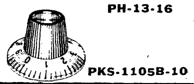
	Finish						
*PK-1100-⅛	B, R	.750″	⅛″	.35	.32	.30	.28
*PK-1100	B, R	.750″	¼″	.35	.32	.30	.28
PKP-1109B	B	.885″	¼″	.60	.54	.51	.48
*PKC-1111	B, R	.750 & .885″	⅛ & ¼″	.95	.85	.82	.76
PK-1108B	B	.937″	¼″	.50	.45	.43	.40
PKP-194B	B	.937″	¼″	.65	.59	.56	.52

*Available in Red plastic



TUNING CONTROL SERIES — modernistically styled, straight knurl, deep recessed spin aluminum plates, ring skirt. Includes hex-head cup point, locking 6/32 set screws. Black plastic.

PH-15-18	B	1.000″	¼″	.25	.23	.22	.20
PH-14-17	B	1.200″	¼″	.30	.27	.26	.24
PH-13-16	B	1.400″	¼″	.35	.32	.30	.28



ALUMINUM DIAL SKIRTS on plastic knobs. PKS-1105B-10 has 0-9 graduations spaced at 36°, PKS-1106B is without graduations but has black hairline, brass insert. Black.

	O.D.	Skirt Dia.					
PKS-1105B-10	.680	1.160″	¼″	.50	.45	.43	.40
PKS-1106B	.680	1.160″	¼″	.45	.41	.39	.36

SPECIFY FINISH CODE FOR TYPES LISTED ABOVE

AB — Natural Body With Black Top; Black Indicator
BA — Black Body With Natural Top; White Indicator

A — Natural Aluminum; Black Indicator
B — Black; White Indicator
G — Gold; Red Indicator
R — Red; White Indicator (for Plastic Control Knobs only)

ALCO® ELECTRONIC PRODUCTS, INC.
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

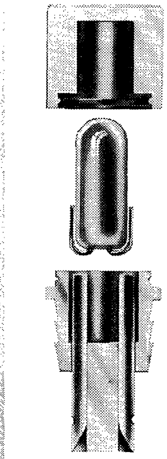
AREA CODE 617
686-3887

BLOC-LITE DIVISION LVC INDUSTRIES INC.

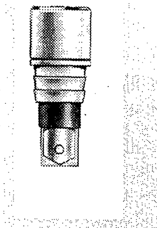
102-48 43rd AVENUE • CORONA, NEW YORK 11368 • 212-899-5588

MINI-BRITE "simplicity" in subminiature indicator lights

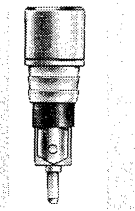
HOUSING GUIDES LAMP LEADS TO CONTACTS



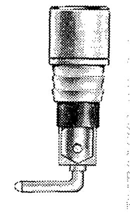
Housing is keyed so that wire leads of lamp will only be accepted by the electrical contacts.



MINI-BRITE
75001
Panel Mount



MINI-BRITE
75002
Panel/Printed
Circuit Mount



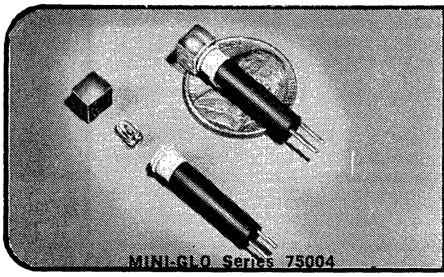
MINI-BRITE
75003
Printed Corcuit
Mount

MINI-BRITE subminiature indicators have been engineered and are manufactured with the idea of achieving the ultimate in simplicity, standardization, reliability and cost reduction . . . this has been accomplished by the design of a unique housing and contact arrangement centered on the use of standard, wire terminal lamps . . . which provides light intensity comparable to units five times their size.

Conforms to MS90308. U. S. Patent #3,559,153

- **FRONT RELAMPABLE**
  just remove the snap on cap
- **STANDARD LAMPS**
  any T-1 lamp, wire lead type
- **EASY INSTALLATION**
  press housing into hole
- **WIRING OPTIONS**
  combination solder/female terminal
- **MOUNTING OPTIONS**
  panel mounted, panel/printed circuit
- **HIGH DENSITY PACKAGING**
  mount on .250 centers.
- **CODED CAPS**
  available in a variety of colors

Write for Bulletin 1470



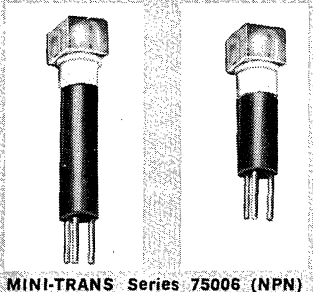
MINI-GLO Series 75004

MINI-GLO subminiature Neon indicator lights

This series of subminiature indicators provided neon bright intensity with the application of 115 VAC power. The complete indicator consists of a MINI-BRITE housing, a standard wire terminal neon lamp type USASI A1K, and a snap-on cap. The housing further incorporates an integral resistor for varying life expectancies. Except for the increased length of the housing, these indicators are compatible and have all of the features of the MINI-BRITE series.

Write for Bulletin No. 1470G

STANDARD OR SPECIAL CONFIGURATIONS



MINI-TRANS Series 75006 (NPN)
75007 (PNP)

MINI-TRANS subminiature Transistorized indicator lights

The MINI-TRANS series incorporates a silicon planar transistor, either NPN or PNP, which will turn on the indicator and provide an extremely bright indication from signal levels as low as 0.30 mA. In addition to standard circuits, specially designed physical and electrical configurations can be furnished to customer specifications. Units can be supplied with a built-in resistor of any standard value. This unique transistorized design capability is ideally suited when extremely low level signals are used for front panel indications, assuring long life and maximum brightness. A wide range of standard incandescent lamps are available to meet your requirements. Except for the increased length of the housing, these indicators are compatible and have all the features of the MINI-BRITE series.

Write for Bulletin No. 1470T

ANNUNCIATORS • LIGHT MATRICES • DISPLAY PANELS • EDGE-LIGHTED PANELS • SPECIAL INDICATORS • ALPHA/NUMERIC READOUTS.

BLOC-LITE can offer specialized lighted products in a wide range of capabilities. Physical and electrical designed configurations based on customer specifications can be proposed and submitted at surprisingly low cost. Our staff will be happy to extend any engineering assistance needed to optimize your application. Please contact the factory direct, or our nearest field engineering representative.

SEE OUR CO-ORD MATRIX BOARDS • SECTION 2100

BOWMAR®

DIGITAL DISPLAYS

Bowmar LOGICATORS® are multi-position readout devices which can have up to 13 positions (10 being the most common). They consist of only one moving part, a permanent magnet and rotating drum assembly which is positioned by excitation of stator coils. Advantages of this display are:

- Readability in brilliant ambient light
- Low power consumption
- Inherent memory with no power
- Very long life

Bowmar has designed and built Logicators using every code considered practical by the industry. In addition, we have our own code; 5 of 5. This enables us to produce Logicators which have:

- Lowest power consumption
- Greatest environmental specifications
- Greatest efficiency

UNIQUE FEATURES OF ALL BOWMAR LOGICATORS

CHARACTERS

Engraved printing masters are used which gives a very sharp character with no fuzziness.

VIBRATION

Units have been built which have been subjected to 10-2KHz, 30 G's vibration with no failures.

WHEELS

Very stable material is used for the wheels. The result is a very high quality wheel which will withstand the rigid military environments without warpage or degradation.

LIGHTING

Bulbs are placed behind wheels which means the wheels do not have to be recessed for front flood lighting and the lit character displays greater contrast. Bowmar has also pioneered in backlighting Logicators with Light Emitting Diodes.

STANDARD LINE LOGICATORS

Highest performance units meeting all known military specifications

DA-3305 — ¼″ character, .45″W x 1.25″H x 1.41″D, 5 volts, 1 watt maximum power

DA-3308 — Same as DA-3305 except has BCD input, .45″W x 1.20″H x 2.50″D

Smallest on market

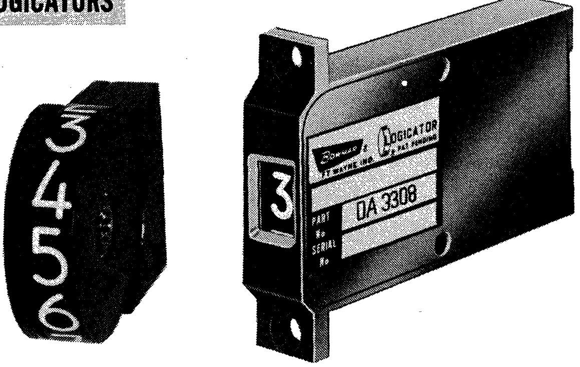
DA-3350 — 3/16″ character, .30″W x .75″H x .75″D, 5 volts, .75 watt maximum power

Medium performance displays

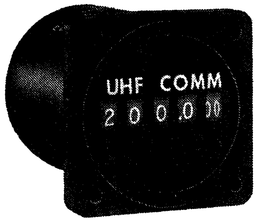
DA-3315 — ¼″ character, .45″W x 1.25″H x 1.41″D, 12 volts, 1 watt maximum power per coil

DA-3320 — Same as DA-3315 only different code

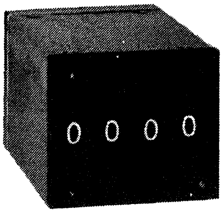
DA-3325 — ¼″ character, .950″ diameter wheel, uncased, 12 volts, 80 milliamp maximum power

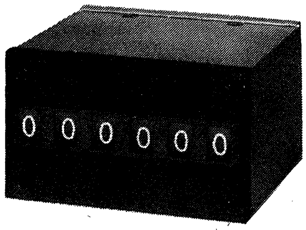


SPECIAL DESIGNS



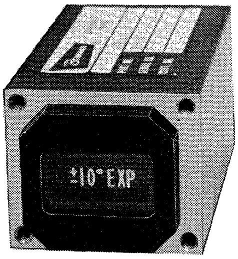
Due to Bowmar's leadership in the field of electromagnetic displays, we have developed the ability to provide, at reasonable cost, digital displays utilizing 3 wire, 1 of 11, 1 or 2 of 5, 1 of 5 reverse polarity, 1 of 12, 1 of 13 and 5 of 5 codes; plus adaptations of these codes.

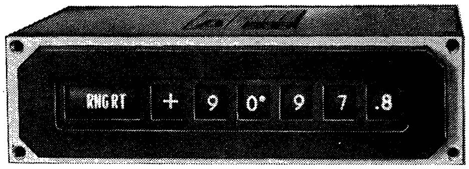




MESSAGE DISPLAYS

These are available with up to 13 messages of up to 7 characters per message. A message display built in this manner has all the advantages of Logicators, particularly in the areas of life and environmental specifications.





BOWMAR INSTRUMENT CORPORATION

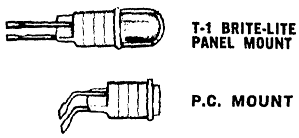
8000 Bluffton Road, Fort Wayne, Indiana 46809 • Tel.: (219) 747-3121 • TWX: 810-332-1510

CHICAGO MINIATURE LAMP WORKS

A GENERAL INSTRUMENT COMPANY

4433 N. RAVENSWOOD AVENUE, CHICAGO, ILLINOIS 60640
Phone: 312-784-1020
TWX: 910-221-5445

CM25 SERIES T-1 BRITE LITES

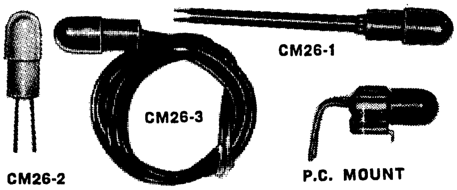


FEATURES:

CM25 Series Brite-Lites are subminiature T-1 indicators built to meet MS90308. An unbased T-1 lamp is inserted into the housing and a cap snapped-on to hold the lamp and provide color identification.

New features include dimpled terminals (patent pending) to assure positive electrical contact together with internally flared lead guides for ease of lamp insertion. Hot stamped legends can be provided with the new cylindrical cap style. The units are small enough to mount on .250″ centers and still allow adequate wiring room and space to re-lamp.

CM26 SERIES T-1 PEANUT-LITES



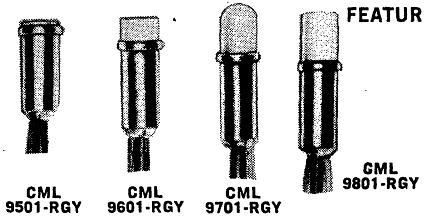
FEATURES:

T-1 Peanut-Lites are a new approach to the ultra-miniature panel indicator applications. Each T-1 Peanut-Lite contains a subminiature lamp sealed in a high-temperature polycarbonate housing. Lamps are available in a wide range of voltages from 1.5 volts to 28 volts. Mounting is easily accomplished with spring mounting clips.

Strain relieved wire leads are available when soldered connections are required. Pin contacts can be supplied for "quick-disconnect" with the CM21-1 socket. Where circuit board mounting is required, a 10384 clip is available.

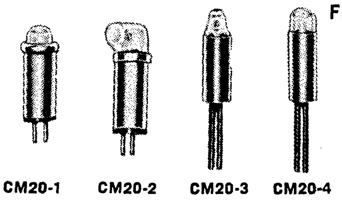
T-1 Peanut-Lites are low cost commercial substitutes for MS25446 and MS90308 indicators.

CML SERIES TRI-A-LITES



FEATURES: Chicago Miniatures new Tri-A-Lites offer a unique and new approach to lighted indicator devices. All Tri-A-Lites appear white in the off position, and take on color only when an input voltage is applied to one of the color coded lead wires. With the use of long life T-¾ lamps, three colors can be obtained from a single indicator light while allowing the designer to use the minimum amount of panel space. Tri-A-Lites mount in 1⁹⁄₆₄″ clearance holes and are retained with a single mounting clip. The standard color combination is red, green, and yellow but other combinations are available. Options include: hot stamped legends, other color combinations, different lead lengths and clear anodized housings. Electrical characteristics are: Volts — 5.0; Amps — .11/Lamp; Life — 15,000 hours average; Activated Colors — red, green, yellow.

CM20 SERIES SUBMINIATURE LENS END-LITES



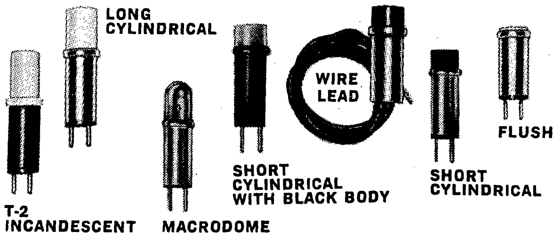
FEATURES: The CM20 family offers a variety of Lens End-Lites, each with finely controlled characteristics for the most demanding optical applications. Spots produced by these assemblies are axially centered, which minimizes adjustment problems and simplifies lamp replacement.

The CM20 Series family is ideally suited for close proximity use with photo sensors where an intense spot of luminous and infrared energy is required. Typical applications are encoders, tape sensors, card readers and optical scanners.

The CM20-1 and CM20-2 are mounted in CML Series Cartridge Holders. CM20-3 and CM20-4 are packaged in gold anodized aluminum sleeves.

Part Number	Current Design Design Volts	±10% (Amps)	Average Life (Hours)	Spot Specifications
CM20-1	2.50	.350	10,000	When projected ⅜″ from end of bulb, spot produced covers a ⅛″ diameter target which is concentric with the axis at a minimum intensity of 750 foot-candles.
CM20-2	3.00	.325	10,000	1″ diameter spot at 1″ with minimum intensity of 350 foot candles at 3.0 V.
CM20-3	2.50	.350	10,000	When projected ⅜″ from end of bulb, spot produced covers a ¹⁄₁₆″ diameter target which is concentric with sleeve. Intensity ⅜″ from bulb is a minimum of 750 foot-candles measured over a ¹⁄₁₆″ diameter circle. Spot is narrow elliptical in shape.
CM20-4	2.50	.350	10,000	Same as CM20-3 except spot covers ⅛″ diameter target. Spot is "round" elliptical in shape.

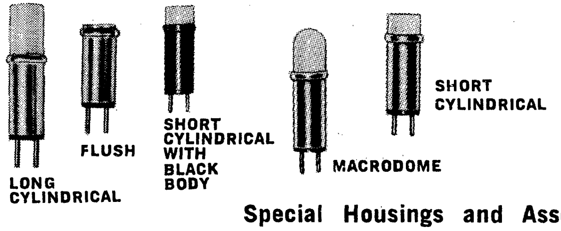
CML SERIES CARTRIDGE INDICATORS



FEATURES:

Cap colors include: red, yellow, white, blue, green and amber. Available both in transparent and translucent colors. Cap materials: Polycarbonate; resistive to color fading and high temperature and Butyrate; color matched to standard industry colors. Legends are hot stamped. Lamps: Any T-1¾ Incandescent. Mil-Spec: Built to meet Mil-L-3661. Polarization: Stainless steel pins are located off-center. This provides polarization or one way insertion in Cartridge Holders.

CML SERIES HIDE-A-LITES



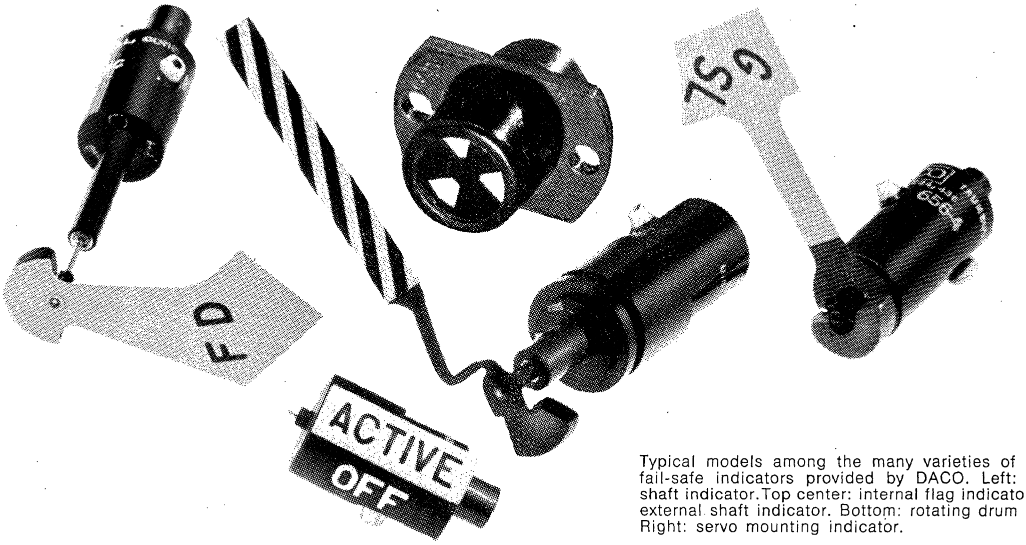
FEATURES:

Hide-A-Lites are a new concept in panel and display lighting. All indicators appear **white** in the off position and **take on color only when activated.** When mounted in multiple indicator panels, a glance is all that is necessary to quickly ascertain which indicators are on. Hide-A-Lites are ideally suited for use as warning lights or on systems control panels where signal and indicator speed is important. Their esthetic value is also of importance to design engineers concerned with panel appearance.

Special Housings and Assemblies May Be Designed to Customer Specifications.

For Complete Specifications on Chicago Miniature Lited Devices, Request CML Series Catalog.

DACO Miniature Fail-Safe Indicators for aircraft, spacecraft and ground support instrumentation.



Typical models among the many varieties of miniature fail-safe indicators provided by DACO. Left: extended shaft indicator. Top center: internal flag indicator. Center: external shaft indicator. Bottom: rotating drum indicator. Right: servo mounting indicator.

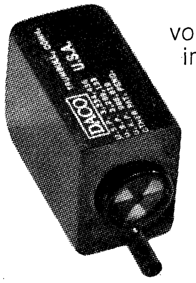
High reliability • Extreme ruggedness
Positive indication • Widest selection
of models, sizes, message and mounting

DACO Solenoid-Actuated Fail-Safe Indicators offer a combination of advantages that has made them the standard with leading international instrument manufacturers. Designed and built specifically to meet the exacting demands of aerospace instrumentation, the indicators are widely used in commercial and military aircraft. Specially designed DACO indicators are being used in a number of space projects. In addition to their many applications in general system annunciation, they are used for sun-shutters, video light sensors and photocell interrupters in spacecraft optical systems; digit maskers, request-action indicators and special system condition indicators.

	Size 5	Size 6
Weight (without flag or mounting bracket)	4.5 grams	9 grams
Dimensions (without flag or mounting bracket)	Length—0.57 in Diameter—0.38 in	Length—0.82 in Diameter—0.44 in
Power input range	DC—0.5 to 1 watt @ 25°C AC—0.7 to 1.3 watt @ 25°C	DC—0.4 to 1.3 watt @ 25°C AC—1.2 to 1.8 watt @ 25°C
Operating voltage	DC operation: up to 45 volts AC operation: 26 and 115 volts 400 Hz	
Rotation	Up to 60° CW or CCW. Standard tolerance ±2.5°	
Response time	0.5 seconds maximum	

For additional details, complete specifications, dimension drawings and ordering information, ask for DACO Bulletins 100-104.

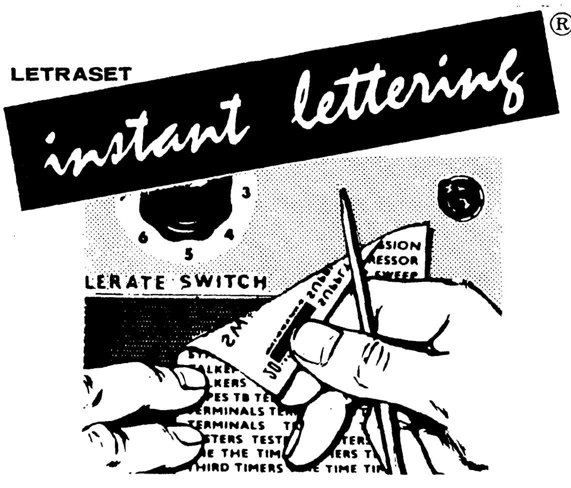
DACO Miniature Latching Indicators



Highly reliable, extremely rugged, and positive indicating, these 2-position electromechanical latching indicators are widely used for visual indication of transitory circuit conditions, registering and holding "over-temperature" and "G-level" indications, monitoring firing circuits, and many other applications. Operating voltage is up to 45 VDC continuous, and input power is 0.75 watt at 25°C. Available with external switch, actuated by the reset button, for a secondary circuit. *For additional details, complete specifications, dimension drawings and ordering information, ask for DACO Bulletin 105.*

DACO Instrument Company, Inc.
Merritt Boulevard, Trumbull, Connecticut 06611 (U.S.A.)
Telephone: (203) 375-5871 TWX: 710-453-1095 Cable: DACOINST-TRUMBULL, CONN.

DACO™



THE REVOLUTIONARY METHOD FOR MARKING ELECTRONIC EQUIPMENT

JUST RUB and it's PRINTED!

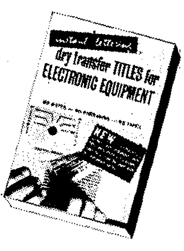
Sharp • Clean • Fast • Not a Decal • No Water • No Tapes

INSTANT LETTERING® marking kits bring you all the necessary elements for completely marking electronic equipment, prototypes, drawings, etc. in this fast new easy-to-use form. There's even a new drafting symbol kit for better more readable schematics.

Words, letters, numerals, switch patterns, arcs, drafting symbols, etc. are printed on a special transparent carrier film. Rubbing over one of these elements with a ballpoint pen releases it from the carrier film and adheres it to your working surface.

INSTANT LETTERING® words and symbols transfer to almost any surface including glass, plastic, even painted and bare metals. Now you can quickly mark all panels, even especially calibrated two-color nomenclatures, pilot light jewels, sub-assemblies, circuit boards, etc. Reproduction quality **INSTANT LETTERING®** transfers are clean and sharp, leave no background haze or film, make prototypes look like finished production equipment and give all equipment and drawings a professional look.

instant lettering DRY TRANSFER MARKING KITS



TITLES for ELECTRONIC EQUIPMENT

NEW, REVISED; Now 20% more titles in a new easy-to-read typeface. Researched to give up to 95% of all electronic marking. For labeling, marking, titling all electronic control panels, drawings, prototypes, etc.

No. 9581—Complete Set (black)	$5.95
No. 9591—Complete Set (white)	$5.95
REFILL SETS—12 sheets per set	
No. 9601—Alphabets (black)	$3.00
No. 9611—Alphabets (white)	$3.00
No. 9621—Numerals (black)	$3.00
No. 9631—Numerals (white)	$3.00

instant lettering
dry transfer TERMINAL & CHASSIS MARKING KIT
NOT A DECAL

TERMINAL & CHASSIS MARKING KIT

All the necessary letters, letter combinations and numerals for marking chassis, printed circuit and terminal boards, rotating components, etc.

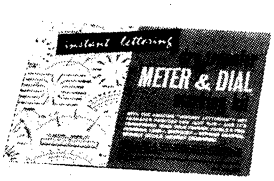
No. 966—Black	$5.95
No. 967—White	$5.95

DATAMARK KITS

Low cost dry transfer marking kits designed to provide useful preset words, symbols and alphabets for specific uses.

DATAMARK
ABCDEFGHIJL
KMNOPRSTUQ
VWXYZ1234
567890&0!

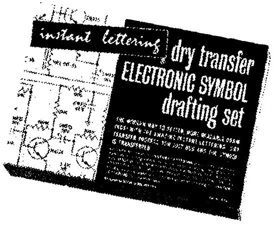
K58B—Audio, TV & Hi-Fi (black)	$1.50
K58W—Audio, TV & Hi-Fi (white)	$1.50
K59B—Amateur Radio & CB (black)	$1.50
K59W—Amateur Radio & CB (white)	$1.50
K60B—Experimenter, Home & Intercom (black)	$1.50
K60W—Experimenter, Home & Intercom (white)	$1.50
K61B—Test & Industrial Equipment (black)	$1.50
K61W—Test & Industrial Equipment (white)	$1.50
K62—Marks & Switch Patterns	$1.50
K63—Alphabets & Numerals (1/8")	$1.50
K64—Alphabets & Numerals (1/4")	$1.50
K65—Alphabets & Numerals (1/2")	$1.50



METER & DIAL MARKING KIT

Arcs, dial patterns, lines, wedges, graduation lines, switch symbols alphabets and numerals in black, white and red for marking standard and special rotary tap switches, potentiometers and prototype and specially calibrated meter dials. Colors provide contrast on scales and switches, simplifying usage of complex instruments.

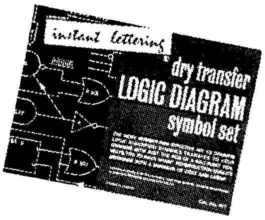
No. 968—Complete Set	$5.95
REFILL SHEETS—set of four identical sheets	
No. 968R—(specify sheet number)	$2.00



ELECTRONIC SYMBOL DRAFTING SET

The quick way to more readable schematics. Contains 40 sheets of electronic symbols plus letters and numerals. Symbols designed to conform with MIL-STD-15-1A. Sheets have heat resistant adhesive for perfect reproduction in any blue- or white-printer. Also included is a complete guide to drawing with dry transfer symbols.

No. 970—Complete Set	$19.15
REFILL SHEETS—set of four identical sheets	
No. 970R—(specify sheet number)	$2.00



LOGIC DIAGRAM SYMBOL SET

NEW! The most modern and effective aid to drawing logic diagrams. Symbols transfer to your drawing in seconds. All you need do is add the connecting leads. Heat resistant adhesive allows perfect reproduction even in diazo and other high speed printers. Symbols conform fully to MIL-STD-806B and ASA-Y32.14.

No. 971—Complete Set	$4.20
REFILL SHEETS—set of four identical sheets	
No. 971R—(specify sheet number)	$2.00

NEW JOTDRAFT SETS

Over 120 sets of logic, schematic, component and printed circuit symbols. Each has a clear, tough plastic overcoat that transfers with the symbol. Tough! Scratch Resistant! Use with pencil, tape and ink. Suited for mylar, standard tracing vellums. All kits $6.50 each.

DATAKOAT — Clear protective coating specifically designed to protect "Instant Lettering" transfers from abrasion and weathering. Datakoat is water-clear and dries quickly.
Protective Coating Kit — contains a 1 oz. bottle of Datakoat with applicator brush in cap and a 1 oz. bottle of thinner.

No. 04176	$1.00

Spray Coatings — the handy aerosol can form of Datakoat (16 oz. cans).

No. 04177 — Glossy	$2.95
No. 04178 — Matte	$2.95

STANDARD SHEETS — Full 10" x 15" sheets of alphabets and numerals are available in over 80 different type faces in sizes ranging from 8 pt. to 288 pt. Also available are arrows, math symbols, line and dot rules, etc. All are available in black, many also come in white and all feature heat resistant adhesive. Free sample and complete type chart available upon request.

SPECIAL SHEETS — Sheets made to your own specifications can include logos, drawings, symbols, preset words — anything that you use repeatedly. Hundreds of lettering and marking problems that were impossible or too expensive become practical with "Instant Lettering". Tell us your problem and let us suggest a "dry transfer" solution.

LETRATAPES — Here's a revolutionary advance in the application of dry transfer component references. The special dispenser does half the job for you. The range of tapes comprises 122 different items including letters of the alphabet, numerals, 0-9, common component designations, frequently used preset words, etc. Letratapes provide an ideal method for a wide range of repetitive marking or coding jobs. Write for complete details.

SPECIAL LETRATAPES — Tapes can be made to fit your own specific needs. Items like company trade marks, technical symbols, frequently used words and phrases —whatever you need—prepared as dry transfers on rolls of tape for fast, easy application. Complete details available upon request.

THE DATAK CORPORATION

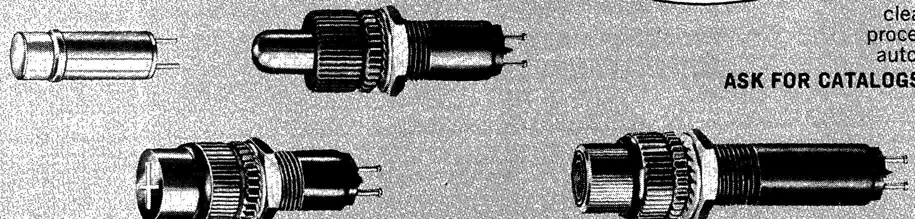
INDICATOR LIGHTS

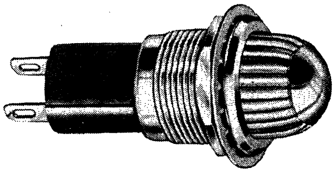
(Illus. approx. 90% actual size unless otherwise noted.)

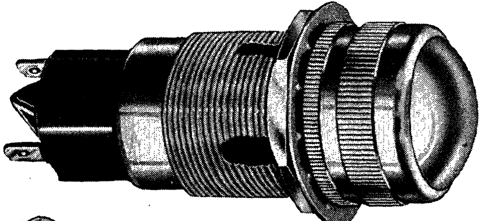
DIALCO®

Ultra-Miniature DATALITES® —and multiple indicators. Meet requirements of MIL-L-3661B. Incandescent and Neon. Mount in 3/8" clearance hole. For data processing, computer and automation applications.

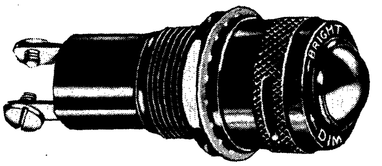
ASK FOR CATALOGS L-160 AND L-203.



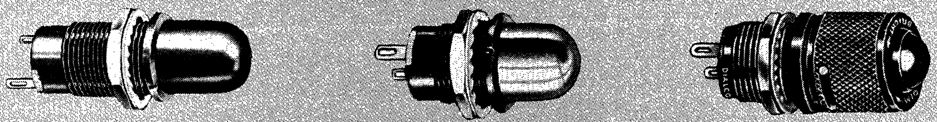


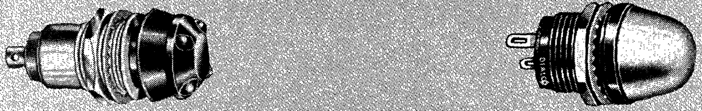


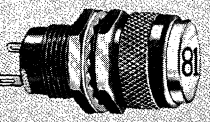
Miniature and Large Indicator Lights. Incandescent and Neon. **Miniature** units mount in 9/16" or 11/16" clearance holes; **Large** units in 1" clearance hole. Wide choice of cap shapes and colors—also include caps with mechanical dimming feature.



ASK FOR CATALOG L-161.

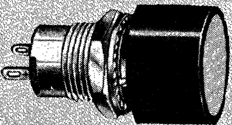


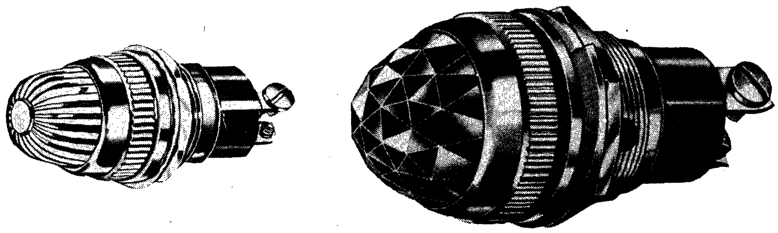




Sub-Miniature Indicator Lights. Incandescent and Neon. Mount in 13/32" to 17/32" clearance holes. Meet or exceed environmental requirements of MIL-L-6723 and MIL-L-3661B. Edge Lighting Indicators meet requirements of MIL-L-7806, conform to MS25010—Revision D.

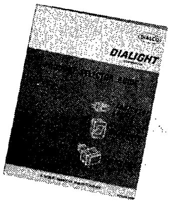
ASK FOR CATALOGS L-157, L-158, L-178.





Oil-Tight Indicator Lights. Incandescent and Neon. Mount in 11/16", 1" or 1-3/16" clearance holes. For heavy duty industrial applications.

ASK FOR CATALOG L-200.



NEW 56 PAGE PRODUCT SELECTOR GUIDE
Aids in the selection and procurement of more than 1,500,000 indicator lights, readouts and switches.
ASK FOR CATALOG SG690

DIALIGHT CORPORATION A NORTH AMERICAN PHILIPS COMPANY
60 STEWART AVE., BROOKLYN, N.Y. 11237 • Area Code 212 497-7600

CURRENT DIALCO LITERATURE

	Catalog No.
Sub-Miniature Indicator Lights	
Two Terminals, Fully Insulated	L-178
One Terminal (for Grounded Circuits)	L-157
Edge Lighting for Plastic Plates	L-158
Sub-Sub-Miniatures (with Long Life Lamps)	L-168
Datalites: Ultra-Miniature Indicator Lights	
Lampholders, Cartridges, Multiple Indicators	L-160
Permanent Lamp Indicator Lights (Ultra-Miniature)	L-203
Miniature & Large Indicator Lights	L-161
Twin Lamp Placard Lights	L-170
Single Plane Numeric Readout	L-181
BCD to Seven Segment Decoder-Driver	L-192
Heavy Duty Oil-Tight Indicator Lights	L-200
Press-To-Test Indicator Lights	L-201
Illuminated Push Button Switches and matching Indicators	L-210
Keyboard Type Illuminated Push Button Cap	L-210-1
Flashing Indicator Light	L-211
Transistorized Indicator Light for IC	L-207
A Cross Reference of DIALIGHT Catalog numbers to Military Type Designations and MS Drawings	CR-680
Product Selector Guide	SG-690
Ask for current Solid State Diode-Lite™ Catalog Sheets	

Send for your copies of these Catalogs.

DIALCO®

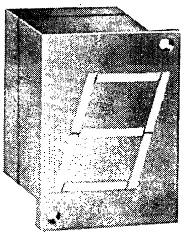
NEW!

Industry's most complete line of solid-state light sources, indicator lights and readouts now available.

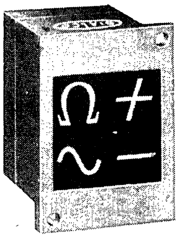
LEDs

Single Plane Numeric Readouts.

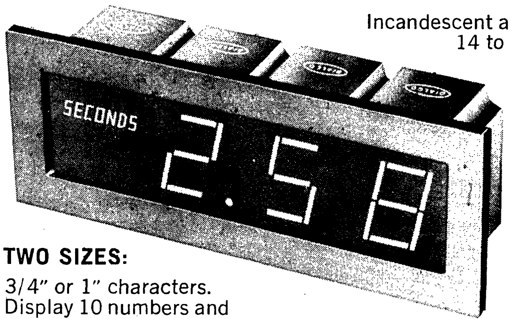
Incandescent and Neon—
14 to 170 volts.



(U.S. Pat. No. 3,210,876)



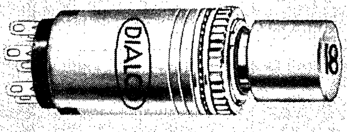
(Illus. approx. 75% actual size.)

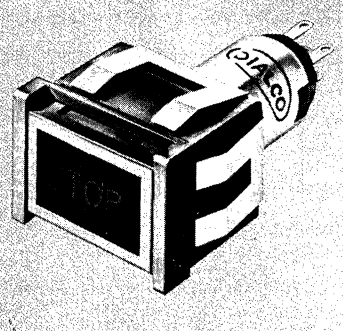


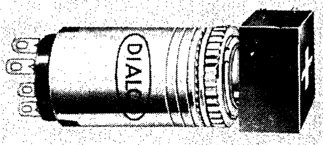
TWO SIZES:
3/4″ or 1″ characters.
Display 10 numbers and 10 letters. Compatible Caption Modules.
ASK FOR CATALOG L-181.

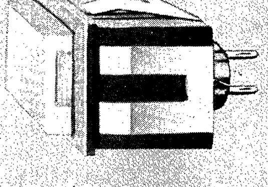
(Illus. approx. 50% actual size.)

Illuminated Push Button Switches and Matching Indicators. NEW low-profile snap-in switches ... and standard mounting switches. Momentary non-snap, snap or alternate switch actions. Ratings up to 5 amps. Cap sizes and shapes include 1/2″, 5/8″ and 3/4″ round or square; 3/4″ x 1″ rectangle.

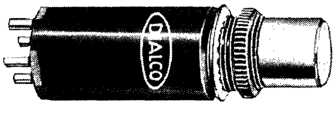








ASK FOR CATALOG L-210.

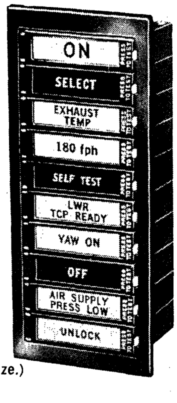


Transistorized Indicator Lights.
Incandescent and Neon. A "single package" containing light source, switching circuit, and all power circuit and bias voltage connections.
ASK FOR CATALOG L-207.

Press-to-Test Indicator Lights.
Incandescent and Neon. Mount in 15/32″, 5/8″ and 1″ clearance holes. Equal or exceed the operational and environmental requirements of MIL-L-7961B.

ASK FOR CATALOG L-201.

Twin Lamp Placard Lights.
Conform to the operational and environmental requirements of MIL-L-3661B, MIL-E-5272 and ABMA-MPD-11023 and 11064.
ASK FOR CATALOG L-170.



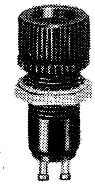
(Illus. approx. 50% actual size.)

DIALIGHT CORPORATION A NORTH AMERICAN PHILIPS COMPANY
60 STEWART AVE., BROOKLYN, N. Y. 11237 • Area Code 212 497-7600

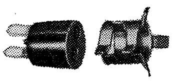
DRAKE INDICATOR LIGHTS..

CARTRIDGE

— **LAMPS**, bodies aluminum, 6 volts and up, long life incandescent or neon, fit Drake or any mfgr.'s holders. Inexpensive all plastic cartridges also available.



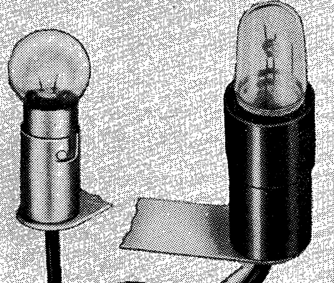
— **LAMPHOLDERS**, black anodized aluminum, indexed to accept lamps with legends; ideal for data processing or other computer applications — commercial or Military.



— **CONNECTOR AND FASTENER**, economical for commercial application with cartridge lamp eliminating lampholder.

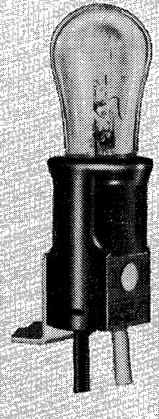
LAMPHOLDERS

Thousands of lampholder and bracket combinations for any application. The more popular are detailed in Brochure 6504.



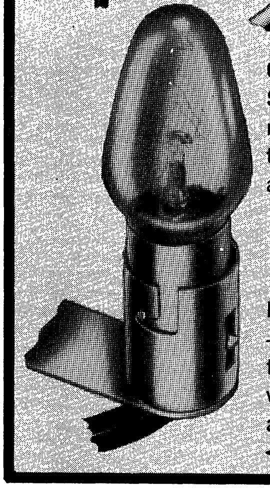
MINIATURE BAYONET— For instruments, radio, TV, automotive, marine and other miniaturized devices.

← Shell without & with housing



CANDELABRA SCREW — For illumination, on-off indicators in appliances and other equipment.

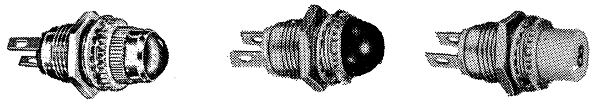
→



DC CAND. BAYONET — Rugged construction for appliances, vending machines and automotive.

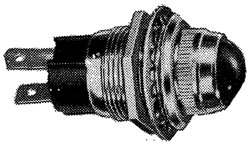
←

"TINYLITES"



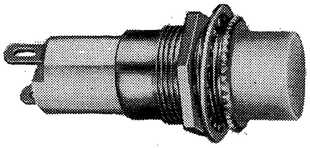
Exclusive Drake, economical, use midget screw base lamp for limited space requirements (overall size occupies only ⅓ cubic inch of space). Lenses: Convex w/bezel, dome, or flat faced lens with or without legend.

"PSB" SLIDE BASE INDICATOR LIGHTS



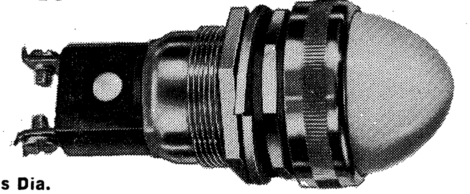
Uses Sylvania PSB slide base lamps; choice of 9 styles of lenses and solder or screw base lugs.

"Deluxe Molded" Indicator Lights

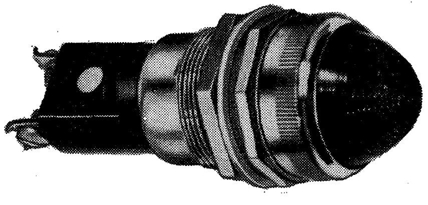


Drake's durable and finest — using T3¼ min. bayonet lamps and 120 V. incandescent for commercial application. Incandescent or neon. Screw or friction fit lenses of many shapes and variety, also mech. dimmer for Military use. "Titelite" type for water-proof and oil-tite application.

"TITELITES"



1¼" Lens Dia.

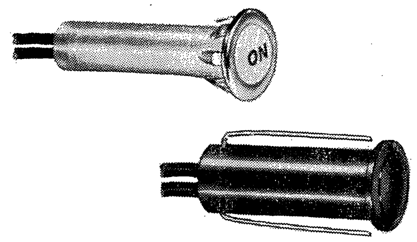


1" Lens Dia.
Available for
MIL-L-3661/38

Oil, water or dust-proof indicator lights with many lens styles for most incandescent lamps.

..LAMPHOLDERS...Reliability Since 1932

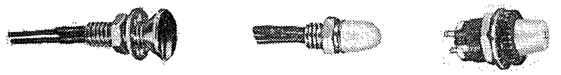
"GLO-LITES"



Commercial one-piece nylon, amber, red or white body and lens (flush or protruding lens with or without metal bezels). Built-in resistor and long life neon lamp. Choice of NEW "Twist-Mount" plug button or nut mount; wire or lug termination. Also NEW High Temp. Aluminum "Glo-Lite."

ALL PHOTOS APPROXIMATELY ¾ ACTUAL SIZE.

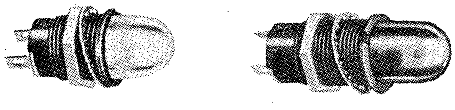
"ASTROLITES" and "GEMLITES"



"Astrolites" — Military or commercial — are Drake's tiniest, with built-in long life incandescent T1 lamp. Choice of 5, 12 volts; wire leads.

"Gemlites," small for commercial application with 2 lug termination using T1 Sub-Midget Flanged replaceable lamp in 5, 12 and 28 volts.

"MF" INDICATOR LIGHTS



Incandescent and neon Midget Flanged lamps are used both for commercial and Military having hundreds of varieties, lens shapes and colors including "Press-to-Test," "Titelite," etc.

DRAKE MANUFACTURING CO.

4626 N. OLCOTT AVENUE
HARWOOD HEIGHTS, ILLINOIS 60656
312 AREA 867-7227 • TWX 910-221-0236

SOLID STATE INDICATOR LIGHTS & LAMPHOLDER

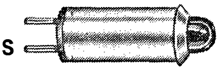
NEW!

"SOLID STATE ASTROLITES"

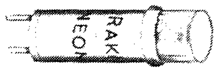
With Wire Leads
6039-004-304

With Wire Terminals
6039-005-304

L.E.D. CARTRIDGES

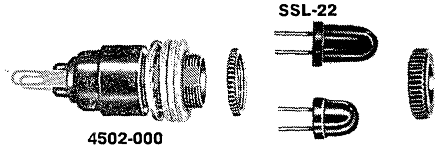


Without Lens -304



With Cylindrical Lens -604

LAMPHOLDER with choice 2 L.E.D.'s



SSL-22

4502-000
Exploded View

SSL-22L

BI-PIN & MIDGET FLANGED L.E.D.'s

For details write for Solid State Data Sheet 7201

***ONLY** ABOVE PHOTOS - ACTUAL SIZE*

DRAKE

Free Literature . . .

on the Complete Drake Line

Lit. No.	Description
6302-B	Short-form Catalog
6403	Project Data Sheet — for customer's specification requirements
6504	Lampholder Brochure
6607-A	"Astrolites" — "Gemlites"
6713	"Glolite" Folder
6800	1¼" Lens "Titelites"
6802-A	Cartridge Lamp Brochure
6803-A	5100 Indicator Lights
6809	5201 Military Indicator Lights
6901-A	Product Index Chart
6902	Cross Ref. Military to Drake
7100	Midget Brochure
7101	Illuminated Switches
7102	5204 Military Indicator Lights
7103	5200 Indicator Lights
7108	How To Order & Representative Listing
7113	Resale Price List
7200	Distributor Catalog Sheet
7201	Solid State "Astrolites"
7202	Midget Groove, Bayonet and Wedge Lampholders Folder
7203	"Slender Glo-lite" Indicator Lights
7205	Stock Lampholder Brackets
7208	UL & CSA Approved Components

Request Literature Today

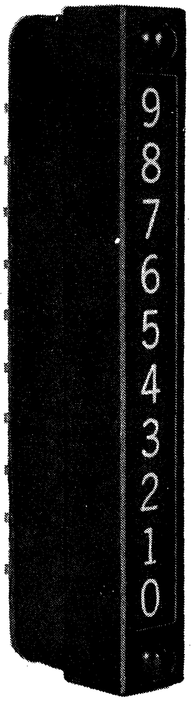
Ask your Drake Representative for location of nearest Distributor.

display devices

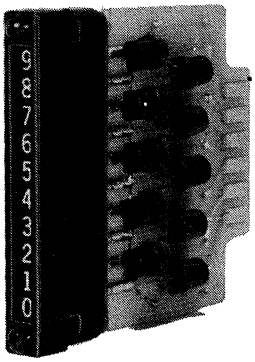
DIGISTRIP front relampable DIGITAL DISPLAYS

For a wide range of console and instrument display applications. Can be mounted horizontally or vertically, directly on p.c. boards, or ganged for high-density readout.

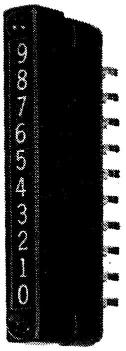
All Digistrip models are available with standard 0-9 legend, or with custom read-out information.



Digistrip II
3″ legend area.



Digistrip I with high-gain transistor drivers on integral printed circuit board.

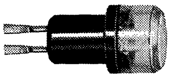


Digistrip I
1½″ legend area.

All illustrations are actual size

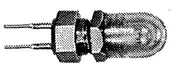
MINIATURE T-1 INDICATOR LIGHTS

Designed to provide the brightest light in the least space.
Available off-the-shelf, or designed to your application.



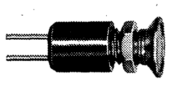
QUICK-LENS

Front-relampable miniature indicator light with built in light reflector for maximum brightness, even in high ambient light.



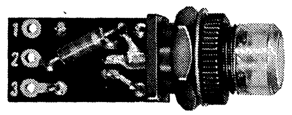
MINI-LENS

Front relampable, micro-miniature indicator light, featuring minimum panel spacing. Can be RFI shielded. Threaded body can mount directly to panel.

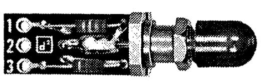


FLUSH-LENS

For panel mounting without protrusion. Available with RFI shield. Unit is relampable from rear of panel. No solder connections required.



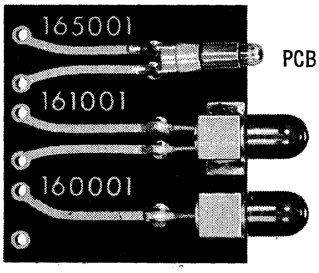
TRANS-LENS

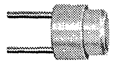


TDML

Each front relampable, with high-gain transistor driver on compact, integral p.c. board. Minimum depth behind panel. Both available in "bare board" configuration for customer to install own components. Trans-Lens is transistor-driven version of Quick-Lens; TDML is transistor-driven version of Mini-Lens.

P.C. BOARD INDICATORS

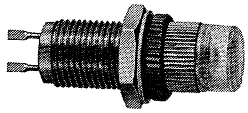




T-1 UNBASED | T-1¾ BI-PIN

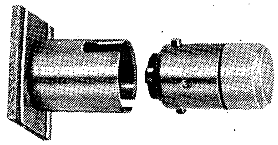
Basic sockets for custom designed lamp holders or p.c. board mounting used as lighting chassis for back lighted display.

Also available in side mounting.



TWIST-LENS

Quick-change lens, available in clear or colors. Waterproof and RFI shielded units available. Uses T-1¾ Bi-Pin base lamp for high brightness.



ADAPTER LENS AND SOCKET

Midget T-1¾ flanged base lamp adaptor used with T-3¼ printed circuit mounted socket. Furnished with or without integral color filter.

ALSO AVAILABLE: Custom back lighted panel assemblies and DF991 (Dead Front) legend screens.

Write for detailed specification sheets

d²

display devices, inc

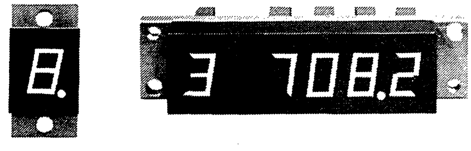
mailing address: **p.o. box 667 encinitas, california 92024**

plant location: **second and E streets** **(714) 753-0113**

DIGITAL READOUTS

ELECTRONS

Electrons' Hi-Contrast Digital Readouts provide easy to read, bright displays against a maximum contrast, black background. Light output is continuously variable from the very bright display needed in a sunlit cockpit, or high ambient-light-level room, to the low level display essential for night, or darkened environment, conditions. Operating at low voltage and current, these readouts work directly from inexpensive, commercially available, IC modules. Very wide-angle viewing is assured, and the parallax exhibited by gas glow or depth stacked numerals is eliminated. As a result of segment shape design, brightness and background contrast, these readouts appear much larger in operation than the small panel size requirements would indicate. Available in individual digits, and in custom molded assemblies.



SPECIFICATIONS

Light Output:	Continuously variable from 500 footlamberts at 4.5V to about one footlambert at 1.2V.
Current Requirements:	20 mA at 4.5V, 8 mA at 1.2V per lamp.
Lamp Life:	Average—40,000 hours at 2.8V. All lamps burned-in to weed out early-life failures.
Viewing Angle:	150° in any plane.
Character Size:	Height — 0.32 in., Width — 0.19 in., Slant — 0.05 in.
Character Spacing:	Single Digits — 0.500 in. c. to c. Molded Block — 0.313 in. c. to c.
Colors and Filters:	Available, consult factory for your specific requirements.

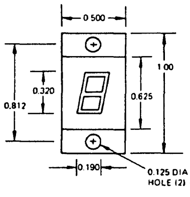
Operation:	Combination of seven segments and decimal point are lighted to form desired character. Segments may be controlled directly by low voltage transistors or IC BCD-to-7 Segment decoder flat packs. Applicable packs include Fairchild UGB931759X, Texas Instrument SN7447J, Discon 5800 and RCA CD2500E.
Construction:	As viewed, segments are ends of shaped, aluminized light pipes cast in black epoxy. Front surface is ground flat and specially treated to avoid surface reflection. Teflon coated wire leads or customer specified connector.

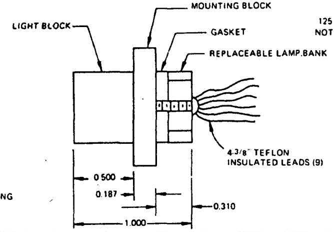
SINGLE DIGITS

Suggested Mounting:
4-40 Screw to Tapped Hole in Panel, or 3-56 Machine Screw and Nut through Panel Clearance Hole.

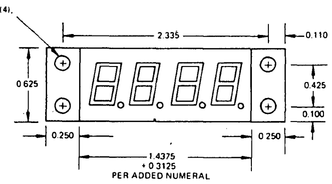
NOTES:

1. All Dimensions in inches.
2. 0.005 Tolerance on all Dimensions.
3. Mounting Hole can be Supplied Tapped.




ALUMINUM HEAT SINK - MOUNTING BLOCK
LIGHT BLOCK
GASKET
REPLACEABLE LAMP BANK
4-3/8" TEFLON INSULATED LEADS (9)
0.500
0.187
0.310
1.000

MOLDED ASSEMBLY

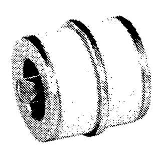


THYRATRONS AND GAS RECTIFIERS

ELECTRONS CO. NEWARK, N.J.
EL C6H-3

For more than 40 years ELECTRONS has been supplying the commercial and military requirements of domestic and overseas customers. Today with one of the widest lines of popularly used tubes in these categories, a nationwide distributor network, and a well stocked warehouse, ELECTRONS can supply your total requirements for THYRATRONS and XENON-FILLED RECTIFIERS without delay.

CERAMIC SURGE ARRESTORS



ELECTRONS line of ceramic, two- and three-element surge arresters provides protection against transient and lightning induced surges in communications and control circuits or in 117 volt, AC, low capacity power lines.

In DC communications circuits, these arresters will pass a surge and turn off without follow through. Extremely fast-acting, they can withstand surges that will normally puncture solid-state devices. Specific types have been designed for use in Western Electric and other equipment.

In control circuits these small devices provide total protection or can be used to back up low voltage solid state protectors.

For additional data on these products call or write

ELECTRONS COMPANY

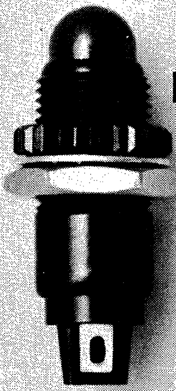
A Unit of General Signal Corp.

65 PASSAIC AVENUE • FAIRFIELD, NEW JERSEY • TELEPHONE: (201) 227-3830

Four ways Eldema packages light emitting diodes

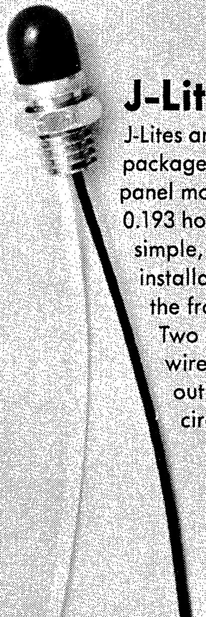
C-Lites

C-Lites are 2-pin cartridge lamps that are easily inserted from the front of the panel into standard incandescent cartridge lamp holders.



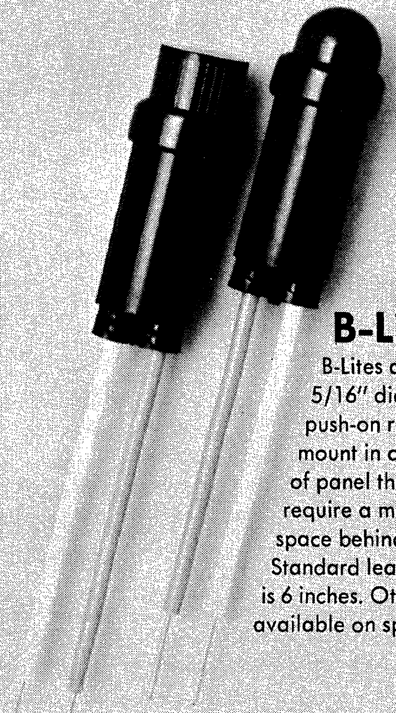
E-Lites

E-Lites can be permanently mounted in panels up to 1/4 inch thick. They have aluminum cases with either a black or clear anodized finish, high dielectric insulation and tin plated terminals.



J-Lites

J-Lites are subminiature packages, offering front panel mounting in a 0.193 hole. They provide simple, trouble free installation, mounting from the front of the panel. Two insulated lead wires are brought out for simple circuit connection.



B-Lites

B-Lites are easily mounted in 5/16″ diameter holes with push-on retainer nuts. They mount in a wide range of panel thicknesses and require a minimum of space behind the panel. Standard lead length is 6 inches. Other lengths available on special order.

and how to find out more about them.

Light emitting diodes are the indicator lamps of the future. These solid state devices are actually gallium phosphide diodes, with a life span that can easily extend beyond any necessity for replacement.

Because of their low current and voltage requirements, LED's are quite compatible with IC's and other solid state circuits.

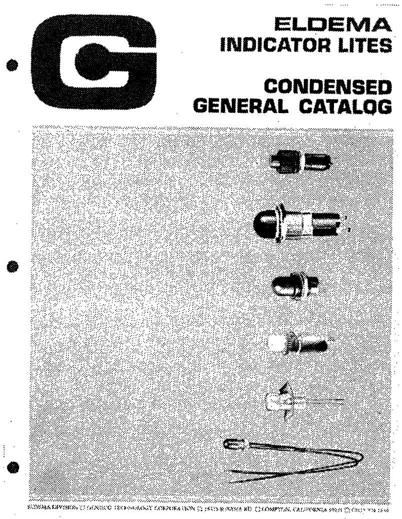
LED's offer extremely high resistance to shock, vibration and catastrophic failures.

Eldema has put these reliable little solid state lamps into four standard incandescent packages, so far. And there are more on the way.

ELDEMA
INDICATOR LITES
SOLID STATE LAMPS

To find out more about the four ways that Eldema now packages light emitting diodes, send for these four brochures. Or write for information on how Eldema can help solve your other LED needs.

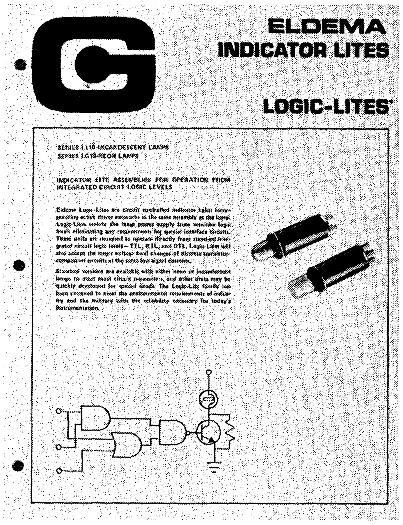
Eldema Division, 18435 Susana Road, Compton, California 90221 (213) 774-1850
Genisco Technology Corporation



ELDEMA
INDICATOR LITES

CONDENSED
GENERAL CATALOG

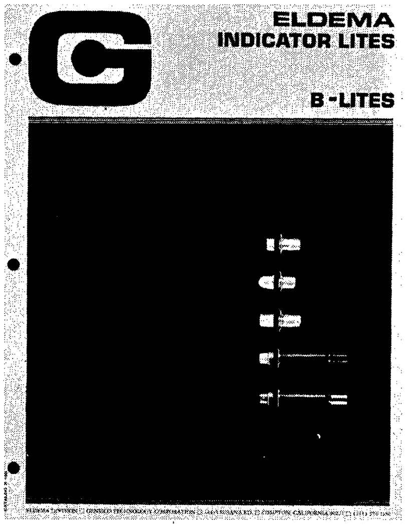
1. Our indicator lights primer.



ELDEMA
INDICATOR LITES

LOGIC-LITES

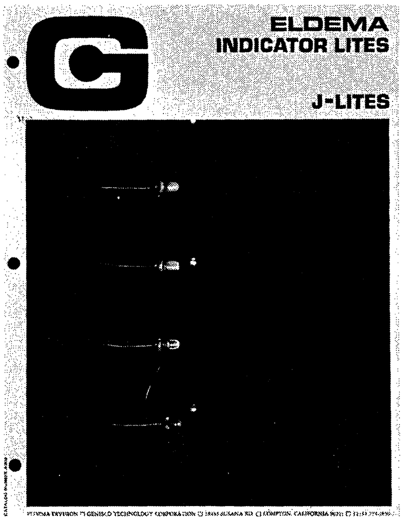
2. Eldema Logic-Lites—indicator lights with built-in transistorized lamp driver networks. Available in neon and relampable incandescent types.



ELDEMA
INDICATOR LITES

B-LITES

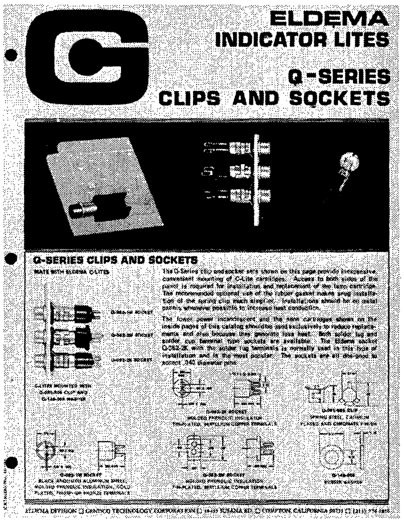
3. Low cost commercial neon lites, with a life in excess of 5000 hours. Easy mounting, with furnished push-on retainer nut, in size "0" (.316" dia.) hole.



ELDEMA
INDICATOR LITES

J-LITES

7. Permanent mounting indicators with built-in long life T-1 lamps. Military or commercial versions and RFI/EMI shielded models available. Easy mounting from the front of the panel.

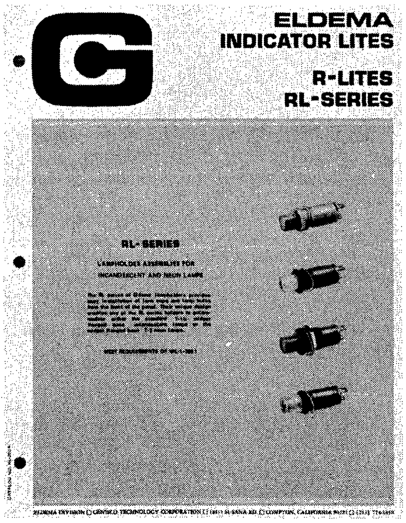


ELDEMA
INDICATOR LITES

Q-SERIES
CLIPS AND SOCKETS

Q-SERIES CLIPS AND SOCKETS

8. Inexpensive and convenient mounting for C-Lite cartridges. Solder lug and solder cup terminal type sockets available. All sockets designed to accept .040 diameter pins.



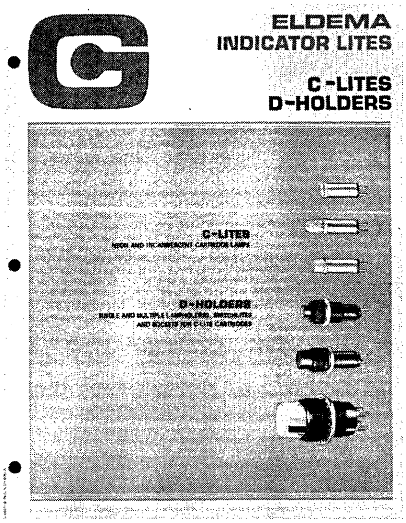
ELDEMA
INDICATOR LITES

R-LITES
RL-SERIES

RL-SERIES

9. Single lampholders provide a choice of either front or rear mounting configurations. Available in watertight models and with built-in resistors for neon lamp applications. Lens caps accommodate either midget flange based incandescent or neon lamps.

What we know about indicator lights could fill a dozen books.



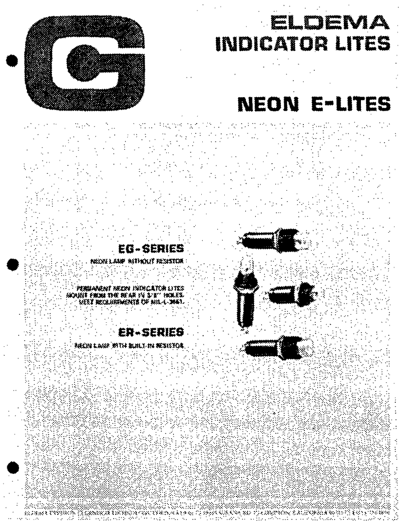
ELDEMA
INDICATOR LITES

C-LITES
D-HOLDERS

C-LITES
NEON AND INCANDESCENT CARTRIDGE LAMPS

D-HOLDERS
SINGLE AND MULTIPLE LAMPHOLDERS, SWITCHLITES
AND SOCKETS FOR C-LITE CARTRIDGES

4. C-Lite lamp cartridges and mating D-holders. All units designed to conform to MIL-L-3661. Static pin and socket construction, originated by Eldema, allows unit to be packaged in small diameter. Neon, incandescent or new solid state lamps.



ELDEMA
INDICATOR LITES

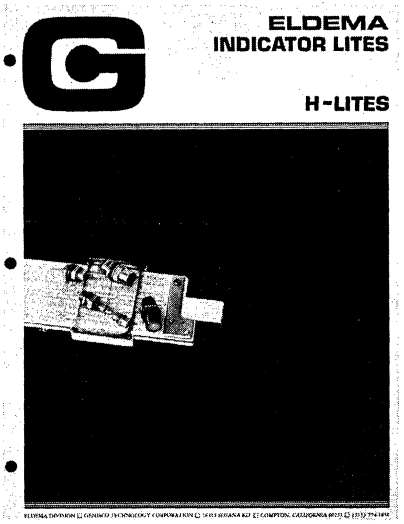
NEON E-LITES

EG-SERIES
NEON LAMP WITHOUT RESISTOR

PERMANENT NEON INDICATOR LITES
MOUNT FROM THE REAR IN 3/8" HOLES.
MEET REQUIREMENTS OF MIL-L-3661.

ER-SERIES
NEON LAMP WITH BUILT-IN RESISTOR

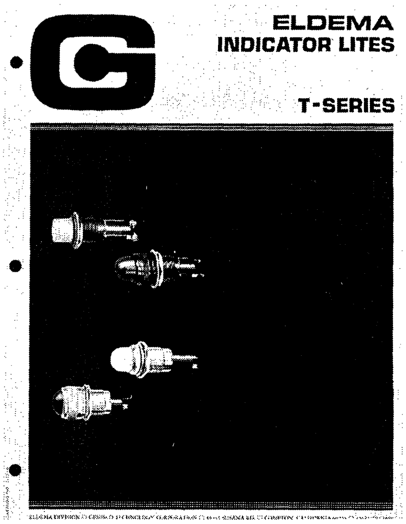
5. Permanent mounting indicators featuring a lamp life that should go beyond any need for replacement. Ideal on applications for 110-125V AC. Lenses available in five colors and a variety of shapes.



ELDEMA
INDICATOR LITES

H-LITES

6. Subminiature T-1 relampable lites. Lamp and lens cap both replaceable from the front without any special tools. Watertight and RFI shielded models available.



ELDEMA
INDICATOR LITES

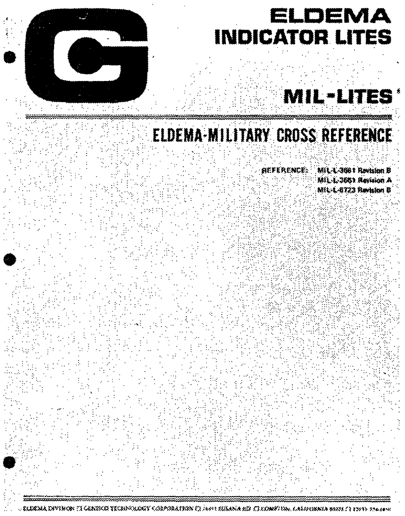
T-SERIES

10. Lampholders and lens caps for the T 3¼ bayonet based incandescent and neon lamps. 11/16" diameter mounting, watertight and RFI shielded models available.

ELDEMA
INDICATOR LITES

RFI/EMI SHIELDING
TECHNICAL BULLETIN

11. Describes materials and methods used in manufacture of Eldema shielded indicator lites. Also, detailed description of testing we carried out, using techniques specified by MIL-STD-285, and the results of those tests.



ELDEMA
INDICATOR LITES

MIL-LITES®

ELDEMA-MILITARY CROSS REFERENCE

REFERENCE: MIL-L-3661 Revision B
MIL-L-3661 Revision A
MIL-L-6723 Revision B

12. Complete cross-reference to MIL-L-3661 Revision B and MIL-L-6723 Revision B.

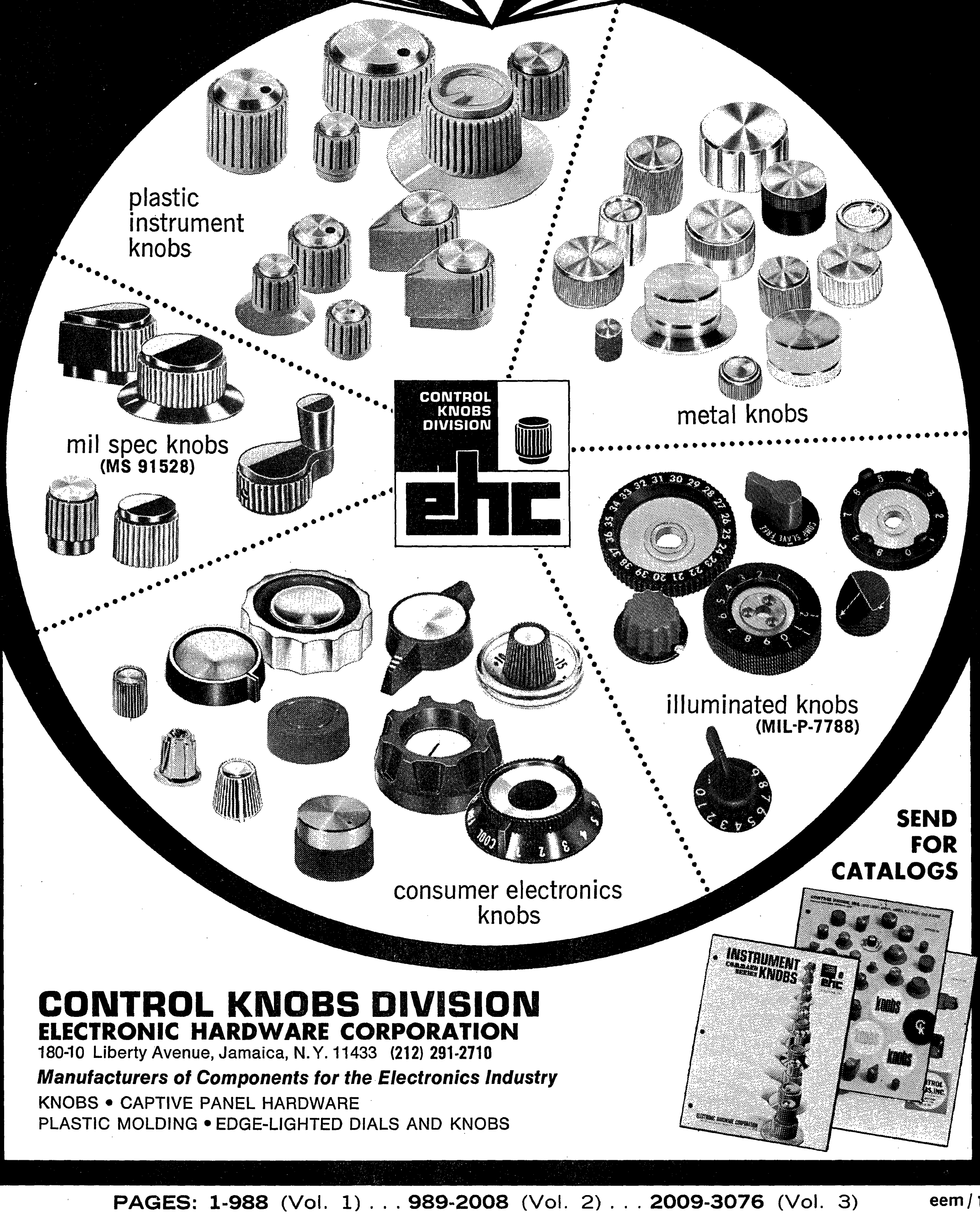
Send for them.

Call or write:
Eldema Division
Genisco Technology Corporation
M/S 520
18435 Susana Rd.
Compton, Calif. 90221
(213) 774-1850

CONTROL KNOBS DIVISION

ELECTRONIC HARDWARE CORPORATION

KNOBS


plastic instrument knobs
metal knobs
mil spec knobs
(MS 91528)
CONTROL KNOBS DIVISION
ehc
illuminated knobs
(MIL-P-7788)
consumer electronics knobs
INSTRUMENT COMMAND SERIES KNOBS
knobs

SEND FOR CATALOGS

CONTROL KNOBS DIVISION

ELECTRONIC HARDWARE CORPORATION
180-10 Liberty Avenue, Jamaica, N.Y. 11433 (212) 291-2710

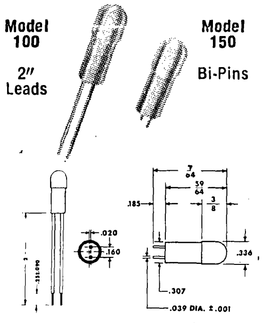
Manufacturers of Components for the Electronics Industry

KNOBS • CAPTIVE PANEL HARDWARE
PLASTIC MOLDING • EDGE-LIGHTED DIALS AND KNOBS

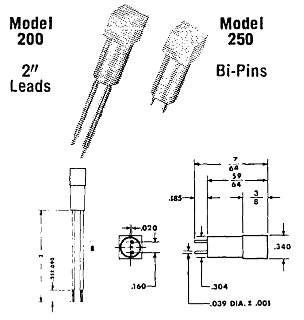
GENERAL ILLUMINATION, INC.
2233 University Avenue, St. Paul, Minn. 55114
Telephone: (612) 646-2823

SUBMINIATURE INDICATOR LIGHTS

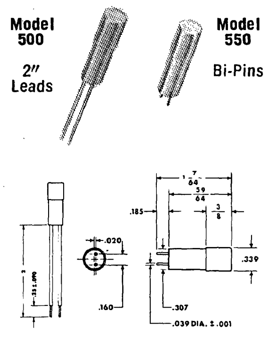
100 SERIES


Model 100
2″ Leads
Model 150
Bi-Pins
7/64
59/64
3/8
.185
.020
.160
.336
.307
.039 DIA. ±.001

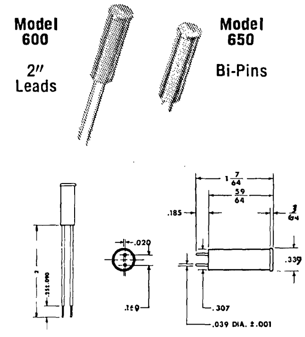
200 SERIES


Model 200
2″ Leads
Model 250
Bi-Pins
7/64
59/64
3/8
.185
.020
.340
.160
.304
.039 DIA. ±.001

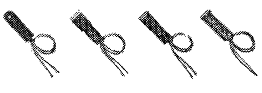
500 SERIES


Model 500
2″ Leads
Model 550
Bi-Pins
1 7/64
59/64
3/8
.185
.020
.339
.160
.307
.039 DIA. ±.001

600 SERIES


Model 600
2″ Leads
Model 650
Bi-Pins
1 7/64
59/64
3/64
.185
.020
.339
.160
.307
.039 DIA. ±.001

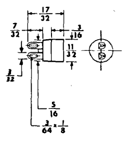
ECONOMY MODELS OF THE ABOVE SERIES:


190
290
590
690

GENERAL SPECIFICATIONS:

- Incandescent bulbs with 28 AWG insulated 8″ stranded leads.
- Not sealed against moisture and dust.
- Lens and body are dimensioned as above.

Model S-101

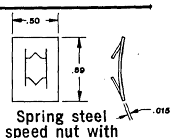

17/32
7/32
3/16
11/32
3/32
5/16
3/64 × 1/8

Socket Bi-Pin

HOW TO ORDER

EXAMPLE:

100	6	H538
Model Number	Lens Color	Bulb Type



Spring steel speed nut with phenolic finish.

LENS COLOR CODES

(Use color code numbers)

1 Transparent Amber
2 Transparent Red
3 Transparent Blue*
4 Transparent Green*
5 Transparent Clear
6 Translucent Yellow
7 Translucent Red
8 Translucent Blue*
9 Translucent Green*
10 Translucent White

*NOTE: Blue and Green lenses not recommended for use with neon bulbs.

STANDARD FEATURES:

- Built-in T1 ¾ incandescent or T2 neon bulbs.
- Standard termination — 2″ stranded insulated leads (incandescent) 1¾″ solid insulated leads (neon) or Bi-Pins (other lead lengths available upon request).
- Rapid assembly with non-corrosive Tinnerman speed nut (furnished).
- Ultra-long life bulbs.
- Sealed against moisture and dust.
- Optically engineered lens provides full 180° visibility.
- Explosion proof — meets requirement of MIL-E-5400.
- Simplified one piece plastic constructed lens and body.
- Choice of 5 transparent and 5 translucent colors.

GENERAL SPECIFICATIONS:

- Front mounting in $\frac{5}{16}$″ clearance hole.
- Center-to-center spacing ½″.
- Materials: High impact butyrate plastic body and lens; 22 AWG PVC $\frac{1}{32}$″ insulated leads 105°C, 600 volt (7/30); or Bi-Pins — brass ½ hard, gold plated.
- Hot stamping legends available: Four 6pt ($\frac{5}{64}$″); Three 8pt ($\frac{3}{32}$″); or Three 10pt ($\frac{1}{8}$″), characters in black or white (NOT AVAILABLE ON 100 SERIES).
- Unless otherwise specified, all tolerances: ±.005 Decimals, and ±$\frac{1}{64}$ Fractions.

BULB SPECIFICATIONS — INCANDESCENT

(Use bulb number)

Bulb Type	Operating Voltage	Current Amperes	Hours Life
(High Brightness)			
H524	5.0	.180	50,000
H529	6.3	.200	50,000
H533	10.0	.070	50,000
H538	14.0	.080	50,000
HM550	24.0	.037	7,000
HM553	28.0	.040	25,000
(Standard Brightness)			
M522	3.0	.015	10,000
M526	5.0	.066	10,000
M525	5.0	.036	90,000
M525	6.0	.039	75,000
M525	6.3	.040	50,000
M801	10.0	.014	10,000
M540	10.0	.036	100,000
M542	14.0	.035	20,000
HM550	18.0	.032	100,000
HM553	24.0	.037	150,000
M555	28.0	.040	50,000

NOTE: Other bulb types available upon request.

BULB SPECIFICATIONS — NEON

(Use bulb number)

Bulb Type	Circuit Volts AC	Circuit Volts DC	Starting Volts AC	Starting Volts DC	Watts	Resistor Attached
(High Brightness — Dark Starting)						
C2A	115	150	95	135	1/4	None*
RC2X	115	150	95	135	1/4	30K ohm
(Standard Brightness)						
A9A	115	115	65	90	1/15	None*
RA9X	115	115	65	90	1/15	100K ohm

Economy version available — (unit not sealed and no insulation on leads) to order place "N" before bulb type.

*NOTE: Neon assemblies without resistor attached require a current limiting device in the circuit.

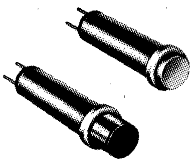
SEE OTHER PRODUCTS LISTED: LIGHT EMITTING DIODES (LED's); PAGE 1460
INCANDESCENT LAMPS; PAGE 1461

GENERAL ILLUMINATION, INC.

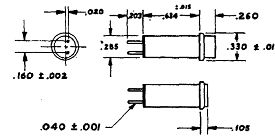
2233 University Avenue, St. Paul, Minn. 55114
Telephone: (612) 646-2823

SUBMINIATURE
CARTRIDGE LIGHTS
AND ULTRAMINIATURE
INDICATOR LIGHTS

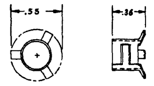
Model 750-1



Model 750-2



C-103



Barrel Fastener

STANDARD FEATURES:

- Built-in T1 ¾ incandescent or T2 neon bulbs.
- Stainless steel Bi-Pin terminal contacts (insulated from body).
- Other contact styles or wire leads available on request.
- Rapid assembly with non-corrosive barrel fastner (optional).
- Ultra-long life bulbs (see bulb table on preceding page).
- Anodized aluminum body.
- Choice of two standard optically engineered lenses providing full 180° visibility.
- Assembly built to meet MIL-L-3661.
- Choice of six standard colors (listed this page-use lens color code when ordering).

LENS COLOR CODES
(Use color code numbers)

5 Transparent Clear	8 Translucent Blue*
6 Translucent Yellow	9 Translucent Green*
7 Translucent Red	10 Translucent White

*NOTE: Blue and Green color lenses not recommended for use with neon bulbs.

GENERAL SPECIFICATIONS:

- Easy front mounting and replacing.
- Center-to-center spacing ½″.
- Materials: High impact butyrate plastic lens (polycarbonate lens available upon request); anodized aluminum body internally insulated.
- Hot stamping legends available in black or white.
- Unless otherwise specified, all tolerances: ±.005 Decimals, and ±1/64 Fractions.

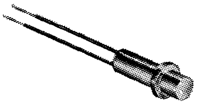
REFER TO PRECEDING PAGE FOR BULB TABLE

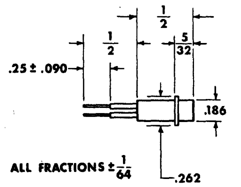
HOW TO ORDER

EXAMPLE:

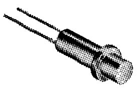
750	**1**	**6**	**H538**
Series	Lens Model	Lens Color	Bulb Type

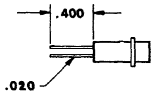
Model 300



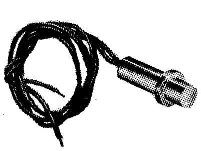


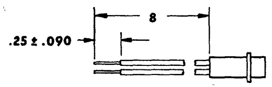
Model 350



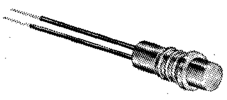


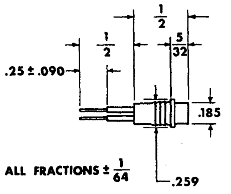
Model 390



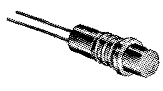


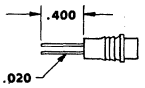
Model 400



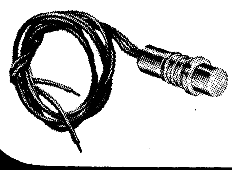


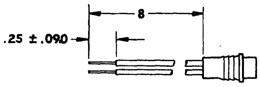
Model 450





Model 490





STANDARD FEATURES AND SPECIFICATIONS:

- Built-in T1 incandescent or neon bulbs.
- Standard termination — ½″ solid insulated wire leads or bi-pins (incandescents or neons) or 8″ stranded insulated leads (incandescent only).
- Rapid assembly — front mounting into 3/16″ clearance hole, with non-corrosive Tinnerman speed nut (300 series) or ribbed body for "snap-in" panel mounting (400 Series). Center-to-center mounting space: ⅜″ series 300; and 5/16″ series 400.
- Sealed against moisture and dust.
- Optically engineered lens provides full 180° visibility.
- Explosion proof — meets requirement of MIL-E-5400.
- Simplified one piece plastic constructed lens and body.
- Choice of 5 transparent and 5 translucent colors (see color code table on preceding page). (See how to order — preceding page).
- Materials: High impact butyrate plastic body and lens. 30 AWG PVC .010 insulated leads, 105°C 300 volts. Bi-Pins — nickel. Spring speed nut (series 300) has phenolic finish (⅜″ x ⅝″).
- Hot stamping legends available: Two 6pt (5/64″) or one 8pt (3/32″) characters in black or white.

BULB SPECIFICATIONS — INCANDESCENT
(Use bulb number)

Bulb Type	Operating Voltage	Current Amperes	Hours Life
	(High Brightness)		
HM609	5.0	.115	40,000
HM619	6.0	.066	18,000
HM619	6.3	.067	10,000
HM628	12.0	.060	16,000
HM642	28.0	.024	16,000
	(Standard Brightness)		
HM605	5.0	.020	5,000
HM619	5.0	.060	200,000
HM628	10.0	.055	160,000
HM631	14.0	.023	200,000
HM642	24.0	.022	110,000

BULB SPECIFICATIONS — NEON
(Use bulb number)

Bulb Type	Circuit Volts AC	Breakdown Volts AC	Resistor Attached
M711	115	100	None*
RM711X	115	100	390K ohm

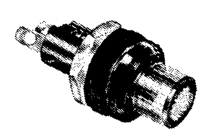
*NOTE: Neon assemblies without resistor attached require a current limiting device in the circuit.

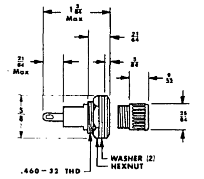
SEE OTHER PRODUCTS LISTED: LIGHT EMITTING DIODES (LED's): PAGE 1460
INCANDESCENT LAMPS: PAGE 1461

GENERAL ILLUMINATION, INC.
2233 University Avenue, St. Paul, Minn. 55114
Telephone: (612) 646-2823

MINIATURE RELAMPABLE INDICATOR LIGHTS

Model 1000

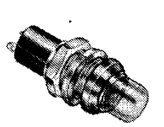


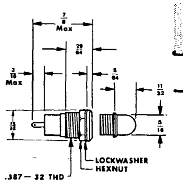


SPECIFIC FEATURES:

- Utilizes T1 ¾ midget screw based incandescent bulb (with elongated glass to permit easy relamping).
- Internal rib fluted plastic "high hat" lens.
- Attractive black bakelite bezel and mounting bushing (15/32"-½" mounting hole).
- Maximum panel thickness—.065"
- Maximum projection back of panel —.930".
- Center-to-center spacing ¾".
- All tolerances ±.005" on decimals. ±1/64" on fractions.

Model 1100





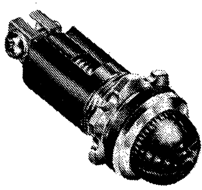
SPECIFIC FEATURES:

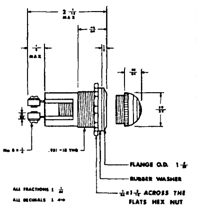
- Utilizes T1 ¾ midget screw based incandescent bulb (with elongated glass to permit easy relamping).
- Plastic dome lens.
- Clearance mounting: 13/32"-27/64".
- Maximum panel thickness — .216".
- Maximum projection back of panel—.795".
- Center-to-center spacing 11/16".
- All tolerances ±.005" on decimals. ±1/64" on fractions.

BULB SPECIFICATIONS — INCANDESCENT
(Use bulb number)

Bulb Type	Operating Voltage	Current Amperes	Hours Life
MM36	3.5	.095	200,000
MR60	5.0	.052	200,000
MM36	5.0	.110	150,000
MM36	6.0	.125	15,000
MR60	6.0	.060	60,000
MM36	6.3	.130	10,000
MR12	10.0	.022	200,000
MR12	12.0	.025	30,000
MR24	18.0	.022	200,000
MR24	24.0	.025	10,000

Model 2000





SPECIFIC FEATURES:

- Utilizes T4 ½ candelabra screw based fluorescent or neon bulbs; (do not exceed 2 watts).
- Bullseye internal fluted plastic lens.
- Screw contact termination.
- Ruggedly made for severe duty.
- Maximum panel thickness — 13/32".
- Maximum projection back of panel—1 15/16".
- Center-to-center spacing 1 7/16".

BULB SPECIFICATIONS — FLUORESCENT
(Use bulb number)

Bulb Type	Operating Voltage	Current Amperes	Hours Life
MM110	105-120	.0055(avg)	1,000

BULB SPECIFICATIONS — NEON

Bulb Type	Circuit Volts AC	Circuit Volts DC	Starting Volts AC	Starting Volts DC	Built-in Resistor	Hours Life
NE58	220	220	55	75	100k	7,500
NE45	115	115	65	90	30k	7,500

Model 1600

Model 1700

SPECIFIC FEATURES:

- Utilizes T3 ¼ S.C. bayonet based bulb.
- Chrome bezeled glass lens (jeweled-model 1600, and convexed-model 1700).
- Clearance mounting 11/16" with shock absorbing grommet (not pictured).
- Maximum panel thickness — 15/64".
- Maximum projection back of panel — 1 33/64".
- Center-to-center spacing 29/32".

BULB SPECIFICATIONS — INCANDESCENT
(Use bulb number)

Bulb Type	Operating Voltage	Current Amperes	Hours Life
(High Brightness)			
44	6.3	.250	3,000
1815	14.0	.200	3,000
1819	28.0	.040	1,000
(Standard Brightness)			
47	6.3	.150	3,000
756	14.0	.080	50,000
757	28.0	.080	50,000

Model 1800

Model 1900

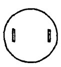
SPECIFIC FEATURES:

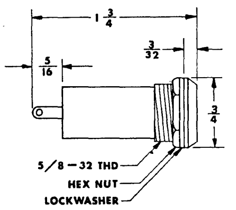
- Utilizes T3 ¼ S.C. bayonet based bulb.
- Internal fluted plastic lens (model 1800), and plastic dome lens (model 1900).
- Maximum panel thickness — 15/64".
- Maximum projection back of panel — 1 33/64".
- Center-to-center spacing 29/32".

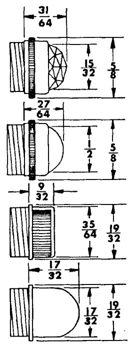
BULB SPECIFICATIONS — INCANDESCENT
(Use bulb number)

Bulb Type	Operating Voltage	Current Amperes	Hours Life
(High Brightness)			
44	6.3	.250	3,000
1819	28.0	.040	1,000
(Standard Brightness)			
47	6.3	.150	3,000
756	14.0	.080	50,000

NOTE: Other lamps available from distributor. Do not exceed 2 Watts models 1800 and 1900.







GENERAL STANDARD FEATURES:

- Lamp and lens replaceable from front of panel.
- Screw-in plastic or glass lenses, (see specific model), provide full 180 visibility.
- Lamp holder bodies made of black bakelite plastic with bright chrome plated brass bezels and mounting bushings.
- Front panel mounting into 4 different hole sizes.
- Choice of several lens colors (see lens color code table this page).
- Solder lug termination.

HOW TO ORDER

EXAMPLE:	Model Number	Lens Color	Bulb Type
With bulb	1000	01	MM36
Without bulb	1000	01	0000

LENS COLOR CODE TABLE

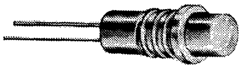
Lens		Models						
Colors	Codes	1000	1100	1600	1700	1800	1900	2000
Transparent Red	01	X	X	X	X	X	X	X
Transparent Clear	02	X	X			X		
Transparent Amber	03	X		X	X	X		
Translucent Red	04	X	X				X	
Translucent White	05	X	X			X		X
Translucent Yellow	06	X	X				X	
Transparent Green	07			X	X	X		X
Transparent Blue	08				X	X		
Translucent Green	09						X	

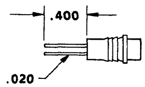
SEE OTHER PRODUCTS LISTED: LIGHT EMITTING DIODES (LED's); PAGE 1460
INCANDESCENT LAMPS; PAGE 1461

GENERAL ILLUMINATION, INC.
2233 University Avenue, St. Paul, Minn. 55114
Telephone: (612) 646-2823

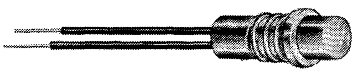
LIGHT EMITTING DIODES LED'S

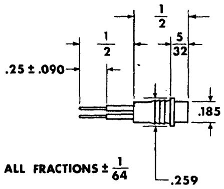
Model 4000
LED Ultraminiature Indicator





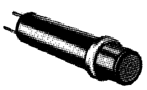
Model 4100

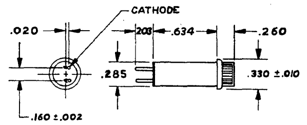




- High brightness LED.
- One piece lens and body.
- Transparent or translucent red body.
- External series resistor required.

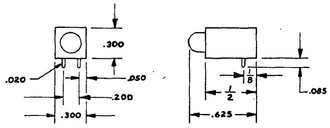
Model 4400
LED Cartridge Light





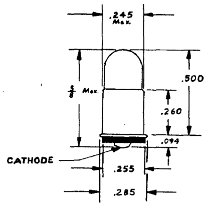
- Cartridge uses a high brightness light emitting diode (1100 foot lamberts typ).
- Package to MIL-L-3661 specifications.
- Solid state reliability.
- Butyrate clear or red lens.
- Low power requirements.
- Stainless steel contacts.
- Clear anodized body.
- Standard bi-pin cartridge holder mounting.
- Series resistor is mounted internally.
- Other contact styles available on request.

Model 4500
Printed Circuit Board Indicator



- Low profile for minimum spacing.
- External series resistor required.
- Plastic body.
- Large high brightness LED.

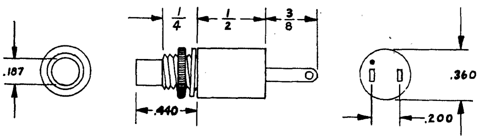
Model 4200
LED T1 3/4 Replacement Lamp



Standard
T1 3/4 SC Midget Flanged Base

External Series Resistor Required

Model 4300
LED Miniature Indicator



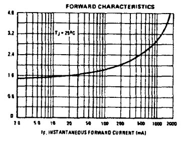
- Mounts in 1/4″ hole.
- Transparent red or clear lens.
- Dot near contact indicates cathode.
- Black anodized aluminum panel nut.
- Gold or solder plated contacts.
- Other contact styles available on request.
- Series resistor mounted internally.

- PN gallium arsenide phosphide.
- Compatible with transistor and integrated circuits.
- Low temperature operation.
- Operating and storage junction temperature −40°C to +85°C.

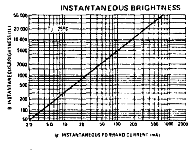
Parameters	Model 4000 4100 4300 Typ.	Model 4000 4100 4300 Max.	Model 4200 4500 Typ.	Model 4200 4500 Max.	Model 4400 Typ.	Model 4400 Max.	Units
Forward Current I_F		40		50		100	mA
Reverse Voltage V_R		3.0		4.0		3.0	Volts
Forward Voltage V_F $I_F = 20$ mA	1.6	2.0	1.6	1.8	1.65	2.0	Volts
Reverse Leakage Current I_R $V_R = 3.0$V $R_L = 1.0$ Megohm	100		100		10		μA nA
Total Device Dissipation @ $T_A = 25$°C P_D Derate above 25°C		120 2.0		120 2.0		200 2.67	mW mW/°C
Total Capacitance C_T $V_R = 0$ V f = 1.0 MHz	150		150		115		pF
Turn On Turn Off Time t_r and t_f	10		10		1		nS
Brightness B (1) $I_F = 10$ mA 20 mA 50 mA	330 750	1600(2)	200 1100		1100		fL

(1) Before packaging. (2) at 40 mA

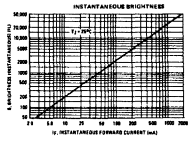
All Models



Model 4000, 4100, 4300



Model 4200, 4400



GENERAL ILLUMINATION

SEE OTHER PRODUCTS LISTED: INDICATOR LIGHTS; PAGE 1457
INCANDESCENT LAMPS; PAGE 1461

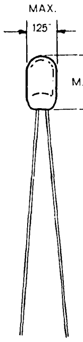
GENERAL ILLUMINATION, INC.

2233 University Avenue, St. Paul, Minn. 55114
Telephone: (612) 646-2823

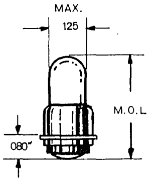
SUB-MINIATURE LAMPS (INCANDESCENT)

A.S.A. Lamp No.	Design Volts	Design Amps	Approx. M.S.C.P.	Average Life (Hrs.)	Filament Style	M.O.L. (inches)
T-1 WIRE TERMINAL (SEE FIGURE 1)						
605	5.0	.020	.034	5,000	C-2R	0.25
680	5.0	.060	.032	200,000	C-2R	0.25
683	5.0	.060	.053	100,000	C-2R	0.25
713	5.0	.075	.088	16,000	C-2R	0.25
715	5.0	.115	.147	40,000	C-2R	0.25
7219	12.0	.060	.150	16,000	C-2V	0.30
7220	18.0	.026	.150	10,000	C-2V	0.30
T-1 SUB-MIDGET FLANGED (SEE FIGURE 2)						
682	5.0	.060	.032	200,000	C-2R	0.375
685	5.0	.060	.053	100,000	C-2R	0.375
714	5.0	.075	.080	16,000	C-2R	0.375
718	5.0	.115	.147	40,000	C-2R	0.375
32	12.0	.060	.150	16,000	C-2V	0.420
7241	18.0	.026	.150	10,000	C-2V	0.420
T-1 BI-PIN BASE (SEE FIGURE 3)						
7682	5.0	.060	.032	200,000	C-2R	0.360
7685	5.0	.060	.053	100,000	C-2R	0.360
7714	5.0	.075	.088	16,000	C-2R	0.360
7718	5.0	.115	.147	40,000	C-2R	0.360
32BP	12.0	.060	.150	16,000	C-2V	0.410
7241BP	18.0	.026	.150	10,000	C-2V	0.410
T-1¾ WIRE TERMINAL (SEE FIGURE 4)						
1783	2.5	.200	.22	500	C-2R	0.52
2158	3.0	.015	.002	10,000	C-6	0.52
1730	6.0	.040	.03	10,000	C-2R	0.52
1784	6.0	.200	.60	1,000	C-2R	0.52
2180	6.3	.040	.02	50,000	C-2R	0.52
1739	6.3	.075	.22	500	C-2R	0.52
2181	6.3	.200	.40	50,000	C-2R	0.52
2112	6.3	.200	.55	3,000	C-2R	0.52
1869	10.0	.014	.008	10,000	C-2F	0.52
2107	10.0	.040	.08	30,000	C-2V	0.52
2182	14.0	.080	.30	50,000	C-2V	0.52
1705	14.0	.080	.50	750	C-2V	0.52
2102	18.0	.040	.15	1,000	C-2F	0.52
2185	28.0	.040	.20	50,000	C-2F	0.52
1762	28.0	.040	.34	1,000	C-2F	0.52
2187	28.0	.040	.30	25,000	C-2F	0.52
T-1¾ MIDGET FLANGED (SEE FIGURE 5)						
338	2.7	.060	.04	6,000	C-2R	0.625
328	6.0	.200	.60	1,000	C-2R	0.625
345	6.0	.040	.03	10,000	C-2R	0.625
380	6.3	.040	.02	50,000	C-2R	0.625
344	10.0	.014	.008	10,000	C-2F	0.625
330	14.0	.080	.50	750	C-2V	0.625
382	14.0	.080	.30	50,000	C-2V	0.625
327	28.0	.040	.34	1,000	C-2F	0.625
387	28.0	.040	.30	25,000	C-2F	0.625
T-1¾ BI-PIN BASE (SEE FIGURE 6)						
7331	1.35	.060	.01	500	C-6	0.625
7338	2.7	.060	.04	6,000	C-2R	0.625
7799	3.0	.015	.002	10,000	C-2R	0.625
7328	6.0	.200	.60	1,000	C-2R	0.625
7345	6.0	.040	.03	10,000	C-2R	0.625
7327	28.0	.040	.34	1,000	C-2F	0.625

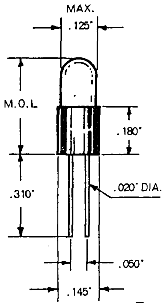
NUMEROUS OTHER LAMP TYPES AND STYLES AVAILABLE ON REQUEST



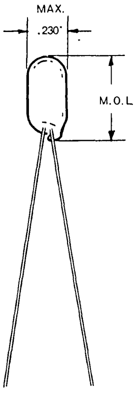
❶



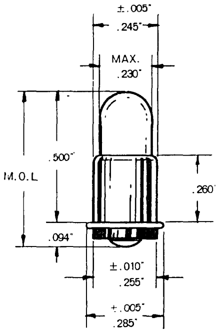
❷



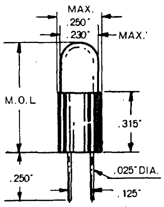
❸



❹



❺

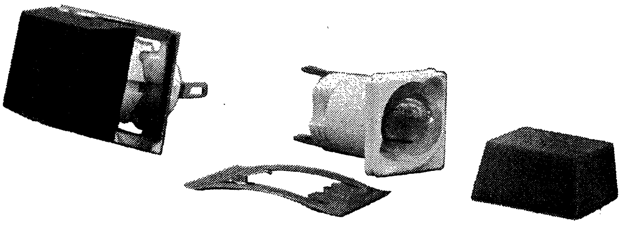


❻

SEE OTHER PRODUCTS LISTED: LIGHT EMITTING DIODES (LED's); PAGE 1460
INDICATOR LIGHTS PAGE 1457

INDICATING LIGHTS

CR103 TYPE B MINIATURE SQUARE INDICATING LIGHTS



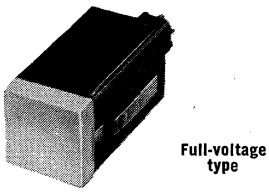
The CR103 Type B general-purpose miniature indicating light is a small, "square look" unit that provides positive visual indication on control panels and consoles, data processing equipment, and wherever production and automated systems exist. A complete light consists of a base unit with bulb, lens and spring clip.

FEATURES

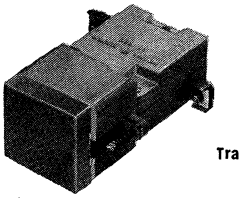
2-pin type lamp replaceable from front of panel; interchangeable lenses of snap-on construction; choice of red, white, green, or yellow lenses; optional arrow indicator on lens ideal for flow charts; low power requirement of 6, 12, or 24 volts; simple one-hole mounting.

Write for Bulletin GEA-7398

CR103 TYPE C SQUARE INDICATING LIGHTS



Full-voltage type

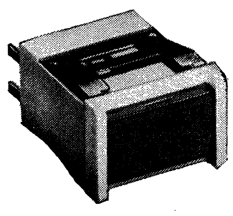


Transformer type

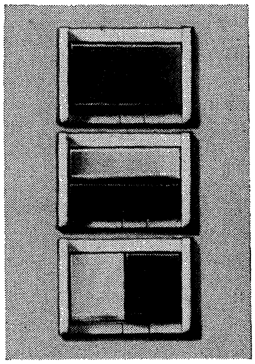
CR103 C square indicating lights are designed for use in a wide variety of applications such as: business machines, operator panels, consoles, control desks, motor control centers, and for the panel building, electronic and intrumentation fields. Full voltage and transformer types in a variety of colors are available. Lenses may be translucent type or transparent type used with a diffuser. Legends can be engraved and filled on translucent lenses.

Write for Bulletin GEA-7366

CR103 TYPE D INDICATING LIGHTS



With solid lens cap installed



Solid or split color fields give added flexibility. Colors can be mixed in the split field forms for even more combinations.

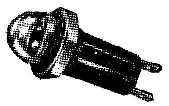
General Electric's new line of CR103 Type D indicating lights are designed for a wide variety of applications such as control and instrument panels, office machines, laboratory instruments, computers and other data processing equipment. Matching illuminated push button switches are shown in Section 5100 on page of General Electric switches.

FEATURES

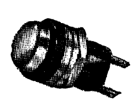
- Units snap into panels from front without tools, and can be gang-mounted horizontally to save space or for group functions.
- Convenient slide-on lens caps in five colors; four housing colors. Units are single button only. and have solid horizontally- or vertically-split color fields. 2-lamp and 4-lamp forms are available.
- Legend inserts for all forms can be printed or engraved on acetate or similar material of 10 mils or less thickness.

Write for Bulletin GEA-7390

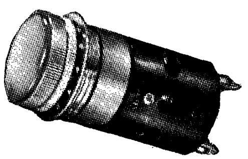
CR103 TYPE H INDICATING LIGHTS



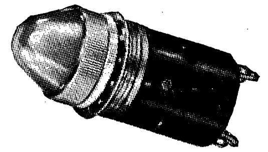
With spherical lens for 11/16-in. mtg. hole



With crown lens for 15/32-in. mtg. hole



With crown lens for 1-in. mtg. hole



With torpedo lens for 1-in. mtg. hole

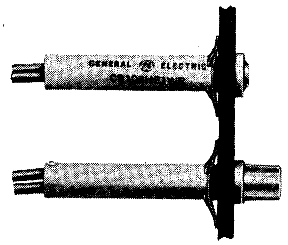
CR103 Type H indicating lights give bright visual indication of circuit operating conditions for applications where oil-tightness is not required.

FEATURES

- **Vivid Colors** — yellow (amber), blue, green, red, white and clear.
- **Even Illumination** — Lexan diffuses light and gives off an even glow.
- **Durable** — lenses will not shatter, resist high temperatures.
- **Compact** — forms for 15/32, 11/16, or 1-inch mounting holes.
- **Rating Flexibility** — wide variety of lamp voltages available. Lamp is supplied by the customer.
- **Ease of Installation** — lamps and lenses install from the front.

Write for Bulletin GEA-8119

CR103 TYPE HE LOW-COST MINIATURE INDICATING LIGHTS



CR103 Type HE indicating lights are new, low-cost units for applications requiring a minimum of space. They are ideally suited for business machines, major appliances, small panels, meters, gages, timers, illuminated pointers, dial indicators, and many other places where panel appearance and visual display are important.

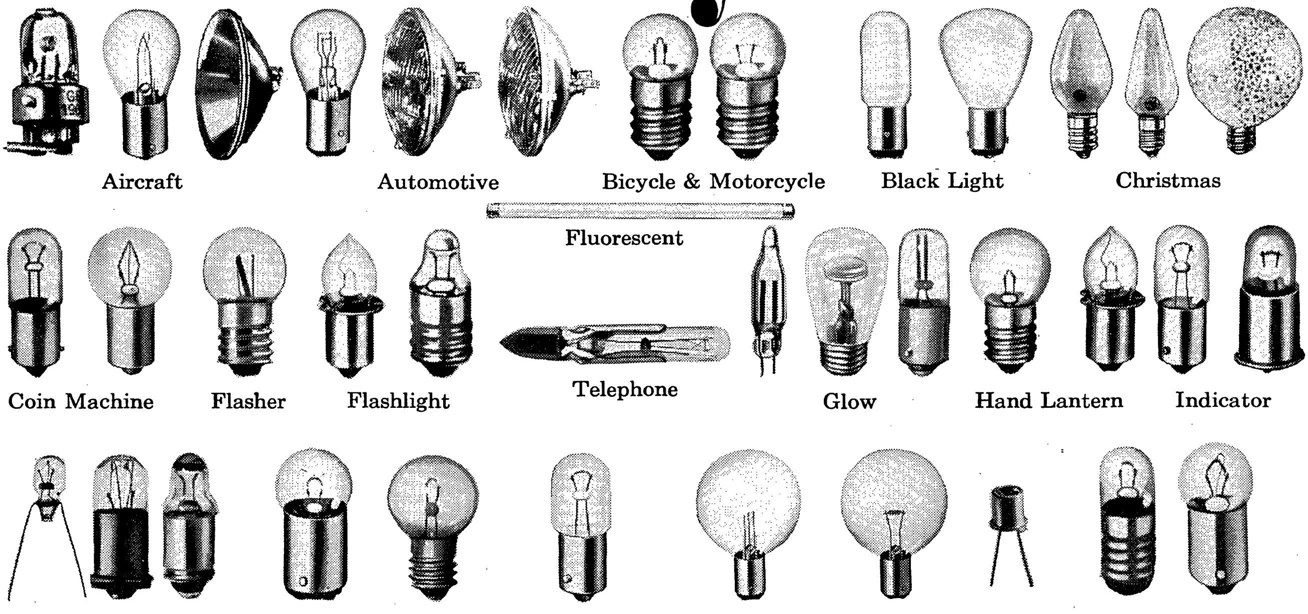
Only 1 11/16″ long, they mount with a speed nut in a 5/16″ dia hole. Choice of amber, clear, red, or white lenses in flush or cylindrical lens style. Body colors are black, gray, tan, or white. For 120, 240, or 480 volts.

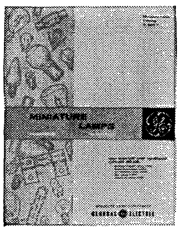
Write for Bulletin GEA-8119

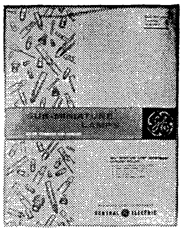
For complete information contact your nearby GE Sales Office, or write to General Electric Co., Section 998-80. Schenectady, N. Y. 12305.

GENERAL ELECTRIC

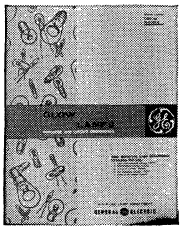
GE Miniature Lamps for every need

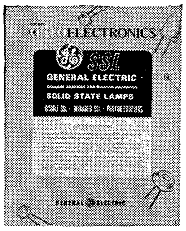



MINIATURE
#3-6253 EM


SUB-MINIATURE
#3-6252 EM

SEALED BEAM
#3-6251 EM


GLOW
#3-6254 EM


SOLID STATE
#3-0281R EM

GE Miniature Lamps for Your Products

Save time and money by selecting the lamp you need before your product design is frozen. Consider factors like size, power source, shock, life, light, temperature and assembly cost. Get complete and up-to-date electrical and physical specifications for over 1200 lamps from the General Electric catalogs shown above. Contact one of the offices below, or write General Electric, Miniature Lamp Dept., M1-1, Nela Park, Cleveland, Ohio 44112.

For helpful service contact one of these offices:

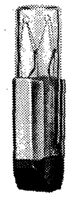
ATLANTA, GA.	120 Ottley Drive, N. E. P. O. Box 13917	30324	875-0921
BALTIMORE, MD.	1401 Parker Rd. Mail: P. O. Box 7427, Baltimore, Md.	21227	242-5700
BOSTON, MASS.	50 Industrial Place, Newton Upper Falls, Mass.	02164	332-6200
CHARLOTTE, N. C.	1001 Tuckaseegee Rd. Mail: P. O. Box 2144	28201	376-6585
CHICAGO, ILL.	550 West Jackson Blvd.	60606	332-4712
CINCINNATI, OHIO	49 Central Ave.	45202	421-6810
CLEVELAND, OHIO	12910 Taft Ave.	44108	266-4337
COLUMBUS, OHIO	800 Northwest Blvd.	43212	294-4115
DALLAS, TEXAS	6500 Cedar Springs Road	75235	351-3725
DENVER, COLO.	6501 Stapleton Dr., North	80216	388-4611
DETROIT, MICH.	15135 Hamilton Ave.	48203	883-0200
HONOLULU, HAWAII	Suite 300, 1149 Bethel	96813	537-3280
HOUSTON, TEXAS	5615 Lymbar Drive	77035	923-2549
INDIANAPOLIS, IND.	2511-F-1 East 46 St.	46205	547-5511
JACKSONVILLE, FLA.	4077 Woodcock Dr., Suite 222	32207	396-1205
N. KANSAS CITY, MO.	535 East 14th Ave.	64116	471-0123
LOS ANGELES, CALIF.	2747 S. Malt Ave.	90022	723-2541
MEMPHIS, TENN.	2021 S. Latham St.	38109	948-2642
MIAMI, FLA.	3655 N. W. 71st St.	33147	693-3811
MILWAUKEE, WIS.	8100 West Florist Ave., Mail: P. O. Box 299	53201	462-3860
MINNEAPOLIS, MINN.	500 Stinson Blvd.	55413	331-4050
NEWARK, N.J.	133 Boyd Street	07103	824-5200
NEW ORLEANS, LA.	4800 River Road, Mail: Box 10236, Jefferson Branch	70121	835-6421
NEW YORK, N.Y.	219 E. 42 St.	10017	750-2000
OAKLAND, CALIF.	999-98th Avenue.	94603	569-3422
OLKAHOMA CITY, OKLA.	Executive Terrace Bldg., 2809 N.W. Expressway	73112	842-4028
PHILADELPHIA, PA.	Rt. 202, At Expressway, King of Prussia, Pa.	19406	688-5900
PITTSBURGH, PA.	238 W. Carson St.	15219	471-9050
PORTLAND, ORE.	2800 N.W. Nela St.	97210	223-2101
RICHMOND, VA.	1510 Willow Lawn Dr., Mail: P. O. Box 8627	23226	282-7644
ROCHESTER, N.Y.	Gibbs St. Bldg., 31 Gibbs St., Room 500	14604	454-2990
ST. LOUIS, MO.	1530 Fairview Ave.	63132	429-6930
SEATTLE, WASH.	2400—6th Avenue, South	98134	622-8081
UTICA, N.Y.	c/o Radio Receiver Dept., P. O. Box 175, 1001 Broad St.	13501	733-0922

MINIATURE LAMP DEPARTMENT

GENERAL ELECTRIC

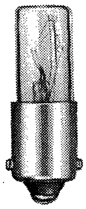
MINIATURE LAMPS & SIGNALING DEVICES

PILOT LAMPS



T-2 SLIDE BASE

Type	Mfg. Code	Rated Volts	Avg. Current (Amps.)	M.S.C.P.	Min. Lab. Life (Hours)
6PSB	30672-0	6	.140	.12	5,000
12PSB	31272-0	12	.170	.48	5,000
24PSB	32472-0	24	.073	.85	5,000
28PSB	32982-0	28	.040	.17	5,000
48PSB	34872-0	48	.053	.52	5,000
60PSB	36072-0	60	.050	.67	5,000
120PSB	32072-0	120	.025	.36	5,000

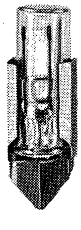


T-2½ MIN. BAY

Type	Mfg. Code	Rated Volts	Avg. Current (Amps.)	M.S.C.P.	Min. Lab. Life (Hours)
6MB	35100-0	6	.140	.12	5,000
12MB	35101-0	12	.170	.48	5,000
24MB	35103-0	24	.073	.85	5,000
28MB	35104-0	28	.040	.17	5,000
48MB	35105-0	48	.053	.52	5,000
60MB	35107-0	60	.050	.67	5,000
120MB	35108-0	120	.025	.36	5,000
120MB/6	35109-0	120	.052	1.30	3,000

INDICATOR LAMPS

INDICATOR LAMPS — SLIDE BASE



Type	Mfg. Code	Rated Volts	Avg. Current (Amps.)	M.S.C.P.	Min. Lab. Life (Hours)
4ESB	30450-0	4	.040	.02	5,000
5ESB	30550-0	5	.040	.04	5,000
6ESB	30650-0	6	.040	.025	5,000
10ASB	31040-0	10	.010	Red Glow	15,000
10CSB	31030-0	10	.017	.048	5,000
10ESB	31063-0	10	.040	.05	10,000
12ESB	31255-0	12	.040	.06	5,000
16CSB	31630-0	16	.017	.016	5,000
16ESB	31650-0	16	.040	.10	5,000
18ESB	31860-0	18	.040	.11	5,000
24CSB	32490-0	24	.017	.02	5,000
24ESB	32455-0	24	.040	.12	5,000
28ESB	32900-0	28	.040	.24	5,000
48ESB	34861-0	48	.040	.16	5,000

PILOT & INDICATOR CARTRIDGE LAMPS

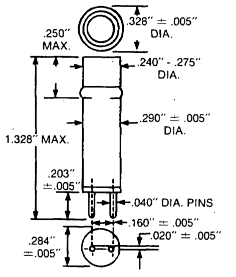
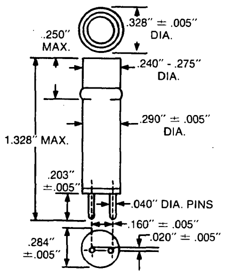


FIGURE I

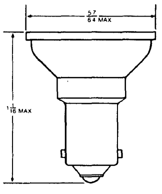
Lamp No.	Mfg. Code	Volts	Avg. Curr. (Amps)	Base	MIL No.
#21	30021-0	6	.140	Bi-Pin Car-tridge	
#31	30031-0	12	.170		
#41	30041-0	24	.073		
#51	30051-0	28	.040		
#61	30061-0	48	.053		MS18238-1
#71	30071-0	60	.050		MS18238-2
#81	30081-0	120	.025		

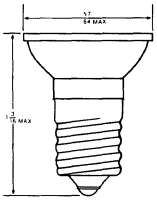
FIGURE II



Lamp No.	Mfg. Code	Volts	Avg. Current (Amps.)	Base
#901	30901-0	4	.040	Bi-Pin Car-tridge
#905	30905-0	5	.040	
#909	30909-0	6	.040	
#913	30913-0	10	.010	
#914	30914-0	10	.017	
#915	30915-0	10	.040	
#918	30918-0	12	.040	
#925	30925-0	16	.017	
#926	30926-0	16	.040	
#930	30930-0	18	.040	
#933	30933-0	24	.017	
#934	30934-0	24	.040	
#938	30938-0	28	.040	
#941	30941-0	48	.040	

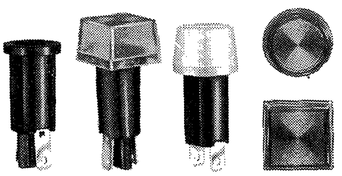
ANNUNCIATOR LAMPS





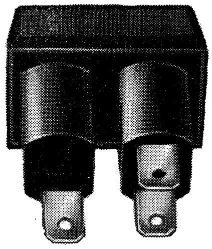
Type	Mfg. Code	Volts	Base
12RC	35121-0	12	Candelabra
60RC	35127-0	60	Candelabra
120RC	35128-0	120	Candelabra
12RB	35221-0	12	Miniature Bayonet
60RB	35227-0	60	Miniature Bayonet
120RB	35229-0	120	Miniature Bayonet

PANEL LIGHTS



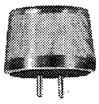
Round Lens Mfg. Code	Color	Square Lens Mfg. Code
30160-0	Red	30170-0
30161-0	Clear	30171-0
30162-0	Amber	30172-0
30163-0	White	30173-0
30164-0	Green	30174-0
30165-0	Blue	30175-0

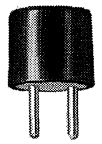
TWIN LIGHT CIRCUIT INDICATOR



LENS NO.	LENS COLOR
30180-0	Red
30182-0	Amber
30183-0	White
30184-0	Green
30185-0	Blue

PLUG-IN PANEL LIGHT, T-LITE





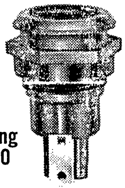
SPECIFICATIONS	PANEL LITE	T-LITE
Operating Volts	6 Volts	5 to 6
Current	130 MA.	60 MA.
Life	Over 5000 Hours	5000 Hours Minimum
Colors	Red-Amber-White Blue-Green	Red-Yellow-White
End View Lighted Area	Approximately ⅝"	5⁄16" Diameter

GTE SYLVANIA

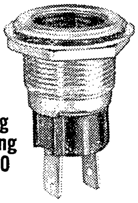
MINIATURE LIGHTING PRODUCTS • West Main St., Hillsboro, N.H. 03244

MINIATURE LAMPS & SIGNALING DEVICES

PILOT LIGHT HARDWARE



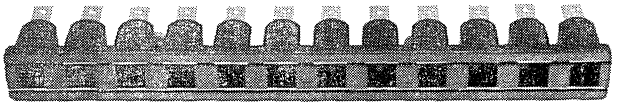
**Phenolic
Pilot
Manufacturing
Code 30094-0**



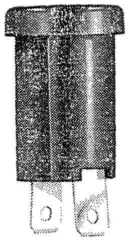
**Universal
Pilot Housing
Manufacturing
Code 30099-0**

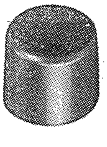
Color	FLAT TOP TRANSLUCENT Mfg. Code	JEWELED Mfg. Code	TRANSPARENT Mfg. Code
RED	30200-0	30100-0	30110-0
GREEN	30212-0	30102-0	30112-0
BLUE	30213-0	30103-0	30113-0
YELLOW	30214-0	—	30114-0
AMBER	—	30106-0	30111-0
CLEAR	—	—	30116-0
WHITE	30233-0	—	—
	FLUTED	**TRANSLUCENT**	
RED	30120-0	30130-0	—
GREEN	30122-0	30132-0	—
BLUE	30124-0	—	—
YELLOW	—	30131-0	—
AMBER	30126-0	—	—
CLEAR	30125-0	—	—
WHITE	—	30133-0	—

INDICATOR LIGHT HARDWARE



Type	Mfg. Code
Strip Socket, ½″ Centers, Common Ground	Strip - 31250-0
Strip Socket, ¾″ Centers, Common Ground	Strip - 31275-0
Strip Socket, ½″ Centers, Individual Contacts	Strip - 33250-0
Strip Stocket, ¾″ Centers, Individual Contacts	Strip - 33275-0

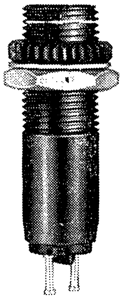




Color	PROFAX* Mfg. Code	PYREX GLASS Mfg. Code
Red	38001-0	38071-0
Yellow	38002-0	38072-0
White	38003-0	38073-0
Green	38004-0	38074-0
Blue	38005-0	38075-0

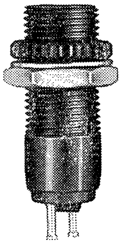
* Tinnerman clips for socket mounting included

CARTRIDGE LIGHT HARDWARE



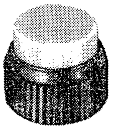
Pilot Cartridge Housing	MIL No.	Mfg. Code
SM-2*	MS 18236	30095-0
SM-2A**	MS 18236	30096-0

* Turret Lugs ** Solder Lugs



Indicator Cartridge Housing	MIL No.	Mfg. Code
SM-1A*	MS 18235	30097-0
SM-1A**	MS 18235	30098-0

* Turret Lugs ** Solder Lugs

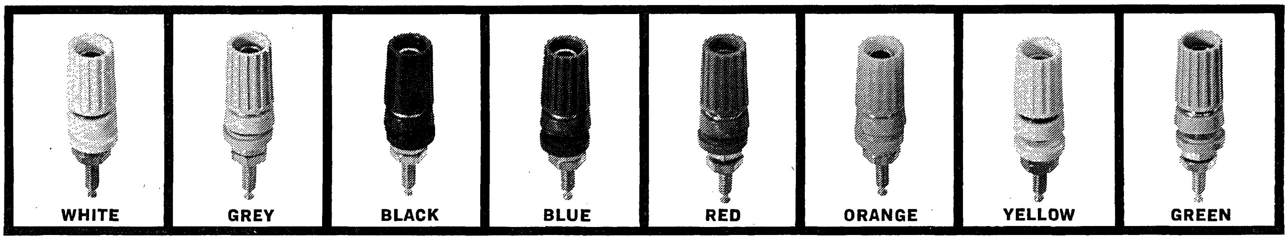


Color	Transparent Mfg. Code	Translucent Mfg. Code
Amber	30140-0	30145-0
Clear	30141-0	30146-0
Red	30142-0	30147-0
Blue	30143-0	30148-0
Green	30144-0	301-490

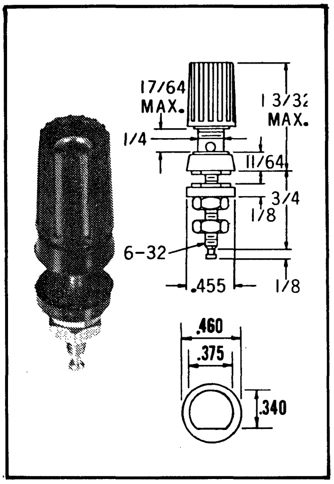
GTE
SYLVANIA

binding posts

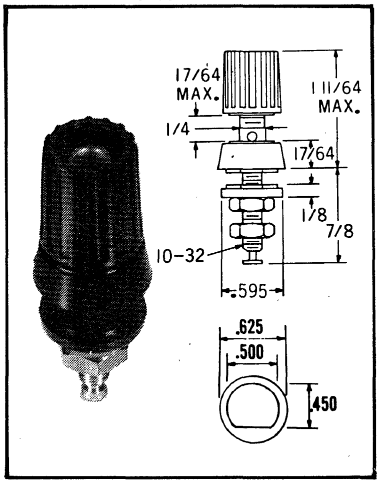
A high quality temporary input terminal for electronic instruments with sensitive and selective measuring capabilities. (See specifications section for voltage, ampere ratings and applicable military specifications.) The fluted design of the Binding Post knob matches any NOBEX control knob series for a co-ordinated front panel. All plastic parts of the assembly are injection molded of polycarbonate resin for excellent insulation resistance and dimensional stability. NOBEX Binding Posts are available in eight (8) standard opaque colors with custom colors available on special order. Series 810 and 820 Binding Posts are stocked with gold plated brass or copper inserts, Series 850 Dual Binding Posts with gold plated brass inserts. The assembly mounts in a round or "D" flat hole with insulator and two (2) brass hexagon nuts supplied for panel mounting. NOBEX Binding Posts are designed to be compatible with all commonly used methods of connection. NOBEX high quality is assured by a one (1) year factory replacement warranty.



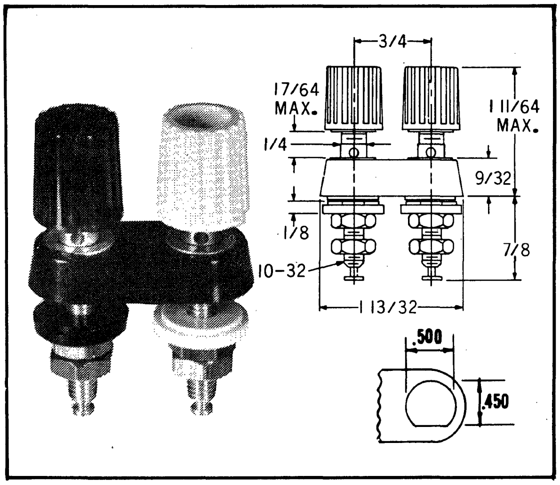
MINIATURE



STANDARD



DUAL STANDARD



ordering information

TYPE	INSERTS	WHITE	GREY	BLACK	BLUE	RED	ORANGE	YELLOW	GREEN
MINIATURE	BRASS	820-25	820-35	820-45	820-55	820-65	820-70	820-75	820-95
	COPPER	825-25	825-35	825-45	825-55	825-65	825-70	825-75	825-95
STANDARD	BRASS	810-25	810-35	810-45	810-55	810-65	810-70	810-75	810-95
	COPPER	815-25	815-35	815-45	815-55	815-65	815-70	815-75	815-95
STANDARD DUAL	BRASS	BLACK/BLACK			BLACK/WHITE			BLACK/RED	
		850-45-45			850-45-25			850-45-65	

specifications

Binding Post Locking Knob, Insulator and Washer

Injection molded of high heat and impact resistant Polycarbonate resin.

Shaft and Inserts

Brass with flash gold plating. Copper, tellurium alloy, flash gold plating.

Mounting Nuts

Brass, finished machined hexagon stock.

Service Rated

Standard Binding Posts are rated at 30 amperes, 1000 volts working. Miniature Binding Posts are rated at 15 amperes, 1000 volts working.

Polycarbonate Plastic exceeds Mil-P-20693, Type IV Military Specifications for nylon compounded parts.

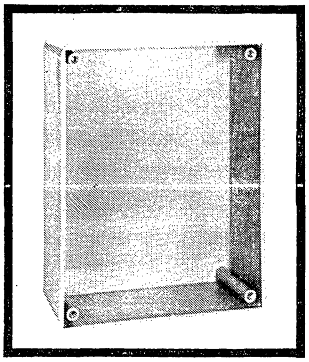
NOBEX ®

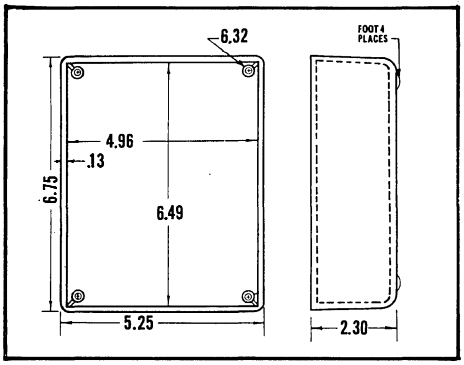
MECHANICAL COMPONENTS

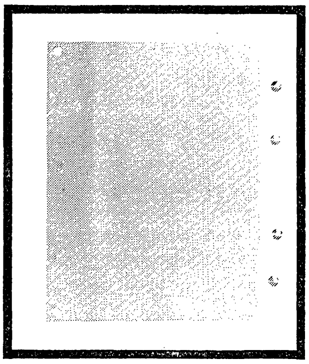
Manufactured in U.S.A.

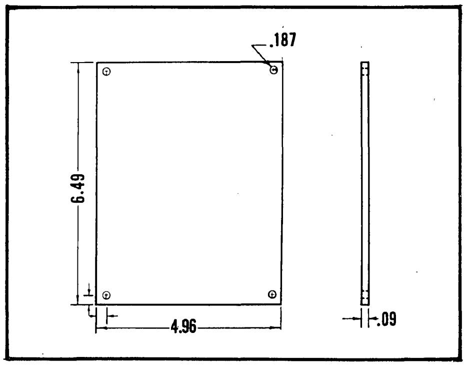
NOBEX DIVISION
GRIFFITH PLASTICS CORPORATION

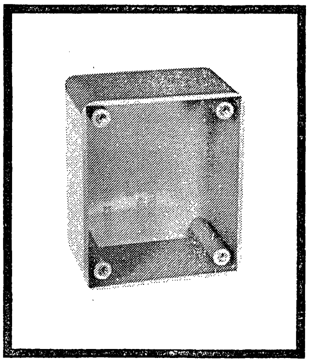
instrument cases

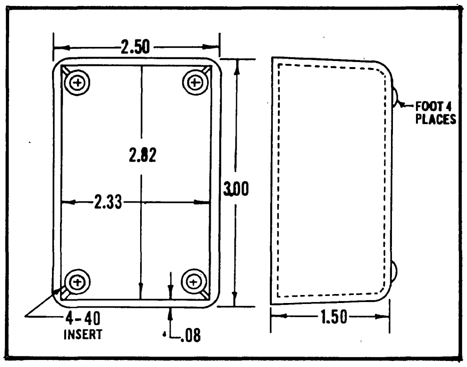


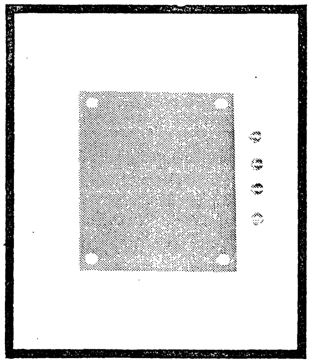


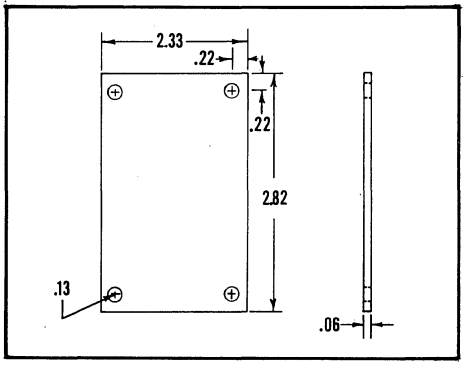


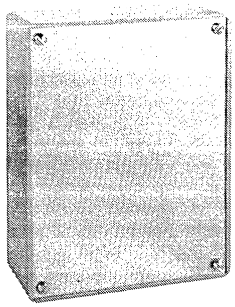












NOBEX manufactures the only line of portable Instrument Cases that are virtually unbreakable under normal use. Series 875 and 895 Instrument Cases are injection molded of tough, impact resistant A.B.S. plastic in a soft semi-gloss finish. The A.B.S. material is easily machined and will not chip, crack, or break during machining operations. NOBEX Instrument Cases are available in a variety of attractive colors for the "Custom Look" in portable electronic equipment. Colors can be custom matched to customer specifications with quantity orders. Mounting bosses are each equipped with a threaded brass insert for reliable panel mounting. NOBEX offers beautiful satin finished, brushed aluminum panels for use with Series 875 and 895 Instrument Cases. Stock panels are cut to size, finished and packaged with protective covering and four (4) panel fastening screws. As with all NOBEX Mechanical Components, Instrument Cases are backed by a one (1) year factory replacement warranty.

ordering information

DESCRIPTION	CATALOG NUMBER
LARGE CASE, GREY	875-35
LARGE CASE, BLACK	875-45
LARGE CASE, TELEPHONE RED	875-60
LARGE COVER	876-C
SMALL CASE, GREY	895-35
SMALL CASE, BLACK	895-45
SMALL CASE, TELEPHONE RED	895-60
SMALL COVER	896-C

Manufactured in U.S.A.

1027 CALIFORNIA DRIVE • BURLINGAME, CALIFORNIA 94010
TELEPHONE (415) 344-7691 • TWX 910-374-2840

Detailed specifications and ordering information available by requesting Bulletin No. 370

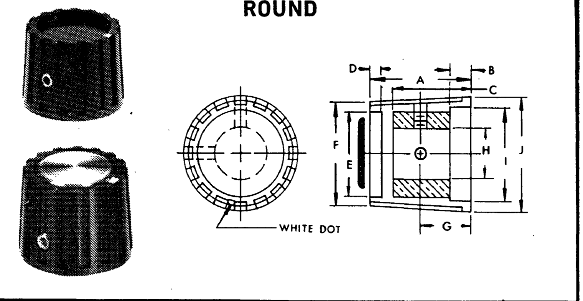
100 and 500 series thermoplastic control knobs, designs patented

NOBEX offers the designer the most comprehensive selection of matching instrument quality control knobs in the industry. This wide variety of sizes and types, many not offered anywhere else, represents an expanding line of products for an ever changing electronic industry.

NOBEX firsts include the patented Color Coding Cap system for use with the 100 Series Knobs. NOBEX is still the only manufacturer to offer a Miniature Series of 7/16" through 5/8" base diameter knobs. Many items standard with NOBEX would be expensive "specials" with our competitors.

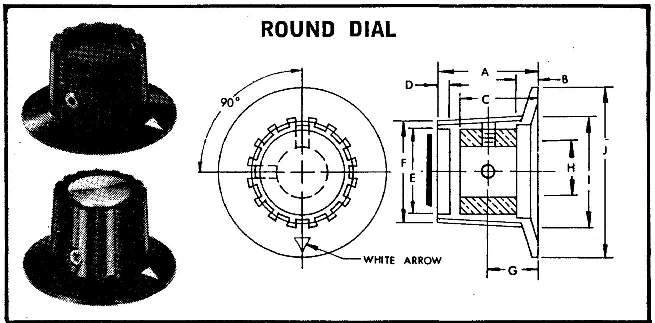
The control knobs shown below are available in the 100 Series (plain top) or in the 500 Series (with decorative aluminum cap) from factory and distributor inventories. The drawings and charts to the right of each knob contain the sizes and part numbers of the knobs available in each style. Control knobs are stocked with two (2) set screws and shaft diameters indicated in the charts.

ROUND



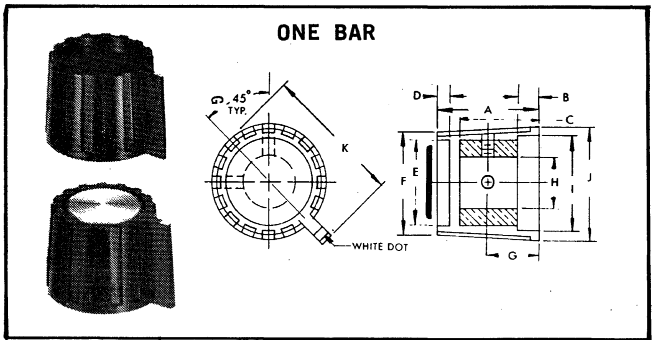
Part No.'s		Dimensions Available										Stock Colors
Plain Top	Alum. Cap	A	B	C	D	E	F	G	H	I	J	
1-123	1-523	.500	.090	.375	.055	.305	.390	.215	.125	.320	.445	B, G, R
1-103	1-503	.500	.090	.375	.060	.340	.455	.215	.125	.375	.500	B, G, R
1-125	1-525	.500	.090	.375	.060	.400	.520	.215	.125	.435	.565	B, G, R
125	525	.500	.090	.375	.060	.400	.520	.215	.250	.435	.565	B, G, R
1-127	1-527	.500	.090	.375	.060	.460	.575	.215	.125	.510	.620	B, G, R
127	527	.500	.090	.375	.060	.460	.575	.215	.250	.510	.620	B, G, R
1-105	1-505	.630	.090	.500	.060	.560	.725	.250	.125	.620	.785	B, G
105	505	.630	.090	.500	.060	.560	.725	.250	.250	.620	.785	B, G
107	507	.750	.080	.570	.105	.770	.950	.250	.250	.800	1.015	B, G
109	509	.750	.120	.570	.105	.965	1.190	.250	.250	.980	1.260	B, G
111	511	.750	.090	.625	.105	1.200	1.450	.250	.250	1.310	1.515	B, G
115	515	.875	.100	.625	.105	1.870	2.140	.312	.250	1.950	2.220	B, G

ROUND DIAL



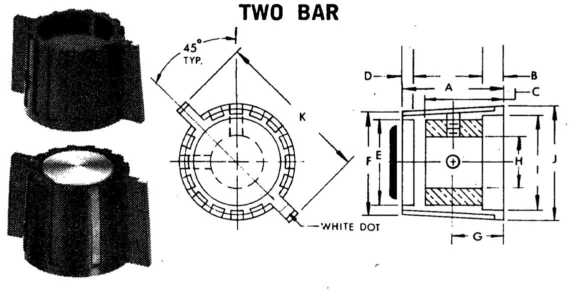
Part No.'s		Dimensions Available											Stock Colors
Plain Top	Alum. Cap	A	B	C	D	E	F	G	H	I	J	K	
1-123-D	1-523-D	.500	.090	.375	.055	.305	.390	.215	.125	.320	.445	.700	B
1-103-D	1-503-D	.500	.090	.375	.060	.340	.455	.215	.125	.375	.500	.765	B
1-125-D	1-525-D	.500	.090	.375	.060	.400	.520	.215	.125	.435	.565	.820	B
125-D	525-D	.500	.090	.375	.060	.400	.520	.215	.250	.435	.565	.820	B
1-127-D	1-527-D	.500	.090	.375	.060	.460	.575	.215	.125	.510	.620	.940	B
127-D	527-D	.500	.090	.375	.060	.460	.575	.215	.250	.510	.620	.940	B
1-105-D	1-505-D	.630	.090	.500	.060	.560	.725	.250	.125	.620	.785	1.180	B
105-D	505-D	.630	.090	.500	.060	.560	.725	.250	.250	.620	.785	1.180	B
107-D	507-D	.750	.080	.570	.105	.770	.950	.250	.250	.800	1.015	1.500	B
109-D	509-D	.750	.120	.570	.105	.965	1.190	.250	.250	.980	1.260	1.750	B
111-D	511-D	.750	.090	.625	.105	1.200	1.450	.250	.250	1.310	1.515	2.120	B
115-D	515-D	.875	.100	.625	.105	1.870	2.140	.312	.625	.250	1.950	3.010	B

ONE BAR



Part No.'s		Dimensions Available											Stock Colors
Plain Top	Alum. Cap	A	B	C	D	E	F	G	H	I	J	K	
1-123-1	1-523-1	.500	.090	.375	.055	.305	.390	.215	.125	.320	.445	.480	B, G
1-103-1	1-503-1	.500	.090	.375	.060	.340	.455	.215	.125	.375	.500	.560	B, G
1-125-1	1-525-1	.500	.090	.375	.060	.400	.520	.215	.125	.435	.565	.625	B, G
125-1	525-1	.500	.090	.375	.060	.400	.520	.215	.250	.435	.565	.625	B, G
1-127-1	1-527-1	.500	.090	.375	.060	.460	.575	.215	.125	.510	.620	.710	B, G
127-1	527-1	.500	.090	.375	.060	.460	.575	.215	.250	.510	.620	.710	B, G
1-105-1	1-505-1	.630	.090	.500	.060	.560	.725	.250	.125	.620	.785	.880	B, G
105-1	505-1	.630	.090	.500	.060	.560	.725	.250	.250	.620	.785	.880	B, G
107-1	507-1	.750	.080	.570	.105	.770	.950	.250	.250	.800	1.015	1.150	B, G

TWO BAR



Part No.'s		Dimensions Available											Stock Colors
Plain Top	Alum. Cap	A	B	C	D	E	F	G	H	I	J	K	
1-124	1-524	.500	.090	.375	.055	.305	.390	.215	.125	.320	.445	.570	B, G
1-104	1-504	.500	.090	.375	.060	.340	.455	.215	.125	.375	.500	.680	B, G
1-126	1-526	.500	.090	.375	.060	.400	.520	.215	.125	.435	.565	.740	B, G
126	526	.500	.090	.375	.060	.400	.520	.215	.250	.435	.565	.740	B, G
1-128	1-528	.500	.090	.375	.060	.460	.575	.215	.125	.510	.620	.850	B, G
128	528	.500	.090	.375	.060	.460	.575	.215	.250	.510	.620	.850	B, G
1-106	1-506	.630	.090	.500	.060	.560	.725	.250	.125	.620	.785	1.030	B, G
106	506	.630	.090	.500	.060	.560	.725	.250	.250	.620	.785	1.030	B, G
108	508	.750	.080	.570	.105	.770	.950	.250	.250	.800	1.015	1.340	B, G
110	510	.750	.120	.570	.105	.965	1.190	.250	.250	.980	1.260	1.620	B, G

NOBEX

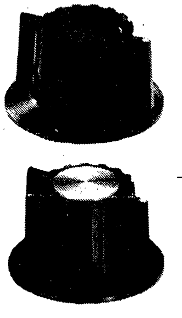
MECHANICAL
COMPONENTS

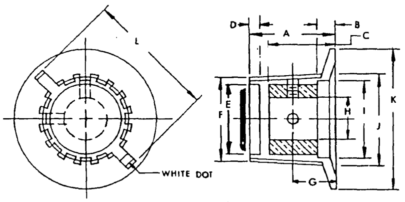
Manufactured in U.S.A.

U.S. Patent Nos. 203,933 and 3,313,057

NOBEX DIVISION
GRIFFITH PLASTICS CORPORATION

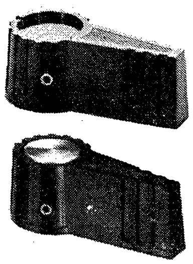
ROUND BAR DIAL

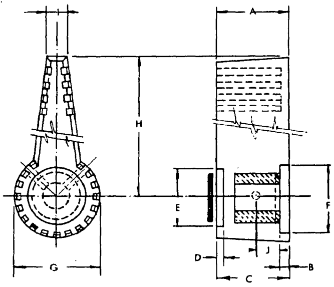




Part No.'s		Dimensions Available												Stock Colors
Plain Top	Alum. Cap	A	B	C	D	E	F	G	H	I	J	K	L	
1-124-D	1-524-D	.500	.090	.375	.055	.305	.390	.215	.125	.320	.445	.700	.570	B
1-104-D	1-504-D	.500	.090	.375	.060	.340	.455	.215	.125	.375	.500	.765	.680	B
1-126-D	1-526-D	.500	.090	.375	.060	.400	.520	.215	.125	.435	.565	.820	.740	B
126-D	526-D	.500	.090	.375	.060	.400	.520	.215	.250	.435	.565	.820	.740	B
1-128-D	1-528-D	.500	.090	.375	.060	.460	.575	.215	.125	.510	.620	.940	.850	B
128-D	528-D	.500	.090	.375	.060	.460	.575	.215	.250	.510	.620	.940	.850	B
1-106-D	1-506-D	.630	.090	.500	.060	.560	.725	.250	.125	.620	.785	1.180	1.030	B
106-D	506-D	.630	.090	.500	.060	.560	.725	.250	.250	.620	.785	1.180	1.030	B
108-D	508-D	.750	.080	.570	.105	.770	.950	.250	.250	.800	1.015	1.500	1.340	B
110-D	510-D	.750	.120	.570	.105	.965	1.190	.250	.250	.980	1.260	1.750	1.620	B

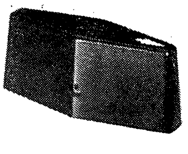
LEVER

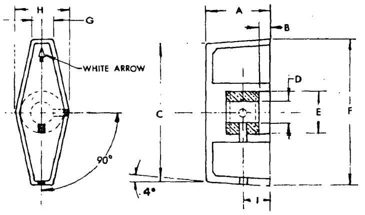




Part No.'s		Dimensions Available										Stock Colors
Plain Top	Alum. Cap	A	B	C	D	E	F	G	H	I	J	
1021	5021	.630	.100	.500	.060	.560	.615	.790	1.125	.280	.250	B, G
1022	5022	.630	.100	.500	.060	.560	.615	.790	2.125	.280	.250	B, G

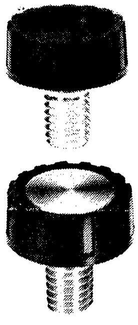
POINTER

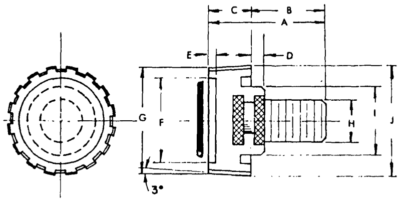




Part No.	Indicator	Dimensions Available									Stock Colors
		A	B	C	D	E	F	G	H	I	
100-U	No Arrow	.750	.130	1.200	.250	.520	1.310	.280	.620	.250	B, G, R
100-1	1 Arrow	.750	.130	1.200	.250	.520	1.310	.280	.620	.250	B, G, R
100-2	2 Arrows	.750	.130	1.200	.250	.520	1.310	.280	.620	.250	B, G, R
101-U	No Arrow	.750	.130	1.615	.250	.520	1.700	.280	.620	.250	B, G, R
101-1	1 Arrow	.750	.130	1.615	.250	.520	1.700	.280	.620	.250	B, G, R
101-2	2 Arrows	.750	.130	1.615	.250	.520	1.700	.280	.620	.250	B, G, R

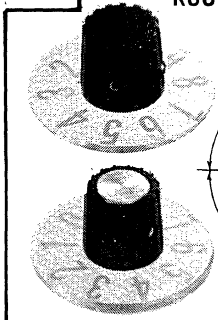
THUMBSCREW

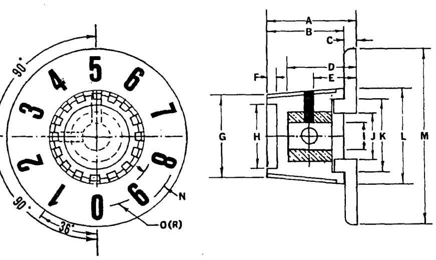




Part No.'s		Dimensions Available										Stock Colors
Plain Top	Alum. Cap	A	B	C	D	E	F	G	Thread	I	J	
107-TS-18	507-TS-18	1.000	.625	.375	.125	.100	.765	.940	10-32	.510	.985	B
107-TS-25	507-TS-25	1.000	.625	.375	.125	.100	.765	.940	¼-20	.510	.985	B
107-TS-31	507-TS-31	1.000	.625	.375	.125	.100	.765	.940	5⁄16-18	.510	.985	B
107-TS-37	507-TS-37	1.000	.625	.375	.125	.100	.765	.940	⅜-16	.510	.985	B, G
111-TS-18	511-TS-18	1.000	.625	.375	.125	.100	1.195	1.490	10-32	.625	1.515	B
111-TS-25	511-TS-25	1.000	.625	.375	.125	.100	1.195	1.490	¼-20	.625	1.515	B
111-TS-31	511-TS-31	1.000	.625	.375	.125	.100	1.195	1.490	5⁄16-18	.625	1.515	B
111-TS-37	511-TS-37	1.000	.625	.375	.125	.100	1.195	1.490	⅜-16	.625	1.515	B, G

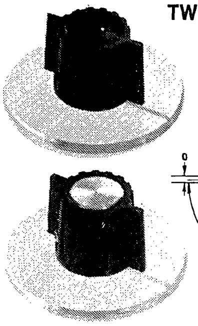
ROUND NUMBERED CLEAR DIAL

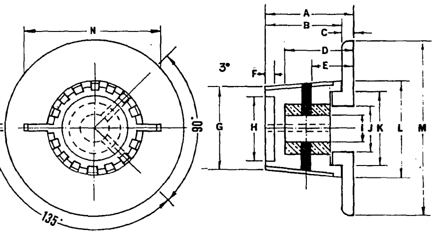




Part No.	Dimensions Available														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
B1-127-CD09	.570	.505	.065	.455	.315	.055	.575	.460	.127	.370	.490	.625	1.410	.250	.500(R)
B127-CD09	570	.505	.065	.455	.315	.055	.575	.460	.252	.370	.490	.625	1.410	.250	.500(R)
B1-105-CD09	.705	.625	.080	.580	.330	.065	.725	.560	.127	.440	.600	.790	1.750	.375	.660(R)
B105-CD09	.705	.625	.080	.580	.330	.065	.725	.560	.252	.440	.600	.790	1.750	.375	.660(R)
B107-CD09	.840	.760	.080	.650	.330	.100	.945	.770	.252	.440	.800	1.020	2.125	.375	.750(R)

TWO BAR LINED CLEAR DIAL





Part No.	Dimensions Available														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
B1-128-CDL	.570	.505	.065	.455	.315	.055	.575	.460	.127	.370	.490	.625	1.410	.855	.040
B128-CDL	.570	.505	.065	.455	.315	.055	.575	.460	.252	.370	.490	.625	1.410	.855	.040
B1-105-CDL	.705	.625	.080	.580	.330	.065	.725	.560	.127	.440	.600	.790	1.750	1.040	.050
B105-CDL	.705	.625	.080	.580	.330	.065	.725	.560	.252	.440	.600	.790	1.750	1.040	.050
B107-CDL	.840	.760	.080	.650	.330	.100	.945	.770	.252	.440	.800	1.020	2.125	1.345	.090

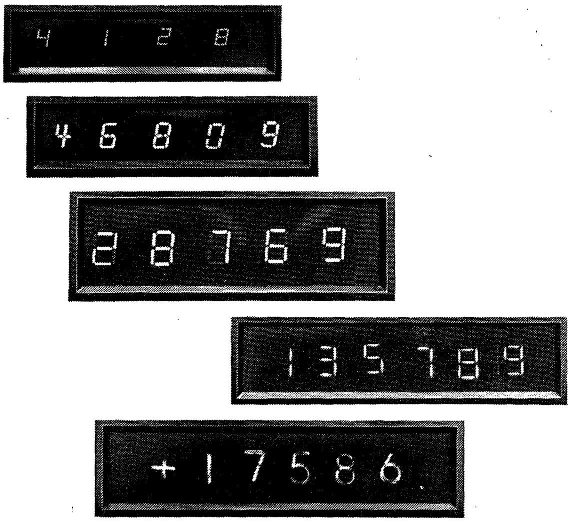
Color Code Designation: B=Black, G=Grey, R=Red

1027 CALIFORNIA DRIVE • BURLINGAME, CALIFORNIA 94010
TELEPHONE (415) 344-7691 • TWX 910-374-2840

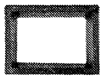
Detailed specifications and ordering information available by requesting Bulletin 300 and 360.

alpha-numeric display bezels

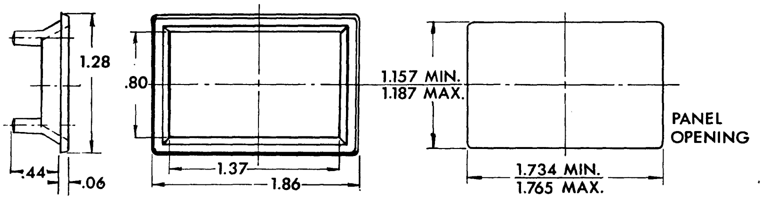
DIGIBEZEL

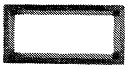

4 1 2 8
4 6 8 0 9
2 8 7 6 9
1 3 5 7 8 9
+ 1 7 5 8 6.

The first and only low cost, easy to assemble standard bezel for alpha-numeric displays. DIGIBEZEL will enhance the front panel lines of instruments and systems incorporating digital displays while providing maximum contrast in high ambient light conditions. DIGIBEZEL is a three piece assembly consisting of a front panel bezel, retaining frame and a circular polarized filter in one of four colors. Rear mounted spring clips eliminate visible mounting hardware. Seven standard sizes accommodate the most commonly used display devices in the industry, including the latest L.E.D. displays.

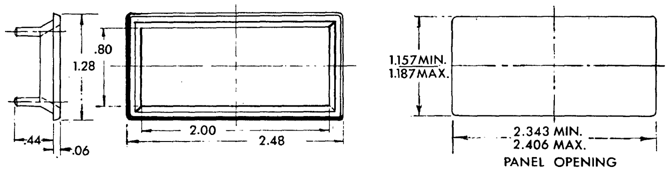


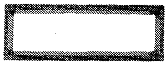
MODEL 905


1.28
.80
.44
.06
1.37
1.86
1.157 MIN.
1.187 MAX.
PANEL OPENING
1.734 MIN.
1.765 MAX.

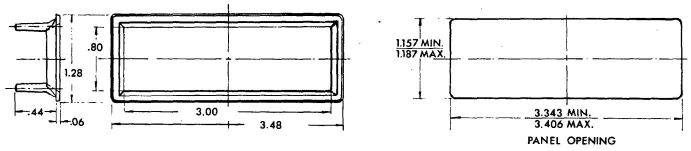


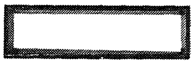
MODEL 910


.80
1.28
.44
.06
2.00
2.48
1.157MIN.
1.187MAX.
2.343 MIN.
2.406 MAX.
PANEL OPENING

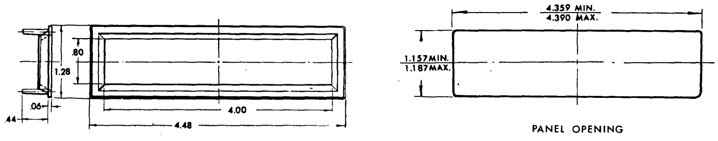


MODEL 915


.80
1.28
.44
.06
3.00
3.48
1.157 MIN.
1.187 MAX.
3.343 MIN.
3.406 MAX.
PANEL OPENING



MODEL 920

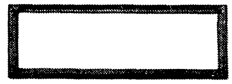

.80
1.28
.06
.44
4.00
4.48
4.359 MIN.
4.390 MAX.
1.157MIN.
1.187MAX.
PANEL OPENING

NOBEX

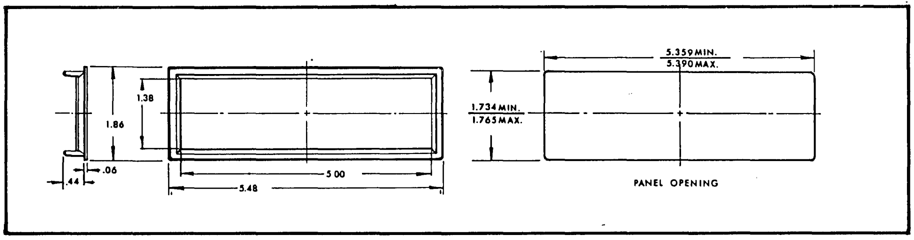
MECHANICAL COMPONENTS

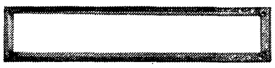
Manufactured in U.S.A.

NOBEX DIVISION
GRIFFITH PLASTICS CORPORATION

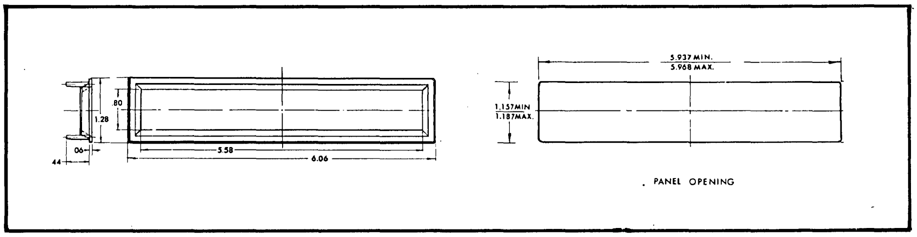


MODEL 930

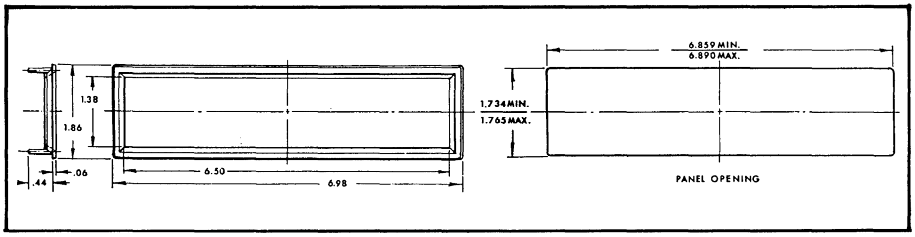

5.359 MIN.
5.390 MAX.
1.38
1.86
.06
.44
5.00
5.48
1.734 MIN.
1.765 MAX.
PANEL OPENING



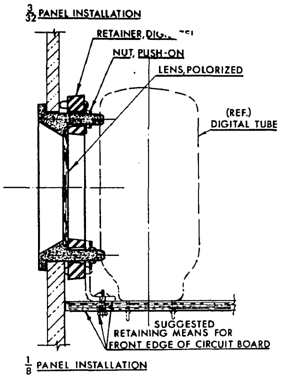
MODEL 940


5.937 MIN.
5.968 MAX.
.80
1.28
.06
.44
5.58
6.06
1.157 MIN
1.187 MAX.
PANEL OPENING

MODEL 950


6.859 MIN.
6.890 MAX.
1.38
1.86
.06
.44
6.50
6.98
1.734 MIN.
1.765 MAX.
PANEL OPENING

installation


3/32 PANEL INSTALLATION
RETAINER, DIG
NUT, PUSH-ON
LENS, POLORIZED
(REF.) DIGITAL TUBE
SUGGESTED RETAINING MEANS FOR FRONT EDGE OF CIRCUIT BOARD
1/8 PANEL INSTALLATION

DIGIBEZEL is easily installed to the panel of the instrument by placing the back side (with bosses) through the rectangular hole cut into the front panel with "top" and "bottom" markings appropriately located. After the front bezel has been placed in the location the polarized filter is then inserted from the back into the recess provided. The DIGIBEZEL retainer is then placed onto the rear bosses using the correct side for appropriate panel thickness (Side 1 for 3/32", Side 2 for 1/8" thick panel) to secure the filter and bezel to the front panel. All three parts of the assembly are held together and in place by rear mounting spring clips.

mounting tool

An optional mounting tool is available from NOBEX for added convenience with DIGIBEZEL installation. The mounting tool is specifically designed to be used with the spring clip hardware supplied with each DIGIBEZEL assembly. The tool is manufactured of aluminum with an easy grip handle.

specifications

Bezel & Filter Retainer

Injection molded of high heat ABS-polycarbonate thermoplastic resin.

Lens Filter

Circular polarized filter laminated acetate sheet.

Mounting Clip

Spring Steel Black Oxide Finish

ordering information

FILTER COLOR	MODEL 905	MODEL 910	MODEL 915	MODEL 920	MODEL 930	MODEL 940	MODEL 950
NEUTRAL FILTER	905-15	910-15	915-15	920-15	930-15	940-15	950-15
RED FILTER	905-60	910-60	915-60	920-60	930-60	940-60	950-60
AMBER FILTER	905-70	910-70	915-70	920-70	930-70	940-70	950-70
GREEN FILTER	905-90	910-90	915-90	920-90	930-90	940-90	950-90

U.S. Patent No. 3,551,630 Foreign Patents Pending

1027 CALIFORNIA DRIVE • BURLINGAME, CALIFORNIA 94010
TELEPHONE (415) 344-7691 • TWX 910-374-2840

Detailed specifications and ordering information available by requesting Bulletin 350.

Hudson Lamps: Tiny Bulbs for Your Big Lighting Jobs.

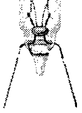


Fig. 1

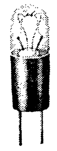


Fig. 2

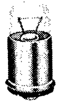


Fig. 3

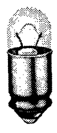


Fig. 4

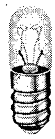


Fig. 5

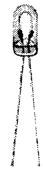


Fig. 6

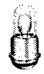


Fig. 7

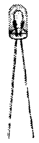


Fig. 9

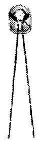


Fig. 10

Illustrations Actual Size

SUB-MINIATURE LAMPS

(Top Section of chart at right.) Designed for maximum service life under conditions of shock and vibration. Will not introduce noise into audio circuits. Manufactured and tested to rigid quality control standards.

"TU-PIN" SUB-MINIATURE LAMPS

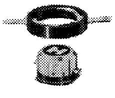
Ideal for printed circuits and transistor sockets. Bases color coded to electrical characteristics. Easy to insert and remove, especially in difficult locations. So small twelve can be mounted in one square inch.

MICRO-MINIATURE LAMPS

(Lower Section of chart at right.) Design lives of 100,000+ hours is common. Tipless bulbs for undistorted end viewing. Pre-aged and photometered to assure reliability, stability, and electrical accuracy.

Ask for Catalog #106

REPLACEABLE ILLUMINATOR FOR EDGE LIGHTED PANELS



The Hudson Disc Lamp is an integral light source for edge lighted panels. Easily installed or removed from companion socket hard mounted to a one piece panel. Ask for Bulletin #301.

T.M.

HUDSON DISC LAMPS

ENGINEERING ASSISTANCE

If you have an application for which no standard lamp is suitable, Hudson will design and manufacture a special lamp to meet your requirements. Please ask us for recommendations, which are furnished to you without obligation, of course.

Designers and production men prefer these dependable incandescent lamps for use in aircraft instruments, computers, read-out devices, edge-lighted panels, switch buttons, instrument pilot lights, and similar uses where space is limited, replacement difficult, and reliability essential.

				DESIGN				FILAMENT		
Lamp Number	Military Std. Number	Bulb	Base	Volts	Amperes	Approximate M S C P	Approx. Hours Life	Type	Light Center Length Inches	Fig. No.
331	—	T-1 3/4	S. C. Mid. Flanged	1.35	.06	.01	500	C-2R	3/8	3
1728	—	T-1 3/4	5/8″ Wire Term.	1.35	.06	.01	500	C-2R	—	1
2301	—	T-1 3/4	Mid. 2-Pin (White)	1.35	.06	.01	500	C-2R	7/16	2
368	—	T-1 3/4	S. C. Mid. Flanged	2.5	.20	.15	500	C-2R	3/8	3
1767	—	T-1 3/4	Midget Screw	2.5	.20	.15	500	C-2R	1/2	5
1769	—	T-1 3/4	Midget Screw	2.5	.20	.15	500	C-2R	1/2	5
1783	—	T-1 3/4	5/8″ Wire Term.	2.5	.20	.15	500	C-2R	—	1
2302	—	T-1 3/4	Mid. 2-Pin (Brown)	2.5	.20	.15	500	C-2R	7/16	2
338	—	T-1 3/4	S. C. Mid. Flanged	2.7	.06	.03	500	C-2R	3/8	3
1738	—	T-1 3/4	5/8″ Wire Term.	2.7	.06	.03	500	C-2R	—	1
2303	—	T-1 3/4	Mid. 2-Pin (Lt. Grn.)	2.7	.06	.03	500	C-2R	7/16	2
2129	—	T-1 3/4	5/8″ Wire Term.	3.0	.30	.34	1,500	C-2R	—	1
2304	—	T-1 3/4	Mid. 2-Pin (Black)	3.0	.30	.34	1,500	C-2R	7/16	2
345	—	T-1 3/4	S. C. Mid. Flanged	6.0	.04	.05	1,000	C-6	3/8	3
1730	—	T-1 3/4	5/8″ Wire Term.	6.0	.04	.05	1,000	C-6	—	1
2305	—	T-1 3/4	Mid. 2-Pin (Silver))	6.0	.04	.05	1,000	C-6	7/16	2
328	MS25237	T-1 3/4	S. C. Mid. Flanged	6.0	.20	.34±15%[1]	1,000	C-2R	3/8	3
328-10	MS25237	T-1 3/4	S. C. Mid. Flanged	6.0	.20	.34±10%[1]	1,000	C-2R	3/8	3
328R[2]	MS25237	T-1 3/4	S. C. Mid. Flanged	6.0	.20	—	1,000	C-2R	3/8	3
337	—	T-1 3/4	Midget Grooved	6.0	.20	.6	1,000	C-2R	3/8	4
1768	—	T-1 3/4	Midget Screw	6.0	.20	.6	1,000	C-2R	1/2	5
1784	—	T-1 3/4	5/8″ Wire Term.	6.0	.20	.6	1,000	C-2R	—	1
2306	—	T-1 3/4	Mid. 2-Pin (Orange)	6.0	.20	.6	1,000	C-2R	7/16	2
349	—	T-1 3/4	S. C. Mid. Flanged	6.3	.20	.34	5,000	C-2R	3/8	3
2112	—	T-1 3/4	5/8″ Wire Term.	6.3	.20	.34	5,000	C-2R	—	1
2307	—	T-1 3/4	Mid. 2-Pin (Dk. Blu.)	6.3	.20	.34	5,000	C-2R	7/16	2
344	—	T-1 3/4	S. C. Mid. Flanged	10.0	.014	.004	5,000+	C-2F	3/8	3
1869	—	T-1 3/4	5/8″ Wire Term.	10.0	.014	.01	5,000+	C-2F	—	1
2308	—	T-1 3/4	Mid. 2-Pin (Beige)	10.0	.014	.01	5,000+	C-2F	7/16	2
367	—	T-1 3/4	S. C. Mid. Flanged	10.0	.04	.05	5,000+	C-2R	3/8	3
2107	—	T-1 3/4	5/8″ Wire Term.	10.0	.04	.05	5,000+	C-2R	—	1
2309	—	T-1 3/4	Mid. 2-Pin (Lt. Blue)	10.0	.04	.05	5,000+	C-2R	7/16	2
330	—	T-1 3/4	S. C. Mid. Flanged	14.0	.08	.5	750	C-2F	3/8	3
336	—	T-1 3/4	Midget Grooved	14.0	.08	.5	750	C-2F	3/8	4
383	—	T-1 3/4	Midget Screw	14.0	.08	.5	750	C-2F	1/2	5
1705	—	T-1 3/4	5/8″ Wire Term.	14.0	.08	.5	750	C-2F	—	1
2310	—	T-1 3/4	Mid. 2-Pin (Yellow)	14.0	.08	.5	750	C-2F	7/16	2
370	—	T-1 3/4	S. C. Mid. Flanged	18.0	.04	.25	1,000	C-2F	3/8	3
346	—	T-1 3/4	Midget Grooved	18.0	.04	.25	1,000	C-2F	3/8	4
2102	—	T-1 3/4	5/8″ Wire Term.	18.0	.04	.25	1,000	C-2F	—	1
2311	—	T-1 3/4	Mid. 2-Pin Dk. Grn.)	18.0	.04	.25	1,000	C-2F	7/16	2
327	MS25237	T-1 3/4	S. C. Mid. Flanged	28.0	.04	.34±25%	1,000	C-2F	3/8	3
327-15	MS25237	T-1 3/4	S. C. Mid. Flanged	28.0	.04	.34±15%	1,000	C-2F	3/8	3
327R[2]	MS25237	T-1 3/4	S. C. Mid. Flanged	28.0	.04	—	1,000	C-2F	3/8	3
334	—	T-1 3/4	Midget Grooved	28.0	.04	.34	1,000	C-2F	3/8	4
335	—	T-1 3/4	Midget Screw	28.0	.04	.34	1,000	C-2F	1/2	5
369	—	T-1 3/4	Midget Screw	28.0	.04	.34	1,000	C-2F	1/2	5
1762	—	T-1 3/4	5/8″ Wire Term.	28.0	.04	.34	1,000	C-2F	—	1
1764	—	T-1 3/4	1″ Wire Term.	28.0	.04	.34	1,000	C-2F	—	1
2312	—	T-1 3/4	Mid. 2-Pin (Red)	28.0	.04	.34	1,000	C-2F	7/16	2
680	MS24367	T-1	1-1/2″ Wire Term.	5.0	.06	.03 ±15%	100,000	—	—	6
682	MS24515	T-1	Sub-Midget Flg'd.	5.0	.06	.03 ±15%	100,000	—	—	7
683	MS24367	T-1	1-1/2″ Wire Term.	5.0	.06	.05 ±15%	100,000	—	—	6
685	MS24515	T-1	Sub-Midget Flg'd.	5.0	.06	.05 ±15%	100,000	—	—	7
713	MS24367	T-1	1-1/2″ Wire Term.	5.0	.075	.09 ±15%	100,000	—	—	6
714	MS24515	T-1	Sub-Midget Flg'd.	5.0	.075	.08 ±15%	100,000	—	—	7
715	MS24367	T-1	1-1/2″ Wire Term.	5.0	.115	.15 ±15%	50,000	—	—	6
718	MS24515	T-1	Sub-Midget Flg'd.	5.0	.115	.14 ±15%	50,000	—	—	7
6801	—	T-1	1-1/2″ Wire Term.	5.0	.06	.03 ±15%	100,000	—	—	6
6831	—	T-1	1-1/2″ Wire Term.	5.0	.06	.05 ±15%	100,000	—	—	6
7131	—	T-1	1-1/2″ Wire Term.	5.0	.075	.09 ±15%	100,000	—	—	6
7151	—	T-1	1-1/2″ Wire Term.	5.0	.115	.15 ±15%	50,000	—	—	6
6802	MS90451	T-1	1-1/2″ Wire Term.	5.0	.06	.03 ±15%	100,000	—	—	10
6832	MS90451	T-1	1-1/2″ Wire Term.	5.0	.06	.05 ±15%	100,000	—	—	10
7132	MS90451	T-1	1-1/2″ Wire Term.	5.0	.075	.09 ±15%	100,000	—	—	10
7152	MS90451	T-1	1-1/2″ Wire Term.	5.0	.115	.15 ±15%	50,000	—	—	10
6803	MS24367	T-3/4	1-1/2″ Wire Term.	5.0	.06	.03 ±15%	100,000	—	—	9
6833	MS24367	T-3/4	1-1/2″ Wire Term.	5.0	.06	.05 ±15%	100,000	—	—	9
7133	MS24367	T-3/4	1-1/2″ Wire Term.	5.0	.075	.09 ±15%	100,000	—	—	9
7153	MS24367	T-3/4	1-1/2″ Wire Term.	5.0	.115	.15 ±15%	50,000	—	—	9

[1] At 5 volts; at 6 volts, approximately 0.6 cp

[2] Coated Aviation Red

Hudson LAMP COMPANY

Write for Free Samples, Recommendations & Prices

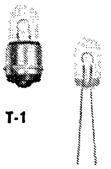
SALES REPRESENTATIVES THROUGHOUT THE WORLD

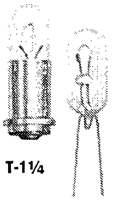
528 Elm St., Kearny, N. J. 07032 • Phone: (201) 997-1850

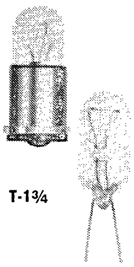
INTER-MARKET INCORPORATED
1920 WAUKEGAN ROAD / GLENVIEW, ILLINOIS 60025 / (312) 729-5330

LAMPS AND LIGHTED DEVICES

SUBMINIATURE LAMPS


T-1


T-1¼


T-1¾

Catalog No.	Industry No.	Bulb	Design Volts	Design Current (mA)	M.S.C.P.† (±25%)	Average Life (Hours)	Filament Type	Base	Price 1000 & up
100-683	683	T-1	5	60	.053	100,000	C-2R	W.T.*	.188 ea.
100-685	685	T-1	5	60	.048	100,000	C-2R	M.F.**	.318
100-680	680	T-1	5	60	.032	100,000	C-2R	W.T.	.188
100-682	682	T-1	5	60	.029	100,000	C-2R	M.F.	.318
100-713	713	T-1	5	75	.088	60,000	C-2R	W.T.	.309
100-714	714	T-1	5	75	.080	60,000	C-2R	M.F.	.449
100-715	715	T-1	5	115	.147	40,000	C-2R	W.T.	.208
100-718	718	T-1	5	115	.132	40,000	C-2R	M.F.	.406
100-1089	1089	T-1	12	55	.147	16,000	C-2F	W.T.	.535
100-1099	1099	T-1	12	55	.132	16,000	C-2F	M.F.	.670
100-1111	23	T-1	14	40	.147	16,000	C-2F	W.T.	.535
100-1113	22	T-1	14	40	.132	16,000	C-2F	M.F.	.670
100-6838	6838	T-1	28	24	.132	16,000	C-2F	W.T.	.740
100-6839	6839	T-1	28	24	.118	16,000	C-2F	M.F.	.872
125-634	634	T-1¼	6	200	.66	3,000	C-2R	W.T.	.159
125-628	628	T-1¼	6	200	.63	3,000	C-2R	M.F.	.283
125-640	640	T-1¼	14	80	.53	2,500	C-2F	W.T.	.205
125-646	646	T-1¼	14	80	.50	2,500	C-2F	M.F.	.332
125-627	8627	T-1¼	28	40	.36	5,000	C-2F	W.T.	.214
125-632	8632	T-1¼	28	40	.34	5,000	C-2F	M.F.	.358
175-6350	—	T-1¾	6.3	50	.06	50,000	C-6	W.T.	.108
175-1784	1784	T-1¾	6	200	.34	3,000	C-6	W.T.	.134
175-328	328	T-1¾	6	200	.34	3,000	C-6	M.F.	.185
175-2112	2112	T-1¾	6.3	200	.57	5,000	C-2R	W.T.	.134
175-349	349	T-1¾	6.3	200	.55	5,000	C-2R	M.F.	.185
175-350	350	T-1¾	6.3	180	.50	3,000	C-2R	M.F.	.185
175-2181	2181	T-1¾	6.3	200	.40	50,000	C-2V	W.T.	.114
175-381	381	T-1¾	6.3	200	.40	50,000	C-2V	M.F.	.185
175-2191	—	T-1¾	12	90	.30	50,000	C-2V	W.T.	.114
175-391	—	T-1¾	12	90	.30	50,000	C-2V	M.F.	.185
175-1705	1705	T-1¾	14	80	.52	2,500	C-2V	W.T.	.134
175-330	330	T-1¾	14	80	.50	2,500	C-2V	M.F.	.185
175-2182	2182	T-1¾	14	80	.30	50,000	C-2V	W.T.	.134
175-382	382	T-1¾	14	80	.30	50,000	C-2V	M.F.	.185
175-2162	2162	T-1¾	14	100	.50	10,000	C-2V	W.T.	.134
175-2192	—	T-1¾	24	50	.30	25,000	C-2F	W.T.	.134
175-392	—	T-1¾	24	50	.30	25,000	C-2F	M.F.	.185
175-1764	1764	T-1¾	28	40	.34	5,000	C-2F	W.T.	.134
175-327	327	T-1¾	28	40	.34	5,000	C-2F	M.F.	.185
175-2187	2187	T-1¾	28	40	.30	25,000	C-2F	W.T.	.134
175-387	387	T-1¾	28	40	.27	25,000	C-2F	M.F.	.185
175-9122	—	T-1¾	28	80	.60	5,000	C-2F	M.F.	.360

† M.S.C.P.—Mean Spherical Candle Power
* W.T.—Wire Terminals ** M.F.—Flanged Base

NEON GLOW INDICATOR LAMPS

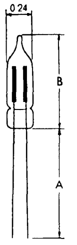


FIG. 1

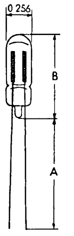


FIG. 5

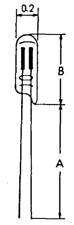


FIG.7

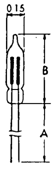


FIG. 9 NEW

STANDARD BRIGHTNESS LAMPS

Catalog No.	Fig. No.	Volts (V.)	Current (mA.)	Power (W.)	Breakdown Voltage	Maintaining Voltage	Series Resistance	Bulb Dia.	Bulb Length B	Lead Length A	Average A.C. Life	Price 1000-9999
A1B (NE-38)	9	105-125	0.2	1/25	75V. (A.C.)	59V. (A.C.)	200K.Ω	0.150″	0.50″	1.00″	25K. hrs.	.1320 ea.
A9A (NE-2E)	1	105-125	0.3	1/17	75V. (A.C.)	59V. (A.C.)	150K.Ω	0.240″	0.75″	2.00″	25K. hrs.	.0605 ea.
PL-10L	7	105-125	0.3	1/17	75V. (A.C.)	59V. (A.C.)	150K.Ω	0.200″	0.75″	1.00″	25K. hrs.	.1760 ea.
A1A (NE-2)	1	105-125	0.3	1/17	75V. (A.C.)	59V. (A.C.)	150K.Ω	0.240″	1.00″	1.00″	25K. hrs.	.0605 ea.
K2A (NE-2M)	5	105-125	0.2	1/25	75V. (A.C.)	59V. (A.C.)	150K.Ω	0.256″	1.00″	1.00″	25K. hrs.	.1090 ea.

HIGH BRIGHTNESS LAMPS

Catalog No.	Fig. No.	Volts (V.)	Current (mA.)	Power (W.)	Breakdown Voltage	Maintaining Voltage	Series Resistance	Bulb Dia.	Bulb Length B	Lead Length A	Average A.C. Life	Price 1000-9999
PL-11L	7	105-125	1.5	1/4	80V. (A.C.)	62V. (A.C.)	33K.Ω	0.200″	0.75″	1.00″	25K. hrs.	.1760 ea.
C2A (NE-2H)	1	105-125	1.5	1/4	80V. (A.C.)	62V. (A.C.)	33K.Ω	0.240″	0.75″	2.00″	25K. hrs.	.0605 ea.
K3A (NE-2P)	5	105-125	1.5	1/4	80V. (A.C.)	62V. (A.C.)	33K.Ω	0.256″	1.00″	1.00″	25K. hrs.	.1160 ea.
RF6-G (Green)	1	105-125	1.5	1/4	80V. (A.C.)	62V. (A.C.)	27K.Ω	0.256″	1.00″	1.00″	10K. hrs.	.1490 ea.

LAMP RESISTOR ASSEMBLIES

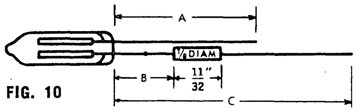


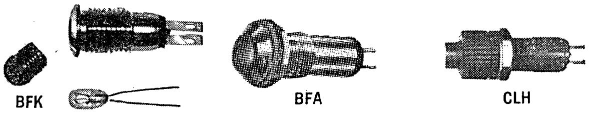
FIG. 10

Catalog No.	Fig. No.	Lamp	Resistance (Ω)	Amps. (A.)	Watts	Dim. A	Dim. B	Dim. C	Price 1000-9999	Remarks
A9AR150	10	A9A	150K.	0.30	1/17	2	1½	3	.0960 ea.	Standard color coded resistance welded into regular tinned leads.
A1AR150	10	A1A	150K.	0.30	1/17	2	1½	3	.0960 ea.	
C2AR33	10	C2A	33K.	1.50	1/4	2	1½	3	.0960 ea.	
K3AR33	10	K3A	33K.	1.50	1/4	2	1½	3	.0960 ea.	

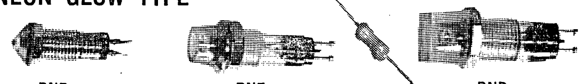
Note: These specifications are intended as a guide to aid in proper selection. Other models are available.

PILOT LIGHTS

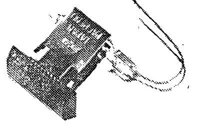
SUB-MINIATURE



NEON GLOW TYPE



NEON LAMPHOLDERS



SPECIFICATIONS AND PRICES

Description	Catalog No.	Specification	Prices 1-99	Prices 100-999	Prices 1000 & up
Sub-Miniature	BFA/BFB	6V & 14V	.50	.40	.32
	BFE/BFF	6V	.40	.32	.26
	BFK	5V	.65	.52	.43
	BFL/BFM	5V	.45	.36	.30
	CF/CFB	Cartridge 6V & 14V	.45	.36	.30
	CLH	Holder	1.00	.80	.65
Neon Glow	BNA/BNB	No Resistor	.45	.36	.29
	BNCR	Resistor Inc.	1.35	1.00	.90
	BND	No Resistor	.50	.40	.32
	BNDR	Resistor Inc.	.60	.48	.39
	BNE/BNF	No Resistor	.45	.36	.29
Neon Lamp Holders	NLH-E1	Holder Only	.16	.13	.11
	NLH-(E2/E6)	Holder Only	.11	.09	.08

[1] *Lamps in other voltages available.*

[2] Incandescent Pilot Lights available with red, green, white, blue, and yellow lens. Neon Pilot Lights and Lamp Holders with red, amber, or clear lens.

[3] For complete specifications, request Catalog SML-70.

MANUFACTURED IN JAPAN BY OKAYA ELECTRIC INDUSTRIES LTD.

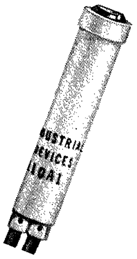
FOR INFORMATION ON IMLEC THUMBWHEEL SWITCHES SEE EEM PAGE 1926

IDI PILOT AND INDICATOR LIGHTS

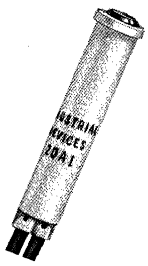
glo-dot

Miniature neon pilot lights
Mounting hole: $\frac{5}{16}$" diameter.

Series 2110A



Series 2120A



Series 2150A

Color	Stock Models Available		
Red	2110A1	2120A1	2150A1
Clear	2110A2	—	—
Amber	2110A3	2120A3	2150A3
White	2110A4	2120A4	2150A4

SPECIFICATIONS

(COMMON TO ALL STOCK MODELS—Except GLO-DOT 2990D and 2990P and OMNI-GLO 1051A and 1090A Series.)

Voltage: 105-125 A.C.

Leads: 4½" 105°C plastic stripped ½".

Lamp: High brightness neon with built-in resistor.

Speednut: Hardened spring steel, rust-resistant finish.

glo-dot 2990p series

One-piece lens body 6, 12 and 28 volt incandescent pilot lights.

Mounting Hole: ½" diameter with plug bezel and low profile lens.

Color	6 Volt Part No.	12 Volt Part No.	28 Volt Part No.
Red	2990P1-6V	2990P1-12V	2990P1-28V
Amber	2990P3-6V	2990P3-12V	2990P3-28V
White	2990P4-6V	2990P4-12V	2990P4-28V
Green	2990P5-6V	2990P5-12V	2990P5-28V
Blue	2990P6-6V	2990P6-12V	2990P6-28V
Yellow	2990P7-6V	2990P7-12V	2990P7-28V

glo-dot 2990d series

One-piece lens body 6, 12 and 28 volt incandescent pilot lights.

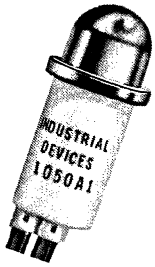
Mounting Hole: $\frac{5}{16}$" diameter.

Color	6 Volt Part No.	12 Volt Part No.	28 Volt Part No.
Red	2990D1-6V	2990D1-12V	2990D1-28V
Amber	2990D3-6V	2990D3-12V	2990D3-28V
White	2990D4-6V	2990D4-12V	2990D4-28V
Green	2990D5-6V	2990D5-12V	2990D5-28V
Blue	2990D6-6V	2990D6-12V	2990D6-28V
Yellow	2990D7-6V	2990D7-12V	2990D7-28V

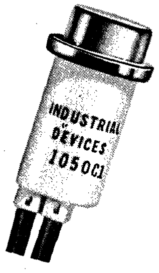
omni-glo

Versatile general purpose pilot lights.
Mounting Hole: ½" diameter.

Series 1050A, 1051A, 1090A



1050C



1050N

INDUSTRIAL DEVICES 1050N1

Color	Stock Models Available		
Red	1050A1	1050C1	1050N1
Clear	1050A2	—	—
Amber	1050A3	1050C3	1050N3
White	1050A4	1050C4	1050N4

Color	6 Volt Part No.	12 Volt Part No.	28 Volt Part No.	250 Volt Part No.
Red	1090A1-6V	1090A1-12V	1090A1-28V	1051A1
Clear	—	—	—	1051A2
Amber	1090A3-6V	1090A3-12V	1090A3-28V	1051A3
White	1090A4-6V	1090A4-12V	1090A4-28V	1051A4
Green	1090A5-6V	1090A5-12V	1090A5-28V	—
Blue	1090A6-6V	1090A6-12V	1090A6-28V	—

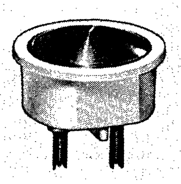
* Matches the Series 1050A in appearance.

omni-glo

Versatile general purpose neon pilot lights.
Mounting Hole: ⅞" diameter.

SERIES 2620K

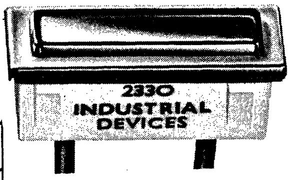
Color	Stock Models Available
Red	2620K1
Clear	—
Amber	2620K3
White	2620K4



line-o-lite

Will snap-fit into panels .050-.070" thick without speednut, other thicknesses with speednut.

Mounting Hole:
$1\frac{9}{32}$" x .395/.400".



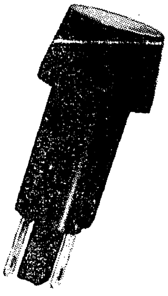
SERIES 2330D

Color	Stock Models Available
Red	2330D1
Clear	—
Amber	2330D3
White	2330D4

MINI-SLIDE

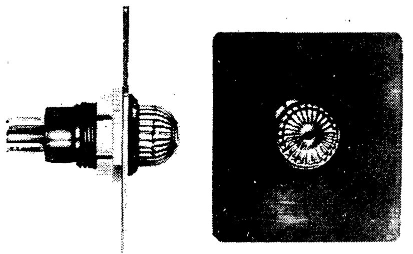
PILOT LIGHT ASSEMBLIES

Model 3040 Series



Model 3060 Series

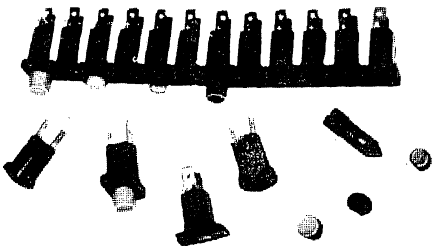
- Two lens shapes, round and square for either model series.
- Sockets for "Pilot" lamps including 120 volt lamp and "Indicator" lamps.



Model 2800 Series

- Screw-in design for easy relamping from front of pane.
- Unique torque-limiting, self-locking nylon mounting nut.

INDIVIDUAL SOCKETS
MULTI-SOCKET STRIPS • END CAPS



- Round and rectangular single sockets.
- Socket strips of 12 sockets on ½″ or ¾″ centers, individual or common ground.

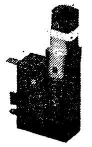
- Attractive on or off. Uniform brilliant light.
- Economical yet reliable and rugged.
- Lenses in a full range of colors.
- Easy to install with push-on speednut mounting, simple panel preparation. Keyed to prevent rotation.
- Lenses can be imprinted.
- Easy relamping from front of panel. No special tools needed.
- Lamps are extreme, long-lived, rugged, reliable, available from 4 volts to 120 volts.
- U.L. approved (phenolic sockets) for 120 volts.
- Either solder or use quick-connect receptacles.

SHORT SLIDE-BASE LAMPS

A complete line of rugged, long-life miniature incandescent lamps is available to fit Industrial Devices individual and multi-socket strips. Several types are offered to cover a wide range of voltages up to 120 volts and ratings up to three watts. Lamps are available in two lengths; the shorter "Indicator" and the longer "Pilot" lamps.

luma switch — Versatile, new, lighted on-off pushbutton control. Custom specifications available on request. SPST alternate action push-on, push-off. Lamp: High brightness neon with built in resistor. Rated at 10 Amps, 125 VAC. Mounting hole: ½″ diameter.

Color	Square Lens	Round Lens
Red	3300A1	3300B1
Clear	3300A2	3300B2
Amber	3300A3	3300B3
White	3300A4	3300B4



SOLID STATE PILOT LIGHTS

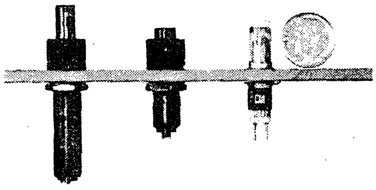
Glo-dot and Mini-cator pilot lights are available with light emitting diodes as well as other types of light sources. They can be supplied with current limiting resistors as well as built-in rectifier diodes for AC service.

Specials . . .
of every description

IDI specializes in designing and adapting pilot lights to particular specifications. We can supply a wide variety of different lens shapes, colors, imprints, mounting styles, leads and terminals. Lights can be provided in complete cost cutting assemblies, to meet any design requirement. Whatever your production calls for, pilot light or complete pilot light assembly, IDI manufacturing expertise will provide quick economical service.

MINI-CATOR

MINIATURE INDICATOR LIGHTS



For use in electronic instrumentation, computers, display panels, precision machinery and electronic equipment in general — including military applications. Neon models available for 65 VAC (90 VDC) and over, with or without built-in resistor. Incandescent models available for 6.3V-.20A, 14V-.08A and 28V-.04A, as well as other voltages and currents. MINI-CATOR consists of replaceable lamp cartridge and mating lampholder. Lamp cartridge has nylon body for long-life ruggedness. Lampholder with built-in resistor for neon cartridges available.

- Lens available in variety of colors, with or without imprints.
- Lampholders mount in ⅜″ hole for space economy.
- Lamp cartridge may be mounted directly in 1⁹⁄₆₄″ dia. hole with mounting clip and lamp connector.

INDUSTRIAL DEVICES, INC.

Edgewater, New Jersey 07020

Phone: 201-943-4084

IEE

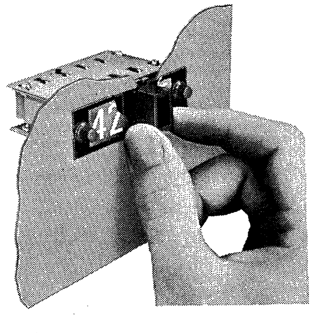
The world's broadest line of rear projection readouts

Industrial Electronic Engineers, Inc.

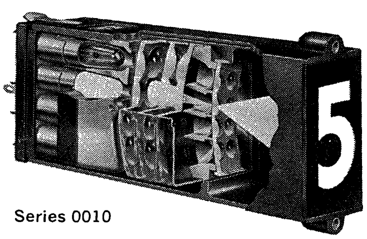
7740 Lemona Avenue, Van Nuys, Calif. 91405 • Phone (213) 787-0311 • TWX 910-495-1707

REAR PROJECTION DISPLAYS

- Single-plane presentation for optimum clarity.
- Bold, bright displays for high readability at wide angles, long distances, in brightest light. (Character brightness up to 100 foot-lamberts.)
- From 11 to 64 message positions per readout. May be displayed individually or in combination.
- No moving parts for unlimited unit life; easily replaceable lamps provide up to 240,000 hours of operation per lamp.
- Low voltage operation.
- Infinite display versatility. IEE readouts permit you to display anything that can be put on film:



Series 0340, Front Relampable



Series 0010

nimo – 10 GUN CRT

Delivers unsurpassed brightness and clarity

$7.70
IN QUANTITIES

Series 6000

- Single plane ⅝" characters (letters, symbols, messages) easily read from 15 ft.
- Normal tube life of 10,000 hours at brightness of 100 ft-L (200,000 hours if time-sharing control circuitry utilized).
- Extremely low power consumption (under 30 milliwatts).
- Wide viewing angle, easily controlled brightness, no external focusing.
- Ideal for serial input applications.

NUMERALS AND LETTERS	POLARITY AND SYMBOLS	MODES AND WORDS	MULTIPLE WORDS AND NUMBERS	ANY SYMBOLS	COLORS WITH OR WITHOUT MESSAGES
A 3	+9.4	1 2 LOAD PRINT	VALVE PUMP 52 34 OPEN OFF	SINA Ω	STOP OK

	SERIES 0345		SERIES 0340		SERIES 0120H			SERIES 0220H			SERIES 0880	
Number of Message Areas	11		11		12			12			12	
Usable Projected Message Area	.38H x .34W		.38H x .34W		.59 Square			.62 Square			.50 Square	
Average Character Brightness at Rated Voltage	#C1 5 Volts	#C1 6 Volts	#1 5 Volts	#1 6 Volts	#328 6 Volts	#330 14 Volts	#327 28 Volts	#328 6 Volts	#330 14 Volts	#327 28 Volts	#718 5 Volts	#718 6 Volts
	30 F/L	60 F/L	30 F/L	60 F/L	100 F/L	35 F/L	25 F/L	100 F/L	35 F/L	25 F/L	30 F/L	60 F/L
IEE Rated Lamp Life	10,000 Hours	1,000 Hours	40,000 Hours	4,000 Hours	3,000 Hours	2,500 Hours	5,000 Hours	3,000 Hours	2,500 Hours	5,000 Hours	40,000 Hours	4,000 Hours
Rated Lamp Life at 30 Foot Lamberts	10,000 Hours	N/A	40,000 Hours	N/A	240,000 Hours	4,500 Hours	2,500 Hours	240,000 Hours	50,000 Hours	2,500 Hours	40,000 Hours	N/A
Standard Character Height Viewing Distance	.37 in. — 8 ft.		.37 in. — 8 ft.		.59 in. — 12 ft.			.59 in. — 12 ft.			.50 in. — 10 ft.	
Overall Dimensions	2.50 x .75 x .50		2.41 x .760 x .505		4.16 x 1.31 x .995			3.96 x 1.475 x 1.07			3.19 x 1.18 x .810	
Lamp Replacement Access	Front Panel		Front Panel		Rear Panel			Front Panel			Front Panel	
Method of Removing Unit from Panel	Pull Forward by Hand		Push In to Release Latch and Pull Forward		Rear Removable			Push In to Release Latch and Pull Forward			Release Positive Latch and Pull Forward	
Type of Lamp Recommended for Optimum Performance	Based T-⅞ #C1		Based T-⅞ #1		Based T-¾ #328			Based T-1¾ #328			Based T-1 #718	
Maximum Operating Ambient Temperature. 1 Lamp Cont.	85°C		85°C		85°C			85°C			85°C	
Method of Changing Film Reticle	Remove 2 Screws and Open Case		Remove 2 Screws and Open Case		Remove 2 Screws and Open Case			Remove 4 Screws and Open Case			Remove 2 Screws and Separator	
Unit Cost (1-49 Quantity) Consult Factory for Quantity Prices	$21.00		$30.00		$35.00			$31.25			$31.25	
IEE Lamp Replacement Costs	$.40 — .78 each		$.63 — .89 each		$.22 — .24 each			$.22 — .24 each			$.596 each	
Assembly Hardware Costs	$5.00 plus $3.00 per unit *		$5.00 plus $10.50 per unit *		$5.00 plus $1.00 per unit			$5.00 plus $5.75 per unit *			$5.00 plus $6.25 per unit *	

*Front relampable units must be ordered with assembly hardware as individual inserts have no mounting provision.

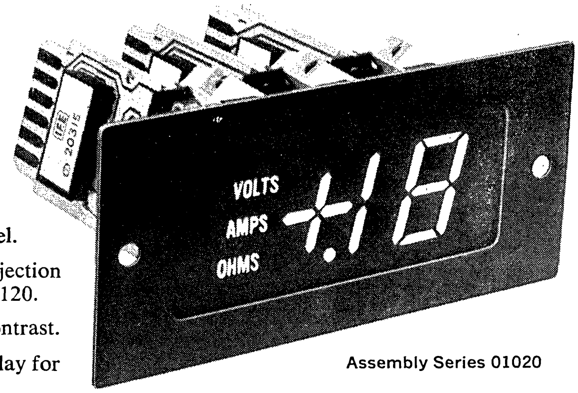
The world's broadest line of rear projection readouts
IEE Industrial Electronic Engineers, Inc.
7740 Lemona Avenue, Van Nuys, Calif. 91405 • Phone (213) 787-0311 • TWX 910-495-1707

7-BAR SEGMENT DISPLAY

Features bright .78″H characters

$2.95 IN QUANTITIES

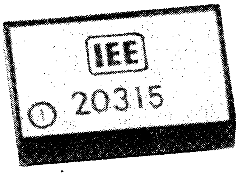
- Optimum single plane viewing from 16′.
- Lamp replacement from front or rear.
- Optional caption display; 1-6 messages.
- Complete assembly, no additional hardware required.
- Choice of 5 screen colors.
- Minimum depth behind panel.
- Optional also with Rear-Projection 12 message display, Series 0120.
- Exceptional brightness and contrast.
- Optional 9-Bar Segment Display for hexadecimal applications.



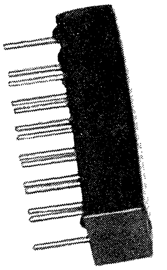
Assembly Series 01020

LOW COST HYBRID DRIVER/DECODERS

- Miniature size .225″H x .750″W x 1.250″D.
- *Low low* price $14.25 (in quantities).
- Completely self-contained.
- Compatible dual in-line mounting.
- 10/12 decoded outputs.
- TTL/DTL compatible logic.
- Lamp blanking circuitry included.
- High drive capability 30V @ 500 ma lamps.
- Designed specifically for lamp dimming applications.



TYPICAL HYBRID CIRCUIT

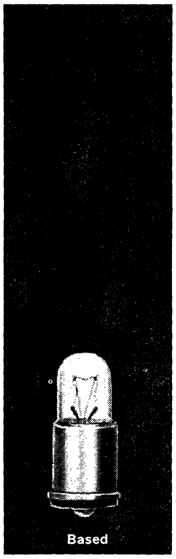


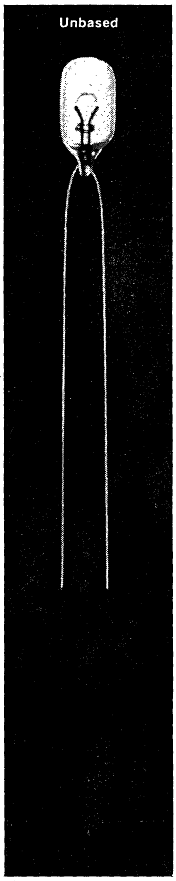
IEE offers a complete line of miniaturized, low cost hybrid Driver/Decoders. Whatever your display application, chips are available either with or without memory both by itself or mounted on a plug-in interface board. IEE can provide the most economical, State-of-The-Art interface in both driving device and panel display.

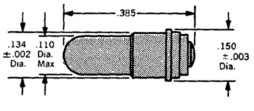
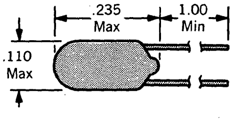
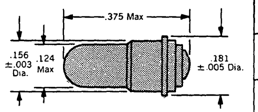
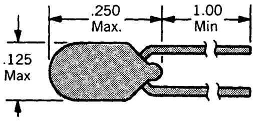
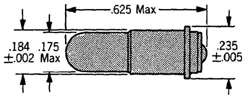
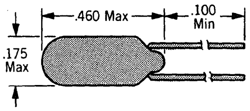
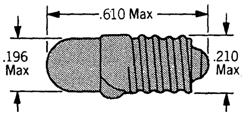
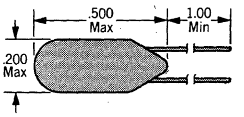
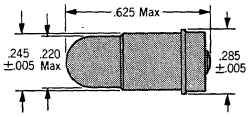
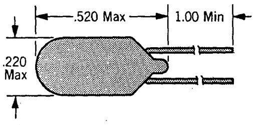
SERIES **0865** Option with Switch becomes 0860		SERIES **0010H**			SERIES **0160H**		SERIES **0360H**			SERIES **0080**			SERIES **0400** Option with Switch becomes 0405		**Status Indicator**		
24		12			12		12			12			12		12		
.50 Square		.94 Square			1.562H x 1.125W		2.0H x 1.5W			3.375H x 2.75W			.50 Square		.43 Square		
#718 5 Volts	#718 6 Volts	#44 6.3 Volts	#1815 14 Volts	#1820 28 Volts	#238 Lamp 6.3 Volts	#44 Lamp 6.3 Volts	#238 6.3 Volts	#1815 14 Volts	#313 28 Volts	#1886 6.3 Volts	#1414 14 Volts	#1495 28 Volts	#718 5 Volts	#718 6 Volts	#47 6.3 Volts	#1815 14 Volts	#1820 28 Volts
20 F/L	38 F/L	75 F/L	60 F/L	32 F/L	45 F/L	24 F/L	60 F/L	20 F/L	25 F/L	45 F/L	35 F/L	19 F/L	30 F/L	60 F/L	200 F/L	220 F/L	140 F/L
40,000 Hours	4,000 Hours	3,000 Hours	3,000 Hours	1,000 Hours	2,000 Hours	3,000 Hours	2,000 Hours	3,000 Hours	5,000 Hours	3,000 Hours	500 Hours	500 Hours	40,000 Hours	4,000 Hours	3,000 Hours	3,000 Hours	1,000 Hours
N/A	9,200 Hours	90,000 Hours	45,000 Hours	N/A	8,000 Hours	N/A	24,000 Hours	N/A	N/A	12,000 Hours	900 Hours	N/A	40,000 Hours	N/A	30,000 Hours	30,000 Hours	10,000 Hours
.50 in. — 10 ft.		.94 in. — 20 ft.			1.50 in. — 30 ft.		2.00 in. — 40 ft.			3.37 in. — 70 ft.			.50 in. — 10 ft.		.37 in. — 8 ft.		
3.095 x 1.39 x .900		5.50 x 2.625 x 1.562			7.00 x 2.69 x 1.56		7.80 x 3.935 x 2.00			12.12 x 5.30 x 3.29			1.12 x .75 x 3.60		2.62 x 2.415 x 1.935		
Front Panel		Rear Panel			Rear Panel		Rear Panel			Rear Panel			Front Panel		Front Screen is Removable by Hand for Lamp Access		
Release Positive Latch and Pull Forward		Rear Removable			Rear Removable		Rear Removable			Rear Removable			Pull Forward by Hand		Front Removable by Hand		
Based T-1 #718		Bayonet Base T-3¼ #44			Bayonet Base T-3¼ #44		Bayonet Base T-3¼ #238			Bayonet Base T-4½ #1886			Based T-1 #718		Bayonet Base T-3¼ #47		
85°C		70°C			70°C		70°C			70°C			85°C		85°C		
Remove 2 Screws and Open Case		Remove 4 Screws and Open Case			Not Changeable by Customer		Remove 4 Screws and Open Case			Remove 4 Screws and Open Case			Remove Two Studs and Separator		Release Screen and Remove Display Grid		
$39.00		$20.00			$25.50		$38.50			$43.00			$36.00		$20.00 — $22.00		
$.596 each		$.10 — .23 each			$.10 — .26 each		$.10 — .30 each			$.20 — .26 each			$.596 each		$.10 — .37 each		
$17.00 plus $12.00 per unit *		$5.00 plus $1.00 per unit			$5.00 plus $1.00 per unit		$6.00 plus $1.50 per unit			$6.00 plus $2.00 per unit			$5.00 plus $2.75 per unit		N/A		

IEE Subminiature Incandescent Lamps

Handworkmanship insures accurate filament location and superior mechanical characteristics. • Handblown, seamless and tipless envelope provides unmatched clarity. • Machined bases for precision fit. • All lamps aged to stability and selected to insure long life and uniform brightness. • Cost savings as much as 40% below competitive manufacturers.


Based


Unbased

Listed below is but a sampling of our over 300 lamp styles.		Lamp No.	Volt	Amp	M.S.C.P.*	Average Life (Hrs.)	Price** (Each)	Description
T 7/8 LAMPS BASED		1	5	.115	.132	40,000	.482	A totally new lamp designed and developed by IEE. Now being widely accepted throughout the industry as a standard. This lamp offers all the features of a standard T1 lamp but requires much less space. Supplied in both standard types and commercial types for low cost applications.
		A3	14	.04	.132	16,000	.619	
		A5	12	.06	.132	16,000	.619	
T 7/8 LAMPS UNBASED		3	5	.115	.147	40,000	.353	
		AU3	14	.04	.147	16,000	.490	
		AU5	12	.06	.147	16,000	.490	
T 1 LAMPS BASED		685	5	.06	.053	100,000	.413	IEE offers price savings of up to 50% on T 1 lamps, and at the same time provides higher quality. This includes aging and selection as a standard at no increase in price. Aging and selection provide a lamp with much longer life and more uniform light.
		714	5	.075	.088	60,000	.413	
		718	5	.115	.147	40,000	.413	
T 1 LAMPS UNBASED		683	5	.06	.053	100,000	.294	
		713	5	.075	.088	60,000	.294	
		715	5	.115	.147	40,000	.294	
T 1-1/4 LAMPS BASED		632	28	.04	.34	5000	.294	IEE provides industry standards on T 1-1/4 lamps and also ages and selects them at no increase in price. Models are also offered with average life of 100,000 hours.
		646	14	.08	.50	2500	.287	
		628	6	.20	.63	3000	.241	
T 1-1/4 LAMPS UNBASED		627	28	.04	.36	5000	.210	
		640	14	.08	.53	2500	.203	
		634	6	.20	.66	3000	.157	
T 1-1/2 LAMPS BASED		317	14	.065	.400	500	.144	IEE T 1-1/2's are special lamps developed to meet the increasing demand for a quality lamp at a very low price for commercial applications.
		318	7	.065	.120	1000	.115	
		333	28	.040	.400	1000	.158	
T 1-1/2 LAMPS UNBASED		GU1	7	.065	.150	1000	.079	
		GU2	14	.065	.400	500	.108	
		GU3	28	.040	.400	1000	.122	
T 1-3/4 LAMPS BASED		327	28	.04	.34	5000	.192	Standard IEE T 1-3/4 lamp life rated at 3 to 5 times the industry standard. However, the lamps are priced considerably below the industry standard. IEE also ages and selects these lamps and does not increase the pricing for this service. The lamps are well stabilized and have a very uniform output of light.
		328	6	.20	.34 at 5V	3000	.188	
		330	14	.08	.50	2500	.202	
T 1-3/4 LAMPS UNBASED		2187	28	.04	.30	25,000	.168	
		1784	6	.20	.36 at 5V	3000	.132	
		1705	14	.08	.52	2500	.146	

*Mean spherical candle power. **Qty. price on 50,000 and over.

Contact your local IEE Representative or Distributor for data on "Special Lamps" for unique applications.

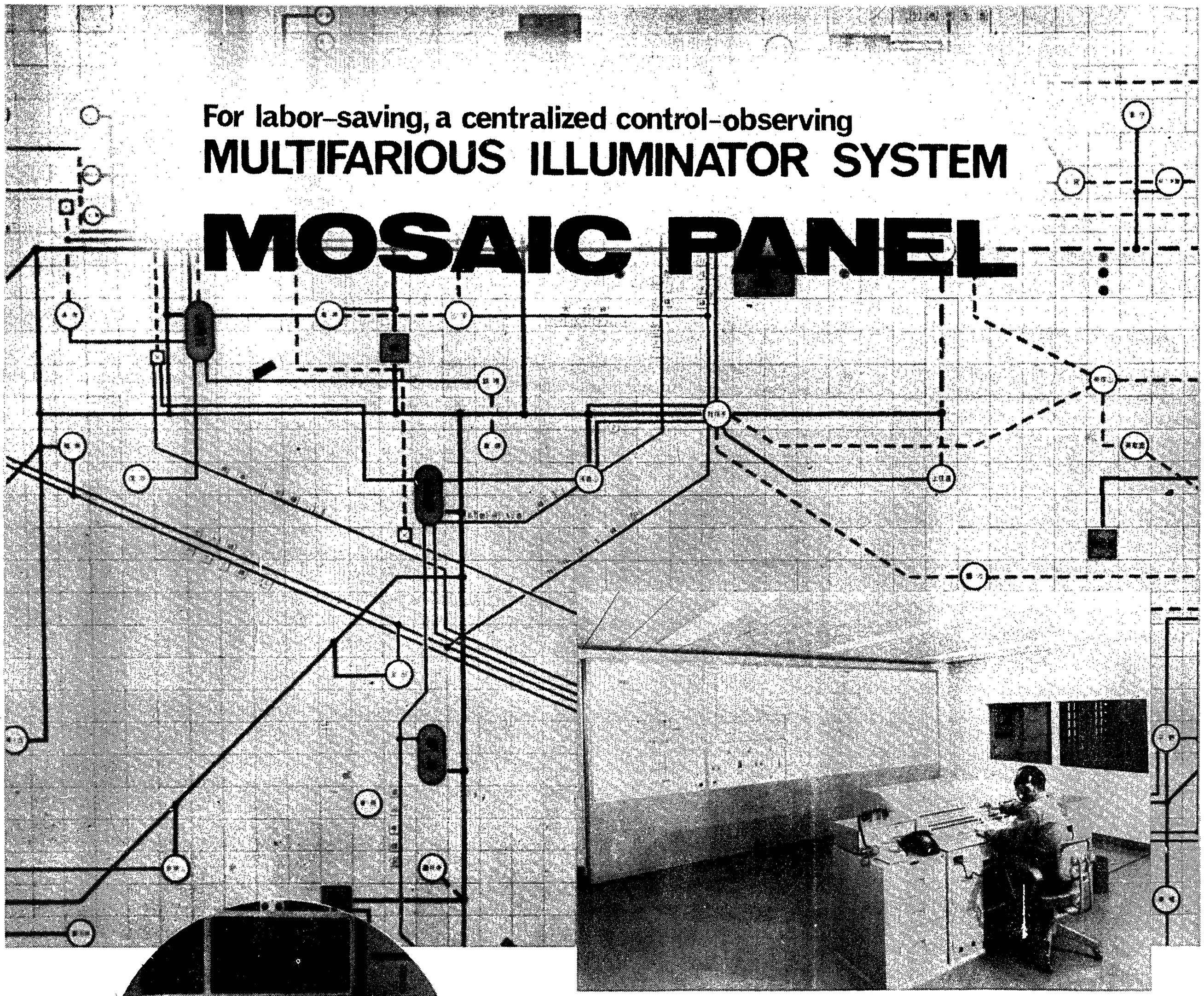
IEE

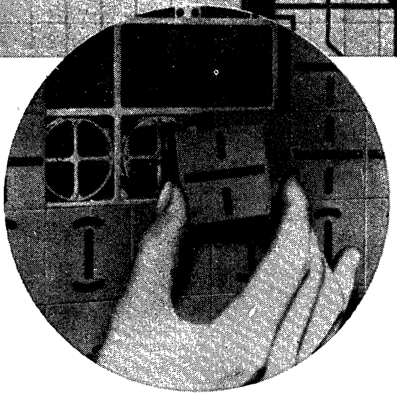
Industrial Electronic Engineers, Inc.,
7740 Lemona Ave., Van Nuys, California

For labor-saving, a centralized control-observing

MULTIFARIOUS ILLUMINATOR SYSTEM

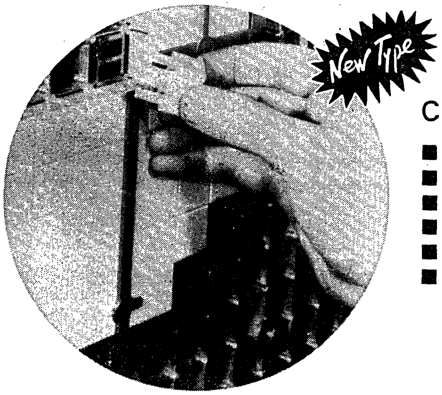
MOSAIC PANEL





SCREW FITTING SYSTEM

- Blocks in thermosetting material
- Resistant to change under the influence of temperature or vibration
- Strong illumination by plug-in lamps up to 3 watt
- 2 block dimension: 45 x 45·25.5 x 25.5m/m
- Suitable for mounting heavy instruments and switch on this system



CLIP FITTING SYSTEM

- Block in polycarbonate
- Suitable for boards mounted by the user
- Fast and easy changing of blocks, lampsockets and instruments
- Can be changed by a single operater
- Low cost-price
- 2 block dimentions: 24 x 24· 48 x 48m/m

KCC SHOKAI LTD. K.C.C.

Head Office: No.31, 4-chome, Ouchi-dori, Nada-ku, Kobe, Japan Phone: (078) 87-0271/3
Agents in U.S.A.: Japan Cotton Co., Ltd. Houston Office Room No. 1510, Melrose Bldg.,Walker at San Jaciato, Houston 2, Texas, U.S.A.
Nichimen Co., Inc. 22nd Floor, 60 Broad St., New York, N.Y. 10004, U.S.A.

The Biggest Selection of the Smallest

For aerospace. For instrumentation. For computers and peripherals. For medical electronics. Miniature. Subminiature. Microminiature. We make more — and more types — of them than anyone else in the world.

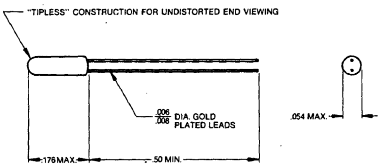
The charts below present 143 of our most popular lamps; so, you may very well find what you need right here. Even if you do, however, be sure to send for our catalog. Not just for our sake. For yours, too. Now. While you're thinking about it.

Why bother? Two reasons. First, the catalog includes a lot of hard-to-find important data: For example, a large, full-color interpretation of the International Commission on Illumination (ICI) chromaticity diagram; nomograph scales, showing the correlation between voltage, current, candle power and useful life; linear graphs of rise time, spectral distribution and spectral response characteristics; and many other types of illustrated technical source.

T-⅜ Lamp

Unsupported Filament Unbased

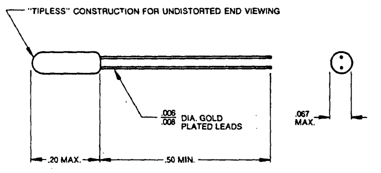
Design Volts	Design Amps	Candle Power (MSCP)	Average Life (Hours)	LAMPS, INC. Number
1.5	.015	.002 NOM.	10,000	173
3.0	.029	.03±15%	5,000	156


"TIPLESS" CONSTRUCTION FOR UNDISTORTED END VIEWING
.006/.008 DIA. GOLD PLATED LEADS
.054 MAX.
.176 MAX.
.50 MIN.

T-½ Lamp

Unsupported Filament Unbased

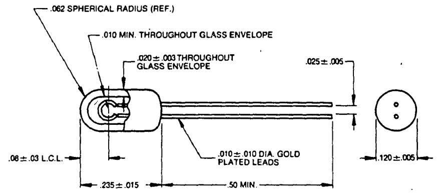
Design Volts	Design Amps	Candle Power (MSCP)	Average Life (Hours)	LAMPS, INC. Number
1.5	.015	.002 NOM.	10,000	174
2.5	.045	.05 NOM.	1,000	186
3.0	.029	.03 NOM.	5,000	176
5.0	.020	.034 NOM.	5,000	157


"TIPLESS" CONSTRUCTION FOR UNDISTORTED END VIEWING
.006/.008 DIA. GOLD PLATED LEADS
.067 MAX.
.20 MAX.
.50 MIN.

T-1 Lamp

Helium Resistant
Unsupported Filament Unbased

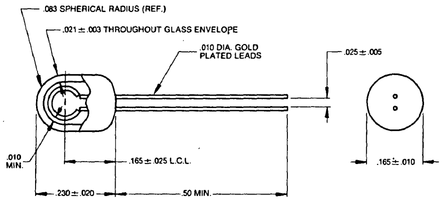
Design Volts	Design Amps	Candle Power (MSCP)	Average Life (Hours)	LAMPS, INC. Number
5.0	.060	.03±15%	60,000	162
5.0	.060	.05±15%	40,000	163
5.0	.075	.09±15%	16,000	164
5.0	.115	.15±15%	16,000	165


.062 SPHERICAL RADIUS (REF.)
.010 MIN. THROUGHOUT GLASS ENVELOPE
.020 ± .003 THROUGHOUT GLASS ENVELOPE
.025 ± .005
.08 ± .03 L.C.L.
.010 ± .010 DIA. GOLD PLATED LEADS
.120 ± .005
.235 ± .015
.50 MIN.

T-1¼ Lamp

Helium Resistant
Unsupported Filament Unbased

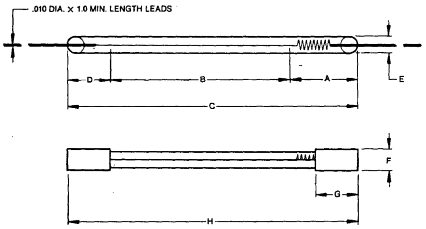
Design Volts	Design Amps	Candle Power (MSCP)	Average Life (Hours)	LAMPS, INC. Number
5.0	.060	.03±15%	60,000	166
5.0	.060	.05±15%	40,000	167
5.0	.075	.09±15%	16,000	168
5.0	.115	.15±15%	16,000	169


.083 SPHERICAL RADIUS (REF.)
.021 ± .003 THROUGHOUT GLASS ENVELOPE
.010 DIA. GOLD PLATED LEADS
.025 ± .005
.010 MIN.
.165 ± .025 L.C.L.
.165 ± .010
.230 ± .020
.50 MIN.

Line Filament Lamp

Design Volts	Design Amps	A Max.	B Min. Hot	C Max.	D Max.	E Max.	F	G	H	LAMPS, INC. Number
2.5	0.04	.20	.37	.88	.12	.052				111
3.0	0.40	.70	1.0	2.2	.50	.160	.19	.31	2.2	218
6.0	0.12	.50	1.0	2.0	.30	.094	.12	.25	2.0	96
6.0	0.12	.35	1.0	1.7	.25	.094	.12	.25	1.7	105
6.0	0.40	.50	1.25	2.3	.55	.160	.19	.31	2.3	140**
12.0	0.12	.50	3.0	3.9	.30	.094	.12	.25	3.9	235
14.0	0.50	.62	3.3	4.7	.38	.160	.19	.31	4.7	211
18.0	0.12	.50	3.5	4.5	.30	.094	.12	.25	4.5	97
20.0	0.12	.50	4.0	5.0	.30	.095	.12	.25	5.0	108
36.0	0.12	.62	7.5	8.8	.30	.094	.12	.25	8.8	98
38.0	0.20	.75	9.0	10.5	.40	.13	.16	.25	10.5	99
48.0	0.20	.75	11.5	12.9	.40	.13	.16	.25	12.9	100

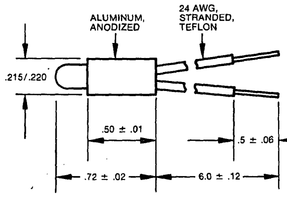
**NUMBER 140 LEAD DIA. IS .020 X 1.0 LONG, SOLDER DIP ONLY.


.010 DIA. X 1.0 MIN. LENGTH LEADS
D
B
A
E
C
F
G
H

TL-1¼ Lamp

Lens End Light Assembly

Design Volts	Design Amps	Average Life (Hours)	Spot Intensity FTC	LAMPS, INC. Number
2.5	.20	1,000	500	474
2.5	.35	10,000	800	476
2.5	.35	10,000	1,000	477
6.0	.20	1,000	1,000	475


ALUMINUM, ANODIZED
24 AWG, STRANDED, TEFLON
.215/.220
.50 ± .01
.5 ± .06
.72 ± .02
6.0 ± .12

Lamps.

Second, the catalog includes several hundred lamps in addition to those shown here. Frankly, this is an incomplete listing of our line. That's one of the prices you pay for being Number One. Even as you read this, we're putting into production new lamps that were still in the idea stage when this edition of EEM went to press. One of them may help you solve a design problem, or spark a new idea.

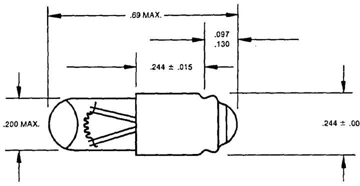
You see, our product listings aren't complete because our product line is.

We'd like to tell you more about it.

LAMPS, Inc. 19220 S. Normandie Ave.,
Torrance, Calif. 90502 (213) 323-7578

TL-1¾ Lamp Lens End Lamps

Design Volts	Design Amps	Average Life (Hours)	LAMPS, INC. Number	Engineering Notes
2.5	.35	10,000	253	⅛" min. dia. spot, .6" from tip.
2.5	.35	10,000	253X	⅛" min. dia. spot, ⅜" from tip., 750 FTC.
2.5	.35	10,000	253-1	1/16" min. dia. spot, ⅜" from tip., 750 FTC.

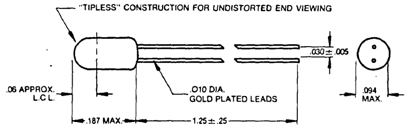


.69 MAX.
.097
.130
.244 ± .015
.200 MAX.
.244 ± .005

T-¾ Lamp

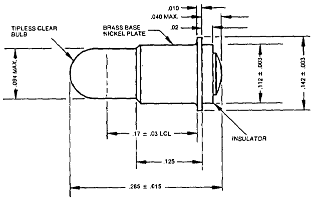
Design Volts	Design Amps	Candle Power (MSCP)	Average Life (Hours)	Unbased LAMPS, INC. Number	Midget Flange Based LAMPS, INC. Number	Bipin Based LAMPS, INC. Number	Coaxial Based LAMPS, INC. Number
5	.02	.02±25%	50,000	213	292	293	294
5	.02	.034±15%	10,000	189	262	455	215
5	.06	.03±15%	100,000	30	239	299	300
5	.06	.05±15%	100,000	9	240	456	302
5	.075	.09±15%	25,000	12	241	303	304
5	.08	.15±15%	6,000	34	305	457	307
5	.115	.15±15%	40,000	17	242	405	309
5	.115	.20±15%	5,000	18	310	458	312
115	.001	.01 NOM.	5,000	249	250	313	314

Unbased



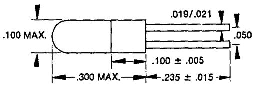
"TIPLESS" CONSTRUCTION FOR UNDISTORTED END VIEWING
.030 ± .005
.06 APPROX. L.C.L.
.010 DIA. GOLD PLATED LEADS
.094 MAX.
.187 MAX.
1.25 ± .25

Midget Flange Based

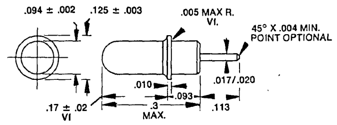


TIPLESS CLEAR BULB
BRASS BASE NICKEL PLATE
.010
.040 MAX.
.02
.094 MAX.
.112 ± .003
.142 ± .003
.17 ± .03 LCL
INSULATOR
.125
.285 ± .015

Bipin Based



.019/.021
.100 MAX.
.050
.100 ± .005
.300 MAX.
.235 ± .015



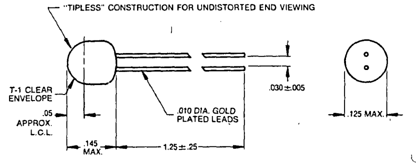
.094 ± .002
.125 ± .003
.005 MAX R. VI.
45° X .004 MIN. POINT OPTIONAL
.010
.093
.017/.020
.17 ± .02 VI
.3 MAX.
.113

Coaxial Based

T-1 Lamp

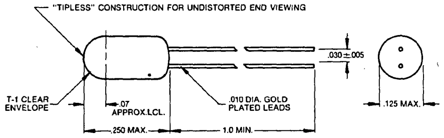
Design Volts	Design Amps	Candle Power (MSCP)	Average Life (Hours)	Reduced Length Unbased LAMPS, Number	Unbased LAMPS, Number	Midget Flange Based LAMPS, Number	Bipin Based LAMPS, Number
1.5	.015	.01 NOM.	10,000	—	4	22	316
1.5	.06	.015 NOM.	100,000	—	81	88	319
3.0	.008	.005 NOM.	10,000	—	80	87	330
3.0	.015	.02 NOM.	5,000	—	138	147	333
5.0	.015	.015 NOM.	10,000	—	8	24	339
5.0	.02	.034±15%	10,000	—	210	263	340
5.0	.03	.03 NOM.	16,000	—	139	160	341
5.0	.04	.1±15%	10,000	—	225	226	342
5.0	.06	.03±15%	100,000	57	32	29	343
5.0	.06	.05±15%	100,000	58	11	25	344
5.0	.06	.15±15%	6,500	—	229	230	345
5.0	.075	.09±15%	25,000	59	14	26	347
5 0	.115	.15±15%	40,000	33	16	27	349
5.0	.115	.2±15%	5,000	60	20	28	356
5.0	.115	.22±15%	5,000	—	70	172	358
5.0	.125	.25±15%	5,000	—	45	46	359
10.0	.027	.10 NOM.	10,000	—	74	85	362
12.0	.04	.15±25%	16,000	—	227	228	383
12.0	.06	.15±25%	16,000	—	66	71	384
14.0	.04	.15±25%	16,000	—	248	256	388
18.0	.026	.15 NOM.	10,000	—	75	86	389
28.0	.024	.15±25%	16,000	—	62	64	393
115.0	.001	.01 NOM.	5,000	—	95	118	396

Reduced Length Unbased



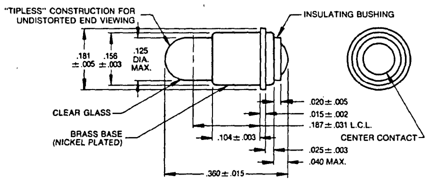
"TIPLESS" CONSTRUCTION FOR UNDISTORTED END VIEWING
T-1 CLEAR ENVELOPE
.05 APPROX. L.C.L.
.010 DIA. GOLD PLATED LEADS
.030 ± .005
.125 MAX.
.145 MAX.
1.25 ± .25

Unbased



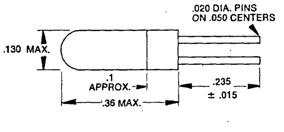
"TIPLESS" CONSTRUCTION FOR UNDISTORTED END VIEWING
.030 ± .005
T-1 CLEAR ENVELOPE
.07 APPROX.LCL.
.010 DIA. GOLD PLATED LEADS
.125 MAX.
.250 MAX.
1.0 MIN.

Midget Flange Based



"TIPLESS" CONSTRUCTION FOR UNDISTORTED END VIEWING
INSULATING BUSHING
.181 ± .005
.156 ± .003
.125 DIA. MAX.
CLEAR GLASS
BRASS BASE (NICKEL PLATED)
.020 ± .005
.015 ± .002
.187 ± .031 L.C.L.
CENTER CONTACT
.104 ± .003
.025 ± .003
.040 MAX.
.360 ± .015

Bipin Based



.020 DIA. PINS ON .050 CENTERS
.130 MAX.
.1 APPROX.
.235 ± .015
.36 MAX.

LEECRAFT®

Leecraft MANUFACTURING CO., INC.

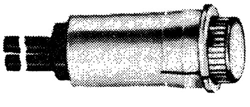
21-16 44th Road, Long Island City, N.Y. 11101 • (212) EXeter 2-8800 • TELEX #12-6977

WRITE FOR PRODUCT LIGHTING GUIDE. PROTOTYPE SAMPLES AVAILABLE ON REQUEST.

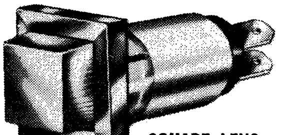
INDICATOR LIGHTS

SNAPLITE INDICATOR LIGHTS

With long-life lamps, high brightness types. Built-in resistors — when neon lamps — to suit applied circuit voltage, provide required lamp life, eliminating replacement need. Features: Snap into place in $\frac{1}{2}$" hole with no additional hardware. Wide variety of lens and housing colors. Tab or solder terminals; or wire leads. AVAILABLE WITH CHROME RINGS. To specify Chrome Rings add R after 1st 2 Digits, i.e., 32-2111 becomes 32R2111.

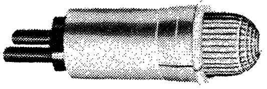


FLAT CYLINDRICAL LENS
32-2111 $\frac{3}{16}$" high



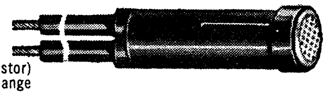
SQUARE LENS
32R2911T $\frac{7}{32}$" high

DOME LENS
32-2211 $\frac{13}{32}$" high



TINEON INDICATOR LIGHTS

Long Life, High Brightness Lamps — Press fit into 5/16" hole — For neon types rated 110-250V — Nylon housing in colors (white standard) — Speed nut furnished — Plastic lens in colors — Legends — Built-in Resistor — Insulated Leads.
All Tineons are available with Incandescent Lamp.



4100 Series
(with neon less resistor or incandescent)

3600 Series
(with built-in resistor)
Available in 3 flange dimensions

No. 45R2111T8

TINEONS
45 Series
(Blade Terminals)

46N2311

46 Series
(Pin Type Terminals)

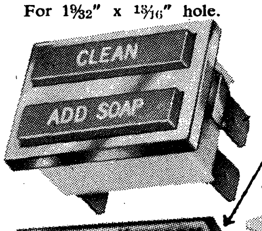
WITH ALUMINUM BEZEL
All Tineons may be furnished with aluminum bezel. Please specify when ordering.

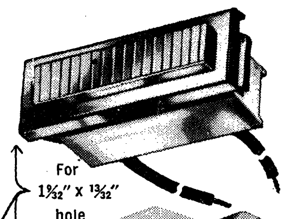
No. 36EN2111 (Hi-Hat red lens)
With aluminum bezel

RECTANGULAR INDICATOR LIGHTS

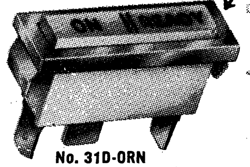
Long Life High Brightness Neon Lamps — Snap into panel securely without additional hardware — Choice of lens colors — Series 3100 has chrome bezel and plastic lens — Series 47 has one-piece plastic lens and body — Complete range of voltages — UL and CSA listed.

DUAL BEZEL
No. 31-ML2
For $1\frac{9}{32}$" x $1\frac{5}{16}$" hole.



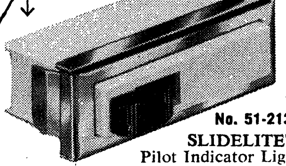


For $1\frac{9}{32}$" x $\frac{13}{32}$" hole



No. 31D-ORN
Dual Message Lights

Barrier separates light into two separate message areas. Individual or simultaneous operation.



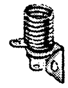
No. 51-2135T
SLIDELITE™
Pilot Indicator Light,
Slide-Switch Combination

Ultra-compact. Simple snap-in installation. Wide voltage range, choice of lights. May be message stamped. Lens colors: red, amber, clear, white, blue, green, others on request. Leads or terminals. $1\frac{25}{64}$"x $\frac{15}{32}$"x$\frac{21}{32}$". Rating: 125 V. 6 Amps.

LAMPHOLDERS

MIDGET SCREW

16-00 SERIES
SOLDER, TERM.
•
16-200 SERIES
WIRE LEADS



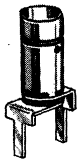
16-08

MIDGET GROOVED

25-200 SERIES WIRE LEADS

25-00 SERIES SOLDERING TERMINALS

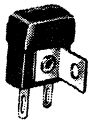
Used in data processing and automation fields with Lens-End Lamp Nos. 253, 253X, and 261.



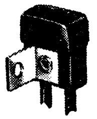
25-35

WEDGE BASE

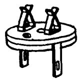
23-00 SERIES **23-200 SERIES** **24-00 SERIES**



23-24



23-223

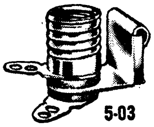


24-07A

23-00 SERIES — Molded housing, terminal.
23-200 SERIES — Molded housing with wire leads.
24-00 SERIES — Wafer type terminals.

MINIATURE SCREW

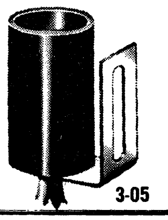
5-00 SERIES
SOLDER
TERMINALS or
WIRE LEADS



5-03

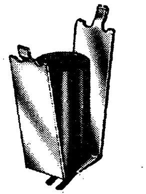
MINIATURE BAYONET

3-00 SERIES



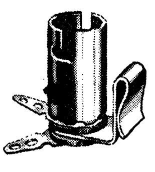
3-05

2-00 SERIES

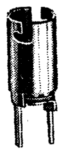


2-15

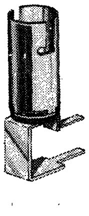
7-00 SERIES



7-01



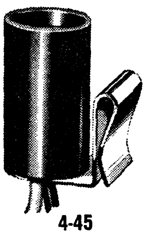
7-35



7-35XP11

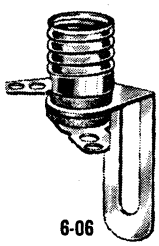
CANDELABRA SCREW

4-00 SERIES



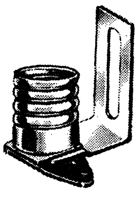
4-45

6-00 SERIES



6-06

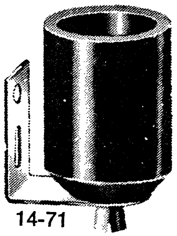
18-00 SERIES



18-79

INTERMEDIATE SCREW

14-00 SERIES

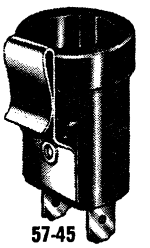


14-71

CANDELABRA BAYONET

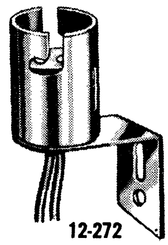
DOUBLE CONTACT

57-00 SERIES



57-45

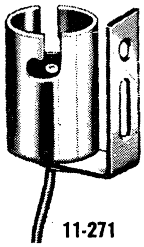
12-200 SERIES



12-272

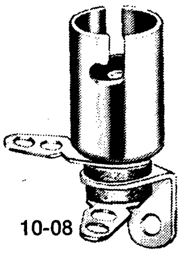
SINGLE CONTACT

11-200 SERIES



11-271

10-00 SERIES

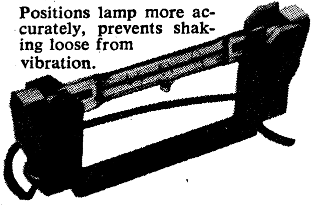


10-08

LAMPHOLDERS FOR SINGLE-ENDED and DOUBLE-ENDED QUARTZ IODINE LAMPS

Double Contact • 2200 Series

Positions lamp more accurately, prevents shaking loose from vibration.



Recessed
Single Contact • 2600 Series

Complete assembly — two holders mounted on common bracket, or separate sockets. Brackets in all lengths.

Legi ELECTRONICS CORPORATION
3118A WEST JEFFERSON BLVD., LOS ANGELES, CALIFORNIA 90018, U.S.A. ■ (213) 737-1521, 737-1522
SUBSIDIARY OF ISE ELECTRONICS CORPORATION
ISE, JAPAN

Legi Electronics Corporation is the U. S. Subsidiary of ISE Electronics Corporation of Japan and is the sole distributor of their Numerical Indicator Display Tubes in the United States, Canada, and Mexico.

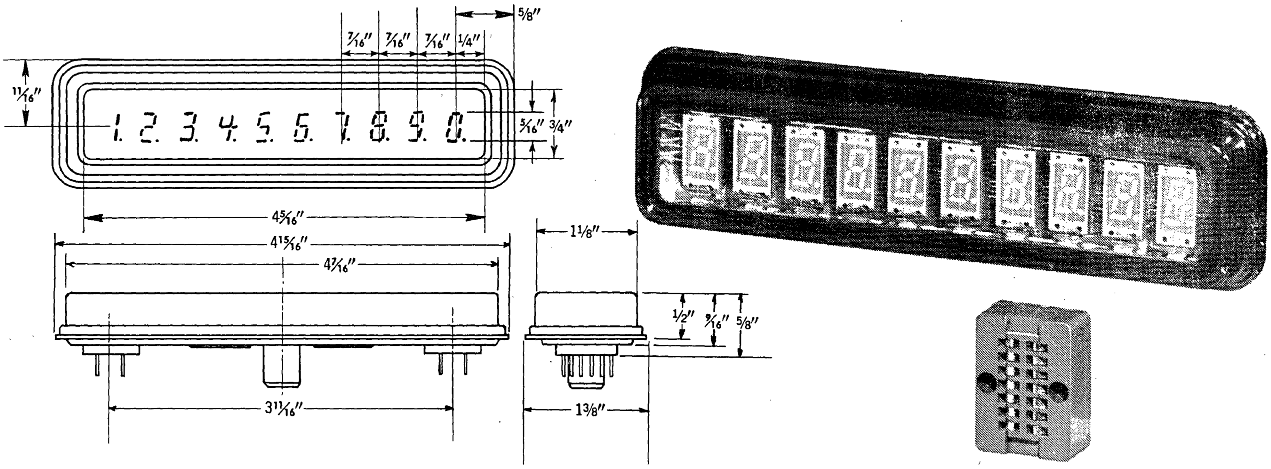
ISE is one of the leading electronic manufacturers in Japan and is especially known throughout the world for their "Fluorescent Numerical Indicator Display Tubes" and for their unique "Matrix Cathode Ray Tubes."

MULTI-LEGI NUMERICAL INDICATOR TUBE

This is a multi-unit fluorescent indicator tube in which two or more fluorescent numeral display tubes developed by ISE Electronics Corp. are contained in one envelope.

As compared with conventional indicator tubes, this new device features the following characteristics:

1. Easy mounting in a set.
2. Connection with a set is very easy.
3. Connection can be made by means of IC sockets (of dual inline type).
4. Numerals are clearly visible due to absence of glass reflection.
5. As the outer envelope is made of metal, the device is less susceptible to static electricity.
6. Intermediate taps are taken from filaments, therefore, brightness difference between digits is very small.
7. Regarding each segment of each digit, the same segment is internally connected in common, reducing the number of external leads.
8. The grid of each digit is independently led out externally.
9. Brightness has been increased (by adopting a new manufacturing method).



ABSOLUTE MAXIMUM RATINGS

Filament Current .... 46 to 53 mA
Segment Voltage .... 45 to 55 V
Grid Voltage .... 45 to 55 Vp-p*
Operating Temperature .... −10 to +70°C
*Pulse Condition: Duty Factor = 1/12

RECOMMENDED OPERATING CONDITION

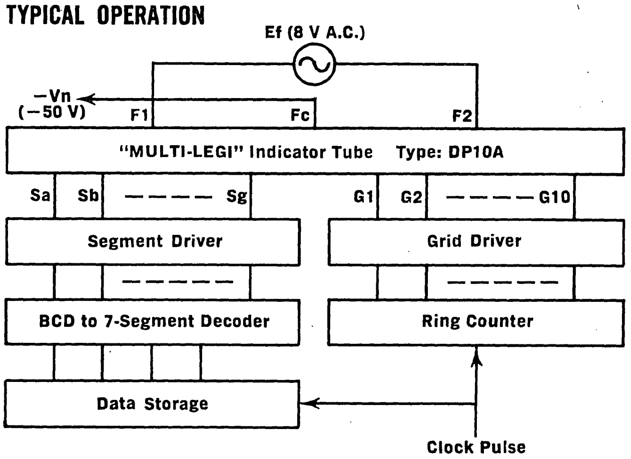
Filament Voltage .... 8.0 V
Segment Voltage .... 50 Vp-p**
Grid Voltage .... 50 Vp-p**
**Pulse Condition: Duty Factor = 1/12

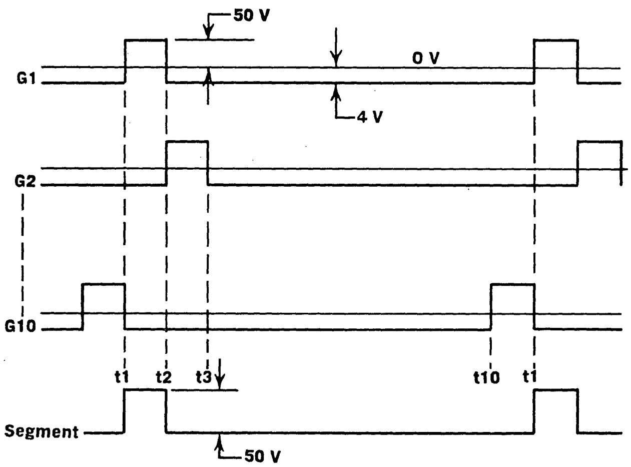
ELECTRICAL CHARACTERISTICS

	Test Conditions	Min.	Limits Typ.	Max.	Units
Filament Voltage	If=50mA, Ep.eg=0V	7.2	8.0	8.8	V
Segment Current	If=50mA, Ep.eg=50V	—	2.0	—	mA
Grid Current	If=50mA, Ep.eg=50V	—	12.0	18.0	mA
Segment Cut-off Voltage	If=50mA, eg=50V	—	—	0	V
Grid Cut-off Voltage	If=50mA, Ep=50V	—	—	−4.0	V
Brightness	If=50mA, Ep.eg=50V	80	—	—	FT/L

If — Filament Current
Ep — Segment Voltage (Duty Factor 1/12 Pulse)
eg — Grid Voltage (Duty Factor 1/12 Pulse)

TYPICAL OPERATION





Grid & Segment Voltage Waveforms

Legi NUMERICAL INDICATOR TUBES

LEGI™ numerical indicator tubes provide a highly efficient display of digits and characters at extremely low operating voltages. These single-plane tube read-outs offer low power consumption with rugged construction, and an exceptionally wide viewing angle with unsurpassed brightness and clarity.

The numerical figures, mathematical symbols, and characters are composed of highly efficient green phosphor-coated segments, energized by electrons emitted from a direct heated super fine cathode. Particularly suited to decimally coded applications such as basic counters and computer circuits, All **LEGI**™ indicator tubes display decimal points and numerical figures "0" through "9."

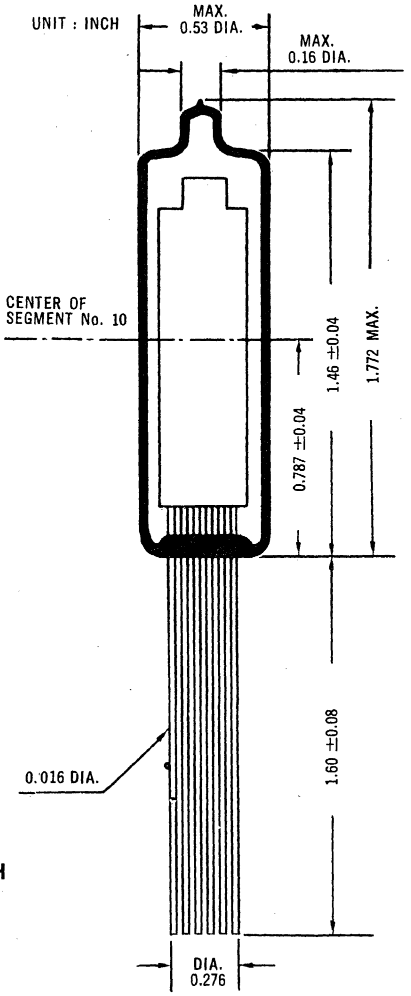
- **UNI-PLANE DESIGN**
- **SHARP, BRIGHT GREEN CHARACTERS**
- **LOW VOLTAGE**
- **LOW POWER CONSUMPTION**

ABSOLUTE MAXIMUM RATINGS

	DG10A	DG10B	DG12A	DG12B	DG12C	DG12H	DG12J	DG19C	DG19E	Units
Filament Current	50	50	105	105	105	89	89	105	105	mA
Segment Voltage (D.C.)	25	25	27	27	27	25	25	27	27	V
Grid Voltage (D.C.)	25	25	27	27	27	25	25	27	27	V
Segment & Grid Voltage at Pulse	See Note (Duty Factor-Segment & Grid Voltage Characteristics)									
Operating Temperature	−10 to +70°C									

TYPICAL ELECTRICAL CHARACTERISTICS & RECOMMENDED OPERATING CONDITIONS

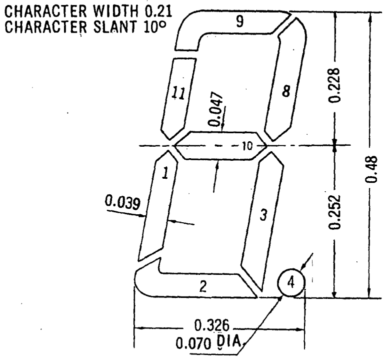
	DG10A	DG10B	DG12A	DG12B	DG12C	DG12H	DG12J	DG19C	DG19E	Units
Filament Voltage	0.7	0.7	0.85	0.85	0.85	0.8	0.8	1.7	1.7	V
Filament Current	48	48	95	95	95	85	85	95	95	mA
Segment Voltage (D.C.)	20	20	20	20	20	20	20	25	25	V
Grid Voltage (D.C.)	20	20	20	20	20	20	20	25	25	V
Numerical Segment Current	0.8	0.8	1.2	1.2	1.2	1.0	1.0	1.3	1.3	mA
D.P. Segment Current	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	mA
Grid Current	3.1	3.1	4.7	4.7	4.7	3.9	3.9	5.6	5.6	mA
Cathode Current	4.0	4.0	6.0	6.0	6.0	5.0	5.0	7.0	7.0	mA
Segment Cut-off Voltage	0	0	0	0	0	0	0	0	0	V
Grid Cut-off Voltage	—4	—4	—4	—4	—4	—4	—4	—4	—4	V
Brightness	80 Foot-lamberts Minimum									

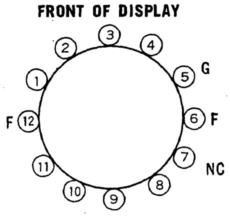

UNIT : INCH
MAX. 0.53 DIA.
MAX. 0.16 DIA.
CENTER OF SEGMENT No. 10
1.46 ±0.04
1.772 MAX.
0.787 ±0.04
0.016 DIA.
1.60 ±0.08
DIA. 0.276

MECHANICAL SPECIFICATIONS

Vibration Test: Frequency: 10 to 55 Hz
Amplitude: ±1.0 mm

Direction: X, Y, Z direction
Time: 5 minutes


CHARACTER WIDTH 0.21
CHARACTER SLANT 10°
9
11
8
0.047
0.228
10
0.48
1
0.039
3
0.252
2
4
0.326
0.070 DIA

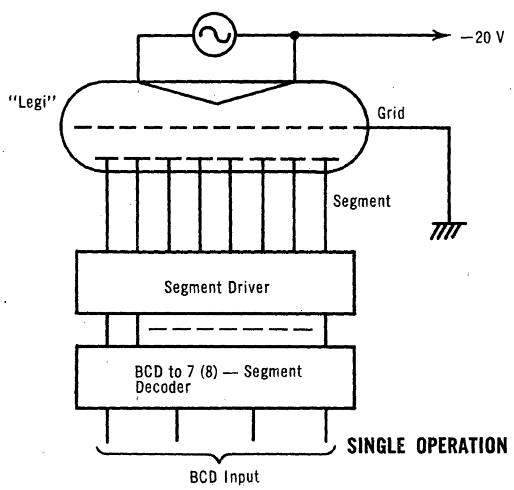

FRONT OF DISPLAY
1
2
3
4
5
G
6
F
7
NC
8
9
10
11
12
F

BOTTOM VIEW

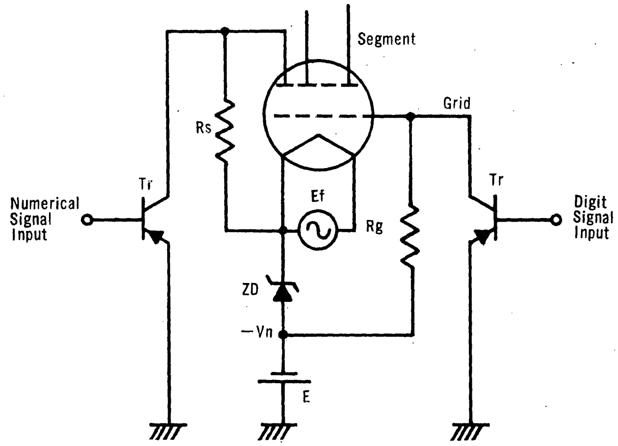
DG-12H

SYMBOLS:
F: FILAMENT (RED SLEEVE)
G: GRID
NC: NON-CONNECTION

TYPICAL OPERATION


Ef A.C.
−20 V
"Legi"
Grid
Segment
Segment Driver
BCD to 7 (8) — Segment Decoder
BCD Input

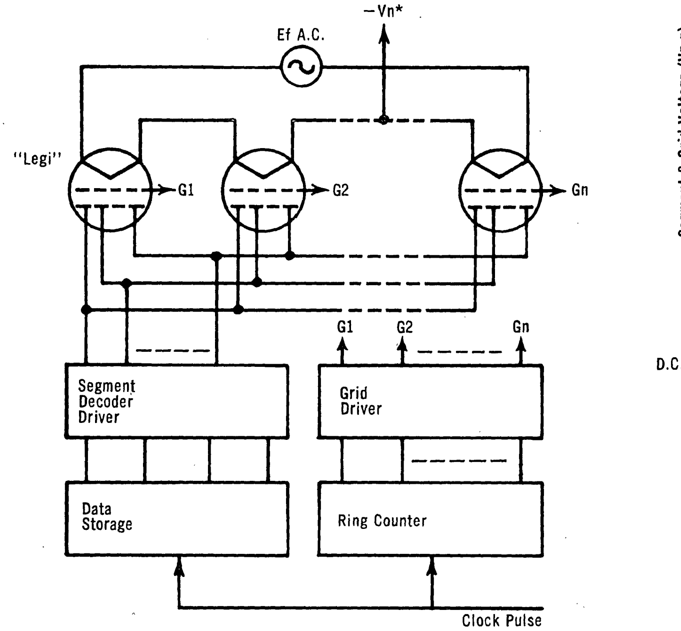
SINGLE OPERATION


Segment
Grid
Rs
Tr
Tr
Ef
Numerical Signal Input
Rg
Digit Signal Input
ZD
−Vn
E

BASIC CIRCUIT OF GRID & SEGMENT DRIVER

CONTINUED

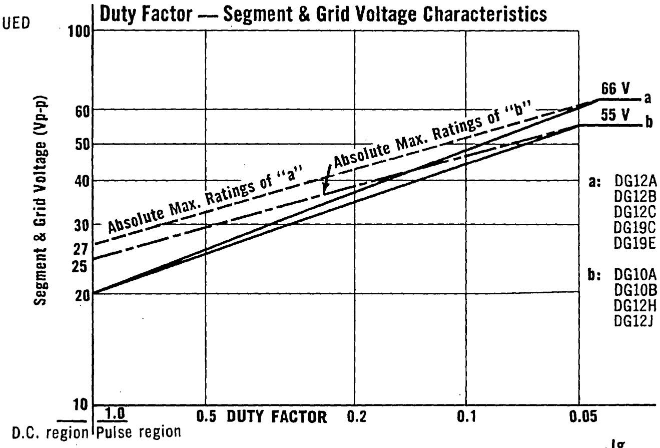
Legi NUMERICAL INDICATOR TUBES CONTINUED

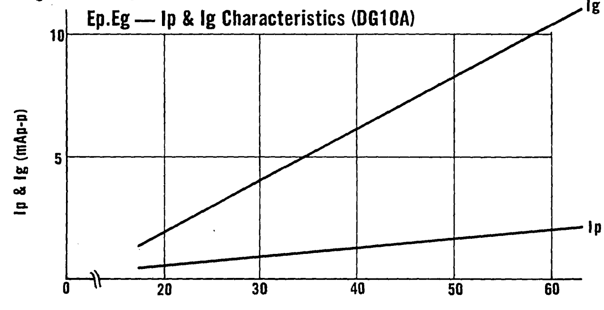


−Vn*
Ef A.C.
"Legi"
G1
G2
Gn
G1
G2
Gn
Segment Decoder Driver
Grid Driver
Data Storage
Ring Counter
Clock Pulse

—Vn*: Minus of Segment voltage and Grid voltage.

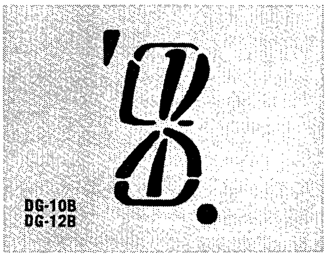
MULTIPLEXING OPERATION



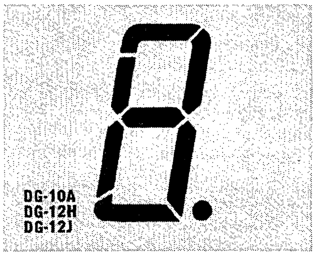


Ep.Eg: Segment & Grid Voltage
Ip: Segment Current
Ig: Grid Current

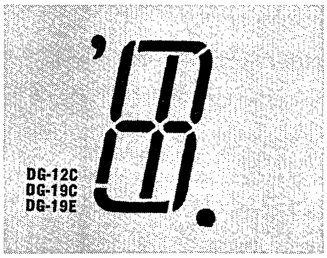
CHARACTER



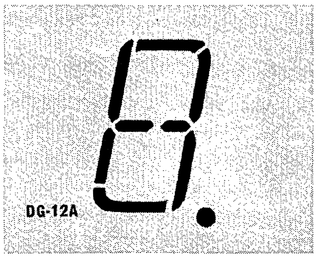
DG-10B
DG-12B



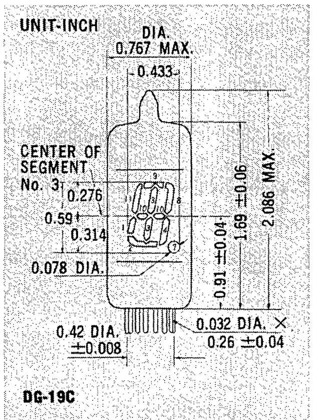
DG-10A
DG-12H
DG-12J



DG-12C
DG-19C
DG-19E

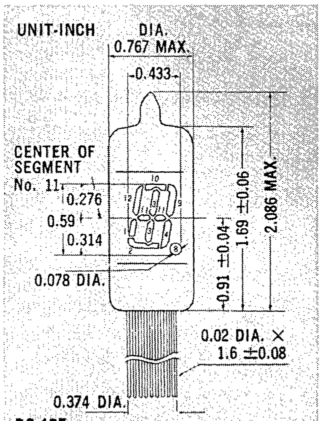


DG-12A



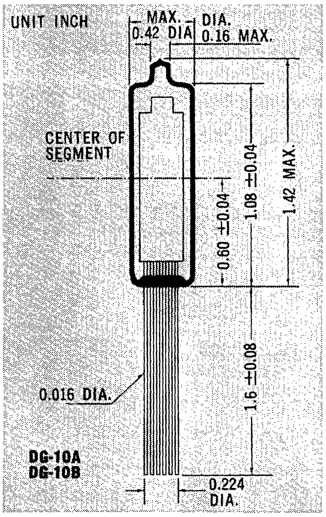
UNIT-INCH
DIA. 0.767 MAX.
0.433
CENTER OF SEGMENT No. 3
0.276
0.59
0.314
0.078 DIA.
0.91 ±0.04
1.69 ±0.06
2.086 MAX.
0.42 DIA. ±0.008
0.032 DIA. × 0.26 ±0.04

DG-19C



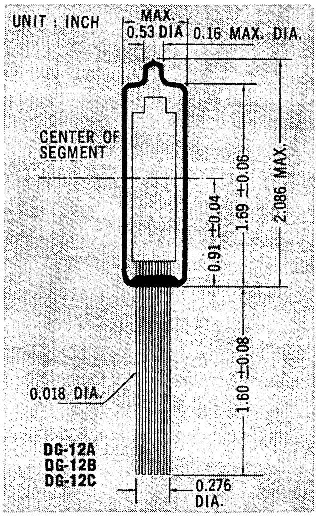
UNIT-INCH
DIA. 0.767 MAX.
0.433
CENTER OF SEGMENT No. 11
0.276
0.59
0.314
0.078 DIA.
0.91 ±0.04
1.69 ±0.06
2.086 MAX.
0.02 DIA. × 1.6 ±0.08
0.374 DIA.

DG-19E



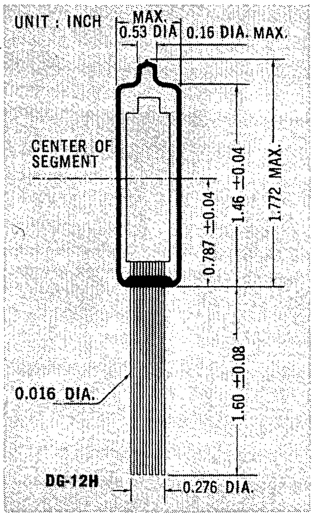
UNIT INCH
MAX. 0.42 DIA
DIA. 0.16 MAX.
CENTER OF SEGMENT
0.60 ±0.04
1.08 ±0.04
1.42 MAX.
1.6 ±0.08
0.016 DIA.
0.224 DIA.

DG-10A
DG-10B



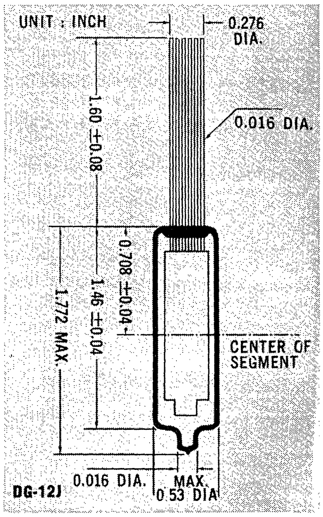
UNIT : INCH
MAX. 0.53 DIA
0.16 MAX. DIA.
CENTER OF SEGMENT
0.91 ±0.04
1.69 ±0.06
2.086 MAX.
1.60 ±0.08
0.018 DIA.
0.276 DIA.

DG-12A
DG-12B
DG-12C



UNIT : INCH
MAX. 0.53 DIA
0.16 DIA. MAX.
CENTER OF SEGMENT
0.787 ±0.04
1.46 ±0.04
1.772 MAX.
1.60 ±0.08
0.016 DIA.
0.276 DIA.

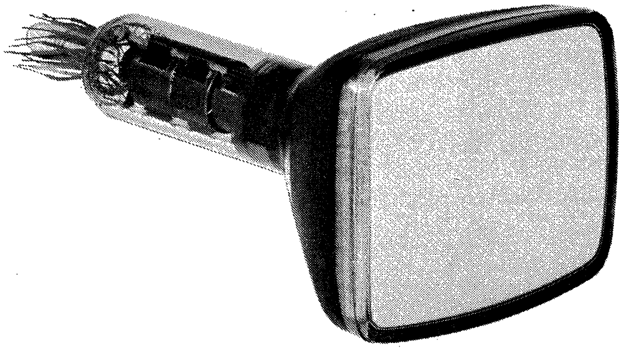
DG-12H



UNIT : INCH
0.276 DIA.
0.016 DIA.
1.60 ±0.08
0.708 ±0.04
1.46 ±0.04
1.772 MAX.
CENTER OF SEGMENT
0.016 DIA.
MAX. 0.53 DIA

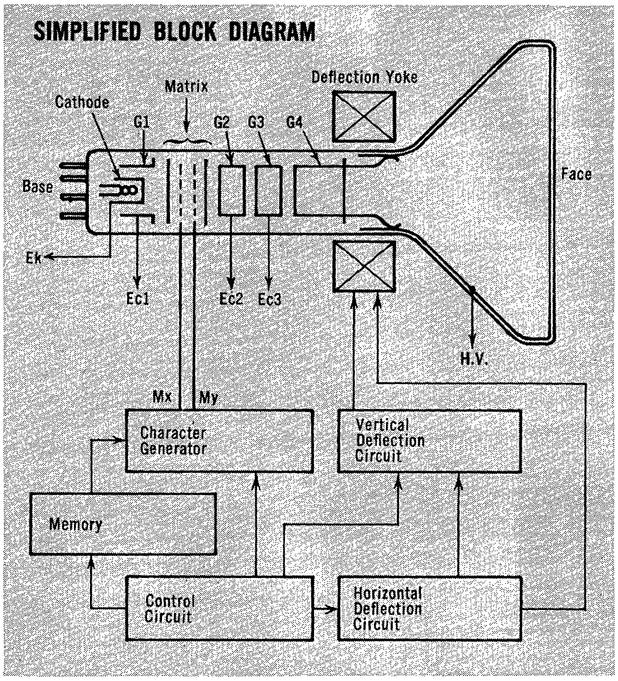
DG-12J

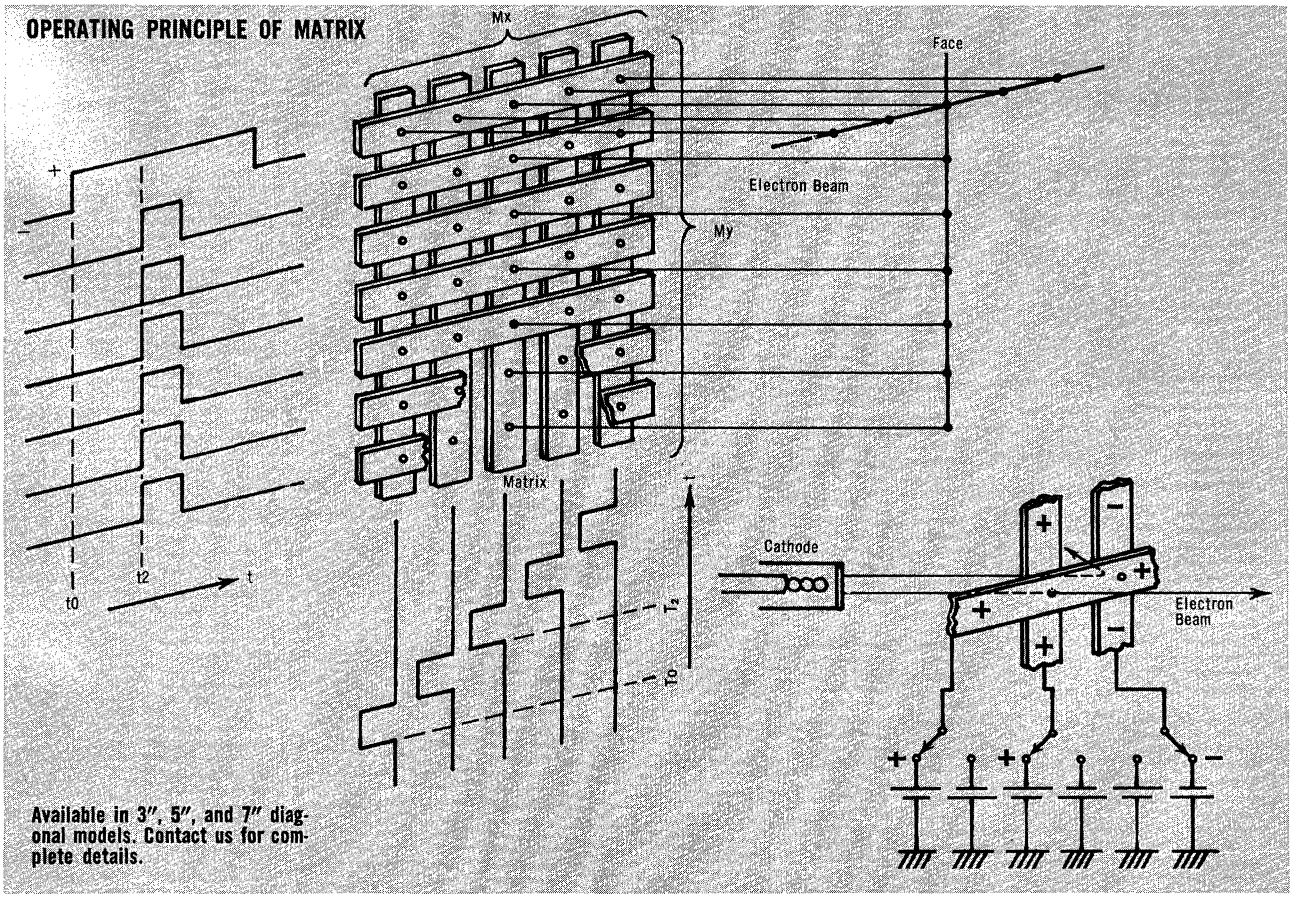
LEGISCOPE MULTI-BEAM CRT TUBES



To date, the cathode ray tubes used for TV, charactrons, and typotrons have been all that were available for use in digital instruments, computer terminals, and other types of information display. In addition to being fairly complicated, these tubes require analog to digital conversion for generating characters.

LEGISCOPE Multi-Beam CRT tubes, through the use of **LEGI** Electronics' unique matrix electrodes, greatly simplifies digital displays since the need for a converter has been entirely eliminated.


SIMPLIFIED BLOCK DIAGRAM
Matrix
Deflection Yoke
Cathode
G1
G2
G3
G4
Base
Face
Ek
Ec1
Ec2
Ec3
H.V.
Mx
My
Character Generator
Vertical Deflection Circuit
Memory
Control Circuit
Horizontal Deflection Circuit


OPERATING PRINCIPLE OF MATRIX
Mx
Face
Electron Beam
My
+
−
t0
t2
t
Matrix
t
T2
To
Cathode
+
−
+
+
−
+
Electron Beam
+
+
−

Available in 3″, 5″, and 7″ diagonal models. Contact us for complete details.

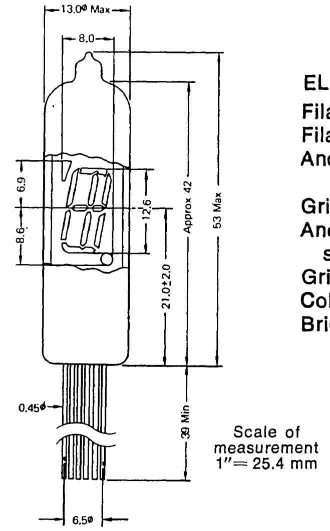
ELECTRONICS CORPORATION

3118A WEST JEFFERSON BLVD., LOS ANGELES, CALIFORNIA 90018, U.S.A. ■ (213) 737-1521, 737-1522

NEC CALCULATOR TUBES-THE ULTIMATE IN ELECTRONIC ENGINEERING WITH SUPER MINIATURIZATION OF DIGITAL INDICATOR TUBES AND NEW NEC INTEGRATED CIRCUITS

Only NEC has the latest digital indicator tubes. Shown here is the No. DG12E/LD-915. ***Equipped with the unique grid which enables dynamic drive***—these are by far the most suitable digital indicator tubes for sharp, clear focus of numerical figures. Other smaller indicator tubes available with similar characteristics. Catalog sheets on request.

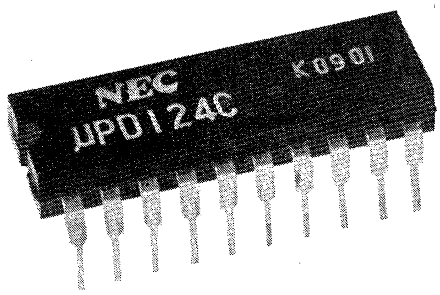
Using directly heated cathode and newly-developed phosphor materials permits uni-planar display in green color to eliminate viewing eye fatigue. FEATURES LOW POWER, LOW VOLTAGE AND COMPETITIVELY PRICED.



Scale of measurement
1"= 25.4 mm

ELECTRICAL SPECIFICATIONS:

Filament Voltage	0.8V
Filament Current	90mA
Anode (Phosphor Segment) Voltage	20 Vdc
Grid Voltage	20 Vdc
Anode Current (Sum of all segment currents)	1mAdc
Grid Current	4mAdc
Color of Figures	Green
Brightness	80ftL



The NECμ PD124C Integrated Circuit, shown at left is precision engineered and especially developed for driving NEC Digital Indicator Tubes.

Composed of P-Channel enhancement type MOS FET, the μPD124C's positive logic operation can drive digital indicator tube anodes directly, corresponding to the binary coded decimal input. Temporary memory capability makes possible direct indication from the dynamic register which provides the circulating storage. Performance guarantee is backed by long years of intensive R&D.

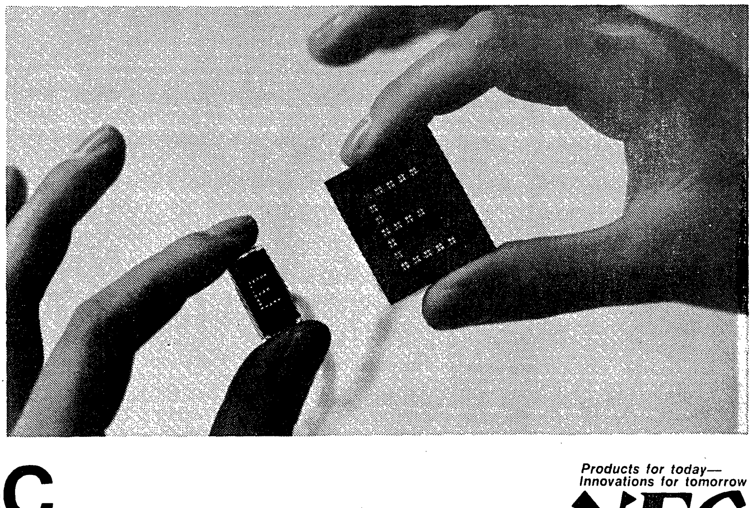
Housed in an impact plastic-molded DIP (Dual in Line Package) 20-pin.

THE LATEST IN SOLID STATE INDICATOR DEVICES

NEC has new and more technically advanced Light Emitting Diodes and LED Display Devices designed expressly to provide bright red emissions (6, 600 Å) with a high efficiency suitable for any display requirements, such as Lamp and Alpha-numeric Displays.

Another important feature is NEC's "Clear-View®" (right) display device which can indicate larger characters than earlier display indicators.

7-9 segment and dot type are available. Also driving Integrated Circuits available.



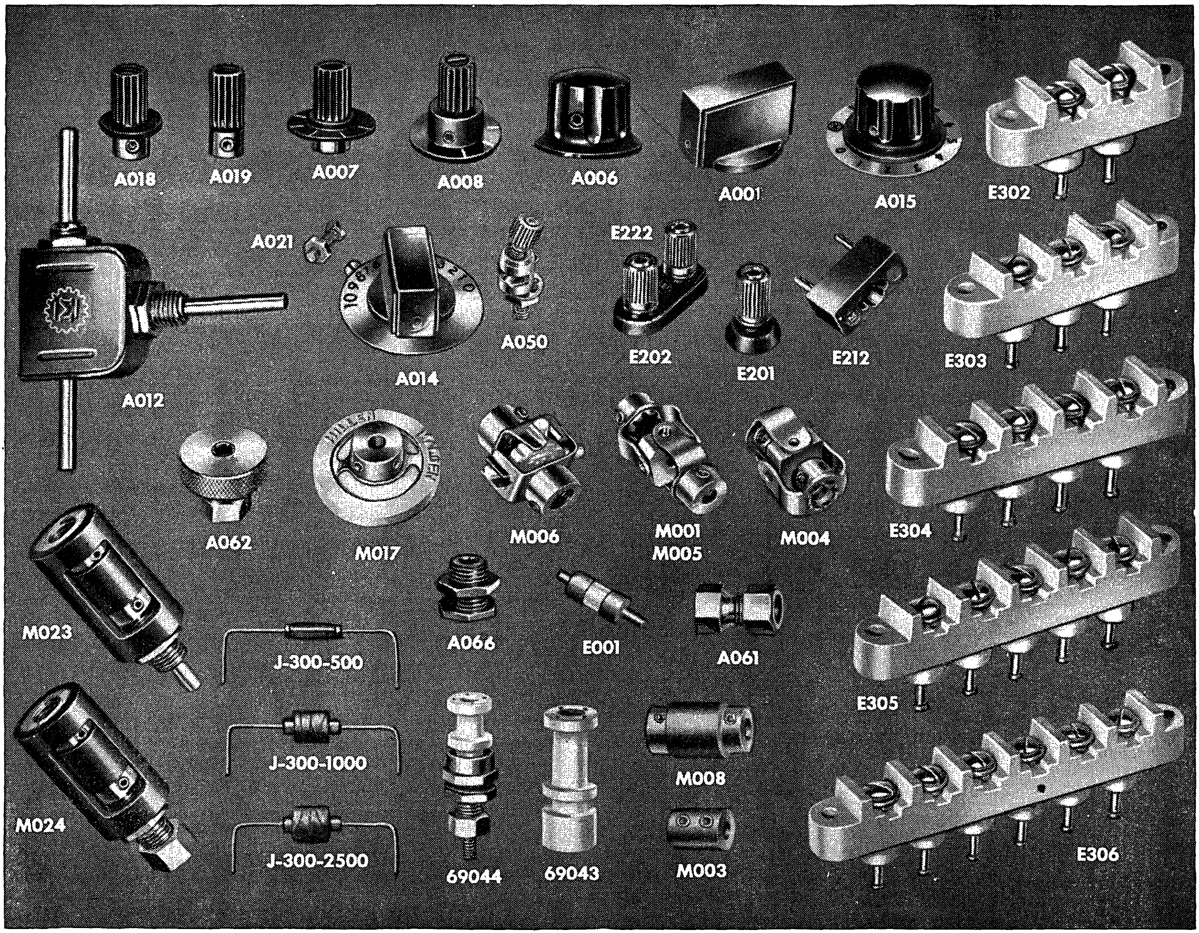
NEC also recommends the following Devices for any solid state applications:

Silicon Complementary Power Transistor
NPN and PNP Low Noise Transistors
I/C and Transistors for TV Receivers, Radio, and Phonograph Sets
Micro-disk Transistors for Hybrid I/C
Dipped Type Tantalum Capacitors

NEC AMERICA, INC.

PAN AM BUILDING • 200 PARK AVENUE • NEW YORK, N.Y. 10017 • (212) 661-3420
TWX: 710-581-3376

Products for today—
Innovations for tomorrow
NEC
TOKYO, JAPAN

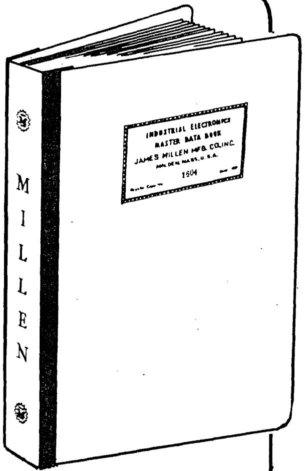

A018
A019
A007
A008
A006
A001
A015
E302
A021
E222
A012
A014
A050
E202
E201
E212
E303
A062
M017
M006
M001
M005
M004
E304
M023
A066
E001
A061
J-300-500
E305
J-300-1000
M008
M024
J-300-2500
69044
69043
M003
E306

MINIATURIZED COMPONENTS

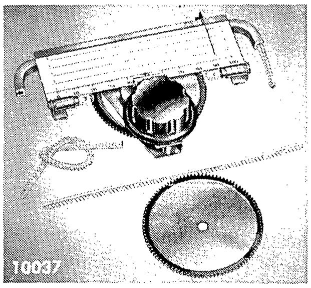
Typical of the MILLEN line of miniature components:

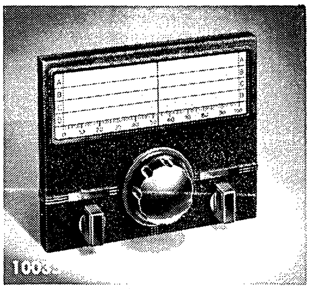
No. A001 Bar knob for 1/8″ shaft. 1/2″ high by 3/4″ long
No. A006 Fluted black phenolic knob with brass insert for 1/8″ shaft
No. A007 and A008 1/4″ black plastic dial knobs; inserts for 1/8″ shaft.
No. A012 Right angle drive for 1/8″ shafts. Single hole mounting
No. A014 1″ bar dial for 1/8″ shaft. 1/2″ high. 180° or 280° dials
No. A015 1″ fluted knob dial for 1/8″ shaft. 1/2″ high. 180° or 280° dials.
No. A017 1 1/8″ diameter fluted black phenolic knob for 1/8″ shaft
No. A018 and A019 Knobs.
No. A050 Miniature dial lock
No. A061 and A062 Miniature shaft locks for 1/8″ shaft
No. A066 Miniature shaft bearing for 1/8″ shaft
No. E201, E202, E212, and E222 Miniature binding posts and plug.
No. E302A to E306A Miniature ceramic terminal strips
No. J300-3.3 to J300-2500 Miniature Inductors
No. M001 and M006 Miniature insulated universal joint style flexible coupling for 1/8″ shafts
No. M004 and M005 Miniature non-insulated universal joint style flexible couplings for 1/8″ dia. shafts
No. M017 Miniature plastic insulated flexible coupling for 1/8″ dia. shafts.
No. M023 and M024 Miniature high voltage insulated shaft extensions for 1/8″ dia. shaft

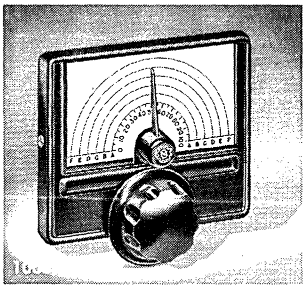
MILLEN
INDUSTRIAL ELECTRONICS MASTER DATA BOOK
Comprehensive Coverage of
MILLEN PRODUCTS
with
Dimensional Drawings
Available to:
Industry Personnel
Qualified Engineers
Purchasing Agents
Design Draftsmen

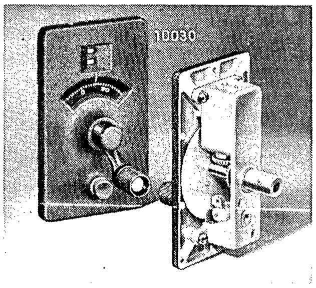


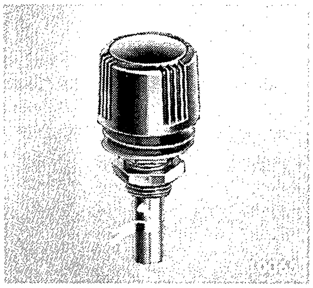
JAMES MILLEN MFG. CO., INC.
MAIN OFFICE AND FACTORY
MALDEN, MASSACHUSETTS, U.S.A.

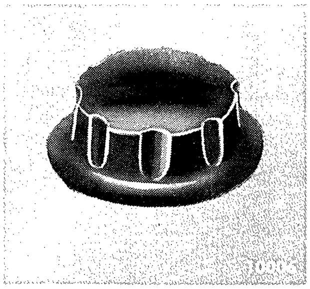


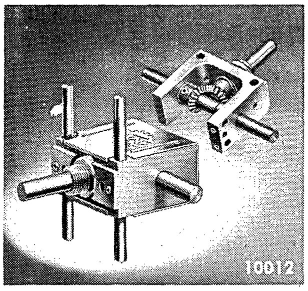


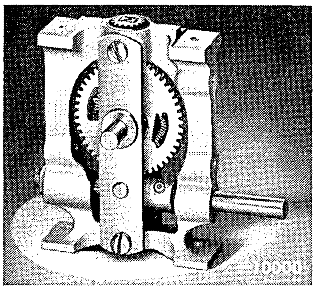


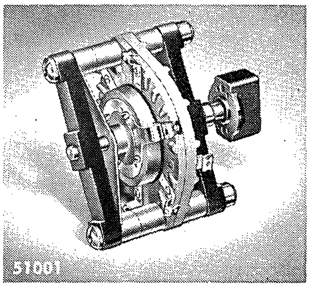


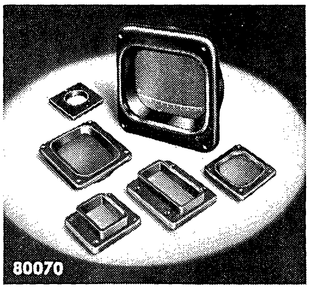


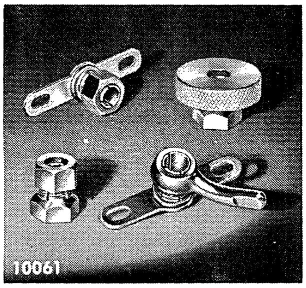


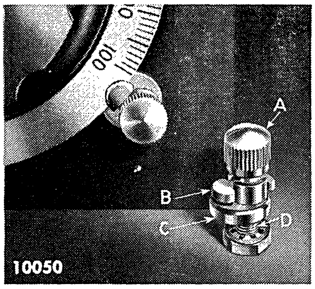












"Designed for Application"® DIALS AND COMPONENTS

NO-STRING DIAL

No. 10037 — No-string illuminated slide rule dial. The pointer is driven by a flexible but non-elastic molded gear driven rack which rides in a multi-slot extruded aluminum channel. This giirder-like channel provides rigidity. Reduction 11:1. Scale length 6½ inches. Supplied with bezel.

FRONT OF PANEL DIALS

Compact mechanical design. Easy to mount. Self-contained mechanisms, thus eliminating back of panel interference. Flat black art metal.

No. 10035 — Illuminated panel dial has 12 to 1 ratio; size 8-3/16" x 6-17/32". Provision for mounting and marking auxiliary controls such as switches, potentiometers, etc. provided.

No. 10039 — Small panel dial has 8 to 1 ratio; size 4" x 3-9/32".

No. 10039-D — Small panel dial with positive loaded gear drive. 20 to 1 ratio; size 4" x 3-9/32". For ten turn devices.

No. 10039-E — Small panel dial with positive loaded gear drive. 10 to 1 ratio; size 4" x 3-9/32". For five turn devices.

COUNTER DIALS

No. 10030 — Extremely sturdy instrument type indication. Control shaft has 1 to 1 ratio. Veeder type counter is direct reading in 99 revolutions.

No. 10030-E — Same as No. 10030 except that the crank handle on the No. 10030 has been replaced by a fluted knob.

KNOBS

A006 — Fluted black phenolic knob with brass insert for ⅛" shaft.
10006 — 2¾" black phenolic knob with brass insert for ¼" shaft.
10016 — ¾" black phenolic knob with brass insert for ¼" shaft.
10016-A — ¾" fluted knob with nickel plated brass pointer.

BEZELS FOR CATHODE RAY TUBES

No. 80071 — Buterate bezel for 1 in. tube such as 1CP1. 2⅜" x 2⅜".
No. 80072 — Phenolic bezel for 2 in. tube such as 2BP1. 2⅝" x 2⅝".
No. 80073 — Phenolic bezel for 3 in. tube such as 3RP1. 3⅝" x 3⅝".
No. 80075 — Phenolic bezel for 5 in. tube such as 5UP1. 6⅛" x 6⅛".
No. 80173-B — Bezel for rectangular tube such as 3XP1. 2½" x 3¼".

HIGH VOLTAGE R-F SWITCH

No. 51001 — High voltage r-f switch designed for high frequency requirements. The No. 51001 features high voltage breakdown, and a non-arc tracking and arc resistant molded frame. Both collector and switched contacts break contact. Heavy duty silver contacts, and insulated mount.

DRIVES

RIGHT ANGLE DRIVES

No. A012 — Miniature right angle drive for ⅛" shafts. 1 to 1 ratio.
No. 10012 — Standard size right angle drive for ¼" shafts. 1 to 1 ratio.
No. 10012-T — Thru-sleeve right angle drive for ¼" shafts. 1 to 1 ratio.

WORM DRIVE UNITS

Cast aluminum frame may be panel or base mounted. Spring loaded split gears to minimize back lash.

No. 10000-A — 16 to 1 ratio.
No. 10000-B — 48 to 1 ratio.
No. 10000-C — 12 to 1 ratio.
No. 10000-D — 36 to 1 ratio.

GEAR DRIVE

No. 10000-12 — Spring loaded split gears to minimize back lash. 2 to 1.

FRICTION DRIVE

No. 10065 — Friction drive for 0.025" to 0.032" thick disc dials.

SHAFT LOCKS

No. 10060 — Shaft lock for ¼" shaft. ⅜"-32 bushing with 7/16" hex nut.
No. 10061 — Lock for conversion of "plain" ¼" shaft to "locking type."
No. 10062 — Thumb screw shaft lock for ¼" shaft. ⅜"-32 bushing.
No. 10063 — Lever operated shaft lock for ¼" shaft. ⅜"-32 bushing.

DIAL LOCKS

No. A050 — Miniature dial lock. Compact, easy to mount, positive in action.
No. 10050 — Rotation of knob A depresses finger B locking dial against C.
No. 10050-A — Lock with index mounting to prevent rotation of assembly.
No. 10053 — Sub panel dial lock. Nickel plated brass.

JAMES MILLEN MFG. CO., INC.
MAIN OFFICE AND FACTORY
MALDEN, MASSACHUSETTS, U.S.A.

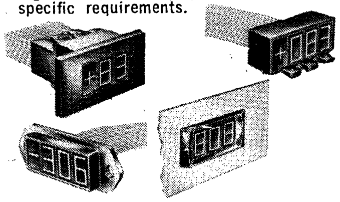
Pinlites
For further information
please contact: P.O. BOX 453, CALDWELL, N.J. 07006 • U.S.A.
A REFAC COMPANY
Office and Plant:
1275 BLOOMFIELD AVENUE FAIRFIELD, N.J. 07006
TELEPHONE: (201) 226-7724 TELEGRAM: PINLITES

Pinlites

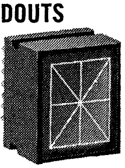
More than ten years of experience with incandescent filament displays resulted in the most efficient, reliable and smallest digital and alphanumeric readouts on the market. The world-wide patented techniques, unique to Pinlites readouts and readouts made under Pinlites license, assure our customers the finest, universally accepted displays.

Pinlites is also known as manufacturer of the smallest incandescent light bulbs. Outside diameters of as little as 0.016" (0.4mm) are possible. These Pinlite® bulbs have an amazing record for reliability, ruggedness and brightness and in some applications have been tested to several thousand "G" forces.

More recently, Pinlites has introduced a custom engineering service to provide our customers with Pinlites' experience in designing display products. This service ranges from selecting the proper readout or delivering the complete display module with decoder, bezels and displays ready for installation, to designing a complete display system to your specific requirements.



ALPHANUMERIC READOUTS

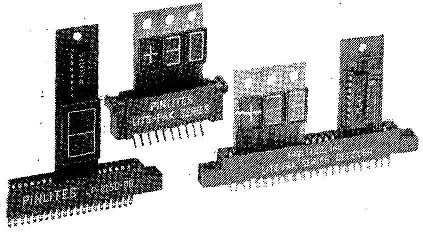


- LOW VOLTAGE — 3V to 5V
- LOW CURRENT as low as 8 ma
- LONG LIFE — rated at 100,000 hours

The ALPHA-LITE® is a 16 segment incandescent light bar arrangement which displays numbers, letters and symbols . . . and all this occupying less space than a 5⁄16" cube. Each ALPHA-LITE produces all letters of the alphabet. Excellent readability is afforded since all light bars are on the same plane. Shock and vibration characteristics are excellent for aero-space applications. Because the segments are actually tungsten incandescent light sources, the brightness can be controlled for various ambient light conditions (from sunshine to a dark room). Uniformity of illumination of each segment and speed of response, so important when transferring information to film, are inherent features of ALPHA-LITE.

The ALPHA-LITE is a modular plug-in unit that can be connected in horizontal rows in conjunction with modular MIDGI-LITES®. Sizes of the ALPHA-LITE are compatible with corresponding sizes of MIDGI-LITES.

For more information request Bulletin #1051.



* Also available in dual in-line mounting — Dip Lite®

DIGITAL READOUTS "LITE-PAK®" SERIES *

FEATURES

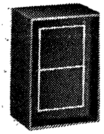
- LOW VOLTAGE — 3-4 or 5 Volts
- LONG LIFE — Over 10 years (100,000 hours)
- LOW CURRENT — (as low as 8 ma)
- VARIABLE BRIGHTNESS
- READABILITY — Can be read in sunlight
- SLIM PROFILE — Only 1⁄4" deep
- LARGE CHARACTERS — Up to 5⁄8" numbers
- UNLIMITED COLOR SELECTION — Filters or tinted glass
- RUGGED CONSTRUCTION — Glass to metal seals
- WIDE-ANGLE VIEWING — Up to 120°

The LITE-PAK Series of readouts combines Pinlites patented technology with advanced packaging. All LITE-PAKS are mounted on 1⁄16" PC Boards with 0.050" spacing to fit standard edge connectors. LITE-PAKS can be supplied with wire leads upon request.

Decoder/drivers for the LITE-PAK Series are also available with PC Board mounting. The 5⁄8" character LITE-PAK display features an IC decoder/driver as integral part of the PC Board (Model: LP-1050-DD), Bulletin (4061).

For more information request Bulletin #1102.

MIDGI-LITE® "0" SERIES



FEATURES

- SHARP, CLEAN DISPLAYS
- PATENTED CROSS-OVER FILAMENT
- LOW VOLTAGE
- LOW CURRENT
- LONG LIFE
- FRONT INSTALLATION
- READABLE IN DIRECT SUNLIGHT
- VARIABLE BRIGHTNESS
- DISTORTION-FREE VIEWING
- FULLY I.C. COMPATIBLE
- RUGGED CONSTRUCTION
- STANDARD PIN PATTERN
- UNLIMITED COLORS DISPLAY
- SPECIAL MATTED FINISH GLASS SURFACE

MIDGI-LITES "0"-Series sub-miniature digital displays offer unequalled volumetric efficiency combined with high brightness. These features in addition to low voltage and low current have made the MIDGI-LITE Series widely accepted in both military and commercial applications, such as: peripheral displays, flight information decks, mobile police communications units, remote computer terminals, ground support equipment, portable displays, etc.

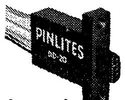
A complete line of connectors, decoder/drivers, and mounting systems are available.

MIDGI-LITES will meet or exceed most MIL-Specs.

Request Bulletin #1001 for more information.

CONNECTORS, DECODER/DRIVERS — DIGITAL & ALPHANUMERIC

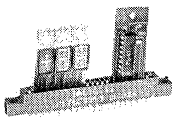
All Pinlites readouts are matched with or plug into standard connectors, decoder/drivers, with and without memory functions.



BCD to 7 Segment

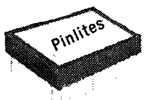
The hermetically sealed DD-20 is a combination of matching connector, and decoder/driver for all MIDGI-LITES®. This unit is available with a memory as Model DDL-20.

Request Bulletin #2001 for further information.



BCD to 7 Segment

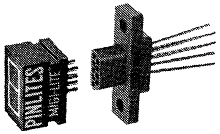
For all LITE-PAK® digital displays, a complete line of dual-in-line IC's and flat-packs are available, either in standard mounting such as the PL-47, or for special mounting.



PLAND-74 Alphanumeric Decoder

For ASCII (64 bits) coding all ALPHA-LITES are completely compatible with Pinlites PLAND-74, 24 pin DIP decoder. Capable of decoding and driving more than one display, the PLAND-74 has unique time sharing features.

Request Bulletin #2051 for more information.



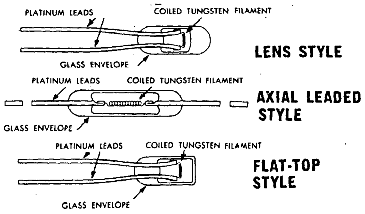
Connectors

All MIDGI-LITE digital displays can be mounted with standard Mil Spec micro-miniature connectors (CF-9H) giving the display front plug-in and removable features.

All ALPHA-LITE alphanumeric displys, when using the matching connectors (CF-20H) have the same convenient plug-in and removable features.

Request Bulletin #2101 for further information.

MICROMINIATURE LAMPS — THE WORLD'S SMALLEST INCANDESCENT LAMPS



PINLITE® lamps, despite their extremely small size, are rugged in design and have been time tested in many commercial and military applications.

High brightness (up to 400 mililumen) and low current consumption (as little as 3 ma) in a small package (as small as 0.016" O.D.) give the PINLITE® Lamps unequalled features.

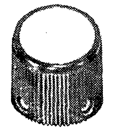
Wherever an extremely small and reliable light source is required PINLITE® Lamps are your answer.

Please request Bulletin #3001 for further information. For special filament packaging check our customer service capabilities.

Rogan

CONTROL KNOBS

67 SERIES

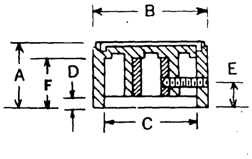


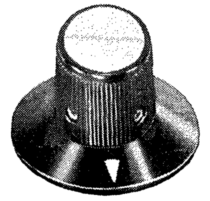
PLAIN

DIMENSIONS (INCHES)

KNOB NO.	SHAFT DIA.	A	B	C	D	D*	E	F
RB-67-0	⅛ ³⁄₁₆ ¼	.483	.510	.390	.050	.160	.153	.410
RB-67-1	⅛ ³⁄₁₆ ¼	.579	.713	.581	.047	.160	.146	.410
RB-67-2	⅛ ³⁄₁₆ ¼	.764	.920	.760	.114	.220	.239	.575
RB-67-3	¼, ¼ × .156	.662	1.261	1.023	.114	.165	.239	.535
RB-67-4	¼ ⅜	.820	1.764	1.526	.114	.220	.239	.625
RB-67-5	¼ ⅜	.845	2.262	2.016	.114	.220	.239	.680

*D. dimension—optional deep core-out.

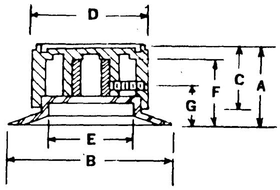


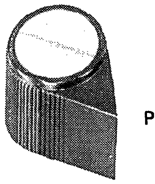


SKIRTED

DIMENSIONS (INCHES)

KNOB NO.	A	B	C	D	E	F	G
RB-67-0-SK	.660	.900	.483	.510	.302	.635	.325
RB-67-1-SK	.775	1.150	.579	.713	.485	.655	.349
RB-67-2-SK	1.000	1.525	.764	.920	.664	.925	.484
RB-67-3-SK	.840	1.837	.662	1.261	.897	.835	.427
RB-67-4-SK	1.070	2.468	.820	1.764	1.398	.985	.489
RB-67-5-SK	1.095	3.020	.845	2.262	1.888	1.020	.489

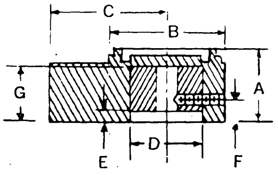




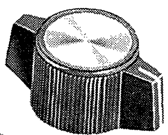
POINTER

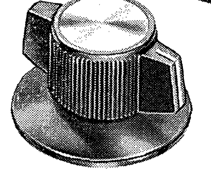
DIMENSIONS (INCHES)

KNOB NO.	SHAFT DIA.	A	B	C	D	E	E1	F	G
RB-67-0-P	⅛″	.540	.500	.490	.420	.053	.160	.158	.410
RB-67-1-P	⅛″ ³⁄₁₆″ ¼″	.610	.703	.680	.485	.047	.160	.187	.420
RB-67-2-P	⅛″ ³⁄₁₆″ ¼″	.790	.906	.885	.640	.115	.220	.260	.575



BAR

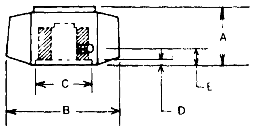


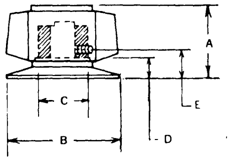


SKIRTED BAR

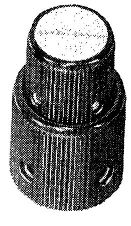
DIMENSIONS (INCHES)

KNOB NUMBER	SHAFT DIAMETER	A	B	C	D	E
PLAIN						
RB-67-1-B	⅛ ³⁄₁₆ ¼	.579	1.150	.581	.047	.146
RB-67-1-B-DC	⅛ ³⁄₁₆ ¼	.739	1.150	.581	.207	.306
RB-67-2-B	⅛ ³⁄₁₆ ¼	.645	1.525	.760	.114	.239
RB-67-2-B-DC	⅛ ³⁄₁₆ ¼	.865	1.525	.760	.334	.459
SKIRTED						
RB-67-1-B-SK	⅛ ³⁄₁₆ ¼	.775	1.150	.485	.185	.349
RB-67-2-B-SK	⅛ ³⁄₁₆ ¼	.881	1.525	.664	.310	.484

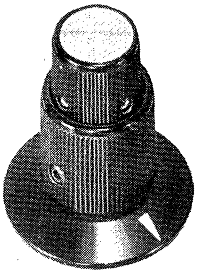




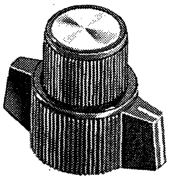
CONCENTRIC KNOBS



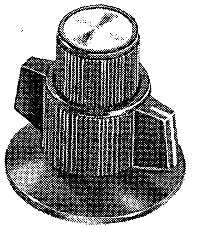
PLAIN



SKIRTED

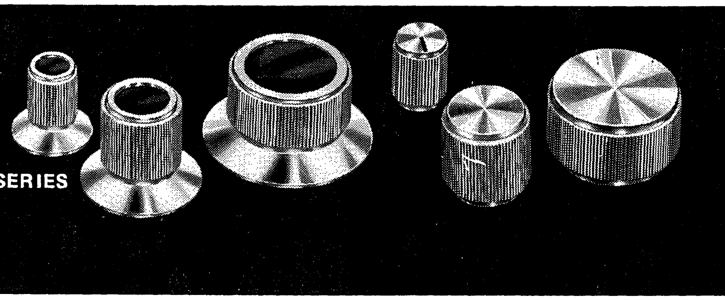


BAR



SKIRTED BAR

Items appearing on this page represent only one series of control knobs from Rogan's extensive catalog of standard parts —write for complete information.

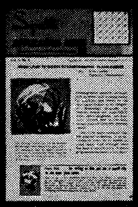


ALUMINUM XR SERIES

Rogan
BROTHERS, INC.
8019 N. Monticello Ave. Skokie, Ill. 60076
Phone: (312) 675-1234

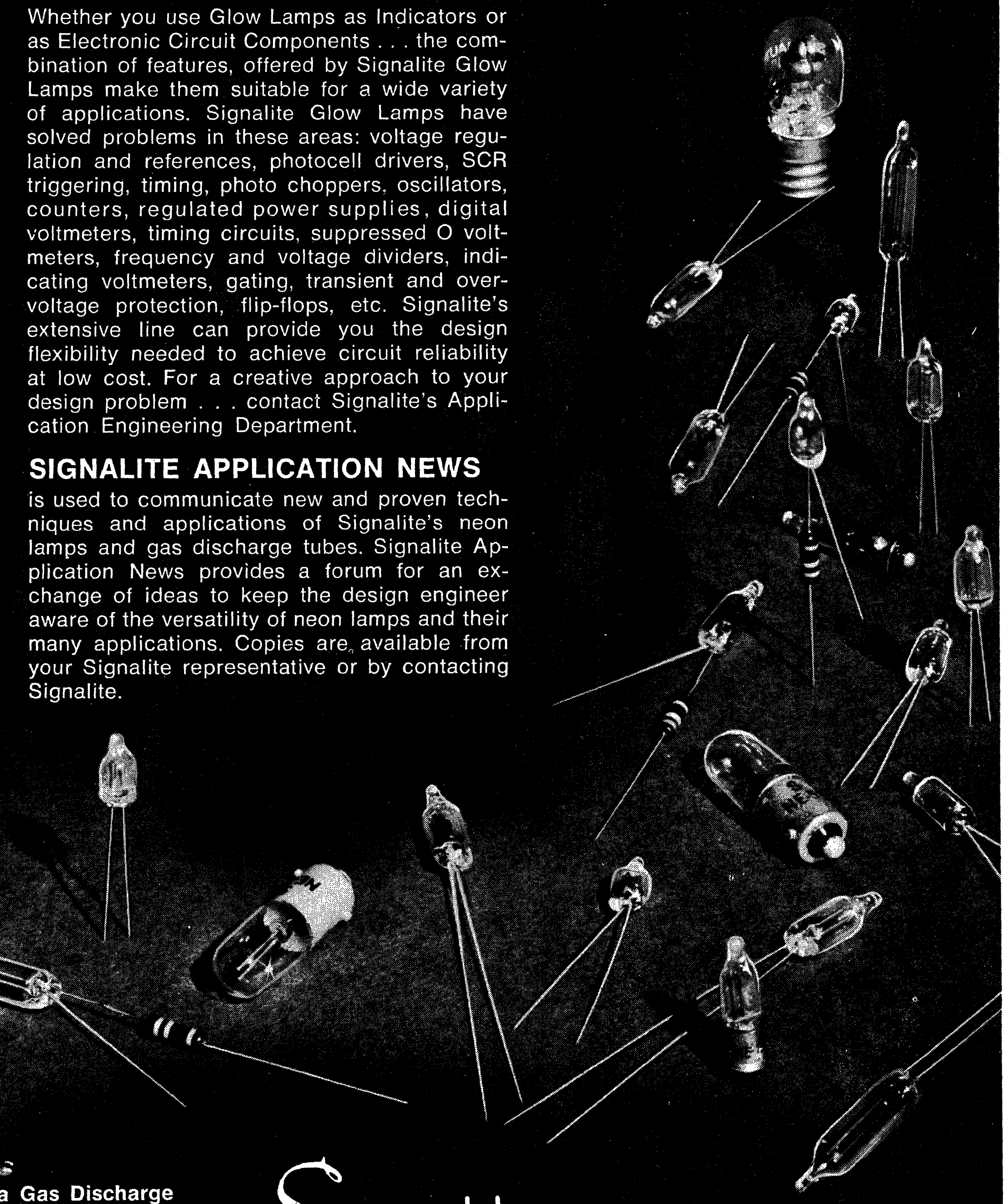
MINIATURE GLOW LAMPS

Whether you use Glow Lamps as Indicators or as Electronic Circuit Components . . . the combination of features, offered by Signalite Glow Lamps make them suitable for a wide variety of applications. Signalite Glow Lamps have solved problems in these areas: voltage regulation and references, photocell drivers, SCR triggering, timing, photo choppers, oscillators, counters, regulated power supplies, digital voltmeters, timing circuits, suppressed O voltmeters, frequency and voltage dividers, indicating voltmeters, gating, transient and overvoltage protection, flip-flops, etc. Signalite's extensive line can provide you the design flexibility needed to achieve circuit reliability at low cost. For a creative approach to your design problem . . . contact Signalite's Application Engineering Department.



SIGNALITE APPLICATION NEWS

is used to communicate new and proven techniques and applications of Signalite's neon lamps and gas discharge tubes. Signalite Application News provides a forum for an exchange of ideas to keep the design engineer aware of the versatility of neon lamps and their many applications. Copies are available from your Signalite representative or by contacting Signalite.



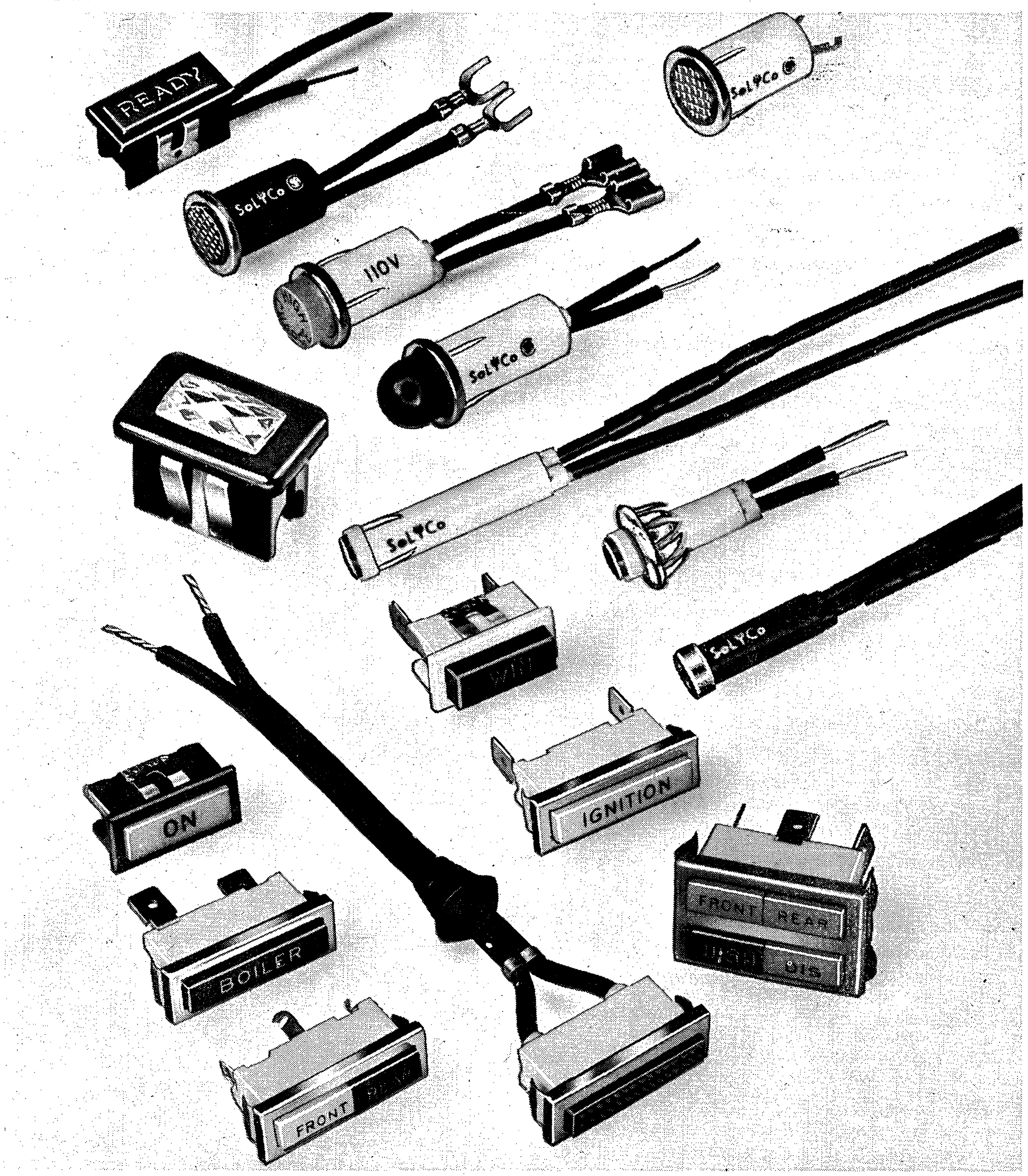
If there is a Gas Discharge Device or Glow Lamp to meet your needs, We'll have it. If there isn't, We'll Design it!

Signalite

DIVISION OF
GENERAL INSTRUMENT

1933 HECK AVENUE, NEPTUNE • NEW JERSEY 07753
(201) 775-2490

321


READY
SoLiCo
110V
SoLiCo
SoLiCo
SoLiCo
SoLiCo
ON
IGNITION
BOILER
FRONT
REAR
FRONT
REAR

SoLiCo PILOT & INDICATOR LIGHTS

- Complete range of voltages.
- Neon and incandescent lamps.
- Lenses in transparent and translucent colors.
- Lenses can be imprinted as desired.
- Decorative chrome plated bezels (other finishes upon request).
- Rectangular and round lights snap into panel.
- Round type lights can be supplied with speed-nut fasteners.
- Variety of terminals.
- Recognized under the component program of Underwriters Laboratories, Inc., and CSA approved.

SORENSON LIGHTED CONTROLS, INC.

530 Oakwood Avenue, West Hartford, Conn. 06110. Telephone: (203) 236-3267 TWX 710-425-0034

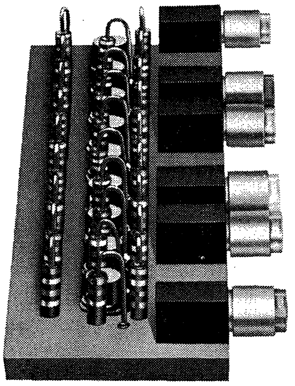
SLOAN

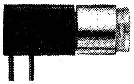
THE SLOAN COMPANY

7704 SAN FERNANDO RD. • P.O. BOX 367 • SUN VALLEY, CALIF. • (213) 875-1123 • TWX 910-498-2250

INDICATOR LIGHTS

101 Pee Cee





101

Description
Right angle, printed circuit board mounted, indicator light.

Lamp Accommodation
T-1 midget flanged base incandescent.

Mechanical
LAMPHOLDER BODY: Black general purpose phenolic.
LENS ASSEMBLY: Anodized aluminum bezel with plastic lens. (Twist lock attachment of lens assembly to lampholder body.)
MOUNTING: Lampholder is mounted by inserting the terminals directly into printed circuit board and flow soldering. Can be mounted on ¼″ centers.

HOW TO ORDER
(Example)

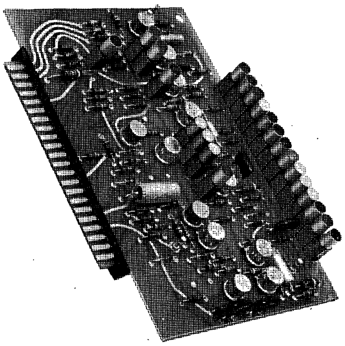
101 - RLUC - Q

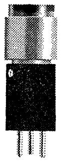
LENS STYLE
DS — Black Anodized Bezel
DSC — Aluminum Anodized Bezel
Q — Aluminum Anodized Bezel
QB — Black Anodized Bezel

LENS COLOR
RL — Red Transparent
RLUC — Red Translucent
WLUC — White Translucent
* BL — Blue Transparent
* BLUC — Blue Translucent
* GL — Green Transparent
* GLUC — Green Translucent
AL — Amber Transparent
ALUC — Amber Translucent
CL — Clear Transparent

MODEL

111 Pee Cee





111

Description
Perpendicular, printed circuit board mounted, indicator light.

Lamp Accommodation
T-1 midget flanged base incandescent

Mechanical
LAMPHOLDER BODY: Black general purpose phenolic.
LENS ASSEMBLY: Anodized aluminum bezel with plastic lens. (Twist lock attachment of lens assembly to lampholder body.)
MOUNTING: Lampholder is mounted by inserting the terminals directly into printed circuit board and flow soldering. Can be mounted on ¼″ centers.

HOW TO ORDER
(Example)

111 - RL - Q

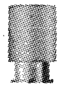
LENS STYLE
DS — Black Anodized Bezel
DSC — Aluminum Anodized Bezel
Q — Aluminum Anodized Bezel
QB — Black Anodized Bezel

LENS COLOR
RL — Red Transparent
RLUC — Red Translucent
WLUC — White Translucent
*BL — Blue Transparent
*BLUC — Blue Translucent
*GL — Green Transparent
*GLUC — Green Translucent
AL — Amber Transparent
ALUC — Amber Translucent
CL — Clear Transparent

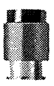
MODEL

* Not recommended for use with neon.

DS



DSC



Q

QB

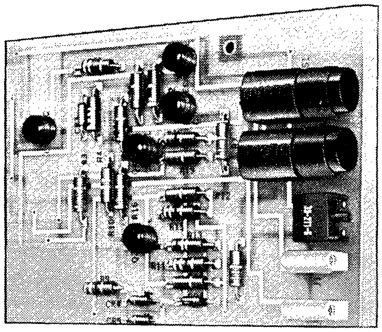
WRITE FOR COMPLETE CATALOG!
FREE SAMPLE ON REQUEST! HOT STAMPING AVAILABLE

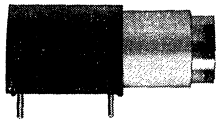
THE SLOAN COMPANY

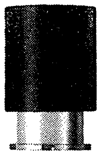
7704 SAN FERNANDO RD. • P.O. BOX 367 • SUN VALLEY, CALIF. • (213) 875-1123 • TWX 910-498-2250

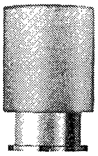
SLOAN

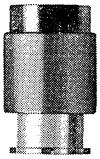
INDICATOR LIGHTS
864/874 Pee Cee

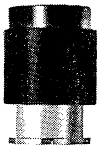


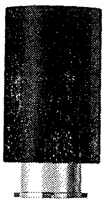

864

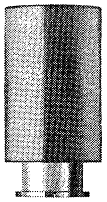

DS7
DS8

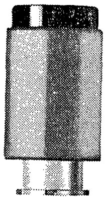

DSC7
DSC8

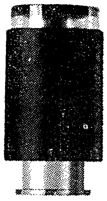

Q7
Q8

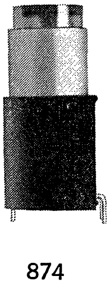

QB7
QB8


DS7N
DS8N


DSC7N
DSC8N


Q7N
Q8N


QB7N
QB8N


874

Description
Right angle and perpendicular, printed circuit board mounted, indicator light.
Lamp Accommodation
T-1¾ midget flanged base incandescent. Special lens available for NE-2D or NE-2J neon lamps.
Mechanical
LAMPHOLDER BODY: Black general purpose phenolic.
LENS ASSEMBLY: Anodized aluminum bezel with plastic lens. (Twist lock attachment of lens assembly to lampholder body.)
MOUNTING: Lampholder is mounted by inserting the terminals directly into printed circuit board and flow soldering. Can be mounted on ½″ centers.

HOW TO ORDER
(Example)

864 - AL - Q - 8 - N

MODEL
LENS COLOR
RL — Red Transparent
RLUC — Red Translucent
WLUC — White Translucent
*BL — Blue Transparent
*BLUC — Blue Translucent
*GL — Green Transparent
*GLUC — Green Translucent
AL — Amber Transparent
ALUC — Amber Translucent
CL — Clear Transparent
* Not recommended for use with neon.
LENS STYLES
DS — Black Anodized Bezel
DSC — Aluminum Anodized Bezel
Q — Aluminum Anodized Bezel
QB — Black Anodized Bezel
DIA.
½, 7⁄16
NEON

GENERAL COMMENTS (Models 101, 111, 864 and 874)

The Sloan Company "Pee Cee" replaceable lamp indicator light is designed specifically for printed circuit board mounting. This unit is mounted by inserting the terminals directly into the board and flow soldering directly into the circuit; two pins provide circuit contacts. Lamps are replaceable from the front by removing the lens. The "Pee Cee" series helps prepare the way for new packaging concepts:

- Permits elimination of front panel.
- Substantial contribution of soldered assemblies to production economy; can be automated.
- One central circuit board for indicator lights. (Mother Board)

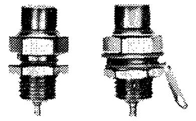
WRITE FOR COMPLETE CATALOG!
FREE SAMPLE ON REQUEST! HOT STAMPING AVAILABLE

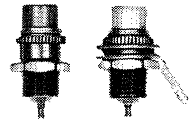
THE SLOAN COMPANY

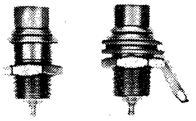
7704 SAN FERNANDO RD. • P.O. BOX 367 • SUN VALLEY, CALIF. • (213) 875-1123 • TWX 910-498-2250

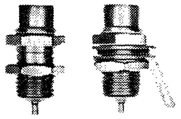
INDICATOR LIGHTS

102


102S 102SI
Hex Flange


102SK 102SKI
Knurled Flange


102SR 102SRI
Round Flange


102SS 102SSI
Short Hex Flange

For use with T-1 based lamps
- Front removable

102S, 102SK, 102SR, 102SS
Single terminal, mount in ¼" dia. hole

102SI, 102SKI, 102SRI, 102SSI
Insulated for two terminal applications, mount in 5⁄16" dia. hole.

Lenses shown are all standard.

HOW TO ORDER
(Example)

102SI - RLUC - DS

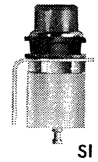
LENS STYLE
DS — Black Anodized Bezel
DSC — Aluminum Anodized Bezel
Q — Aluminum Anodized Bezel
QB — Black Anodized Bezel

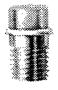
LENS COLOR
RL — Red Transparent
BL — Blue Transparent
GL — Green Transparent
AL — Amber Transparent
CL — Clear Transparent
RLUC — Red Translucent
WLUC — White Translucent
BLUC — Blue Translucent
GLUC — Green Translucent
ALUC — Amber Translucent

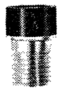
BODY TYPE

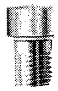
107

S

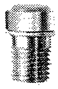

SI


STD


DS


DSC

QB


Q

For use with T-1 based lamps
Rear relamping. Minimum
mounting hole spacing 5⁄16".

HOW TO ORDER
(Example)

107 - RL - QB

LENS STYLE
STD — Standard
DS — Black Anodized Bezel
DSC — Aluminum Anodized Bezel
Q — Aluminum Anodized Bezel
QB — Black Anodized Bezel

LENS COLOR
RL — Red Transparent
BL — Blue Transparent
GL — Green Transparent
AL — Amber Transparent
CL — Clear Transparent
RLUC — Red Translucent
WLUC — White Translucent
BLUC — Blue Translucent
GLUC — Green Translucent
ALUC — Amber Translucent

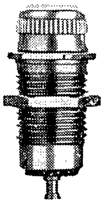
BODY TYPE

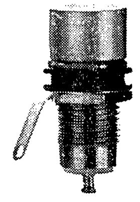
WRITE FOR COMPLETE CATALOG!
FREE SAMPLE ON REQUEST! HOT STAMPING AVAILABLE

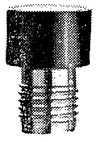
THE SLOAN COMPANY
7704 SAN FERNANDO RD. • P.O. BOX 367 • SUN VALLEY, CALIF. • (213) 875-1123 • TWX 910-498-2250

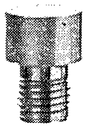
INDICATOR LIGHTS

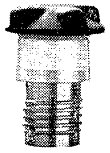
855


855S
Std.
Lens
Shown


855SI
DS
Lens
Shown


DS
Black
Anodized
Bezel


DSC
Aluminum
Anodized
Bezel


SE

For use with T-1¾ based lamps ◦ front removable.
855S — Single terminal, mounts in ⅜″ dia. hole.
855SI — Insulated for two terminal applications, mounts in $\frac{27}{64}$″ dia. hole.
Color coding at rear of body in E I A colors to simplify wiring.

HOW TO ORDER
(Example)

855SI - R - 2 - M

MODEL

LENS COLOR
General Purpose Lens Material
(translucent)*
R — Red, W — White, B — Blue, G — Green,
A — Amber, C — Clear*

COLOR CODING
0 — Black, 1 — Brown, 2 — Red, 3 — Orange,
4 — Yellow, 5 — Green, 6 — Blue,
7 — Violet, 8 — Gray, 9 — White.

These lenses may be used with both 855S and 855SI body styles.

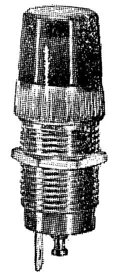
Special (G.E. Lexan) Lens Materials
(NO INCREASE IN PRICE)
(Transparent) RL — Red, BL — Blue,
GL — Green, AL — Amber, CL — Clear.
(Translucent) RLUC — Red, WLUC — White,
BLUC — Blue, GLUC — Green, ALUC — Amber.

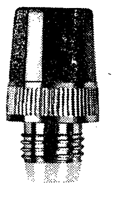
* M-Lens available in Clear.

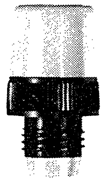
All M-Lens color transparent except white.

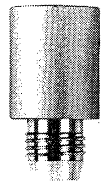
LENS STYLE

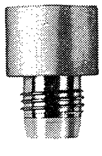
856

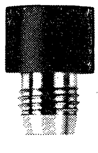


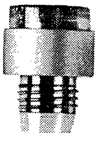

M


MB


DSCN


DSC


DS


Q

For use with T-1¾ and T-2 based lamps ◦ front removable.
Two terminal, mounts in $\frac{7}{16}$″ dia. hole.

HOW TO ORDER
(Example)

856S - R - M

MODEL

LENS COLOR
R — Red, W — White, B — Blue*,
G — Green*, A — Amber, C — Clear.
* Not recommended for use with neon.

LENS STYLE
M, MB, DSCN, DSN, QN, QBN accepts
all T-1¾ and T-2 based lamps.
DSC, DS, Q, QB accepts all T-1¾ and T-2
based lamps except long neons (NE2J type).

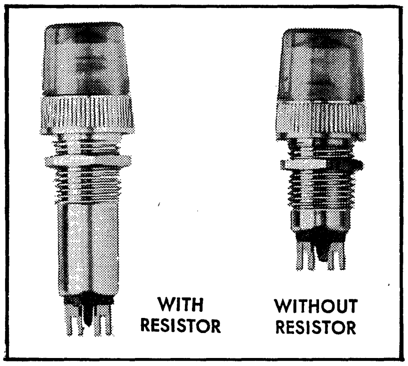
WRITE FOR COMPLETE CATALOG!
FREE SAMPLE ON REQUEST! HOT STAMPING AVAILABLE

THE SLOAN COMPANY

7704 SAN FERNANDO RD. • P.O. BOX 367 • SUN VALLEY, CALIF. • (213) 875-1123 • TWX 910-498-2250

INDICATOR LIGHTS

857



Neon or incandescent lamps built in, with or without resistor. Mounts in ⅜″ dia. hole.

HOW TO ORDER
(Example)

857 - R - NE-2H - 22K

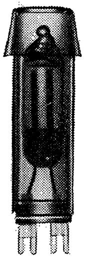
MODEL

LENS COLOR
R — Red, W — White, B — Blue*,
G — Green*, A — Amber, C — Clear.
* Incandescent only

LAMP

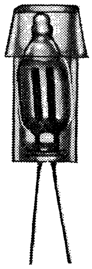
RESISTOR WHEN REQUIRED

858



Long-lamp T-2 neons, T-1¾ and T-1 incandescent lamps built in. Also short bulb neons with resistor. Mounts in 5/16″ dia. hole with Tinnerman nut. See Model 105 for T-1 lamp specifications.

859



Long or short-lamp neons with or without resistor attached, T-1¾ incandescent (available). Mounts in 5/16″ dia. hole with Tinnerman nut.

HOW TO ORDER
(Example)

858 - C - A1C - 68K

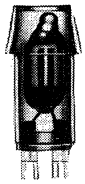
MODEL

COLOR
R — Red, W — White, Blue — *,
G — Green*, A — Amber, C — Clear.
* Incandescent only

LAMP

RESISTOR WHEN APPLICABLE

862



Short-lamp neons, T-1¾ and T-1 incandescent lamps built-in. Mounts in 5/16″ dia. hole with Tinnerman nut. See Model 105 for T-1 lamp specifications.

WRITE FOR COMPLETE CATALOG!
FREE SAMPLE ON REQUEST! HOT STAMPING AVAILABLE

THE SLOAN COMPANY

7704 SAN FERNANDO RD. • P.O. BOX 367 • SUN VALLEY, CALIF. • (213) 875-1123 • TWX 910-498-2250

INDICATOR LIGHTS

106

T-1 incandescent lamp built-in.
Mounts in 5/16″ dia. hole.

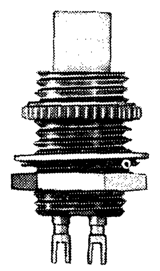
T-1 LAMP SPECIFICATIONS

Sloan	Volts	Hours Life	MSCP	Amps	Sloan	Volts	Hours Life	MSCP	Amps
F2	5.0	100,000	.05	.060	F45	12.0	10,000	.15	.060
F38	28.0	16,000	.13	.024	F46	10.0	10,000	.10	.027
F44	18.0	10,000	.15	.026	F47	14.0	10,000	.15	.065

HOW TO ORDER
(Example)

106 - B - F38

SLOAN LAMP NO.
LENS COLOR
(Transparent) RL — Red, BL — Blue, GL — Green, AL — Amber, CL — Clear.
(Translucent) RLUC — Red, WLUC — White, BLUC — Blue, GLUC — Green, ALUC — Amber.
MODEL



105

T-1 incandescent lamp built-in.
Mounts in 13/64″ dia. hole.

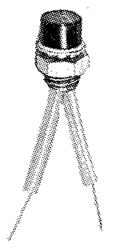
T-1 LAMP SPECIFICATIONS

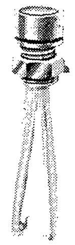
Sloan	Volts	Hours Life	MSCP	Amps	Sloan	Volts	Hours Life	MSCP	Amps
F2	5.0	100,000	.05	.060	F45	12.0	10,000	.15	.060
F38	28.0	16,000	.13	.024	F46	10.0	10,000	.10	.027
F44	18.0	10,000	.15	.026	F47	14.0	10,000	.15	.065

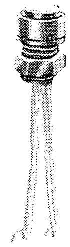
HOW TO ORDER
(Example)

105 - B - Q - F38

SLOAN LAMP NO.
LENS STYLE
STD — Standard
DS — Black Anodized Bezel
DSC — Aluminum Anodized Bezel
Q — Aluminum Anodized Bezel
QB — Black Anodized Bezel
LENS COLOR
(Translucent) RLUC — Red, WLUC — White, BLUC — Blue, GLUC — Green, ALUC — Amber.
(Transparent) RL — Red, BL — Blue, GL — Green, AL — Amber, CL — Clear.
MODEL


STD


DS & DSC


Q & QB

104

T-1⅛ neon lamp built-in mounts in 15/64″ dia. hole.

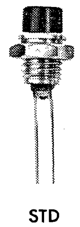
LAMP SPECIFICATIONS

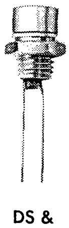
Volts	Hours Life	Amps	Resistor
120	30,000	.3	200K
240	30,000	.3	560K

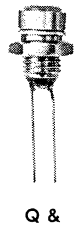
HOW TO ORDER
(Example)

104 - R - Q

LENS STYLE
STD — Standard
DS — Black Anodized Bezel
DSC — Aluminum Anodized Bezel
Q — Aluminum Anodized Bezel
QB — Black Anodized Bezel
LENS COLOR
(Transparent) RL — Red, AL — Amber, CL — Clear.
(Translucent) RLUC — Red, WLUC — White, ALUC — Amber.
MODEL


STD


DS & DSC

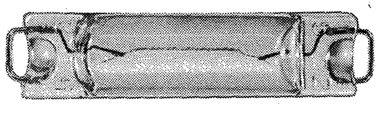

Q & QB

Above are but a few examples of many special indicator lights that The Sloan Company has designed and manufactured over the years. We can modify our standard indicator lights to your requirements or design and build a completely new indicator light to meet your particular needs. Our in-house molding facilities and complete prototype shop gives us the flexibility necessary to provide the finest service in the industry. When indicator lights are a problem, The Sloan Company has the engineering capability to develop the solution.

WRITE FOR COMPLETE CATALOG!
FREE SAMPLE ON REQUEST! HOT STAMPING AVAILABLE

TUNG-SOL® MOLDED BASE LAMPS AND BASELESS CARTRIDGE LAMPS

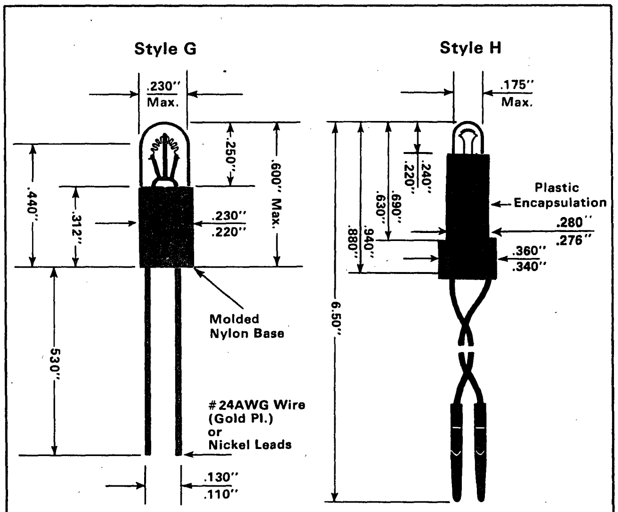
BASELESS CARTRIDGE LAMPS

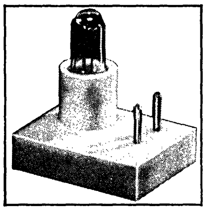


ELECTRICAL CHARACTERISTICS

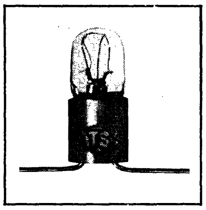
Lamp Type	Design Volts	Design Amps	Design C.P.	Life Hours
561	12.8	.97	12	600 @ 12.8V
562	13.5	.74	6	2000 @ 14V
563	13.5	.52	4	1000 @ 14V
564	14.0	.44	2	5000 @ 14V
565	28.0	.38	4.5	5000 @ 28V

These lamps may be mounted on a variety of simplified terminals. AMP Inc., Harrisburg, Pa., makes several types.

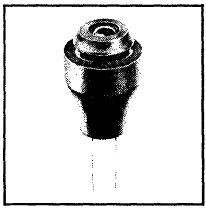




Plug-in module activates photo-electric sensor in high speed check sorter.



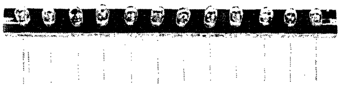
Molded base permits bending lead wires at acute angles.

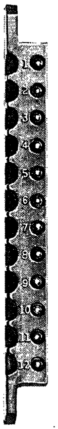


Soft plastic encapsulation permits push-in mounting in sheet-metal panels.

The molded base lamp provides important advantages that simplify production and contribute added reliability to the end product. The molded base is permanently bonded to the bulb. It replaces the previously cemented-on metal base. The former receptacle that had to be wired into the circuit is completely eliminated. The molded base lamp is self-mounting. In fact, the Tu-Pin lamp can be applied with automated equipment.

The molded base technique makes it possible to provide a wide variety of lamp packages—built-in key ways, plug-in types, unusual positioning of the leads and multi-purpose configurations.





Strip-mounted, grain-size, 21-mil lamps snap into molded plastic holder to form a condition monitor for computer circuit boards. Lamp sockets are numbered to correspond to individual circuits. Space for test probe contacts is provided. Units can be operated in either normally "on" or "off" condition and can be wired to a door switch or test push button.

TUNG-SOL®
TUNG-SOL DIVISION
Wagner Electric Corporation
630 W. Mt. Pleasant Avenue, Livingston, N. J. 07039
TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426
Trademark "TUNG-SOL" Reg. U.S. Pat. Off. and Marcas Registradas

ELECTRICAL CHARACTERISTICS						PHYSICAL CHARACTERISTICS				
Lamp No.	Style	Design Volts	Design Current	Nominal Light Output	Average Rated Life	Midget Base Style	Max. Bulb Diam.	MOL	Filament Type	Indicator Base Color
2301	G	**1.35**	.06	.02	500	Tu-Pin Molded	.230	.600	S-2	White
2302	G	**2.5**	.20	.25	500	Tu-Pin Molded	.230	.600	C-2R	Brown
2303	G	**2.7**	.06	.04	500	Tu-Pin Molded	.230	.600	C-2R	Lt. Grn.
2304	G	**3.0**	.30	.34	1500	Tu-Pin Molded	.230	.600	C-2R	Black
2305	G	**6.0**	.04	.03	1000	Tu-Pin Molded	.230	.600	C-2V	Silver
2306	G	**6.0**	.20	.60	1000	Tu-Pin Molded	.230	.600	C-2R	Orange
2307	G	**6.3**	.20	.50	3000	Tu-Pin Molded	.230	.600	C-2R	Dk. Blue
2319	G	**6.3**	.20	.40	50,000	Tu-Pin Molded	.230	.600	C-2F	Lt. Brown
2308	G	**10.0**	.014	.006	5000	Tu-Pin Molded	.230	.600	C-2F	Pink
2309	G	**10.0**	.04	.10	5000	Tu-Pin Molded	.230	.600	C-2V	Lt. Blue
2310	G	**14.0**	.08	.50	750	Tu-Pin Molded	.230	.600	C-2F	Yellow
2339	G	**15.0**	.040	.075	25,000	Tu-Pin Molded	.230	.600	C-2F	Black
2311	G	**18.0**	.04	.25	1000	Tu-Pin Molded	.230	.600	C-2F	Dk. Grn.
2318	G	**24.0**	.080	.50	20,000	Tu-Pin Molded	.230	.600	C-2F	Lt. Blue
2312	G	**28.0**	.04	.34	1000	Tu-Pin Molded	.230	.600	C-2F	Red
2329	G	**28.0**	.046	.34	2500	Tu-Pin Molded	.230	.600	C-2F	Gray
2334	G	**6.3**	.075	.25	1000	Tu-Pin Molded	.230	.600	C-2R	Red
EN1748 *	H	**2.5**	400	800 ft.-cd(5)	Indef.	Encapsulated	.175	.940	C-2R	Gray
EN1748S *	H	**2.5**	400	1250 ft.-cd(6)	Indef.	Encapsulated	.175	.940	C-2R	Red

*Various lead lengths are available

TUNG-SOL® SUBMINIATURE LAMPS

All base and bulb types for read-out and indicator applications

SPECIFICATIONS: T-1¾ LAMPS

ELECTRICAL CHARACTERISTICS					PHYSICAL CHARACTERISTICS					
Lamp No.	**Design Volts**	**Design Current**	**Nominal Light Output**	**Average Rated Life**	**Midget Base Style**	**Max. Bulb Diam.**	**MOL**	**Filament Type**	**LCL**	**Application**
331	1.35	.06	.02 CP	500	Flange	.230	.625	S-2	.375	Indicator(4)
440	1.5	.05	.012 CP	Indef.	Flange	.230	.625	C-2R	.375	Indicator
1769	2.5	.20	.20 CP	500	Screw	.230	.718	C-2R	.500	Indicator
1767	2.5	.20	.25 CP	500	Screw	.230	.625	C-2R	.500	Indicator(4)
364	2.5	.40	.28 CP	5000	Flange	.230	.625	C-2R	.375	Indicator
4(1)	2.5	.40	800 ft.-cd(5)	Indef.	Groove	.240	.813	C-2R		Read-out
4S(1)	2.5	.40	1250 ft.-cd(6)	Indef.	Groove	.240	.813	C-2R		Read-out
1748(1)(2)	2.5	.40	800 ft.-cd(5)	Indef.	⅝″ Leads	.240	.718	C-2R		Read-out
1748S(1)(2)	2.5	.40	1250 ft.-cd(6)	Indef.	⅝″ Leads	.240	.718	C-2R		Read-out
2169(2)	2.5	.35	.21 CP	10,000	⅝″ Leads	.230	.520	C-2R		Indicator
1738(2)	2.7	.06	.04 CP	500	⅝″ Leads	.230	.520	C-2R		Indicator
338	2.7	.06	.04 CP	500	Flange	.230	.625	C-2R	.375	Indicator
342	6	.04	.03 CP	1000	Screw	.230	.718	C-2V	.500	Indicator
345	6	.04	.03 CP	1000	Flange	.230	.625	C-2V	.375	Indicator(4)
328	6	.20	.60 CP	1000	Flange	.230	.625	C-2R	.375	Indicator(4)
337	6	.20	.60 CP	1000	Groove	.230	.625	C-2R	.375	Indicator
1768	6	.20	.60 CP	1000	Screw	.230	.625	C-2R	.500	Indicator(4)
1730(2)	6	.04	.03 CP	1000	⅝″ Leads	.230	.520	C-2V		Indicator
2134(2)	6	.04	.03 CP	1000	1¾″ Leads	.230	.520	C-2V		Indicator
1784(2)	6	.20	.60 CP	1000	⅝″ Leads	.230	.520	C-2R		Indicator
380	6.3	.040	.02 CP	50,000	Flange	.230	.625	C-2V	.375	Indicator
1739(2)	6.3	.075	.25 CP	1000	⅝″ Leads	.230	.520	C-2R		Indicator
1775	6.3	.075	.25 CP	1000	Screw	.230	.625	C-2R	.500	Indicator(4)
350	6.3	.15	.45 CP	3000	Flange	.230	.625	C-2R	.375	Indicator(4)
349	6.3	.20	.50 CP	3000	Flange	.230	.625	C-2R	.375	Indicator
379	6.3	.20	.40 CP	50,000	Groove	.230	.625	C-2V	.375	Indicator
381	6.3	.20	.40 CP	50,000	Flange	.230	.625	C-2V	.375	Indicator
2112(2)	6.3	.20	.50 CP	3000	⅝″ Leads	.230	.520	C-2R		Indicator
2181(2)	6.3	.20	.40 CP	50,000	⅝″ Leads	.230	.520	C-2V		Indicator
344	10	.014	.002 CP	5000+	Flange	.230	.625	C-2F	.375	Indicator(4)
367	10	.04	.10 CP	Indef.	Flange	.230	.625	C-2V	.375	Indicator
374	10	.014	.006 CP	5000+	Flange	.230	.625	C-2F	.375	Indicator
1869(2)	10	.014	.002 CP	5000+	⅝″ Leads	.230	.520	C-2F		Indicator
1917(2)	10	.014	.006 CP	5000+	⅝″ Leads	.230	.520	C-2F		Indicator
2107(2)	10	.04	.10 CP	Indef.	⅝″ Leads	.230	.625	C-2V		Indicator
2207	10	.04	.10 CP	20,000	Groove	.230	.625	C-2V	.375	Indicator
384	11	.025	.05 CP	2000	Flange	.230	.625	C-2F	.375	Indicator
1916(2)	12	.019	.012 CP	Indef.	⅝″ Leads	.230	.520	C-2V		Indicator
336	14	.08	.50 CP	750	Groove	.230	.625	C-2F	.375	Indicator
373	14	.08	.50 CP	750	Screw	.230	.718	C-2F	.500	Indicator
382	14	.08	.30 CP	50,000	Flange	.230	.625	C-2F	.375	Indicator
386	14	.08	.30 CP	50,000	Groove	.230	.625	C-2F	.375	Indicator
330	14	.08	.50 CP	750	Flange	.230	.625	C-2F	.375	Indicator(4)
1705(2)	14	.08	.50 CP	750	1″ Leads	.230	.520	C-2F		Indicator
2182(2)	14	.08	.30 CP	50,000	⅝″ Leads	.230	.520	C-2F		Indicator
346	18	.04	.25 CP	1000	Groove	.230	.625	C-2F	.375	Indicator
370	18	.04	.25 CP	1000	Flange	.230	.625	C-2F	.375	Indicator
457	22	.04	.30 CP	2000	Groove	.230	625	C-2F	.375	Indicator
327	28	.04	.34 CP	1000	Flange	.230	.625	C-2F	.375	Indicator(4)
327X	28	.046	.34 CP	2500	Flange	.230	.625	C-2F	.375	Indicator(4)
334	28	.04	.34 CP	1000	Groove	.230	.625	C-2F	.375	Indicator(4)
335	28	.04	.34 CP	1000	Screw	.230	.718	C-2F	.500	Indicator
340(3)	28	.04	.34 CP	1000	Flange	.230	.625	C-2F	.375	Indicator(4)
369	28	.04	.34 CP	1000	Screw	.230	.593	C-2F	.500	Indicator
1762(2)	28	.04	.33 CP	1000	⅝″ Leads	.230	.520	C-2F		Indicator(4)
387	28	.04	.30 CP	25,000	Flange	.230	.625	C-2F	.375	Indicator
388	28	.04	.30 CP	25,000	Groove	.230	.625	C-2F	.375	Indicator
2187(2)	28	.04	.30 CP	25,000	⅝″ Leads	.230	.520	C-2F		Indicator
1764(2)	28	.04	.33 CP	1000	1″ Leads	.230	.520	C-2F		Indicator
1860(2)	28	.04	.34 CP	1000	1″ Tinned Leads	.230	.520	C-2F		Indicator
1762X(2)	28	.046	.34 CP	2500	⅝″ Leads	.230	.520	C-2F		Indicator

These lamps are normally supplied in clear glass. Colored bulbs will be made on special order. Unless otherwise specified, all lamps have metal bases.

SPECIFICATIONS: T-3/4 LAMPS

Lamp No.	Design Volts	Design Current	Nominal Light Output	Average Rated Life	Midget Base Style	Max. Bulb Diam.	MOL	Filament Type	LCL	Application
2	5	.021	.034	Indef.	1·3/16″ Tinned leads	.102	.200	C-6		Digital

Reference Notes Indef.—Life over 5000 hours. (1) Lens end. (2) Wire leads. (3) High temperature solder. (4) Application in aircraft service. (5) Through 3/16″ min. dia. window at 3/8″ from lamp tip. (6) Through 1/8″ min. dia. window at 3/8″ from lamp tip.

Wire Lamp Types Not Shown—Type F. 2264—2129—2176—2183—2119—2201—2265 and 2002.

TUNG-SOL DIVISION/Wagner Electric Corporation

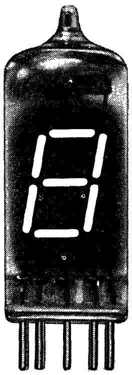
630 W. Mt. Pleasant Avenue, Livingston, N.J. 07039 / TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426

Trademark "TUNG-SOL" Reg. U. S. Pat. Off. and Marcas Registradas

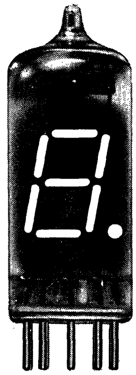
TUNG-SOL® DIGITAL AND ALPHANUMERIC DISPLAYS

VACUUM TYPES

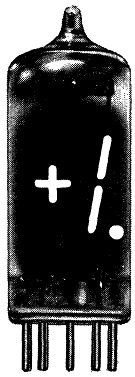
DIGIVAC S/G™ VACUUM FLUORESCENT DISPLAYS



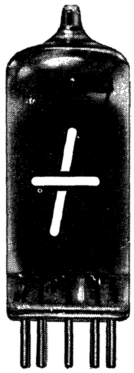
DT1704B
Numerals 0 to 9
and 14 letters



DT1705D
with
decimal point



DT1707B
plus/minus
one, decimal

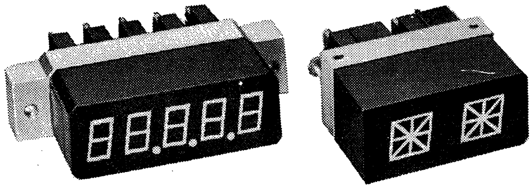


DT1719A
plus/minus

This Tung-Sol development, which created a whole new set of digital display standards, is now made in a narrower configuration that reduces the space required for array applications. Low voltage, low power drain (25 V and 1.6 V) is ideal for low signal level requirements, especially battery-operated equipment. Digivac S/G displays meet MIL specs. They employ standard miniature tube bases and have inexpensive logic/driver requirements. Display is single plane with space-age-type segmented characters. Solderable-lead option provides for circuit board mounting. Common filters provide unlimited color selection for identification, or to heighten contrast. Illustrated types are standard. Other symbols on special order.

INCANDESCENT TYPES

7 Segments, 16 Segments, Stacked, Integrated, Status Indicators



STBY
PROG
DT1568
TCK ALI
DL

Designed to provide optimum contrast under ambient light conditions. Light shades are not needed. Tung-Sol displays function in extreme environmental conditions. The 20 mA and 10 mA lamp banks are mechanically interchangeable.

7 Segments—Display 0 through 9.

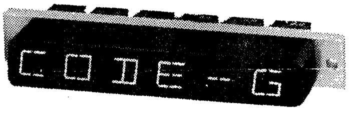
16 Segments—Full alphanumeric display.

Stacked—Digits as well as lamp blocks individually replaceable for each digit.

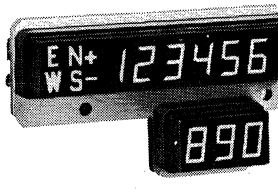
Integrated—Monolithic construction requires less width per character. Individual lamp blocks replaceable.

Status Indicators—Fixed messages, or symbols, to specification. Supplied readable when off, or completely blank.

TYPICAL CONFIGURATIONS



N 40°26'74"
W 076°43'69"



TUNG-SOL DIVISION / Wagner Electric Corporation

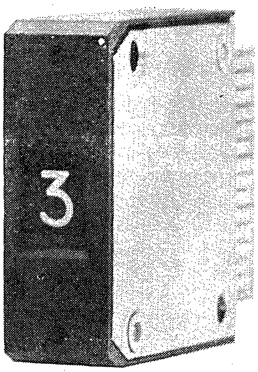
630 W. Mt. Pleasant Avenue, Livingston, N.J. 07039 / TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426

Trademark "TUNG-SOL" Reg. U. S. Pat. Off. and Marcas Registradas

VERNITRON CATALOG DIGEST

SPECIAL PRODUCTS

ELECTRO-MAGNETIC READOUTS



VERNIDEX
STANDARD
½ x 1½ x 1½

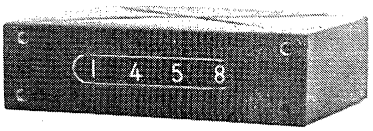
The tiny module that converts digital inputs to an electro-magnetic readout.

In addition to standard models listed, Vernitron will manufacture to your specifications.

Part No.	Volts D.C.	No. of Char.	Size of Char.	Pulse Mode	No. of Leads or Term.
06VEA-0022	10	11	.156 x .156	1-1-1-1	12 L
06VBA-0048	10	10	.156 x .156	1-2-1-2	6 T
06VBD-1105 3 Position Flag	10	3	.187 x .187	Return to Flag with Power off	3 T
12VBB-1002	6	10	.281 x .250	Polarity Reversal	6 P/C
12VAC-0015	6	11	.250 x .156	1-1-1-1	12 P/C

Write or phone today for detailed bulletin and stock list.

TO THE TOP OF THE LINE



VERNIDEX
MINIATURE
0.390 x 0.840 x 0.875

Hermetically sealed, fully qualified to Military Specifications:

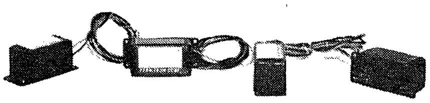
Altitude	Shock	Fungus	Radio Interference
Temperature	Salt Spray	Explosion	Life
Vibration	Sand/Dust	Acceleration	Fogging

OPTIONS:

BCD Input	Full Logic Self-Contained	Commercial Version

Problems with VISIBILITY? Problems with LIFE? Problems with POWER SHUTOFF? Call VERNITRON (516-586-5100) for selection from the widest available range of RELIABLE electro-magnetic readouts.

THE VERNIBRATOR



The VERNIBRATOR is an electro-mechanical vibrating device originally designed to eliminate stiction from instruments such as altimeters, etc. The Vernitron vibrator produces exceptionally High-G forces over 10,000 hours of failure and maintenance-free operation, while consistently attaining reliable low-voltage operation.

Consult the factory for either standard or custom-made designs.

Part No.	Input Voltage	Input Current	Peak G's	Size (Inches)	Weight
PX 10014	28 VDC	50 ma	.75 - 2.0	1.6 x .67 x .65	28 grams
PX 10018	13-15 VDC	25 ma max. @ 13V	.75 - 2.0	1.6 x .67 x .65	28 grams
PX 10021	21-28 VDC	25 ma @ 21V 30 ma @ 28V	.75 - 2.0	1.0 x .725 x .65	24 grams
PX 10036	14-28 VDC	30 ma max.	.25	.75 x .725 x .65	22 grams

VERNITRON CORPORATION
* Motor Products Division
300 Marcus Boulevard, Deer Park, New York 11729 / (516) 586-5100, TWX: 510-227-6079

Other Control Components Group Products: Control Components Division, Torrance, California - Synchros, Resolvers, Torqsyns*, Servo Assemblies; Magnetic Technology Division, Canoga Park, California - Torque Motors and Tachometer Generators. *Reg. T.M.

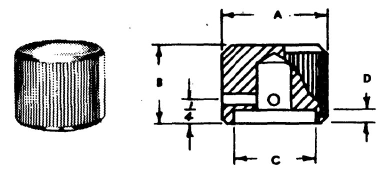
CONTROL KNOBS

STANDARD SERIES

VEMALINE

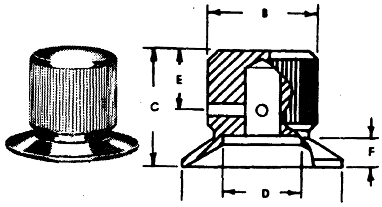
FOR MILITARY OR COMMERCIAL EQUIPMENT — ONE PIECE ALL METAL

PLAIN



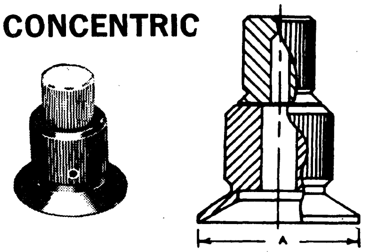
SERIES	A	B	C	D
1073	1 1/4	3/4	9/16	1/8
1027	15/16	3/4	9/16	1/8
1020	3/4	5/8	9/16	3/32
1003	5/8	5/8	9/16	3/32
1017	1/2	1/2	7/16	3/32
1021	1/2	11/16	7/16	3/32

DIAL



SERIES	A DIAL	B KNURL	C HEIGHT	D	E	F
1016	5/8	1/2	5/8	3/8	3/8	1/8
1015	7/8	1/2	11/16	3/8	3/8	3/16
1002	1	5/8	13/16	3/8	7/16	5/32
1019	1 1/8	3/4	13/16	9/16	1/2	3/16
1001	1 3/8	5/8	7/8	3/8	7/16	1/8
1018	1 3/8	3/4	7/8	9/16	1/2	1/8

CONCENTRIC

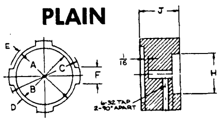


TOP KNOB	RECOMMENDED BOTTOM KNOB (State "Through Hole" When Ordering)
1017	1018, 1019 1020, 1001, 1002, 1003
1016	1018, 1019, 1020, 1073, 1027
1003	1018, 1019, 1020, 1073, 1027,
1020	1027, 1073,

Additional shaft hole dimensions available.

CONTEMPORARY SERIES*

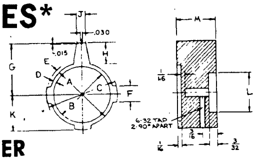
PLAIN



J
E
A
C
F
B
D
H
1/16
6-32 TAP 2-90° APART

SERIES	C Dia.	J
1-10-☐	1-7/64	3/4
1-75-☐	27/32	5/8
1-62-☐	45/64	5/8
1-50-☐	9/16	1/2
1-37-☐	7/16	1/2

POINTER

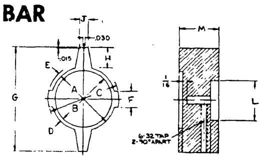


J
.030
.015
H
G
E
D
A
C
F
B
K
M
1/16
L
6-32 TAP 2-90° APART
3/16
1/16
3/32

SERIES	C Dia.	G	K	M
3-10-☐	1-7/64	13/16	35/64	3/4
3-75-☐	27/32	41/64	27/64	5/8
3-62-☐	45/64	35/64	23/64	5/8
3-50-☐	9/16	15/32	9/32	1/2
3-37-☐	7/16	23/64	7/32	1/2

SERIES	C Dia.	G	M
2-10-☐	1-7/64	1-41/64	3/4
2-75-☐	27/32	1-9/32	5/8
2-62-☐	45/64	1-3/32	5/8
2-50-☐	9/16	29/32	1/2
2-37-☐	7/16	47/64	1/2

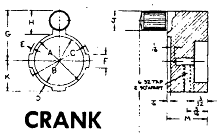
BAR



J
.030
.015
H
M
E
A
C
F
B
G
D
L
1/16
6-32 TAP 2-90° APART

SERIES	C Dia.	G	K	N
4-10-☐	1-7/64	59/64	35/64	1-1/4
4-75-☐	27/32	51/64	27/64	1-1/8

*ALSO AVAILABLE IN ABS PLASTIC.



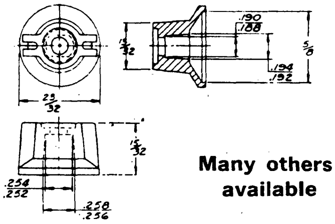
G
H
J
E
A
C
F
B
K
D
1/16
6-32 TAP 2-90° APART
M
N

CRANK

MANY OTHER KNOBS AVAILABLE. WRITE FOR CATALOG.

MIL. STANDARD

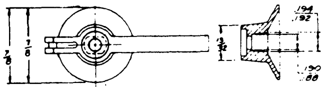
MS 91524



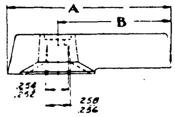
.190
.188
13/32
5/8
.194
.192
23/32
13/32
.254
.252
.258
.256

Many others available

MS 91525



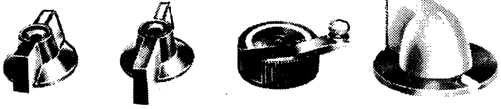
7/8
1/8
13/32
.194
.192
.190
.88



A
B
.254
.252
.258
.256

PART NO.	A	B	VEMALINE
MS 91525-1	19/32	1 3/16	NO: V25-1
MS 91525-2	27/32	1 7/16	NO: V25-2
MS 91525-3	1 11/32	1 15/16	NO: V25-3
MS 91525-4	1 31/32	2 9/16	NO: V25-4

Other MIL KNOBS Available From Stock



MS 91522 MS 25167
MS 91523 MS 25168
MS 91524 MS 25169
MS 91525 MS 25170
MIL KNOBS in Aluminum
5355 Series and Signal Corps Knobs.

MANY OTHER KNOBS AVAILABLE. WRITE FOR CATALOG.

MS Specification sheets for further data are available on request.

HOW TO ORDER: Show basic series number desired, color is denoted by a suffix "1" for Clear, "2" for Black, "A" for 1/8" shaft, "B" for 1/4" shaft, "C" for 3/16" shaft.

Example: Order #1001-1-B, Series 1001 knob — clear — 1/4" shaft.

(If index line is required, this must be stated on order. Cost is 10¢ more, any quantity.)

CONTACT FACTORY FOR CONCENTRIC KNOB APPLICATIONS.

ENGRAVED KNOBS TO YOUR SPECIFICATIONS AVAILABLE ON SHORT NOTICE.

VEMALINE PRODUCTS COMPANY, INC.

WYCKOFF, NEW JERSEY / PHONE (201) 891-3200

INDICATOR PANELS & LIGHTS

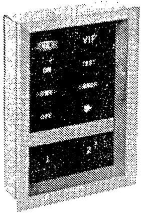
MANY OTHER LIGHTS AVAILABLE. WRITE FOR CATALOG.

VEMALINE

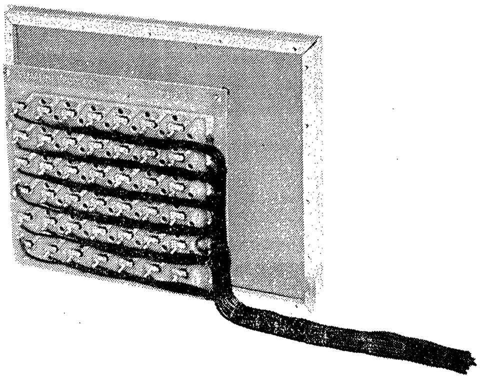
VEMALINE INDICATOR PANELS offer simplicity of design and construction. The standard panel is backlighted allowing a non-glare, no-mar face. Size range can be adjusted to customer's specifications, with or without switches or other components. Special circuitry is also available. Costs are far below those of panels presently available. Special screened outlines or nomenclature can be added to the face.

ADDITIONAL FEATURES: • Extremely shallow panel, protrudes approximately one inch behind face of panel when mounted • Non-glare face • Satin-clear anodized • Bezel finishes • Legends can be visible or invisible when not lighted and can be lighted in any color desired.

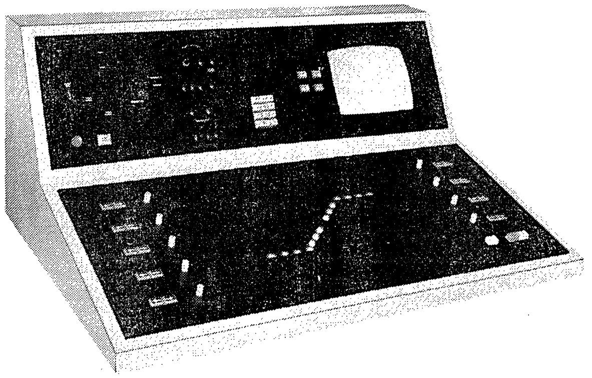
TYPICAL
SAMPLE
READOUT



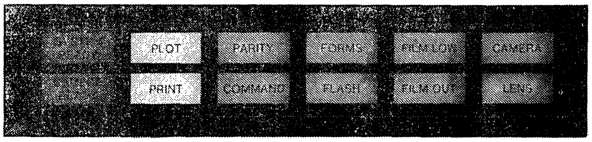
WRITE FOR
COMPLETE CATALOG



REAR VIEW
BULB & WIRING
ASSEMBLY



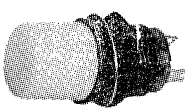
R.R. TERMINAL STATUS BOARD

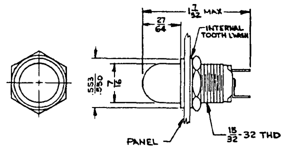

PLOT
PARITY
FORMS
FILM LOW
CAMERA
PRINT
COMMAND
FLASH
FILM OUT
LENS

CAMERA READOUT

INDICATOR LIGHTS

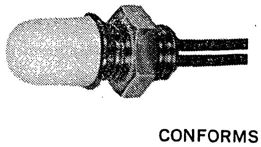
7014-24-☐

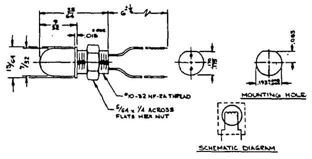



1 7/32 MAX
27/64
INTERNAL TOOTH L'WASH
.553
.550
7/16
PANEL
15/32-32 THD

SUB-MINIATURE INDICATOR LIGHTS

7019-☐

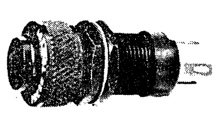


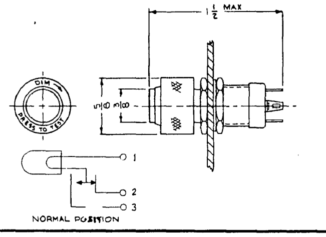

35/64
9/32
.015
6
13/64
7/32
#10-32 NF-2A THREAD
5/64 x 1/4 ACROSS FLATS HEX NUT
.170
.175
.085
.193
MOUNTING HOLE
SCHEMATIC DIAGRAM

CONFORMS TO MIL-L-3661

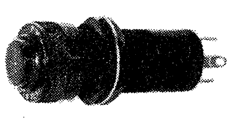
PRESS-TO-TEST ASSEMBLIES (DIMMER AND NON-DIMMER TYPES)

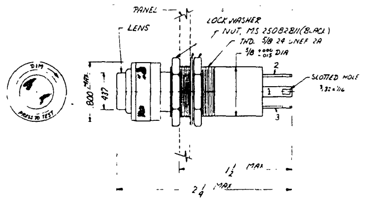
7027-25-☐




1 1/2 MAX
DIM
PRESS TO TEST
5/8
3/8
1
2
3
NORMAL POSITION

7052-☐




PANEL
LENS
LOCK WASHER
NUT, MS 25082B11 (BLACK)
THD. 5/8 24 UNEF 2A
5/8 DIA
DIM
PRESS TO TEST
.800 MAX
.437
2
1
3
SLOTTED HOLE
1 1/2 MAX
2 1/4 MAX

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
RED	GREEN	AMBER	BLUE	WHITE	YELLOW	CLEAR	RED	GREEN	AMBER	BLUE	WHITE	YELLOW

VEMALINE PRODUCTS COMPANY, INC.

WYCKOFF, NEW JERSEY / PHONE (201) 891-3200

All-tronics, inc.

RADIO INTERFERENCE
FILTERS

FOLLOW THESE EASY STEPS

1. DETERMINE CURRENT AND VOLTAGE OF CIRCUIT WHERE THIS FILTER WILL BE USED.
2. OBTAIN BASIC PART NUMBER FROM TABLE BELOW BASED ON SUPPRESSION REQUIREMENTS.
3. SELECT MOUNTING STYLE AND TERMINAL TYPE FROM FACING PAGE.
4. BUILD UP PART NUMBER THIS WAY ⟶

70D 6.3G W 11

BASIC PART NUMBER — MOUNTING STYLE — TERMINAL TYPE

RECTANGULAR TYPES EFFECTIVE TO 400 MEGAHERTZ

Amperes	Case Size			0-70 Volts DC Series		400 VDC/150 VAC 0-70 Hertz Series		150 VAC 50-1000 Hertz Series		600 VDC/250 VAC 0-70 Hertz Series		250 VAC 50-1000 Hertz Series	
	a	b	c	Basic Part No.	db	Basic Part No.	db	Basic Part No.	db	Basic Part No.	db	Basic Part No.	db
0.40	1⅛	1	¹¹⁄₁₆	70D0.4E	48	400D0.4E	24	400A0.4E	24	*	*	*	*
	1¾	1¼	⅞	70D0.4F	60	400D0.4F	47	400A0.4F	47	600D0.4F	42	600A0.4F	42
	2	1¾	1⅛	70D0.4G	90	400D0.4G	90	400A0.4G	90	600D0.4G	90	600A0.4G	90
0.63	1⅛	1	¹¹⁄₁₆	70D0.6E	48	*	*	*	*	*	*	*	*
	1¾	1¼	⅞	70D0.6F	56	400D0.6F	40	400A0.6F	40	600D0.6F	35	600A0.6F	35
	2	1¾	1⅛	70D0.6G	90	400D0.6G	85	400A0.6G	92	600D0.6G	83	600A0.6G	87
1.0	1⅛	1	¹¹⁄₁₆	70D1.0E	47	*	*	*	*	*	*	*	*
	1¾	1¼	⅞	70D1.0F	53	400D1.0F	30	400A1.0F	30	600D1.0F	30	600A1.0F	30
	2	1¾	1⅛	70D1.0G	87	400D1.0G	74	400A1.0G	87	600D1.0G	75	600A1.0G	80
2.5	2	1¾	1⅛	70D2.5G	75	400D2.5G	57	400A2.5G	60	600D2.5G	59	600A2.5G	64
	2	2	1¼	70D2.5H	80	400D2.5H	63	400A2.5H	67	600D2.5H	69	600A2.5H	70
4.0	2	1¾	1⅛	70D4.0G	72	400D4.0G	48	400A4.0G	52	600D4.0G	50	600A4.0G	52
	2	2	1¼	70D4.0H	82	400D4.0H	68	400A4.0H	68	600D4.0H	62	600A4.0H	62
6.3	2	1¾	1⅛	70D6.3G	72	400D6.3G	43	400A6.3G	45	600D6.3G	44	600A6.3G	47
	2	2	1¼	70D6.3H	80	400D6.3H	60	400A6.3H	60	600D6.3H	55	600A6.3H	55
	3¹⁄₁₆	2⅞	1⅝	*	*	400D6.3J	88	400A6.3J	90	600D6.3J	75	600A6.3J	75
10	2	1¾	1⅛	70D10G	60	400D10G	40	400A10G	43	600D10G	27	500A10G	30
	2	2	1¼	70D10H	72	400D10H	50	400A10H	54	600D10H	35	600A10H	35
	3¹⁄₁₆	2⅞	1⅝	70D10J	90	400D10J	72	400A10J	75	600D10J	63	600A10J	66
16	3¹⁄₁₆	2⅞	1⅝	70D16J	77	400D16J	65	400A16J	65	600D16J	49	600A16J	55
25	3¹⁄₁₆	2⅞	1⅝	70D25J	70	400D25J	55	400A25J	55	600D25J	44	600A25J	48
	3¹⁄₁₆	2⅞	2⅛	70D25K	84	400D25K	60	400A25K	65	600D25K	55	600A25K	60
40	3¹⁄₁₆	2⅞	1⅝	70D40J	50	400D40J	20	400A40J	23	600D40J	35	600A40J	35
	3¹⁄₁₆	2⅞	2⅛	70D40K	75	400D40K	50	400A40K	50	600D40K	45	600A40K	45
63	3¹⁄₁₆	2⅞	1⅝	70D63J	50	400D63J	19	400A63J	22	600D63J	35	600A63J	35
	3¹⁄₁₆	2⅞	2⅛	70D63K	55	400D63K	50	400A63K	50	600D63K	40	600A63K	45
	3½	3½	2½	70D63L	80	400D63L	60	400A63L	60	600D63L	45	600A63L	54
100	3¹⁄₁₆	2⅞	2⅛	70D100K	55	400D100K	50	400A100K	50	600D100K	40	600A100K	45
	3½	3½	2½	70D100L	60	400D100L	55	400A100L	55	600D100L	45	600A100L	50

TUBULAR TYPES EFFECTIVE TO 10 GIGAHERTZ

Amperes	Case Size		0-70 Volts DC Series		400 VDC/150 VAC 0-500 Hertz Series		600 VDC/150 VAC 0-500 Hertz Series	
	Dia.	Length	Basic Part No.	db	Basic Part No.	db	Basic Part No.	db
1.0	1	2½	70R1.0M	75	400R1.0M	70	600R1.0M	55
	1	4	70R1.0P	90	400R1.0P	85	600R1.0P	70
2.5	1	2½	70R2.5M	75	400R2.5M	60	*	*
	1	4	70R2.5P	88	400R2.5P	70	600R2.5P	55
	1⅜	4⅛	*	*	400R2.5R	90	600R2.5R	75
4.0	1	4	70R4.0P	75	400R4.0P	65	600R4.0P	45
	1⅜	4⅛	70R4.0R	90	400R4.0R	85	600R4.0R	70
6.3	1	4	70R6.3P	70	*	*	*	*
	1⅜	4⅛	70R6.3R	85	400R6.3R	65	600R6.3R	45
	1½	4⅜	*	*	400R6.3S	90	600R6.3S	75
10	1	4	70R10P	60	*	*	*	*
	1⅜	4⅛	70R10R	80	400R10R	65	600R10R	45
	1½	4⅜	*	*	400R10S	80	600R10S	60
16	1⅜	4⅛	70R16R	70	400R16R	55	600R16R	35
	1½	4⅜	70R16S	85	400R16S	70	600R16S	50
20	1½	4⅜	70R20S	70	400R20S	60	600R20S	40

All-tronics, inc.

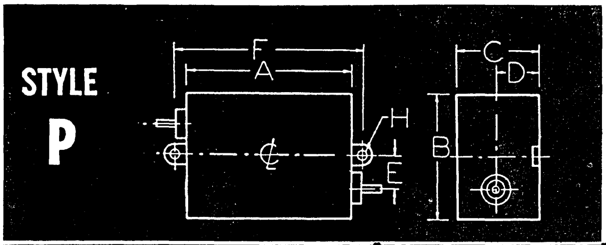
45 BOND STREET, WESTBURY, L. I., N. Y. 11590 • (516) 333-3090

RADIO INTERFERENCE FILTERS

STYLES & DIMENSIONS STANDARD MOUNTING

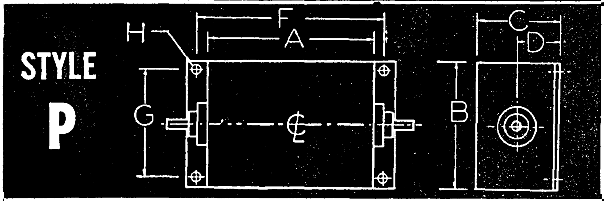
IF BASIC PART NUMBER ENDS WITH THIS LETTER

RECTANGULAR TYPES



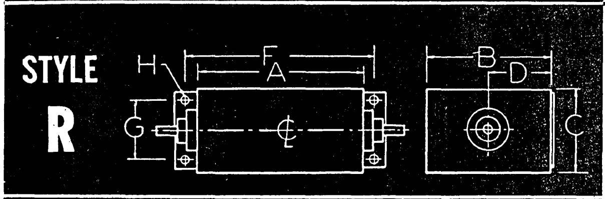
STYLE P DIMENSIONS ARE

	A	B	C	D	E	F	H
E	1⅛	1	11/16	11/32	¼	1 7/16	5/32
F	1¾	1¼	⅞	7/16	¼	2⅛	3/16
G	2	1¾	1⅛	9/16	½	2⅜	3/16
H	2	2	1¼	⅝	⅝	2⅜	3/16



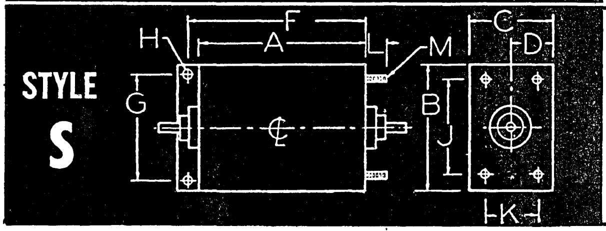
STYLE P DIMENSIONS ARE

	A	B	C	D	F	G	H
J	3 1/16	2⅞	1⅝	13/16	3⅝	2⅛	.195
K	3 1/16	2⅞	2⅛	1 1/16	3⅝	2⅛	.195
L	3½	3½	2½	1¼	4½	2	.195



STYLE R DIMENSIONS ARE

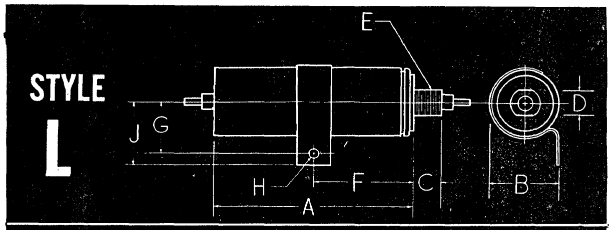
	A	B	C	D	F	G	H
J	3 1/16	2⅞	1⅝	1 7/16	3⅝	⅞	.195
K	3 1/16	2⅞	2⅛	1 7/16	3⅝	1⅜	.195
L	3½	3½	2½	1¾	4½	1¾	.195



STYLE S DIMENSIONS ARE

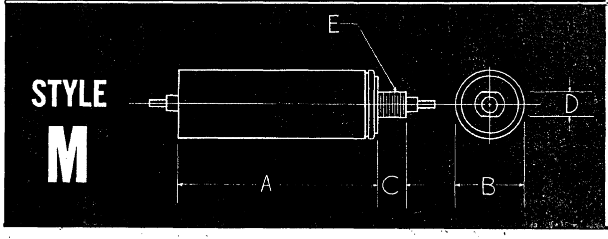
	A	B	C	D	F	G	H	J	K	L	M
J	3 1/16	2⅞	1⅝	13/16	3⅜	2⅛	.195	2	⅞	15/32	10-32
K	3 1/16	2⅞	2⅛	1 1/16	3⅜	2⅛	.195	2	1⅜	15/32	10-32
L	3½	3½	2½	1¼	4	2	.195	2¼	1¾	15/32	10-32

TUBULAR TYPES



STYLE L DIMENSIONS ARE

	A	B	C	D	E	F	G	H	J
M	2½	1	7/16	⅜	7/16-20NF	1¼	¾	.156	15/16
P	4	1	7/16	⅜	7/16-20NF	2	¾	.156	15/16
R	4⅛	1⅜	⅝	17/32	⅝-24NF	2 1/16	1	.195	1¼
S	4⅜	1½	⅝	17/32	⅝-24NF	2 3/16	1⅛	.195	1⅜



STYLE M DIMENSIONS ARE

	A	B	C	D	E
M	2½	1	7/16	⅜	7/16-20NF
P	4	1	7/16	⅜	7/16-20NF
R	4⅛	1⅜	⅝	17/32	⅝-24NF
S	4⅜	1½	⅝	17/32	⅝-24NF

SELECT TERMINALS FROM FOLLOWING PAGE ⟶

45 BOND STREET, WESTBURY, L. I., N. Y. 11590 • (516) 333-3090

All-tronics, inc.

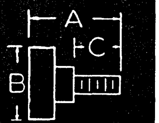
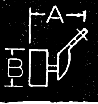
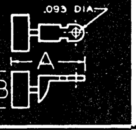
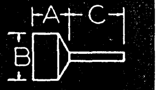
RADIO INTERFERENCE FILTERS

TERMINALS

IF BASIC PART NUMBER ENDS WITH ONE OF THESE LETTERS

USE TERMINAL TYPE

FOR THIS CURRENT RANGE

			AMP.	THREAD SIZE	A	B	C
THREADED TERMINAL  Supplied with Nut and Lockwasher.	EFGHMP	10	0-2.5	4-40	½	5/16	3/16
	FGHRS	11	0-10	6-32	⅝	7/16	9/32
	FGHJRS	12	0-16	8-32	⅝	7/16	5/16
	JKL	13	4-25	10-32	13/16	1	5/16
	JKL	14	10-63	¼-20	1	1	⅜
	JKL	15	25-100	⅜-16	1¼	1½	9/16
SOLDER TERMINAL (45°) 	EFGHJ	16	0-16	—	13/32	5/16	—
SOLDER TERMINAL (90°) 	EFGHJMP	17	0-16	—	½	5/16	—
	RS	31	0-20	—	½	15/32	—
SHIELDED LEAD 	EFGH	19	0-2.5	—	5/16	5/16	12
	EFGH	22	0-2.5	—	5/16	5/16	36
	FGHRS	24	2.5-16	—	5/16	13/32	11
	FGHRS	26	2.5-16	—	5/16	13/32	36
	MP	28	0-4	—	5/16	5/16	12
	MP	30	0-4	—	5/16	5/16	32

STANDARDIZED FILTERS

Standardized filters are low pass filters. Rectangular and some tubular filters are pi types while the lower insertion loss tubulars are L types. They are supplied with two terminals to be connected in series with a power line. This places an inductor in series with the line and a capacitor is internally connected from terminal to the case. The filter case must be grounded for proper operation. The internal inductors and capacitors are especially designed for radio frequency filter operation to provide good filtering action over a wide frequency range.

All rectangular filters are in deep drawn seamless cases. They are hermetically sealed with solder sealed covers. Dimensions shown for cases are basic sizes, but because of their deep drawn nature, dimensions will vary slightly depending upon the point of measurement.

CURRENT & VOLTAGE RATINGS

Filters are rated for continuous use at a maximum ambient temperature of 85°C (185°F). They are made to withstand occasional momentary surges for normal motor starting, etc. If you have an intermitten duty problem contact factory for a suitable rating.

The filters are rated for continuous use at the specified voltage at temperatures up to 85°C (185°F). Filters with a dual voltage rating (e.g. 400 VDC/150 VAC) are rated for the higher voltage only in direct current applications. The rating drops to the lower value for alternating current applications. Any filter may be used at a lower voltage than its rating.

All filters are designed to have a voltage drop of low value so that they will not interfere with proper operation at the equipment in which they are installed. The 70 volts D.C. series has a maximum drop of 0.3 volt when operated at full rated current. The 400 VDC/150 VAC and the 600 VDC/250 VAC have a drop of less than one percent of the AC rating when carrying full rated current.

INSERTION LOSS

The column marked **db** in the table of basic part numbers is the insertion loss at a frequency of 150 kilohertz. Insertion loss is a measure of the effectiveness of a filter at a particular frequency. The insertion loss is the logarithmically adjusted ratio of signal input to signal output measured in a standard circuit of 50 ohms input and output impedance. The larger the number of **db** the greater is the signal reducing ability of the filter.

All the **db** figures in the chart represent the insertion loss for each filter at 150 kilohertz. A complete description of insertion loss requires a graph or a tabular chart showing a number of **db** readings at frequencies spread throughout the useful range of the filter. The filters in this catalog have a useful range from below 150 kilohertz to above 250 megahertz. They have been designed to maintain approximately the stated level of insertion loss in the frequency range of 150 kilohertz to about 10 megahertz and then to follow a gently sloping reduction maintaining effective levels of insertion loss to between 250 and 400 megahertz. This corresponds to the normal frequency distribution of radio interference generated by most electrical machinery, electromechanical devices and a great deal of electronic equipment.

The tubular filters are designed for more severe requirements and will maintain the stated level of insertion loss from 150 kilohertz to greater than 10,000 megahertz.

WHY USE FILTERS?

Much electronic and electrical equipment produces interference which disrupts radio communication and seriously affects the safety and efficient operation of aircraft, marine, industrial and military communications. As a result, the Federal Communications Commission is enforcing statutes which require control of interference and interference sources. The various military branches of the Department of Defense are specifying interference free operation in much of the equipment they now purchase. Manufacturers of sensitive and complex electronic equipment find that often their devices do not function properly as a result of interference produced in parts of their own or nearby systems.

HOW TO USE FILTERS EFFECTIVELY

First one must learn to recognize the serious sources of radio frequency interference. Interference is generated wherever there is a spark or electrical discharge. Commutator type electric motors and generators, electric arc and fluorescent lamps, switches and relays, thyratron and other gaseous discharge tubes may all be sources of radio interference of which the manufacturer or user may not be aware. Electronic equipment which utilizes oscillating circuits may generate radio frequency signals to perform necessary functions. These signals become radio interference when they leave the confines of the circuits and equipment where they are needed and interfere with other radio frequency sensitive equipment. An example of this is the oscillator used in a superhetrodyne receiver. Among electronic generators those dealing with critically shaped waveforms such as saw tooth or square wave and pulse generators can cause a considerable amount of interference as a result of harmonics of the fundamental frequencies.

For the best results, isolate the severe interference producing sources and prevent them from contaminating interference free equipment or lines nearby. This can be accomplished by shielding and enclosing case construction around the interference sources combined with filters in the power lines.

Filters will reduce the radio interference currents flowing in power lines to very low levels. This is essential to prevent unwanted signals from traveling great distances and radiating into space from these distant power lines. Filters are not a complete cure for all radio interference problems. They need the help of adequate shielding and isolation to be completely effective.

The physical placement of a filter is important. Improper positioning can sometimes nullify the effectiveness of a filter. The radio interference filter should be mounted close to a shielded source, or considering the whole chassis a source, close to the power line entrance. Input and output lines of the filter should be separated. For best results use mounting styles L, M, or S and project one terminal through a shielding partition or bulkhead in the chassis or wiring enclosure. Shielded lead style terminals can also help isolate input and output lines. Be sure that shielded leads have the outer covering grounded to chassis at both ends.

ALL-TRONICS RFI/EMI TESTING SERVICE

In addition to the Standardized Flters shown in this catalog and all the many custom designed interference filters which All-tronics, Inc. supplies, the company also maintains a laboratory facility especially instrumented for Radio Frequency Interference/Electromagnetic Interference testing. This laboratory utilizes fully shielded testing rooms and late model interference and field intensity meters. If you require compliance with FCC Regulations or military specifications such as MIL-STD-461, contact us for testing information. Supplementing the measurement of levels of interference produced by your equipment, the laboratory can also perform susceptibility tests to determine if interference causes your sensitive equipment to malfunction. To help solve your RFI/EMI requirements for interference or susceptibility testing and test procedure preparation, contact All-tronics, Inc.

All-Tronics, Inc. reserves the right to improve design specifications or withdraw items from this catalog in the light of new technological advances.

All-tronics, inc.

45 BOND STREET, WESTBURY, L. I., N. Y. 11590 • (516) 333-3090

Active Electronic Filters

Analyze your requirements with our variable frequency instruments and select our low cost fixed frequency modules accordingly.

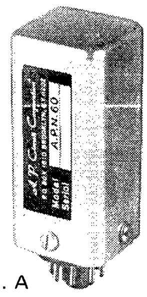


FIG. A

Applications: Communication, Data Transmission, Control, Vibration testing, Biomedicine, Military Engineering.

PORTABLE VARIABLE FREQUENCY FILTERS (FIGS. B, C, D, F)

These variable filters permit the setting of cut-off frequencies continuously and are available in a variety of versions as shown in the table below.

All units feature: Unity gain in passband, 24 DB/octave skirt, max. attenuation 80 DB, input impedance 1 Megohm, output impedance 50 ohm.

Battery or A.C. line operation. Up to 4 model APV series or two model AP 200 series can be supplied on a standard 19" rack, 5¼" high, as shown on Fig. F.

Model **	Fig.	Low Pass	High Pass	Band Pass	Band Reject	Tuning Range	Price*
APVL–41-4	C	✓				0.2Hz–2KHz	315.-
APVL–42-4	C	✓				2Hz–20KHz	315.-
APVL–43-5	C	✓				0.02Hz–2KHz	350.-
APVL–44-5	C	✓				0.2Hz–20KHz	350.-
APVL–1	C	✓				1 Decade †	220.-
APVH–41-4	C		✓			0.2Hz–2KHz	315.-
APVH–42-4	C		✓			2Hz–20KHz	315.-
APVH–43-5	C		✓			0.02Hz–2KHz	350.-
APVH–44-5	C		✓			0.2Hz–20KHz	350.-
APVH–1	C		✓			1 Decade †	220.-
APVLH–41-5	B	✓	✓			0.2Hz–20KHz	430.-
APVLH–44-5	B	✓	✓			2.0Hz–20KHz	430.-
AP–200-1	D			✓		1 Decade †	420.-
AP–240-5	D			✓		0.02Hz–2KHz	580.-
AP–245-4	D			✓		0.2Hz–2KHz	520.-
AP–250-5	D			✓		0.2Hz–20KHz	580.-
AP–255-4	D			✓		2.0Hz–20KHz	520.-
AP–230-4	D	✓	✓	✓		2Hz–20KHz	540.-
AP–235-5	D	✓	✓	✓		0.02Hz–2KHz	680.-
AP–240-4	D	✓	✓	✓		0.2Hz–2KHz	580.-
AP–245-5	D	✓	✓	✓		0.2Hz–20KHz	680.-
AP–250-4	D	✓	✓	✓	✓	0.2Hz–2KHz	650.-
AP–255-5	D	✓	✓	✓	✓	0.2Hz–20KHz	700.-
AP–260-5	D	✓	✓	✓	✓	0.1Hz–10KHz	750.-
AP–265-5	D	✓	✓	✓	✓	0.02Hz–2KHz	750.-
AP–270-4	D	✓	✓	✓	✓	2.0Hz–20KHz	560.-
AP–280-5	D	✓	✓	✓	✓	2.0Hz–200KHz	590.-

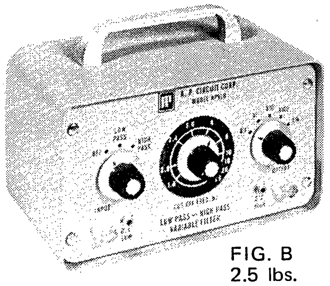


FIG. B
2.5 lbs.

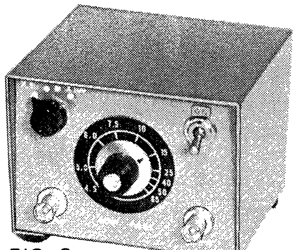


FIG. C
2.0 lbs.

* *Price is for Battery Operated Units. Add $20.- for 110 volt or 220 volt A.C. supplies.*

** *Last Digit indicates Number of Decades covered.*

† *Available Ranges 0.1-1.0, 0.2-2.0, 0.5-5.0 and multiples of 1, 10, 100, 1000. Other ranges upon request.*

VARIABLE TUNED SPIKE FILTERS

Variable center frequency and adjustable bandwidth. 4 units can be mounted on standard 19" rack.

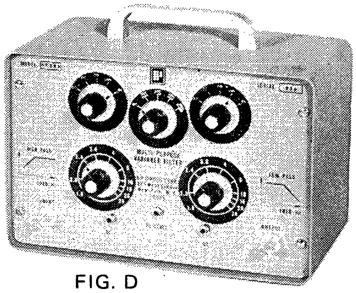


FIG. D
5.5 lbs.

FIXED FREQUENCY FILTERS (FIGS. A, E)

All units feature: Unity gain in Passband; max. attenuation 80 DB, input impedance 1 Megohm, output impedance 50 ohm.

NOTCH FILTERS High Q narrow bandwidth. These filters are available in a number of standard frequencies, for P.C. mounting (Fig. E) or with Octal Base (Fig. A)

Model APN 60 reduces 60 Hz content to less than 1% of input voltage but passes all other frequencies from D.C. to 200 KHz. The rejection bandwidth can be narrowed to 1 Hz. Q's up to 100 can be obtained by an external adjustment. A matching power supply is available.

MODEL	FIG.	FUNCTION	PRICE
APN 60	A,E	60 Hz NOTCH	$155.
APN 50	A,E	50 Hz NOTCH	$155.
APN 120	A,E	120 Hz NOTCH	$155.
APN 400	A,E	400 Hz NOTCH	$155.
APS 1		Notch Power Supply	$58.

Additional frequencies are available upon request.

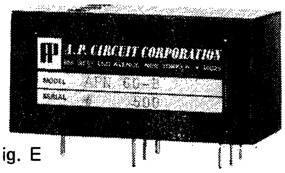


Fig. E

APPLICATION NOTE UPON REQUEST

TUNED SPIKE FILTERS High Q Narrow Bandwidth

NEW LOW COST MODULES

24 Db/Octave (4 pole) cut off range 10 Hz-15KHz

Low Pass	$49.-
High Pass	$49.-
Band Pass	$98.-

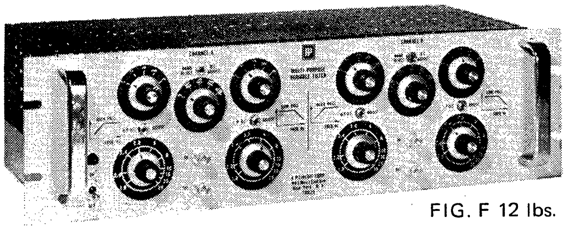


FIG. F 12 lbs.

For Additional Information write to Dept. P.

A.P. CIRCUIT CORPORATION

865 WEST END AVENUE, NEW YORK, N. Y. 10025
TEL: 212 - 222-0876

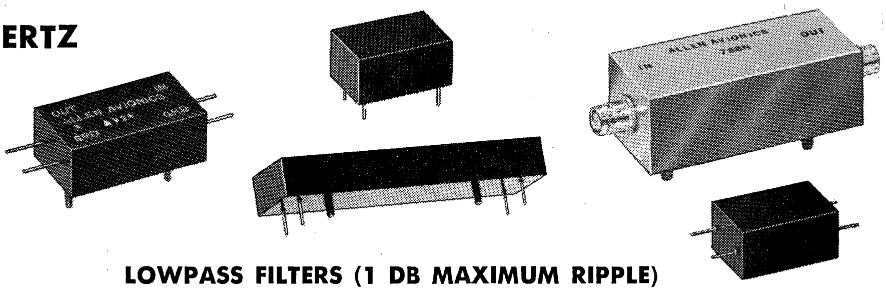
ALLEN AVIONICS, INC.
224 EAST SECOND STREET • MINEOLA, NEW YORK 11501 • PHONES: 516-248-8080 OR 516-747-5450

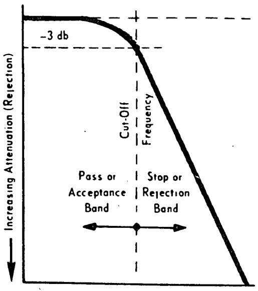
SEE OUR
PAGES UNDER
DELAY LINES
SECTION 2350

CUSTOM-BUILT L-C FILTERS

200 HERTZ TO 50 MEGAHERTZ
FAST PROTOTYPES!

TYPES: LOWPASS, HIGHPASS, BANDPASS.
FREQUENCY RANGE: 200 hertz to 50 Megahertz.
IMPEDANCE RANGE: 50 ohms to 100K ohms.
CONSTRUCTION: Epoxy encapsulated or hermetically sealed in steel cans.
SIZE: From .460 x .780 x .250 inches depending on electrical specifications.
DELIVERY: Prototypes can often be delivered in one week.

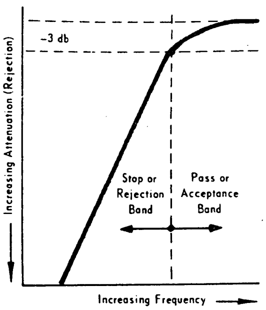

OUT
ALLEN AVIONICS
IN
OUT
ALLEN AVIONICS


-3 db
Cut-Off Frequency
Pass or Acceptance Band
Stop or Rejection Band
Increasing Attenuation (Rejection)
Increasing Frequency

(a) Low-Pass Filter

LOWPASS FILTERS (1 DB MAXIMUM RIPPLE)

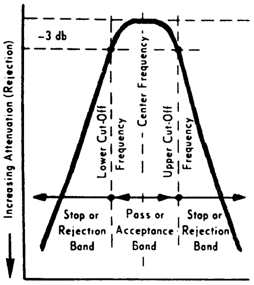
Cut-off (fc) Frequency Range (3db Max.) (Hz)	Impedance Range (Ohms)	Attenuation		Size Range (Inches)	
		20db Min.	40db Min.	From	To
200 to 1K	1K to 2K	2.50 fc	5.50 fc	1.25 x 1.25 x .750	3 x 1.5 x 1
		1.15 fc	1.40 fc	2.5 x 1.125 x .750	4 x 2.5 x 1
1K to 5K	200 to 10K	2.50 fc	5.50 fc	1.25 x 1.25 x .750	3 x 1.5 x 1
		1.15 fc	1.40 fc	2 x 1.125 x .750	3 x 1.5 x 1
5K to 500K	50 to 10K	2.50 fc	5.50 fc	1.25 x .875 x .625	3 x 1.5 x 1
		1.15 fc	1.40 fc	1.25 x 1.25 x .750	3 x 1.5 x 1
500K to 1M	50 to 5K	2.50 fc	5.50 fc	.780 x .460 x .250	1.25 x .875 x .625
		1.15 fc	1.40 fc	1.25 x 1.25 x .750	2.5 x 1.125 x .750
1M to 5M	50 to 500	2.50 fc	5.50 fc	.780 x .460 x .250	1.25 x .875 x .625
		1.15 fc	1.40 fc	1.25 x .875 x .625	2.0 x 1.125 x .750
5M to 30M	50 to 100	2.50 fc	5.50 fc	.780 x .460 x .250	1.25 x .875 x .625
		1.15 fc	1.40 fc	1.25 x .875 x .625	1.25 x 1.25 x .750
30M to 50M	50	2.50 fc	5.50 fc	.780 x .460 x .250	1.25 x .875 x .625
		1.15 fc	1.40 fc	1.25 x .875 x .625	1.25 x 1.25 x .750


-3 db
Stop or Rejection Band
Pass or Acceptance Band
Increasing Attenuation (Rejection)
Increasing Frequency

(b) High-Pass Filter

HIGHPASS FILTERS (1 DB MAXIMUM RIPPLE)

Cut-off (fc) Frequency Range (3db Max.) (Hz)	Impedance Range (Ohms)	Attenuation		Size Range (Inches)	
		20db Min.	40db Min.	From	To
200 to 1K	1K to 2K	.40 fc	.18 fc	1.25 x 1.25 x .750	3 x 1.5 x 1
		.87 fc	.71 fc	3 x 1.5 x 1	4 x 2.5 x 1
1K to 5K	500 to 10K	.40 fc	.18 fc	1.25 x 1.25 x .750	2.5 x 1.125 x .750
		.87 fc	.71 fc	2 x 1.125 x .750	3 x 1.5 x 1
5K to 500K	50 to 2.5K	.40 fc	.18 fc	1.25 x .875 x .625	2.5 x 1.125 x .750
		.87 fc	.71 fc	2 x 1.125 x .750	3 x 1.5 x 1
500K to 1M	50 to 1.5K	.40 fc	.18 fc	1.25 x .875 x .625	2 x 1.125 x .750
		.87 fc	.71 fc	1.25 x 1.25 x .750	2.5 x 1.125 x .750
1M to 5M	50 to 250	.40 fc	.18 fc	.780 x .460 x .250	1.25 x .875 x .625
		.87 fc	.71 fc	1.25 x .875 x .625	1.25 x 1.25 x .750
5M to 20M	50 to 100	.40 fc	.18 fc	.780 x .460 x .250	1.25 x .875 x .625
		.87 fc	.71 fc	1.25 x .875 x .625	1.25 x 1.25 x .750
20M to 40M	50	.40 fc	.18 fc	.780 x .460 x .250	1.25 x .875 x .625
		.87 fc	.71 fc	1.25 x .875 x .625	1.25 x 1.25 x .750


-3 db
Lower Cut-Off Frequency
Center Frequency
Upper Cut-Off Frequency
Stop or Rejection Band
Pass or Acceptance Band
Stop or Rejection Band
Increasing Attenuation (Rejection)
Increasing Frequency

(c) Band-Pass Filter

BANDPASS FILTERS (1 DB MAXIMUM RIPPLE)

Center Frequency Range (Hz)	Q Range Center Frequency / 3db Bandwidth	Impedance Range (Ohms)	Rejection Ratio		Size Range (Inches)	
			20db / 3db	40db / 3db	From	To
400 - 1K	1 - 5	500 - 5K	2.50	5.50	1.125 x 2.5 x .750	3 x 1.5 x 1
1K - 10K	1 - 25	500 - 10K	2.50	5.50	1.25 x 1.25 x .750	3 x 1.5 x 1
10K - 100K	1 - 50	100 - 5K	2.50	5.50	1.25 x 1.25 x .750	3 x 1.5 x 1
	1 - 15	500 - 5K	1.60	2.50	1.25 x 1.25 x .750	3 x 1.5 x 1
	1 - 5	500 - 10K	1.45	1.85	3.5 x 1.125 x .500	2.5 x 4.5 x .813
100K - 500K	1 - 50	100 - 5K	2.50	5.50	1.25 x 1.25 x .750	3 x 1.5 x 1
	1 - 15	500 - 5K	1.60	2.50	1.25 x 1.25 x .750	3 x 1.5 x 1
	1 - 10	50 - 10K	1.45	1.85	3.5 x 1.125 x .500	2.5 x 4.5 x .813
500K - 1M	1 - 25	50 - 5K	2.50	5.50	1.25 x .875 x .625	1.25 x 1.25 x .750
	1 - 15	50 - 1K	1.60	2.50	1.25 x 1.25 x .750	3 x 1.5 x 1
	1 - 10	50 - 10K	1.45	1.85	3.5 x 1.125 x .500	3 x 1.5 x 1
1M - 5M	1 - 20	50 - 500	2.50	5.50	1.25 x .875 x .625	1.25 x 1.25 x .750
	1 - 10	50 - 1K	1.60	2.50	1.25 x 1.25 x .750	3 x 1.5 x 1
	1 - 5	50 - 500	1.45	1.85	3.5 x 1.125 x .500	3 x 1.5 x 1
5M - 10M	1 - 5	50 - 100	2.50	5.50	1.25 x .875 x .625	1.25 x 1.25 x .750
	1 - 10	50 - 100	1.60	2.50	1.25 x 1.25 x .750	3 x 1.5 x 1
	1 - 5	50	1.45	1.85	3.5 x 1.125 x .500	3 x 1.5 x 1
10M - 25M	1 - 5	50 - 100	2.50	5.50	1.25 x .875 x .625	1.25 x 1.25 x .750

WE HAVE MINIATURE LOW & HIGHPASS L-C FILTERS FOR IMMEDIATE DELIVERY

**Our Engineering Staff is always available to help with any L-C Filter problem.
Please feel free to call us for our assistance.**

ALLEN-BRADLEY
Milwaukee, Wisconsin 53204

High-Frequency Low Pass Feed-Thru Filters.

GENERAL SPECIFICATIONS

RF CURRENT RATING—The RF current shall be limited to 0.25 amperes. For higher currents consult factory.

FEED-THRU TERMINAL RESISTANCE—0.01 ohm maximum.

INSULATION RESISTANCE — Initial, after 2 minutes at rated dc voltage through a protective resistance of 1 megohm when measured between terminals and mounting ground, is 20,000 megohms maximum.

CAPACITANCE—Maximum values at +25°C, 0.5 to 2.5 VRMS, 1 kHz.

ATTENTUATION — Minimum attenuation values from 100 MHz to 10 GHz, when measured with an input 50 ohm resistor (except FCS-C which is determined without 50 ohm series resistor), and at 0 volts dc and 0 amperes dc. The 50 ohm series resistor reference method is used to evaluate attenuation beyond the specified 1 GHz frequency limitation of MIL-STD-220.

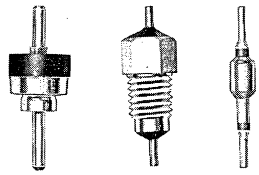
This method is also more applicable for maintaining proper input termination to conventional 50 ohm coaxial systems, attenuator pads, etc., when measuring filters that feature a low input reactance.

Attenuation measured per MIL-STD-220 is approximately 6 dB less.

For complete information write for Publication 5410.

ELECTRICAL CHARACTERISTICS

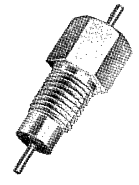
Part Number	Attenuation		Cap. Value (pF)	Operating Temp. Range	DC Working Voltage	DC Flash Test (Volts)	Feed-thru Current (Amps.)	Mounting	Mounting Hardware
	25°C	Max. Temp.							
FCS-C	25 dB	20 dB	1000	−55°C to + 85°C	500	1250	25	Solder	M-6447 Washer
SMFB-A1	35 dB	35 dB	1300	−55°C to +125°C	200	500	10	#12-32 Bolt	M-6377 Mounting Nut M-6351 Lock Washer
SMFB-A2	60 dB	50 dB	5500	−55°C to + 85°C	200	500	10		
SMFB-A4	50 dB	45 dB	2500•	−55°C to +125°C	500	1250	10		
SMFO-1	35 dB	35 dB	1300	−55°C to +125°C	200	500	10	Solder	M-6446
SMFO-2	60 dB	50 dB	5500	−55°C to + 85°C	200	500	10		



RFI/EMI Suppression Feed-Thru Filter–Type BE.

This EMI suppression filter is designated for use in place of conventional feed-thru filters when superior filtering is required from 1 MHz to 10 GHz. The filters employ Allen-Bradley CL multi-layer capacitors whose coaxial construction eliminates detrimental inductance, yielding superior filter performance. The filter is formed by combining ferrite material with two CL001DA503P multilayer capacitors. This provides more than 65 dB of insertion loss at 10 MHz and typically 90 dB at 25 MHz.

For complete information write for Publication 5416.

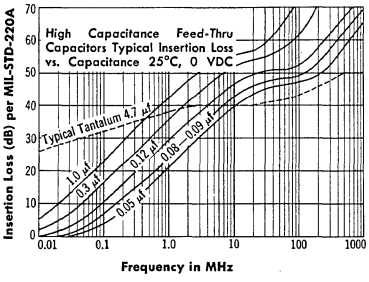


ELECTRICAL CHARACTERISTICS

Parameter	Specifications		
DC Working Voltage (DCWV)	100 volts		
Capacitance, µF at 0.1 VRMS, 25°C, 1 KHz	0.1 minimum		
Dielectric Withstanding Voltage, VDC, 1 Sec., Charging Current <50 ma.	250 volts		
Operating Temperature Range	−55°C to +125°C		
DC Feed-Thru Current	10 amperes		
Minimum Insulation Resistance at DCWV, 25°C, 2 sec., charging current <50 ma.	5K megohms		
Minimum Insertion Loss in dB per MIL-STD-220, 25°C, 0 volts	1 MHz	10 MHz	25 MHz to 10 GHz
	18	65	75

Multi-Layer Feed-Thru Capacitors–Types CL, MS, and MT.

These new Allen-Bradley non-polar multilayer capacitors are extremely small, light weight, and have high dielectric strength and reliability. Maximum operational temperature is +125°C, with no voltage derating. The concentric structure yields a low inductance when compared to conventional rolled dielectric capacitors. They are ideally suited for by-passing, filtering, and coupling.


High Capacitance Feed-Thru Capacitors Typical Insertion Loss vs. Capacitance 25°C, 0 VDC
Typical Tantalum 4.7 µf
1.0 µf
0.3 µf
0.12 µf
0.08—0.09 µf
0.05 µf
Insertion Loss (dB) per MIL-STD-220A
0
10
20
30
40
50
60
70
0.01
0.1
1.0
10
100
1000
Frequency in MHz

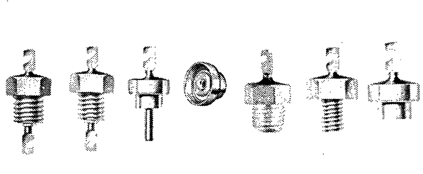
For complete information write for Publications 5411 (Type CL) and 5414 (Types MS and MT).

ELECTRICAL CHARACTERISTICS

PARAMETER	TYPE		
	CL	MT	MS
DC Working Voltage (DCWV)	50 to 200	50, 100	50, 100
Capacitance, µF at 0.1 VRMS, 25°C, 1 kHz	0.05 to 1.0	0.05, 0.3, 1.0	0.05, 0.3, 1.0
Maximum Dissipation Factor at 0.1 VRMS, 25°C, 1 kHz	4 percent	4 percent	4 percent
DC Feed-Thru Current (amps)	*	10	10
Operating Temperature Range	−55°C to +125°C	−55°C to +125°C	−55°C to +125°C
Minimum Insulation Resistance at DCWV, 25°C, with 2 minute charging current of less than 50 milliamperes.	500 ohm-Farad	500 ohm-Farad	500 ohm-Farad

*Dependent on size terminal used.

Ceramic Disc Type Feed-Thru and Stand-Off Capacitors.



GENERAL SPECIFICATIONS

AMBIENT TEMPERATURE—−55°C to +85°C

CORROSION RESISTANT AND NON-MAGNETIC—All metal parts including hardware are made of corrosion resistant non-magnetic materials which pass MIL-STD-202 salt spray tests.

PARALLEL RESONANCE—None of the feed-thru capacitor types will exhibit parallel resonance effects at frequencies of 1,000 MHz or less, regardless of capacitance value.

CAPACITANCE VALUES AND TOLERANCES (STANDARD)—470 pF ±20 percent and 1,000 pF GMV (−0, +100 percent).

(SPECIAL)—6.8 pF to 1,000 pF inclusive in EIA or MIL nominal values. Tolerances: ±10 percent, ±20 percent or GMV (−0, +100 percent) depending upon nominal capacitance value.

MAXIMUM CONTINUOUS WORKING VOLTAGE — 500 volts dc all types except uninsulated FW5N—300 volts dc. Derate linearly from maximum rating at —85°C to 50 percent rating at +125°C, all types.

MAXIMUM DIELECTRIC WITHSTANDING VOLTAGE—1,250 volts dc for all types except uninsulated FW5N—600 volts dc. Applied for 5 seconds, with surge current limited to 50 milliamperes maximum in all cases.

INSULATION RESISTANCE—More than 100,000 megohms at +25°C for all types and all values, after 2 minutes at maximum continuous working voltage.

DISSIPATION FACTOR—Less than 2 percent at 1 KHz for all types and all values. "Q" more than 50.

STANDARD CONDITIONS—Unless otherwise specified, all measurements are understood to be made at normal atmospheric pressure; a relative humidity of 50 ±2 percent; an ambient temperature of +25° ±1°C; a frequency of 1 kHz; and 2.5 VRMS maximum.

MILITARY SPECIFICATIONS — Meet or exceed the applicable requirements of MIL-C-11015.

For complete information write for Publication 5409.

© Allen-Bradley 1971 EC71-14

BULOVA LC FILTERS/MAGNETIC COMPONENTS

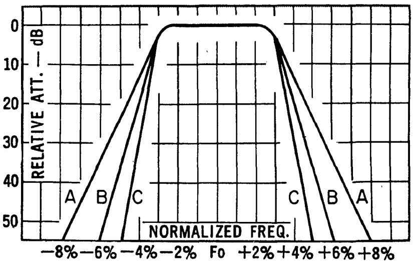
Computer Designed for Maximum Performance—To Your Spec—DC to 80MHz

Pioneers in Time/frequency product design, Bulova has developed a diversified L C Filter product line that features ● Computer programmed performance characteristics ● Competitive pricing ● Custom product sophistication ● High-use, long-life reliability

A continuing effort in L C filter design for the selection and shaping of frequencies has culminated in the development of a unique series of filters, particularly engineered for spectrum analysers.

Filters With Excellent Shape Factor

High frequency filters with 45db/3db shape factors between 1.5/1 and 2.3/1. They are designed to operate between 100 ohm impedances and exhibit excellent temperature stability.



Comb Filters

Useful for such applications as spectrum analysis and available as standard items in contiguous banks from 10 Hz to 10 MHz.

IRIG BANDPASS FILTERS—Available from 400 Hz to 165 kHz with attenuation at ±7.5% of center frequency within 3 db in 21 channels. Eight other standard channels are available in frequency from 22 kHz to 165 kHz at ±15% 3 db points.

IRIG LOW PASS FILTERS—Low Pass and Linear Phase Low Pass filters are available in IRIG frequencies. The low pass are intended to attenuate the 2nd and higher harmonics of the incoming signal. Bulova's linear phase low pass filters attenuate the higher harmonics and provide minimum phase distortion and therefore low transient response. These filters are for 10k ohms terminating impedances.

TONE CHANNEL FILTERS—Designed for data transmission systems, Bulova offers a wide selection of special (and standard) tone filters (band pass and low pass) featuring high stability, small package size, a wide variety of center frequencies and shape factors, phase linearity, etc. Range: 10 Hz to 10 kHz; Stability: better than .1%; Bandwidth: as narrow as 1% can be supplied.

TUNABLE, MULTI-FREQUENCY TONE TRANSFORMERS—Tone Transformers are ideal components for communication equipment, using tones to accomplish signaling functions. To cover a wide range of applications, these transformers are available with 4 to 10 terminals, suitable for printed circuit mounting.

BAND REJECT FILTERS—Some of the outstanding features of Bulova LC Band Reject Filters are their high discrimination and stability. This type of filter is available in a wide range of frequencies and shape factors . . . Bulova also specializes in LC and RC Notch Filters.

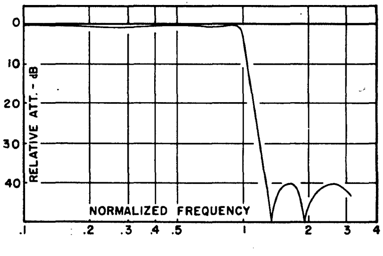
LUMPED CONSTANT DELAY LINES—Bulova custom designs Delay Lines to cover any practical impedance range. Keeping physical dimensions at a minimum, these networks feature low signal attenuation, excellent thermal stability, low pulse distortion and extended band width, achieving high delay-to-rise-time ratio.

EQUALIZERS—Maintaining narrow tolerances, a wide selection of custom designed Amplitude and Phase (Delay) Equalizers have been developed to be used with transmission lines, amplifier networks etc. Bulova's engineering staff is always available to consult with you on design problems. Additional information on all networks is available upon request.

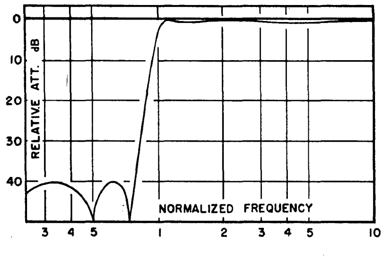
90-150 HZ DUAL BAND PASS FILTERS FOR AVIONIC SYSTEMS—Designated Series 3300, the units are designed for application in Instrument Landing Systems. The primary features of the Bulova Band Pass Filters include high frequency stability over temperature (−10°C to +50°C) and exceptionally accurate output tracking (within .1 db over temperature range).

INTERSTAGE FILTERS—60 Hz to 20 kHz

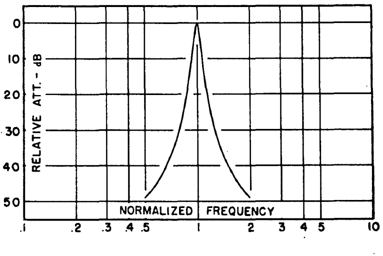
Low Pass
Available up to 30 MHz



High Pass
Available in impedance from 50 ohms to 10 K ohms



Band Pass
Standard filters available with 600 ohm and 10 K ohm terminations. All have provision for terminating into grid circuit.



Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA fcp

BULOVA FREQUENCY CONTROL PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

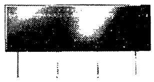
ESC LC FILTERS.......

design and performance checked BEFORE prototyping

New Dual In-line LC Filters—

compatible with integrated circuit boards . . .

ESC's Dual In-line Filters are passive, stable networks that fit any commercial dual in-line connector or hole spacing. They meet the requirements of MIL-F-18327C, grade 5, class R, operating temperature range of −55°C to +105°C. Ripple in all standard DIF filters is less than ±1 db in passband. Insertion loss for low pass DIF filters is .5 db max. at 1 Fc; .5 db max. at 10 Fc for high pass DIF filters.



.76"L x .46"W x .25"H

Type	DIF-L20	DIF-L39
Attenuation in stopband	20 db min. at 1.4 Fc and higher	39 db min. at 2.5 Fc and higher
Type	**DIF-H20**	**DIF-H39**
Attenuation in stopband	20 db min. at .715 Fc and lower	39 db min. at .4 Fc and lower

For non-standard DIF filters, other characteristics can be custom designed to your specifications, e.g. linear phase, band pass, telemetering filters.

To meet your specific filter requirements, ESC first constructs a mathematical model based on actual physical components available. Through the use of high speed computer techniques with ESC's inhouse IBM 1130, the electrical characteristics and physical dimensions of your proposed filter are immediately tested and "proven out." Typical computer output data includes input impedance, attenuation, phase, phase delay, and group delay—all versus frequency. It is therefore possible for ESC to evaluate your filter needs, develop a suitable design and submit a quotation in a fraction of the time previously required.

The products illustrated to the right were designed and produced by ESC and are representative examples of our filter capabilities.

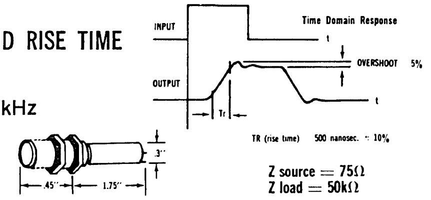
From design through production of custom-designed LC filters, contact ESC, or write for ESC Filter Catalog

as sophisticated as your application

RFI TUBULAR FILTER WITH CONTROLLED OVERSHOOT AND RISE TIME

FREQUENCY RESPONSE

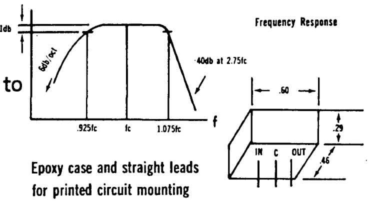
Flat within ± ½ db to 200 kHz
2 MHz > 3 db
30 MHz > 60 db
30 MHz—1 GHz > 40 db



Z source = 75Ω
Z load = 50kΩ

ULTRAMINIATURE TELEMETERING FILTERS

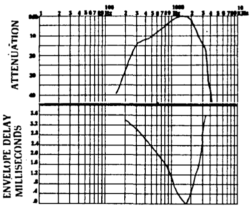
Center frequencies from 400 Hz to 165 kHz. Available in bandwidths of ± 7½% and ± 15% of center frequency (fc)
Z source/load = 10kΩ



Epoxy case and straight leads for printed circuit mounting

TELEPHONE LINE SIMULATORS

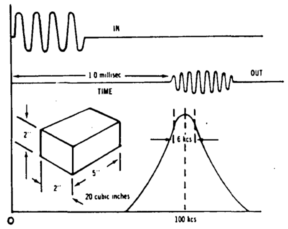
Duplicate worst case conditions of amplitude and envelope delay of Bell Telephone data channel 3002 and C1, C2, and C4 conditioning.
Insertion loss=16 db at 1000 Hz
Impedance Z source/load=600Ω balanced
Write for full specifications.



3002 channel
ESC Model
41F21

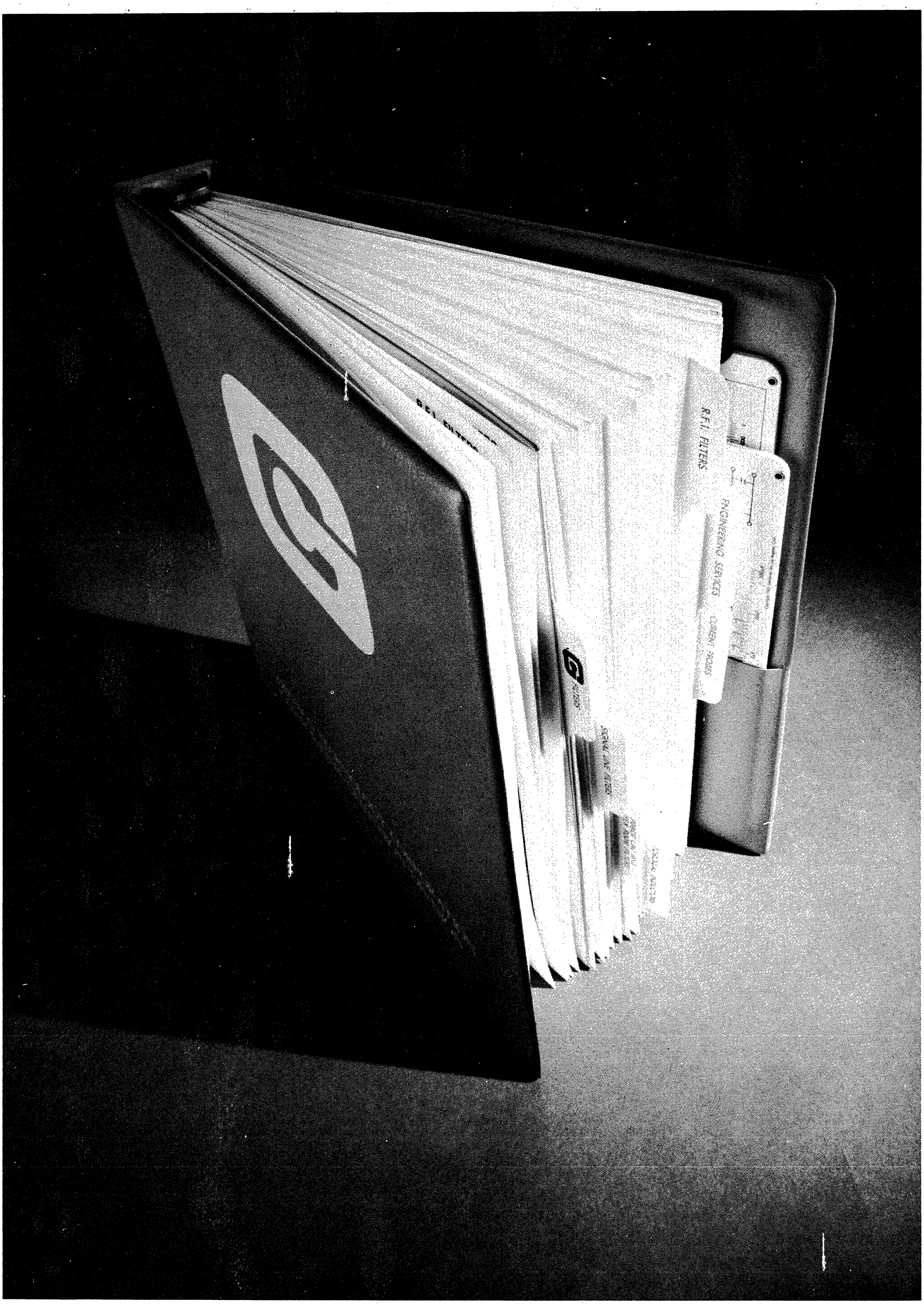
BANDPASS DELAY LINE FOR HIGH DELAY IN SMALL PACKAGE

Center frequency 100kHz
Passband ± 3kHz < 1 db
Group delay 1.0 millisec.
Z source/load = 1kΩ



WRITE TODAY FOR YOUR COPY OF ESC'S FILTER QUESTIONNAIRE.

ESC ELECTRONICS CORPORATION
534 BERGEN BOULEVARD • PALISADES PARK, N. J. 07650 • (201) 947-0400
World's Leading Producer of Delay Lines


R.F.I. FILTERS
ENGINEERING SERVICES

Free RFI/EMI catalogues

Learn about a company that has solved more than 16,000 different RFI/EMI filter problems in the past fifteen years. With the largest independent consulting laboratory in the United States, specializing in electromagnetic compatibility. And a staff of engineers who are consistent contributors to state-of-the-art.

Genistron has designed and built everything from minifilters to 10' x 10' shields, in almost every imaginable shape. And we've manufactured them in quantities ranging from one to ten thousand. This experience will help us solve your problem.

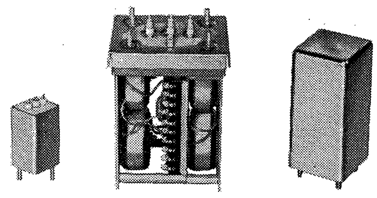
We design and manufacture to meet military or U.L. specifications.

For all the facts about Genistron, write for your free catalogue.

Genistron Division
Genisco Technology Corporation
18435 Susana Road, Compton, California 90221 (213) 774-1850

HERTZ FILTERS

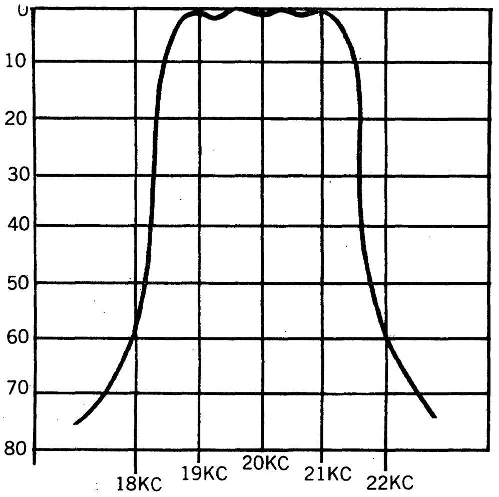
BAND PASS FILTERS CUSTOM DESIGNED TO FILL YOUR NEEDS



Hertz Filter Corporations' engineering department is made up entirely of specialists in the field of custom design of band pass filters. They are all fully experienced and prepared to help you solve your filter problems. Call or write Hertz for reliable service and prompt delivery.

FEATURES

1. Filters, Band Pass, Passive
2. Center Frequencies — 50 Hz to 50 Meg Hz
3. Shape factors — better than 2.0 for ratios of 60 db to 3 db
4. Bandwidth to center frequency ratio — up to 10%
5. Phase linearity — within 10° through passband
6. Low passband insertion loss
7. Better than 80 db attenuation 50% above and below center frequency
8. Input and output impedances as required
9. Low input and output impedances in stop band
10. Low passband ripple
11. L, C, and R elements only



PARTIAL LIST OF HERTZ FILTERS

(all filters in accordance with MIL-F-18327)

BAND PASS PART NO.	PASS BAND	STOP BAND	Z_o	I.L.@CF	SIZE
BP-7907-1	3db(150-300)Hz	60db(50-850)Hz	600	1db	2 x 2¼ x 4
BP-7907-2	3db(300-900)Hz	60db(110-1700)Hz	600	1db	2 x 2¼ x 4
BP-7907-3	3db(600-1200)Hz	60db(210-3400)Hz	600	1db	2 x 2¼ x 4
BP-7907-4	3db(1.2-2.4)KHz	60db(.43-6.8)KHz	600	1db	2 x 2¼ x 4
BP-7907-5	3db(2.4-4.8)KHz	60db(.85-13.5)KHz	600	1db	2 x 2¼ x 4
BP-7907-6	3db(4.8-9.6)KHz	60db(1.7-27)KHz	600	1db	2 x 2¼ x 4
BP-7907-7	3db(8.9-11.2)KHz	60db(3.1-32)KHz	600	1db	2 x 2 x 3
BP-7996-1	3db(825-1,175)Hz	40db(650-1,350)Hz	30K	3db	1 x 2¼ x 4½
BP-8004-10	3db(8-26)KHz	30db(4-30)KHz	10K/2K	2db	1⅜ x 1⅝ x 2¾
BP-8004-11	3db(19.5-33.5)KHz	30db(16.5-36.5)KHz	10K/2K	2db	1⅜ x 1⅝ x 2¾
BP-8004-12	3db(26.25-40.25)KHz	30db(23.25-43.25)KHz	10K/2K	2db	1⅜ x 1⅝ x 2¾
BP-8004-13	3db(32.6-52.6)KHz	30db(27.6-57.6)KHz	10K/2K	2db	1⅜ x 1⅝ x 2¾
BP-7897-1	3db(37.5-40.5)KHz	30db(34.5-43.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-2	3db(40.5-43.5)KHz	30db(37.5-46.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-3	3db(43.5-46.5)KHz	30db(40.5-49.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-4	3db(46.5-49.5)KHz	30db(43.5-52.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-5	3db(49.5-52.5)KHz	30db(46.5-55.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-6	3db(52.5-55.5)KHz	30db(49.5-58.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-7	3db(55.5-58.5)KHz	30db(52.5-61.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-8	3db(58.5-61.5)KHz	30db(55.5-64.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-9	3db(61.5-64.5)KHz	30db(58.5-67.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-10	3db(64.5-67.5)KHz	30db(61.5-70.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-11	3db(67.5-70.5)KHz	30db(64.5-73.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-12	3db(70.5-73.5)KHz	30db(67.5-76.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-13	3db(73.5-76.5)KHz	30db(70.5-79.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-14	3db(76.5-79.5)KHz	30db(73.5-82.5)KHz	10K/1K	4db	1¼ x 1¼ x 2
BP-7897-15	3db(79.5-82.5)KHz	30db(76.5-85.5)KHz	10K/1K	4db	1¼ x 1¼ x 2

LOW PASS PART NO.	PASS BAND	STOP BAND	Z_o	SIZE
LP-7907-1	4db@300Hz, 1db@225Hz	60db@850Hz	600	2 x 2 x 3
LP-7907-2	4db@600Hz, 1db@450Hz	60db@1700Hz	600	2 x 2 x 3
LP-7907-3	4db@1.2KHz, 1db@.9KHz	60db@3.4KHz	600	2 x 2 x 3
LP-7907-4	4db@2.4KHz, 1db@1.8KHz	60db@6.8KHz	600	2 x 2 x 3
LP-7907-5	4db@4.8KHz, 1db@3.6KHz	60db@13.5KHz	600	2 x 2 x 3
LP-7907-6	4db@9.6KHz, 1db@7.2KHz	60db@27KHz	600	2 x 2 x 3
LP-7907-7	4db@11.2Hz, 1db@10KHz	60db@32KHz	600	1⅜ x 1⅝ x 2¾
LP-7996-1	5db@1,175Hz, 2db@1,000Hz	40db@650Hz	30K	1⅜ x 1⅝ x 2¾
LP-8004 10	5db@26KHz, 1db@17KHz	30db@30KHz	10K/2K	1¼ x 1¼ x 2
LP-8004-11	5db@33.5KHz, 1db@26.5KHz	30db@36.5KHz	10K/2K	1¼ x 1¼ x 2
LP-8004-12	5db@40.25KHz, 1db@33.25KHz	30db@43.25KHz	10K/2K	1¼ x 1¼ x 2
LP-8004-13	5db@52.6KHz, 1db@42.6KHz	30db@57.6KHz	10K/2K	1¼ x 1¼ x 2

PART NO. HIGH PASS	PASS BAND	STOP BAND	Z_o	SIZE
HP-7907-1	4db@150Hz, 1db@225Hz	60db@50Hz	600	2 x 2 x 3
HP-7907-2	4db@300Hz, 1db@450Hz	60db@110Hz	600	2 x 2 x 3
HP-7907-3	4db@600Hz, 1db@900Hz	60db@210Hz	600	2 x 2 x 3
HP-7907-4	4db@1.2KHz, 1db@1.8KHz	60db@.43KHz	600	2 x 2 x 3
HP-7907-5	4db@2.4Hz, 1db@3.6KHz	60db@.85KHz	600	2 x 2 x 3
HP-7907-6	4db@4.8Hz, 1db@7.2KHz	60db@1.7KHz	600	2 x 2 x 3
HP-7907-7	4db@8.9KHz, 1db@10KHz	60db@3.1KHz	600	1⅜ x 1⅝ x 2¾
HP-7996-1	5db@825Hz, 2db@1,000Hz	40db@1,350Hz	30K	1⅜ x 1⅝ x 2¾
HP-8004-10	5db@8KHz, 1db@17KHz	30db@4KHz	10K/2K	1¼ x 1¼ x 2
HP-8004-11	5db@19.5KHz, 1db@26.5KHz	30db@16.5KHz	10K/2K	1¼ x 1¼ x 2
HP-8004-12	5db@26.25KHz, 1db@33.25KHz	30db@23.25KHz	10K/2K	1¼ x 1¼ x 2
HP-8004-13	5db@32.6KHz, 1db@42.6KHz	30db@27.6KHz	10K/2K	1¼ x 1¼ x 2

HERTZ FILTER CORPORATION
50 WASHINGTON AVENUE • GARDEN CITY PARK, L. I., N. Y. 11040
TEL: (516) PIoneer 7-7250

hisonic inc.

249 N. TROOST • OLATHE, KANSAS 66061
PHONE: 913-782-0012
TELEX: 4-2562

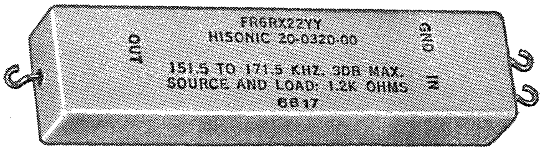
STANDARD FILTERS

FOR HIGHEST SELECTIVITY

Standard filters are designed by modern network methods for minimum stop to pass band ratios. Applications are those requiring optimum utilization of frequency spectrum.

CUSTOM FILTERS

Low, band or high pass and band stop filters with optimum characteristics can be supplied to your special requirements and MIL-F-18327. Construction utilizes toroidal inductors and high quality capacitors of special films or silvered mica, according to frequency and space requirements. Operating frequencies range to 10 mc/s. Temperature stabilization for both amplitude and frequency can be effected. Mechanical styles may be epoxy encapsulated or hermetically sealed steel in sizes from 0.2 to 200 cu. in.



A PARTIAL LIST OF HISONIC FILTERS BY PART NUMBER

BAND PASS FILTERS

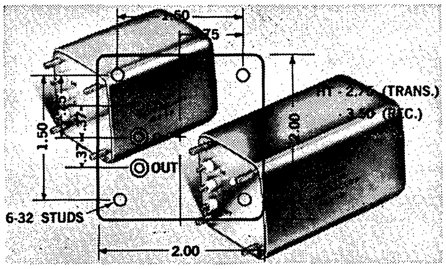
PART NUMBER	FREQ.	INS. LOSS	SOURCE/ LOAD	PASS BAND	STOP BAND	SIZE
20-0184-10	100 c/s	5 db	600/600	3 db @ ± 20 c/s	60 db @ 50 c/s 54 db @ 250	3 x 3½ x 6
20-0199-10	210 c/s	2 db	600/4.6M	3 db @ ± 4 c/s	60 db @ 170 c/s	3 x 3½ x 4½
20-0038-11	800 c/s	9 ± 1 db	15K/15K	3 db @ ± 160 c/s	35 db from 1600 to 1Mc/S	1 5/16 x 1 11/16 x 2¼
20-0205-10	1150 c/s	2.8 db	600/10K	3 db @ ± 10 c/s	30 db @ ± 300 c/s	2 Sq. x 3½
20-0206-10	1600 c/s	.2 db	600/10K	3 db @ ± 50 c/s	50 db @ ± 350 c/s	2 Sq. x 3½
20-0018-10	1940 c/s	6 db	1K/1K	3 db @ ± 500 c/s	40 db @ ± 1 Kc/S	1⅝ x 1¾ x 2¼
20-0027-10	3.35 K/S	6 db	1K/1.6K	3 db @ ± 180 c/s	30 db @ 1200 c/s	2½ Sq. x 1¼
20-0029-10	4 Kc/S	3 ± ½ db	1K/1.6K	3 db @ ± 175 c/s	30 db @ ± 1000 c/s	1¾ Sq. x 2¼
20-0030-10	8 Kc/S	6 db	1K/100K	3 db @ ± 225 c/s	40 db @ 11.5 Kc/S	1 13/32 Sq. x 2 5/16
20-0080-10	12 Kc/S	11 db	33K/33K	3 db @ ± 200 c/s	60 db @ ± 6000 c/s	2 x 3 x 2¼
20-0020-11	18 Kc/S	8 db	47K/500	3 db ± @ 250 c/s	30 db @ ± 2 Kc/S	2 x 3 x 1½
20-0091-11	26 Kc/S	6 ± ½ db	10K/30K	3 db @ ± 1500 c/s	40 db @ ± 12.5 Kc/S	2 x 2¼ x 3 1/16
20-0100-10	48 Kc/S	4 db	15K/5M	± 1 db @ ± 50 c/s	60 db @ ± 4 Kc/S	1 1/32 x 1 29/32 x 3 25/32
20-0093-10	64.75 Kc/S	5 db	600/20K	3 db @ ± 2200 c/s	60 db @ ± 6250 c/s	2⅝ x 4⅛ x 3 7/16
20-0104-10	88 Kc/S	6 db	600/600	.5 db @ ± .1 Kc/S	20 db @ ± 4 Kc/S	2 1/32 x 2 17/32 x 1 1/64
20-0177-11	142.5 KC/S	20 db	5K/5K	3 db @ ± 1.75 Kc/S	70 db @ ± 9 Kc/S	1¾ x 2 x ⅞
20-0168-11	156 Kc/S	6 db	300/1K	.5 db @ ± 10 Kc/S	60 db @ ± 39 Kc/S	¾ x 1¾ x 3
20-0105-10	216 Kc/S	6 db	600/600	.5 db @ ± .1 Kc/S	20 db @ ± 4 Kc/S	2 1/32 x 2 17/32 x 1 1/64
20-0103-10	216 Kc/S	1.5 db	600/600	.25 db @ ± 52 Kc/S	55 db @ 304 Kc/S	2 9/16 x 1 5/16 x 2 5/32
20-0157-10	336 Kc/S	2.5 db	600/600	2 db @ 312 to 360 Kc/S	70 db @ 250 & 450 Kc/S	1 1/32 x 2 19/32 x 2 5/32
20-0098-10	338 Kc/S	3 db	600/600	within .5 db @ 310 to 367 Kc/S	70 db @ 479 Kc/S	2 13/16 x 3 x 1 1/64
20-0097-10	384 Kc/S	3 db	600/600	within .5 db @ 360 to 408 Kc/S	70 db @ 528 Kc/S + 112	2 13/16 x 3 x 1 1/64
20-0101-10	384 Kc/S	2.5 db	600/600	within 2 db @ 360 to 480 Kc/S	70 db @ — 88 Kc/S	2 9/16 x 1 5/16 x 2 5/32
20-0095-10	424 Kc/S	2.5 db	124/124	within 1 db @ ± 424 c/s	50 db @ 848 Kc/S	1 x 1½ x 1
20-0096-10	435 Kc/S	2.5 db	600/600	3 db @ ± 29 Kc/S	55 db @ 516 Kc/S	2 13/16 x 3 x 1 1/64
20-0169-10	781 Kc/S	3 db	1K/1K	±.5 db @ 10 Kc/S	40 db @ 39 Kc/S + 436	¾ x 1¾ x 2
20-0185-10	2.172 Mc/S	5 db	135/135	.5 db @ ± 120 Kc/S	50 db @ — 376 Kc/S	2¾ x 7 x 1 1/64
20-0014-10	3 Mc/S	1 ± ½ db	300/300	3 db @ ± .55 Mc/S	40 db @ ± .8 Mc/S	2¼ x 2½ x 4
20-0179-10	14 Mc/S	15 db	500/500	3 db @ ± .15 Mc/S	65 db @ 1 Mc/S	1⅝ x 2 x 1⅛
20-0234-10	21.5 Kc/S	6 db	600/2500	3 db 21.5 to 24.3 Kc/S	25 db @ 21.06 Kc/S 40 db @ 20.46 & 35 Kc/S	1 11/16 x 2 5/32 x 1
20-0215-10	31.8 Kc/S	7 db	3K/1.5K	3 db 31.8 to 34.5 Kc/S	25 db @ 31.29 Kc/S 40 db @ 30.69 & 45 Kc/S	1 11/16 x 2 1/64 x 1

LOW PASS FILTERS

PART NUMBER	SOURCE/ LOAD	PASS BAND	STOP BAND	SIZE
20-0153-10	10/5M	2 ± 1 db @ 15 to 37 c/s	40 db @ 400 c/s	1¼ Sq. x 1½
20-0127-10	1K/10K	3 db @ 40 c/s	40 db @ 75 c/s	1½ Sq. x 2
20-0212-10	1K/1K	3 db @ 185 c/s	60 db @ 430 c/s	⅞ x 1⅝ x 1½
20-0213-10	1K/1K	3 db @ 300 c/s	24 db @ 1200 c/s	⅞ x 1⅝ x 1½
20-0221-10	15K/47K	.5 db @ 430 c/s	25 db @ 800 c/s	¾ x 1¾ x 3
20-0145-11	600/600	3 db @ 2350 c/s	40 db @ 2575 c/s	3½ x 3 x 6
20-0268-10	1K/1K	±.5 db .3 to 3 Kc/S	50 db above 4 Kc/S	1¼ x 3 5/16 x 21/32
20-0223-10	600/600	±.5 db .25 to 3 Kc/S	35 db 3.4 to 4.5 Kc/S	1½ x 4 x 1 1/16
20-0117-10	600/600	±.5 db .25 to 3.4 Kc/S	35 db 3.8 to 5.0 Kc/S	1½ x 4 x 1 1/16
20-0072-10	10K/10K	within 1 db 300 c/s to 30 Kc/S	40 db @ 44 Kc/S	1½ Sq. x 2
20-0102-10	600/600	within .25 db 36 to 140 Kc/S ±.1	35 db @ 164 Kc/S	2 7/16 x 2 13/16 x 1 1/64
20-0198-10	75/75	—.5 db @ 2.05 Mc/S	40 db @ 2.5 Mc/S	2 9/16 Sq. x 1¼

HIGH PASS FILTERS

20-0001-10	2K/2K	3 db @ 300 c/s	50 db @ 120 c/s	1¼ Cube
20-0214-10	2K/2K	3 db @ 350 c/s	40 db @ 175 c/s	⅞ x 1⅝ x 1½
20-0145-12	600/600	3 db @ 2575 c/s	40 db @ 1000 c/s	3½ x 3 x 6
20-0002-11	100/150	3 db @ 5 Kc/S	50 db @ 4 Kc/S	1¾ x 2⅜ x 4¼



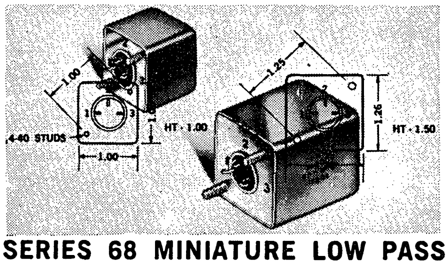
SERIES 03 TELEGRAPH TONE CHANNEL BAND PASS

(170 cycle spacing)

SPECIFICATIONS:

	Freq.	Receiver No.	Trans. No.
Relative Attenuation			
(Receive Filters)	425	03-01	03-21
3 db max at ± 42.5 cps	595	03-02	03-22
20 db min at ± 85 cps	765	03-03	03-23
40 db min at ± 128 cps	935	03-04	03-24
(Transmit Filters)	1105	03-05	03-25
3 db max at ± 42.5 cps	1275	03-06	03-26
15 db min at ± 85 cps	1445	03-07	03-27
30 db min at ± 128 cps	1615	03-08	03-28
	1785	03-09	03-29
Insertion Loss—10 db max	1955	03-10	03-30
	2125	03-11	03-31
Terminations	2295	03-12	03-32
Input: 600 ohms	2465	03-13	03-33
(inputs all channels may	2635	03-14	03-34
be operated in parallel)	2805	03-15	03-35
Output: Receive 50K ohms	2975	03-16	03-36
Transmit 600 ohms	3145	03-17	03-37
	3315	03-18	03-38

In addition to series listed, other tone channel series with spacings from 85 to 500 c/s are available.



SERIES 68 MINIATURE LOW PASS

SPECIFICATIONS:

	f_c cps	Part No.
Relative Attenuation		
3 db ± .5 @ f_c		
20 db min @ 1.3 f_c	330	68-01
40 db min @ 1.5 f_c	450	68-02
	600	68-03
Insertion loss—1 db max	660	68-04
	790	68-05
Terminations	900	68-06
Input—10K ohms	1050	68-07
Output—10K ohms	1200	68-08
	1600	68-09
Physical Specifications	2100	68-10
Case Hermetically Sealed Steel	3000	68-11
Size (330 to 900 cps)	3300	68-12
1.26"x1.26"x1.5" High	4000	68-13
Mounting: two 6-32 studs	4500	68-14
spaced 1.25"	5250	68-15
Size (1050 to 13000 cps)	6000	68-16
1"x1"x1" High	8000	68-17
Mounting: two 4-40 studs	10500	68-18
spaced 1"	11500	68-19
Terminals—3 solder type	13000	68-20

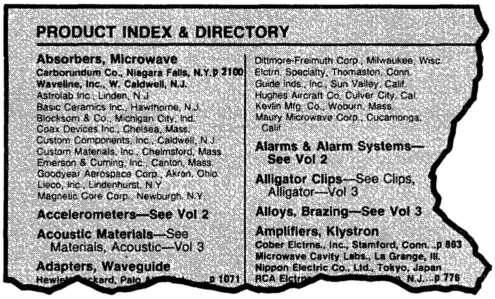
hisonic inc.

OTHER PRODUCTS: Precision Inductors • Transformers & Reactors • Tuned Circuits • Amp/Phase Equalizers • Lumped Constant Delay Lines

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y. p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N.J.
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass.
Emerson & Cuming, Inc., Canton, Mass.
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.
Accelerometers—See Vol 2
Acoustic Materials—See Materials, Acoustic—Vol 3
Adapters, Waveguide
Hewle ckard, Palo A p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co., Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Alarms & Alarm Systems—See Vol 2
Alligator Clips—See Clips, Alligator—Vol 3
Alloys, Brazing—See Vol 3
Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. ..p 883
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctr N.J. ..p 776

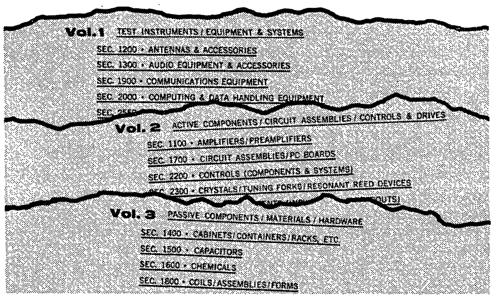
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT
Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
SEC. 2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES
Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

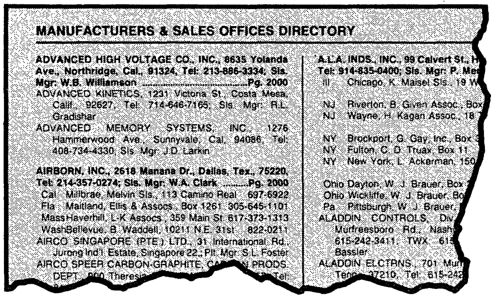
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



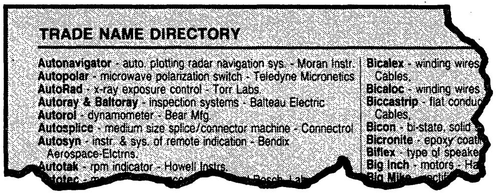
MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal. 94086, Tel: 408-734-4330; Sls. Mgr: J.D. Larkin
AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE.) LTD., 31 International Rd., Jurong Ind'l Estate, Singapore 22.; Plt. Mgr: S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C N PRODS. DEPT., 800 Theresi Tel:
A.L.A. INDS., INC., 99 Calvert St., H
Tel: 914-835-0400; Sls. Mgr: P. Me
Ill Chicago, K. Maisel Sls., 19 W
NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18
NY Brockport, G. Gay, Inc., Box
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150
Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer, Bo
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-3411; TWX 615 Bassler
ALADDIN ELCTRNS., 701 Mur Tenn. 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires Cables,
Bicaloc - winding wires
Biccastrip - flat condu Cables,
Bicon - bi-state, solid
Bicronite - epoxy coati
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

HOPKINS ENGINEERING CO.

FILTERS

- EMI/RFI Custom
- Power
- Shielded Panelboards
- Signal Communications
- Gen. Purpose Tubular/Rectangular
- UL Data Processing
- Band Pass/Wave
- Special Chokes

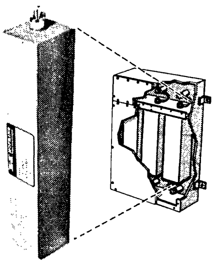
12900 Foothill Blvd., San Fernando, California 91342 • Telephone: (213) 361-8691 • TWX 910-496-1531

POWER FILTERS

Hopkins Power Line Filters are designed, built and tested to deliver maximum trouble-free continuous service year-after-year. Available as individual power filters, or housed in cabinet assemblies, these units are intended for use in shielded enclosures, secure installation and general power applications. They are available in various current ratings from 1 AMP through 200 AMPS.

1960 Series

The 1960 Series filters furnish 100 DB of attenuation from 14KHZ to 10GHZ when measured in accordance with Mil Standard 220A load conditions.

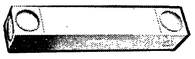


12600 Series

The 12600 Series filters furnish 100 DB of attenuation from 14KHZ to 10GHZ when measured in accordance with Mil Standard 220A. Also measured under full load conditions from 14KHZ to 20MHZ with special buffer networks to allow valid measurements below 100KHZ.

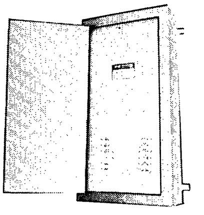
1776 Series and 1620 Series

Filters are also available in single and dual circuit units offering lower performance characteristics when required.

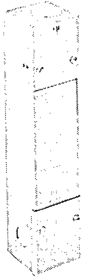


RF SHIELDED & FILTERED CIRCUIT BREAKER PANELBOARD

Hopkins R-F Shielded and Filtered C/B Panelboards are intended for use in installations where secure communication is mandatory. The unique design of these Panelboards maintains shielding integrity with the cabinet door **open**. Designs are available utilizing both the 1960 Series and 12600 Series filters. Circuit Breaker Complement must be specified when ordering.



COMMUNICATIONS/ SIGNAL LINE FILTERS

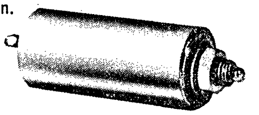


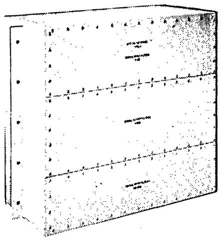
258B-S2

This unit is a Voice and Signal Line Filter offering 100 DB attenuation from 14KHZ to 1GHZ per Mil Standard 220A with outstanding reliability. Originally designed for use in 600 OHM balance system, it has been widely used in other applications such as Secure Communications.

F-4386 & F-4386-1

These Voice and Signal Filters are designed to meet the requirements of DCA Cir 175-6A Application #1. They are single circuit bulkhead mounting tubular filters intended for cabinet installation.





Special cabinet designs are available incorporating any number of the above filters modified for cabinet installation. These units are constructed with an R-F Shielded bulkhead between input and output housings in order to maintain shielding integrity required for secure installations.

UL RECOGNIZED FILTERS FOR DATA PROCESSING EQUIPMENT

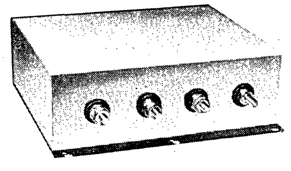
The 44 Hopkins RFI Filters designed expressly for data processing equipment provide maximum suppression of Radio Frequency Interference and other extraneous signals detrimental to efficient operation of data processing equipment.

Hopkins RFI Filters are designed and tested to deliver maximum, trouble-free duty for many years.

You will speed production and save both time and money in the manufacture of your data processing equipment when you specify, whenever possible, off-the-shelf Hopkins RFI Filters which are included as recognized components.

The Hopkins line offers the widest selection of RFI filters recognized under the component program of Underwriters' Laboratories, Inc.

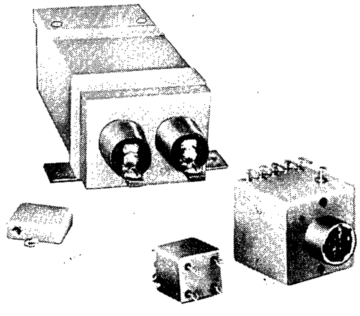
U.L. Yellow Card listings available upon request. Available in various amperage ratings and case styles.



EMI/RFI TESTING SERVICES AVAILABLE —to determine compliance with military, customer or your individual requirements.

Custom Filters

Hopkins has long been a leader in the design and development of special custom filters to satisfy specific customer requirements. Thousands of designs are on file incorporating all voltage, current ratings and case configurations. Design and performance are verified by computer. Our complete Engineering and Manufacturing Facility is available to assist in the solution of your particular filter problems.

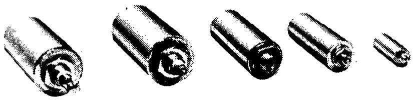


General Purpose Tubular Filters—14000 Series

Intended for use in critical applications where the "feed-thru" characteristic is necessary for good high frequency performance. Available in various circuit configurations from a single element capacitor thru multiple element Pi and T sections. Various performance characteristics are available to allow the user to select the unit best suited to his needs. Typical ratings from 50VDC @ 1 Amp. to 277 VAC @ 50 Amp.

All units designed to meet requirements of MIL-F-15733.

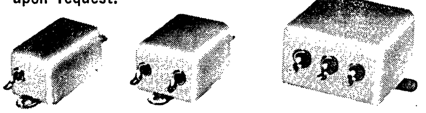
These Units are available mounted in cabinets on special request. Contact Factory.



General Purpose Rectangular Filters—16000 Series

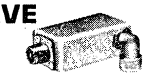
These units are intended to be used where installation is not critical. They are available in one, two and three circuit configuration as well as a wide variety of voltage and current ratings. Various attenuation characteristics allow the user to select the unit best suited to fit his particular needs. Typical ratings are from 50 VDC @ 1 Amp. to 277 VAC @ 50 Amp. All units are designed to meet the requirements of MIL-F-15733.

Electronic Wave Filters utilizing modern network design techniques are available as custom filters upon request.



SPECIAL CHOKES

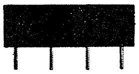
BAND PASS/WAVE FILTERS



DIP filters

New dual In-line LC filters

Kappa's **DIP-Filters** are housed in a standard dual in-line package for PC board mounting.



DIP-Filters provide the design engineer with a variety of electrical characteristics compatible with high density assemblies on integrated circuit boards.

how to order

- ☐ 1. Enter tables for required stop band.
- ☐ 2. Select standard part number from required cutoff frequency and impedance.
- ☐ 3. Add Suffix L (Lowpass) or H (Highpass).
- ☐ 4. Consult factory for items not shown.

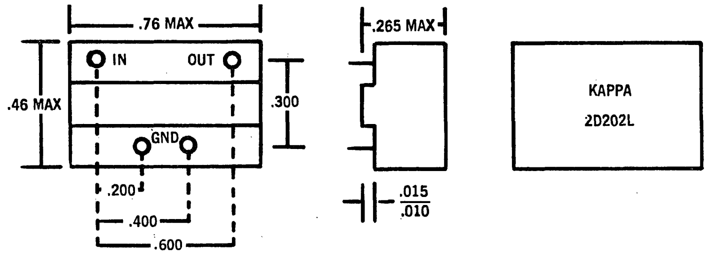
20 db STOPBAND		SPECIFICATIONS	39 db STOPBAND	
LOWPASS (L)	**HIGHPASS (H)**		**LOWPASS (L)**	**HIGHPASS (H)**
< .5 db at .1 Fc	< .5 db at 10 Fc	**INSERTION LOSS**	< .5 db at .1 Fc	< .5 db at 10 Fc
< ±1 db to Fc	< ±1 db to Fc	**RIPPLE**	< ±1 db to Fc	< ±1 db to Fc
< 3 db to Fc	< 3 db to Fc	**ATTENUATION**	< 3 db to Fc	< 3 db to Fc
> 20 db at 1.4 Fc & up	> 20 db at .715 Fc & lower		> 39 db at 2.5 Fc & up	> 39 db at .4 Fc & lower

IMPEDANCE (Ω) 50	100	200	500	1K	2K	5K	Cutoff Frequency Fc	IMPEDANCE (Ω) 50	100	200	500	1K	2K	5K
							1 KHZ				2D102			
				1E202			2 KHZ				2D202	2E202		
			1D502	1E502	1F502		5 KHZ			2C502	2D502	2E502	2F502	
		1C103	1D103	1E103	1F103	1G103	10 KHZ	2A103	2B103	2C103	2D103	2E103	2F103	2G103
		1C153	1D153	1E153	1F153	1G153	15 KHZ	2A153	2B153	2C153	2D153	2E153	2F153	2G153
	1B203	1C203	1D203	1E203	1F203	1G203	20 KHZ	2A203	2B203	2C203	2D203	2E203	2F203	2G203
1A503	1B503	1C503	1D503	1E503	1F503	1G503	50 KHZ	2A503	2B503	2C503	2D503	2E503	2F503	2G503
1A104	1B104	1C104	1D104	1E104	1F104	1G104	100 KHZ	2A104	2B104	2C104	2D104	2E104	2F104	2G104
1A154	1B154	1C154	1D154	1E154	1F154		150 KHZ	2A154	2B154	2C154	2D154	2E154	2F154	
1A204	1B204	1C204	1D204	1E204	1F204		200 KHZ	2A204	2B204	2C204	2D204	2E204	2F204	
1A504	1B504	1C504	1D504	1E504	1F504		500 KHZ	2A504	2B504	2C504	2D504	2E504	2F504	
1A105	1B105	1C105	1D105				1 MHZ	2A105	2B105	2C105	2D105			
1A205							2 MHZ	2A205						

STANDARD PART NUMBERS — STANDARD PART NUMBERS

Case drawing applies to all DIP-filters

Material: Black epoxy
Pins: .020 Tinned copper
.20 length, min.
Weight: ≈ 3 grams
Dip-Filters meet specification MIL-F18327C, Grade 5, Class R, −55°C to +105°C



KAPPA NETWORKS, INC.

DELAY LINE SPECIALISTS • ELECTRIC WAVE FILTERS • MANUFACTURING ENGINEERS
DESIGN • PRODUCTION • DELIVERY
165 ROOSEVELT AVENUE • CARTERET, NEW JERSEY 07008 • TEL. (201) 541-4226

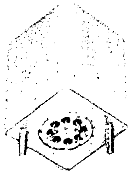
The following examples of Kappa's LC filter design capabilities are but a small representation of the broad range of our experience. Through our use of an IBM 360, level 60 computer, output data plotted against frequency including impedance, attenuation, phase, group delay and phase delay can be evaluated to supply an immediate quotation.

We can also computer-check your special filter requirements. Ask for details on our low-cost feasibility reports.

Low Pass • High Pass • Band Pass • Band Reject • Linear Phase • Constant Group Delay • Phase Matched • Attenuation Matched • Phase Equalizers • Delay Equalizers • Attenuation Equalizers • Low Transient Response •

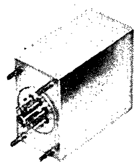
KAPPA the proven leader in computer-designed custom LC filters

LOW PASS FILTERS



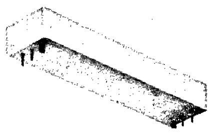
Frequency Range: DC to 50MHz
Impedance Range: 1 ohm to ∞
Stop Bands: 10 to 80db

BAND PASS FILTERS



Frequency Range: DC to 50MHz
Bandwith: 1% to >100%
Stopband: 10 to 80db
Impedance Range: 1 ohm to ∞

HIGH PASS FILTERS



Frequency Range: DC to 50MHz
Impedance Range: 1 ohm to ∞
Stop Bands: 10 to 80db

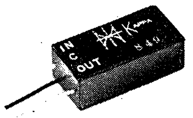
BAND REJECT FILTERS

Frequency Range: DC to 50MHz
Band Width: 1% to >100%
Stop Band: 10 to 80db
Impedance Range: 1 to ∞

MATCHED PHASE & ATTENUATION

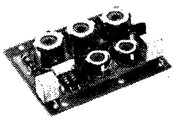
Typical Specifications:
Phase Matched ±2½% in Pass Band
Attenuation Matched ±.25db in Pass Band for use in Sonar & other multi channel systems.

MAXIMUM FLAT DELAY (BESSEL) FILTER



Size (Typical): .75" x .75" x 1.5"
Frequency Range: 1.5KHz to 1MHz
Z Range: 50 to 10 K
Overshoot: <1%
Delay Flat: <2% to Fc

LINEAR GROUP DELAY VIDEO FILTER



Typical Specifications:
L.P. Cutoff: 4.5 MHz
I.L.: <1db
Passband Ripple: <±.1db
Pass Band Delay Distortion: <25 nsec.
Stopband: >25db

GROUP DELAY & ATTENUATION EQUALIZER NETWORK

To correct system introduced delay distortion & attenuation roll off.

constant group delay filters

Computer-designed and checked to give ripple delay over the pass band insuring exact delay and attenuation characteristics.

Frequency Range: DC to 50 MHz
Impedance Range: 1 ohm to ∞
Temperature Range: −55°C to +125°C.
Complete Encapsulation
Hermetic Seal
P.C. Board Construction
Case Configuration:
Stock or Custom Designed
P.C. Card
Dual In-Line
Standard Hardware Program
All filters conform to applicable mil specifications.

Phase & Attenuation Matching

Differential phase and attenuation matched to eliminate the need for adjustments in multi-channeled systems.

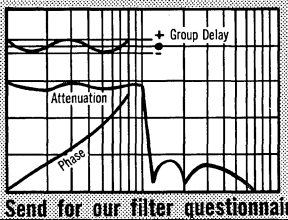
Linear Phase Filters

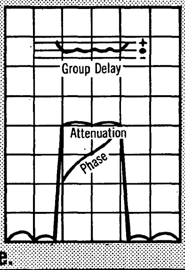
To reduce distortions and lower transient response in modulated systems.

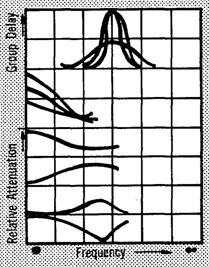
Equalizers

Phase/Delay/Attenuation

Computer-designed correction network derived from system error curves.







Send for our filter questionnaire.

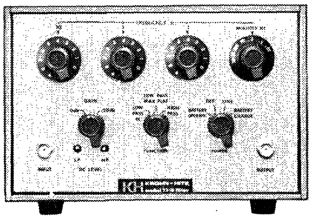
KAPPA NETWORKS, INC.

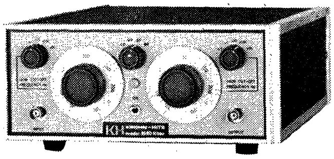
DELAY LINE SPECIALISTS • ELECTRIC WAVE FILTERS • MANUFACTURING ENGINEERS

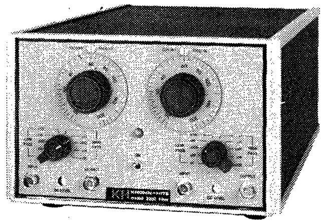
165 ROOSEVELT AVENUE • CARTERET, NEW JERSEY 07008 • TEL. (201) 541-4226

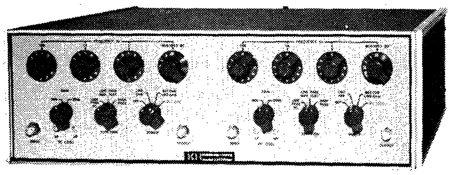
FROM KROHN-HITE THE WAVE MAKERS:

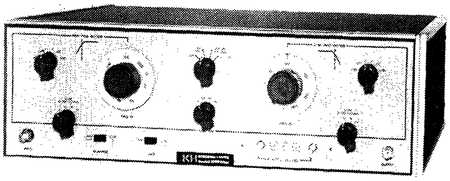
THE FINEST IN VARIABLE ELECTRONIC FILTERS


Model 3321 Single Channel .01 Hz to 99.9 kHz


Model 3550 2 Hz to 200 kHz


Model 3202 20 Hz to 2 MHz


Model 3343 Dual Channel .01 Hz to 99.9 kHz


Model 3750 Tunable Multifunction .02 Hz to 20 kHz

Frequency Range	Filter Model*	Function				Add. Feature	Freq. Acc. %	Attenuation Slope. db/octave	Hum and Noise (RMS)	Max. Atten-uation	Output Volt/Amps (RMS)	3 db Points	Approx. Shipping Weight lbs/kgs	Price U.S.A. Only
		B P	B R	H P	L P									
.001 Hz – 99.9 kHz	3320			X	X	Batt. Op.	2%	24	0.5 mv	80 db	5v/50ma	dc – 1 MHz	24/11	$ 725
.001 Hz – 99.9 kHz	3322	X	X	X	X	Batt. Op.	2%	24/48	0.5 mv	80 db	5v/50ma	dc – 1 MHz	34/16	$1395
.001 Hz – 99.9 kHz	3340			X	X	Batt. Op.	2%	48	0.5 mv	80 db	5v/50ma	dc – 1 MHz	27/12	$1075
.001 Hz – 99.9 kHz	3342	X	X	X	X	Batt. Op.	2%	48/96	0.5 mv	80 db	5v/50ma	dc – 1 MHz	40/18	$2075
.01 Hz – 99.9 kHz	3321			X	X	Batt. Op.	2%	24	0.5 mv	80 db	5v/50ma	dc – 1 MHz	24/11	$ 635
.01 Hz – 99.9 kHz	3323	X	X	X	X	Batt. Op.	2%	24/48	0.5 mv	80 db	5v/50ma	dc – 1 MHz	34/16	$1225
.01 Hz – 99.9 kHz	3341			X	X	Batt. Op.	2%	48	0.5 mv	80 db	5v/50ma	dc – 1 MHz	27/12	$ 995
.01 Hz – 99.9 kHz	3343	X	X	X	X	Batt. Op.	2%	48/96	0.5 mv	80 db	5v/50ma	dc – 1 MHz	40/18	$1825
.02 Hz – 2 kHz	330B	X					5%	24	0.1 mv	80 db	10v/1ma		35/16	$ 595
.02 Hz – 20 kHz	3750	X	X	X	X	Batt. Op.	5%	6, 12, 18, 24	0.2 mv	80 db	10v/2ma	dc – 1 MHz	26/12	$ 925
.2 Hz – 20 kHz	3700	X				Batt. Op.	5%	24	0.2 mv	80 db	5v/1ma		19/9	$ 595
2 Hz – 200 kHz	3550	X	X	X	X		5%	24	0.2 mv	60 db	5v/10ma	.2 Hz – 3 MHz	15/7	$ 590
10 Hz – 1 MHz	3100	X					5%	24	0.1 mv	80 db	3v/10ma		17/8	$ 650
10Hz – 3 MHz	3103	X					5%	24	0.15 mv	80 db	3v/10ma		17/8	$ 675
20 Hz – 200 kHz	3500	X					10%	24	0.2 mv	60 db	5v/10ma		14/7	$ 450
20 Hz – 2 MHz	3200			X	X		5%	24	0.1 mv	80 db	3v/10ma	dc – 10 MHz	16/8	$ 450
20 Hz – 2 MHz	3202	X	X	X	X		5%	24/48	0.1 mv	80 db	3v/10ma	dc – 10 MHz	22/10	$ 795

BP – Band Pass BR – Band Reject HP – High Pass LP – Low Pass *Add suffix "R" for Rack mounting

For complete details, write: The Wavemakers:
Krohn-Hite Corporation, 580 Massachusetts Avenue,
Cambridge, Mass. 02139 U.S.A.
Tel: (617) 491-3211 TWX: 710-320-6583

KROHN-HITE CORPORATION

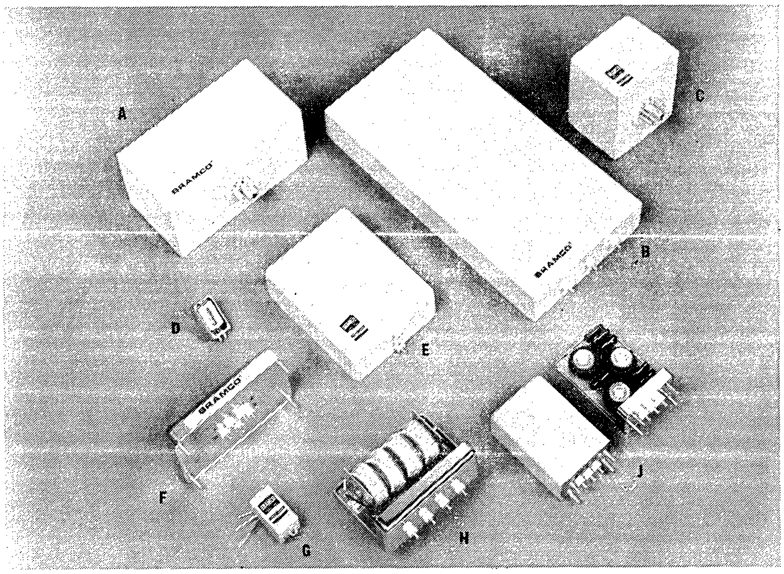
OSCILLATORS / FILTERS / AC SOURCES / FUNCTION GENERATORS / AMPLIFIERS

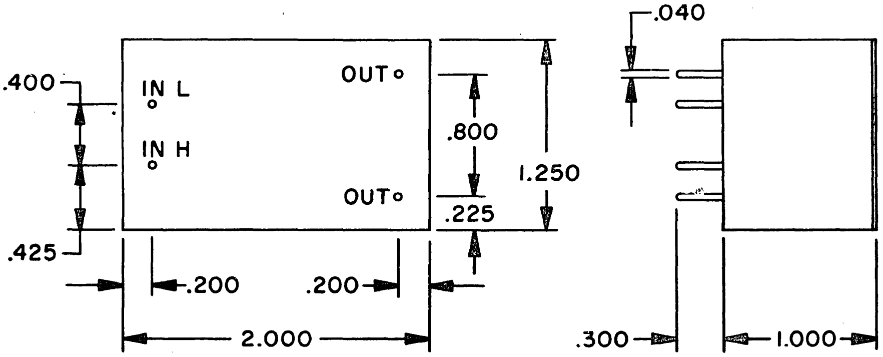
BRAMCO CUSTOM FILTERS

LC & ELECTROMECHANICAL, 0-50 MHZ

Whether you work with audible, sub-audible, or radio frequencies, commercial or military filters, Bramco has the engineering and manufacturing capability to deliver the LC, RC, or electromechanical design that best fits your application. Shown are just a few examples to illustrate our broad range of experience.

- **A.** Tone Telegraph Bandpass Receiver Filter (MIL-F-18327/7)
- **B.** Tone Accessory Band Stop Filter
- **C.** Tone Telegraph Bandpass Transmit Filter (MIL-F-18327/7)
- **D.** **RF20** Contactless Resonant Reed Filter, 80 to 3000 Hz
- **E.** Tone Accessory Low Pass Filter
- **F.** Dual Hipass - Lowpass Tone Filter
- **G.** EIA Land Mobile Low Pass Voice Filter
- **H.** Tone Telegraph Bandpass Receiver Filter
- **J.** Radio Receiver Low Pass Filter (MIL-F-18327/14, Type FR60X11YY1)





BRAMCO STANDARD LC FILTERS

Bramco standard LC filters, designed for PC mounting, often give you the quickest, simplest, and most economical solution. Try a Bramco standard for your prototype. Then, if you do find you have special requirements, you can always depend on Bramco custom engineering experience for the exact design you need.

HIGH PASS FILTERS

f_c (Hz.)	Specifications	Price
300		
600	Source and Load Impedance: 600 ohms	
900		
1200	Pass Band Attenuation: 3 db maximum	
1500	from f_c to 20 KHz.	$49.00
1800		
2100	Stop Band Attenuation: 40 db minimum	
2400	from 20 Hz. to 0.8 f_c	

LOW PASS FILTERS

1500	Source and Load Impedance: 600 ohms	
1800	Pass Band Attenuation: 3 db maximum	
2100	from 20 Hz to f_c	$49.00
2400	Stop Band Attenuation: 40 db minimum	
2700	from 1.25 f_c to 20 KHz.	

BAND PASS FILTERS

f_c (Hz.)	Specifications	Price
697	Source and Load Impedance: 600 ohms	
770		
852	Insertion Loss: 7 db maximum at mini-	
941	mum loss frequency	$49.00
1209		
1336	Attenuation: 1.5 db maximum at f_c ±3%	
1477	10 db minimum at f_c ±10%	
1633		

Voice Band Filter	Source and Load Impedance: 600 ohms Insertion Loss: .5 db maximum at 1000 Hz. Attenuation: 30 db minimum at 150 Hz. 5.5 db maximum at 300 Hz. 8 db maximum at 3500 Hz. 14 db minimum at 5000 Hz.	$49.00

When you come to Bramco with your application, you benefit by a diverse background of talents in tone controls. We also design and produce tone modules and systems for radio communications, tone telemetry systems, and both single and multi-digit tone telephone receivers. Write for data sheets, and be sure to see section 2300 for other Bramco frequency products.

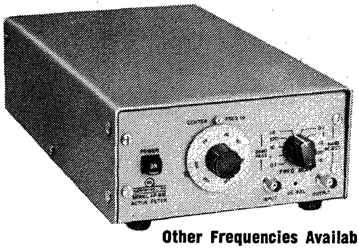
BRAMCO CONTROLS DIVISION, LEDEX INC.
550 South College Street, Piqua, Ohio 45356 • phone (513) 773-8271

multimetrics
INDUSTRIES, INC.

active filters

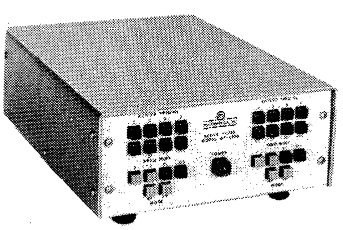
variable and fixed 0.001Hz to 2MHz

- **Top performance and versatility!**
- **Individual channels are independent High or Low Pass Butterworth Filters!**
- **Interconnected channels are Band Pass, Band Reject or have sharpened attenuation slopes!**
- **Selectable Time Domain response for optimum transient (pulse) behavior!**
- **All units rack-mountable!**
- **Quick delivery!**



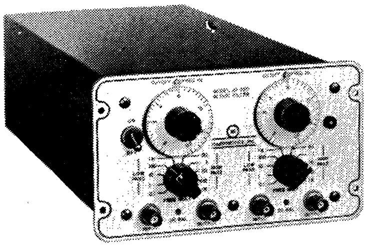
Other Frequencies Available

Model AF-810
2.0 Hz to 20 kHz; tunable sharp spike (Q=10) and notch (Q=2). Ideal for narrow band width signal processing and analysis.

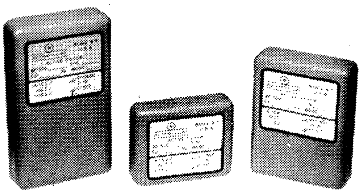


Series AF-500A
0.2Hz to 20KHz; Push Button Digital Tuning. High performance in a low cost package. Simple keyboard operation. Ideal for laboratory or production use.

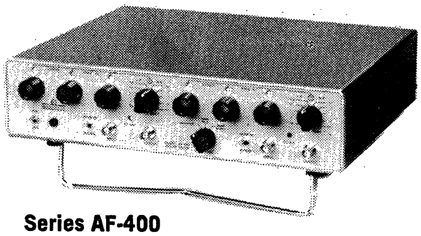
MODEL	AF-110	AF-120	AF-210	AF-220	AF-410	AF-420	AF-410L	AF-420L	AF-520A	AF-540A	AF-610	AF-620	AF-810
FREQ. RANGE, Hz	20 to 2M		0.2 to 20K		0.01 to 99.9K		0.001 to 9.99K		0.2 to 20K	0.2 to 20K	REMOTELY PROGRAMMABLE VERSIONS OF AF-400 AND AF-500 SERIES		2 to 20K
ACCURACY	±5%		±5%		±2%		±2%		±5%	±5%			±5%
CHANNELS	1	2	1	2	1	2	1	2	2	—			1
TUNING	CONTINUOUS				DIGITAL SWITCH				DIGITAL PUSH BUTTON	DIGITAL PUSH BUTTON			CONTINUOUS
SLOPE, db Octave	24 (48 — 2 CHANNELS IN SERIES)												—
FUNCTIONS	HP, LP	HP, LP BP, BR	HP, LP	HP, LP BP, BR	HP, LP BYPASS	HP, LP BP, BR BYPASS	HP, LP BYPASS	HP, LP BP, BR BYPASS	HP, LP BP, BR	HP, LP, BP BYPASS			BP (SPIKE Q = 10) BR (NOTCH Q = 2)



Series AF-100 & AF-200
Ruggedly built. Designed for a wide range of applications.



Series AF-300
Fixed frequency mini-sized modules, Low, High, Band Pass, Band Reject and Notch functions, Butterworth, Chebyshev, Legendre and elliptic responses.



Series AF-400
Superb accuracy and stability. 115/230 VAC or battery.

Series AF-600 (not shown)
Designed for manual use and to interface with computer outputs; analog or digital automatic test systems.

Other frequencies, response characteristics and pole configurations available. Call or write for information

multimetrics
INDUSTRIES, INC.
120-30 JAMAICA AVENUE, RICHMOND HILL, NEW YORK 11418
(212) 441-4240

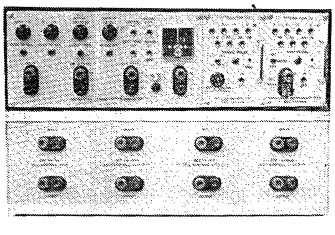
PASSIVE • ACTIVE • EQUALIZERS

FILTERS

SIMULATORS • SPECIAL DEVICES

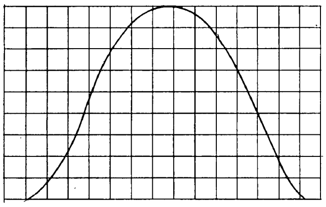
SEG ELECTRONICS CORP. OFFERS THE STRONGEST AND MOST HELPFUL APPLICATION ENGINEERING IN THE ELECTRONICS INDUSTRY – FREE – OF COURSE!! – SUPPORTED BY UNSURPASSED DESIGN AND PRODUCTION FACILITIES.

TOP RATED SUPPLIERS TO THE MILITARY/ INDUSTRIAL COMPLEX.



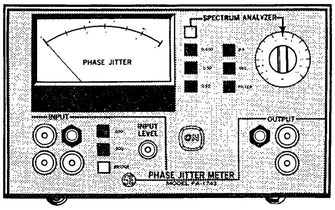
SEG TELEPHONE CHANNEL SIMULATION

SEG Phase Jitter Simulator FA 1564 with accessory units FA 1565 and FA 1566 duplicate most of the active impairments of the telephone channel. • Phase Jitter — 0 to 45° P. to P. at 50, 100, 150, 60, 120 and 180 Hz • Harmonic Distortion — 0 to 15% • Phase Hits • Single Tone Interference • Broad-Band Noise • Impulse hits.
SEG Line Simulators for attenuation and delay. FA 1445-3002 • FA 1446-C1 • FA 1447-C2 • FA 1448-C4 shown in carrying case LSCC-4.



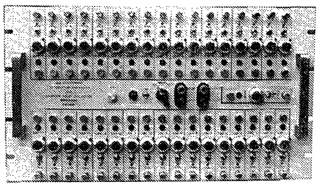
SEG COMPROMISE TELEPHONE LINE EQUALIZERS

SEG FA 1698 Compromise Equalizer is a highly popular passive unit for building into your modem — cased or P.C. board construction.



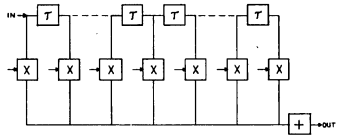
SEG PHASE JITTER METER

SEG Phase Jitter Meter FA 1743. The most versatile instrument in its field. Meets and exceeds Bell System guidelines • Measures Phase Jitter 0 to 100° P. to P. or average anywhere in a channel • Features a spectrum analyzer mode to determine nature of Phase Jitter.



SEG PROGRAMMABLE ANALOG FILTER

SEG FA 1591 Programmable Filter is part of a series that features any desired attenuation, phase and delay characteristic programmed by digital computer either by direct connection, card reader or front panel control.



SEG DIGITAL FILTERS

SEG FA 2000 Series develops any attenuation, delay or phase characteristic in the digital domain • Fixed modules or fully programmable by direct connection to computer, card reader or ROM • Recursive and non-recursive.

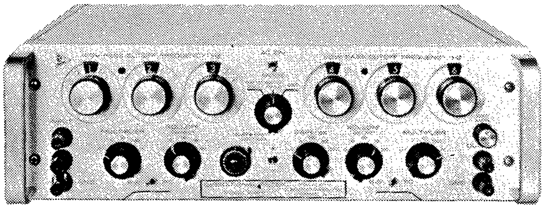
SEG ELECTRONICS CORP. (212) 441-3200

120-30 JAMAICA AVENUE
RICHMOND HILL, N.Y. 11418

ROCKLAND

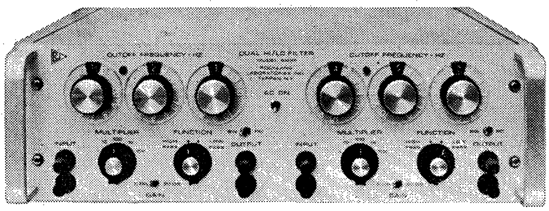
ANALOG FILTERS featuring:

OPERATIONAL FILTER: Series 1000



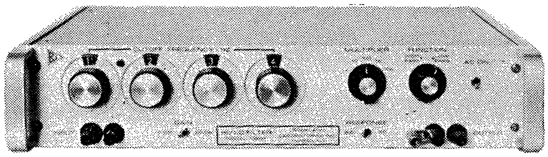
High Pass, Low Pass, Band Pass, Band Reject
Frequency Range: 0.001 Hz to 11.1 KHz at 2% accuracy
Variable-order filter: 0, 6, 12, 18, 24 db/oct
Passband Gain: 0, 6, 20, 40 db
Butterworth and RC response
Sine-wave Oscillator: 0.001 Hz to 11.1 KHz, 2% accuracy, 0.5% distortion
2 Meg (balanced) input and 50-ohm output impedance
Output Signal: 30 volts, p-p

DUAL HI/LO FILTER: Models 1022F, 1042F



High Pass, Low Pass, Band Pass, Band Reject
Frequency Range: 0.001 Hz to 111 KHz at 2% accuracy (see options)
Attenuation slope (each section): 24 db/oct (1022F), 48 db/oct (1042F)
Sections can be cascaded to produce 48 db/oct (1022F), 96 db/oct (1042F)
Passband Gain: 0, 20, 40 db
Butterworth and RC response
10 Meg input and 50-ohm output impedance
Output Signal: 20 volts, p-p

HI/LO FILTER: Model 1020F



High Pass, Low Pass
Frequency Range: 0.001 Hz to 111 KHz at 2% accuracy
Attenuation Slope: 24 db/oct
Passband Gain: 0, 20 db
Butterworth and RC response
10 Meg input and 50-ohm output impedance
Output Signal: 20 volts, p-p

PROGRAMMABLE DIGITAL FILTERS: Series 4000

Built-in flexibility lets you choose: • Arbitrary filter characteristics • Single or multichannel processing • Recursive structures (poles with or without zeros) or non-recursive (zeros only) • One channel at 500 kHz sampling rate or 500 channels at 1 kHz (or anything in between) • Optional word lengths in 4 bit increments—16 or 24 bits standard • Interface with computer, paper tape, or keyboard • Internal A/D and D/A conversion • Programmable characteristics with read-write memory • Fixed characteristics with read-only memory (ROM)

Series 4000 Lineup of Digital Filters Includes...

*SERIES 4100:
General purpose digital filters for laboratory-scale data analysis, simulation and testing applications in such areas as communications, sonar and geophysics.

*SERIES 4300:
Narrow band-pass/band-reject filters for applications in wave/distortion analysis.

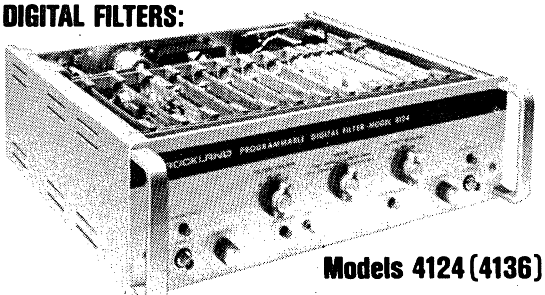
*SERIES 4400:
Programmable comb filters for spectral analysis with primary applications in data analysis, vibration testing, radar.

*SERIES 4500:
Speech synthesizers to produce natural-sounding speech in real time for voice communications systems including computer voice response.

*SERIES 4600:
Variable low-pass, high-pass, band-pass, and band-reject filters as digital complements to Rockland's analog filters.

*SERIES 4900:
Variable all-pass filters for phase equalization and variable delay approximations.

DIGITAL FILTERS:



Models 4124 (4136)

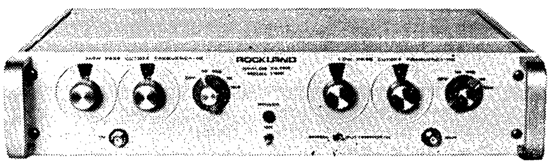
Recursive tenth-order, (eighth-order) digital filter
All classical designs: Butterworth, Bessel, Chebyshev, (& Elliptic)
Programmable poles (& zeros)
Modes: Low Pass, High Pass, Band Pass, (& Band Reject)
Sampling Rate: 100 KHz (Model 4124), 80 KHz (Model 4136)
Computational Accuracy: 16 bits (Model 4124), 24 bits (Model 4136)
Coefficient Accuracy: 12 bits (Model 4124), 16 bits (Model 4136)
Options: Internal A/D (10 or 12 bits) and D/A (10 or 12 bits)

SYSTEMS CAPABILITIES

Rockland's extensive experience in signal processing is at your disposal for satisfying your specialized requirements—analog, digital or hybrid.

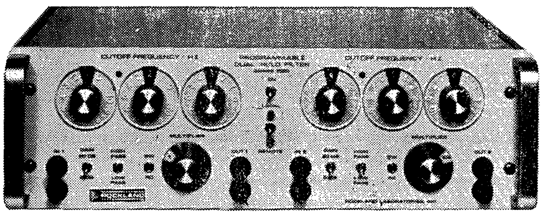
Digital Frequency Selection, Local and Remote Programming

VARIABLE ANALOG FILTERS: Models 1100, 1200



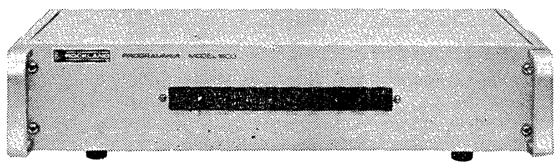
High Pass, Low Pass, Band Pass (Model 1100) and Band Reject (Model 1200)
Frequency Range: 10 Hz to 1.1 MHz at 5% accuracy
Attenuation Slope: 24 db/oct
Passband Gain: 0 db
Butterworth and Bessel response
100K input and 50-ohm output impedance
Output signal: 10 volts, p-p

PROGRAMMABLE DUAL HI/LO FILTER: Series 1500



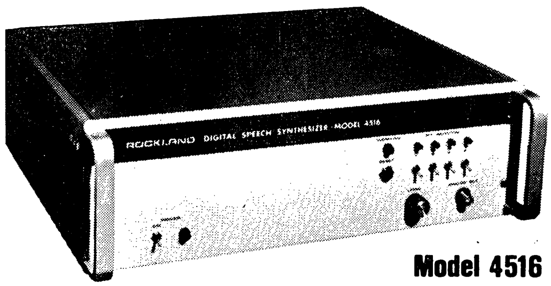
Local and/or Remote programming of all functions
Programming options: Contact closures, logic levels (options 02, 03) various BCD codes
High Pass, Low Pass, Band Pass, Band Reject
Frequency Range: 0.001 Hz to 111 KHz at 2% accuracy (see options)
Attenuation slope: 24 db/oct, each section, sections can be cascaded to produce 48 db/oct
Passband Gain: 0, 20, 40 db
Butterworth and RC response
10 Meg input and 50-ohm output impedance
Output Signal: 20 volts, p-p

PROGRAMMER: Model 1600



Convenient control of programmable instruments such as Series 1500
Pushbutton selection of ten 46-bit programs
Programs easily changed with diodes

DIGITAL SPEECH SYNTHESIZER:



Model 4516

Produces natural-sounding speech in real time
Simulates the speech-producing mechanism, including the vocal tract and its excitation sources
Sampling Rate: up to 12.8 KHz
Clock signal: externally supplied, up to 6.25 MHz
Computational Accuracy: 24 bits
Coefficient Accuracy: 16 bits
Operation: Pitch synchronous with up to 1024 samples per pitch period
Gains: 0 to 2^{23} in steps of 2^8 for both the pulse and noise generators
Output: Digital output (16 bits) and Analog output through 12-bit D/A converter

PROGRAMMABLE FREQUENCY SYNTHESIZERS: Series 5000

(Available mid-1971)

Direct Digital Design: No mixing or phase-locking
Frequency Range: 0.01 Hz to 2 MHz
Selectivity: 8 decimal digits
Frequency Stability: ±.005% to 1 part in 10^9 (depending on crystal)
Distortion: Less than 54 db (harmonic), less than 70 db (spurious)
Amplitude Stability: ±¼ db over frequency and temperature
Programming: 1-2-4-8 BCD
Switching transients: None. Amplitude and phase continuity is maintained when frequency is changed
Outputs: Analog, 10 v/50 mA, p-p
Digital, 10 bits
Option: Fully programmable linear sweep between any two frequencies up to eight decades apart, at variable rates of up to 1 MHz per second
Price Range: $2000 to $3850, depending upon options

Rockland Systems Corporation
131 Erie Street East, Blauvelt, New York 10913

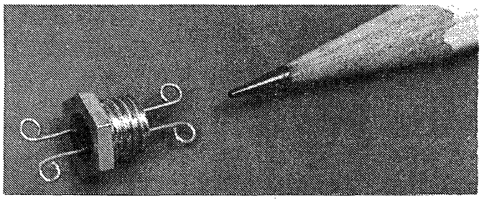
For Instant Information Telephone
(914) 359-1818

ROCKLAND

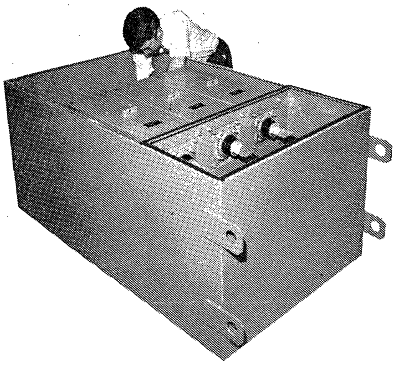
RF INTERONICS

100 Pine Aire Drive • Bay Shore, N.Y. 11706 516 231-6400 • TWX 510 227-6233

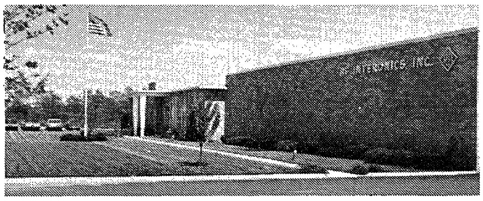
Now more than ever the nation's leading producer of RFI/EMC Filters and Capacitors



Subminiature Types. We were one of the first. Three basic lines to choose from: 50 VDC, 100 VDC and 115 VAC.



Much Bigger Ones, too. Ratings from 1 milliamp to 2,000 amps; 0.1 volt to 20,000 volts; fractions of an ounce to more than 1,000 lbs.



The Most Modern Facility of its type in the Nation. Fully air conditioned and humidity controlled. With Clean Rooms for capacitor winding and assembly.

The most complete range of products in the industry. Sophisticated, complex, multi-circuit filter assemblies, or simple feedthru capacitors — we make them all. QPL listed filters per MIL-F-15733E, high-power shielded room types, subminiature units, telephone and signal filters... many for immediate delivery!

Over a period of many years, the engineering and production teams at RF Interonics have built a reputation for unsurpassed technical competence, quick-reaction capability, and proven, reliable performance. The next time RFI is a problem to you, call RF Interonics. Your inquiry will receive a prompt and meaningful response.

The types listed below are representative of thousands of standard and custom-engineered filter units and assemblies described in our catalog.

Cylindrical Filters, Per MIL-F-15733
Style FL 22 ....100 VDC.............1 to 30 Amps
Style FL 24 ....400 VDC.............1 to 55 Amps

Rectangular Filters, Per MIL-F-15733
Style FL 51, FL 56.......100 VDC ....1 to 55 Amps
Style FL 53, FL 57.......125 VAC, 400 VDC ......1 to 55 Amps
Style FL 54, FL 58.......250 VAC, 600 VDC ......1 to 55 Amps

L & PI Circuit Cylindrical Filters, RF700 Series
(A Standard of the Industry for more than 9 years.)
100 VDC, 115 & 250 VAC ....0.5 to 50 Amps
Insertion loss: 40 db @ 150 KHz, to 80 db @ 150 KHz

Feed-Thru Capacitors—MIL-C-11693 Performance
Standard and custom-engineered types, subminiature to high-current units, 0.047 to 10 MFD.

PI, T & L-Circuit Subminiature Cylindrical Filters
50 & 100 VDC, 115 VAC ... Up to 10 Amps ... High Insertion Loss

Multiple-Circuit Assemblies
115 VAC (Line-to-Ground).............3 to 50 Amps per circuit

Shielded Room Filters
Single, Dual, Triple & 4-Circuit assemblies, with a variety of configurations and performance characteristics, completely welded assemblies for maximum reliability.

Up to 450 VAC...25 to 200 Amps (Special designs to 2000 Amps)

Power Factor Correction Inductors
For the elimination of loading effects of high-capacitance filters on limited-current power sources.

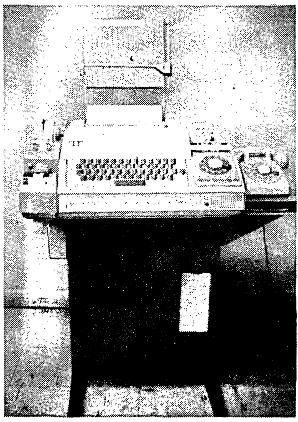
Signal & Telephone Circuit Filters
A wide variety of standard and custom-engineered filters for use in communications and data lines requiring compliance with sophisticated, classified emission control specifications.

TOROTEL INC.

13402 SOUTH 71 HIGHWAY, GRANDVIEW, MO. 64030
PHONE: 816-761-6314 TWX-910-7777037

THE BEST SOURCE FOR YOUR CUSTOM REQUIREMENTS BECAUSE WE HAVE THE BEST FACILITIES FOR: FILTERS

DESIGN

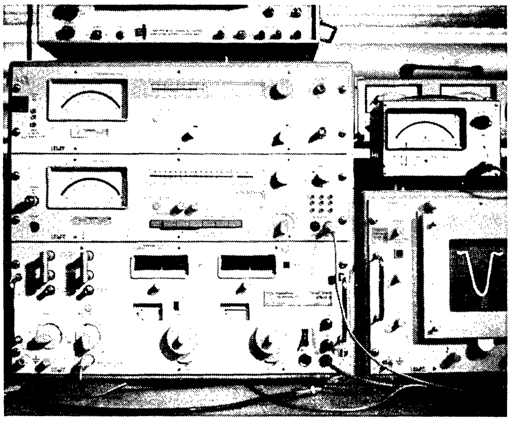


An extensive file of analysis and synthesis software and direct access to either G.E. 265, G.E. 420, or CDC 6400 data processors assures a fast and accurate response from our engineering staff.

PRODUCTION

We have developed an in house capability to build most of the components used in our filters . . . (Inductors, capacitors, crystals, transformers) all of which gives us better control and more flexibility in filter production.

TEST

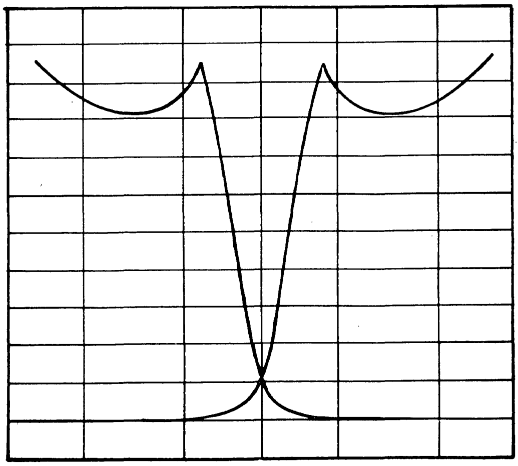


Our filter test instrumentation is the finest available in the frequency range up to 35 MHZ thus minimizing your risk in costly test correlation problems and rejected shipments. Naturally, all of our products are tested 100% prior to shipment.

L. C. CRYSTAL ACTIVE

WE SPECIALIZE IN PASSIVE NETWORKS IN THE FREQUENCY RANGE FROM DC TO 35 MHZ FOR:

- DATA MODEMS
- RF COMMUNICATIONS
- AVIONICS
- TELEGRAPH
- INSTRUMENTATION
- TELEMETRY



- BAND PASS
- BAND REJECT
- LOW PASS
- HIGH PASS
- LINEAR PHASE
- PHASE EQUALIZER
- AMPLITUDE EQUALIZER
- DELAY LINES
- FSK
- SINGLE SIDEBAND

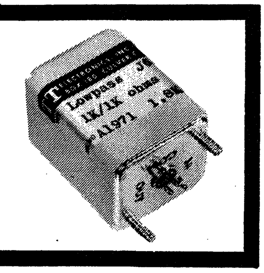
WE ALSO SPECIALIZE IN PACKAGING TO MEET YOUR REQUIREMENTS

Torotel filters and networks can be supplied in several basic configurations with any desired mounting and termination provisions. You may want to consider:

- Epoxy encapsulated or metal enclosed for pc board mounting.
- Metal enclosed or open pc board for card cage plug-in.
- Front panel plug-in.
- Chassis mount or chassis plug-in.

Call or write and let us know about your filter requirements. We also manufacture other frequency control devices—see separate listings in EEM Section 2300 for crystals, oscillators, etc.

TT *miniature* FILTERS



THESE PAGES CATALOG OVER 1,000,000 STANDARD FILTER TYPES — SPECIFY ANY COMBINATION OF FREQUENCY, SOURCE AND LOAD OHMS WITHIN THE MIN-MAX RANGES

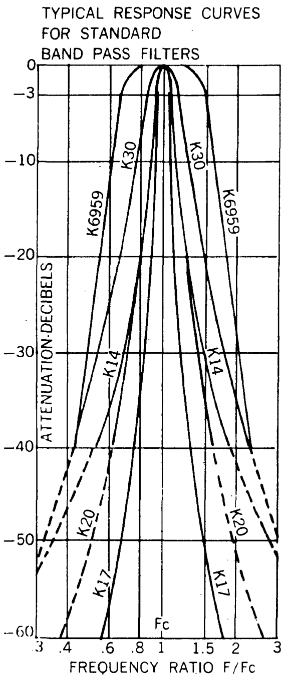
These pages give complete electrical, mechanical and price information for ordering standard filters. Quality control per MIL-Q-9858.

BANDPASS FILTERS FOR ANY CENTER FREQUENCY FROM 30Hz TO 5MHz (Specials from 10Hz upward)

Series	F_c Center Freq. Range Min.	Max.	Bandwidth at −3db	Attenuation	Source, Ohms Min.	Max.	Load, Ohms Min.	Max.	Case Size	Approx. Price
K10	500Hz	9.9KHz	±1%F_c	30db at .92F_c & 1.1F_c	1K	500K	1K	500K	4	$43
K11	10KHz	200KHz	±1%F_c		1K	10K	1K	10K	3	$43
K13	30Hz	99Hz	±5%F_c	60db at .5F_c & 2F_c	1K	500K	1K	500K	5	$60
K14A	100Hz	100KHz	±5%F_c	40db at .5F_c & 2F_c	500	10K	100	1Meg	3	$32
K14B	300Hz	999Hz	±5%F_c	35db at .5F_c & 2F_c	700	15K	700	15K	11	$39
K14C	1KHz	99KHz	±5%F_c	43db at .5F_c & 2F_c	1K	1K	1K	10K	10	$39
K14D	100KHz	5MHz	±5%F_c	43db at .5F_c & 2F_c	50	100	50	100	10	$44
K17	100Hz	10KHz	±5%F_c	60db at .5F_c & 2F_c	500	10K	100	1Meg	4	$43
K17A	300Hz	999Hz	±5%F_c	50db at .5F_c & 2F_c	500	15K	500	30K	12	$50
K17B	1KHz	99KHz	±5%F_c	50db at .5F_c & 2F_c	100	50K	100	100K	11	$50
K17C	100KHz	5MHz	±5%F_c	60db at .5F_c & 2F_c	50	300	50	300	11	$55
K18	10KHz	100KHz	±5%F_c	60db at .5F_c & 2F_c	100	100K	100	500K	3	$43
K20	100Hz	3.9KHz	±7.5%F_c	40db at .57F_c & 1.75$_c$	500	10K	500	10K	4	$50
K20A	250Hz	99KHz	±7.5%F_c	35db at .5F_c & 2F_c	1K	10K	1K	10K	10	$39
K20B	100KHz	5MHz	±7.5%F_c	40db at .67F_c & 1.5F_c	50	300	50	300	11	$55
K21A	4KHz	100KHz	±7.5%F_c	40db at .67F_c & 1.5F_c	500	10K	500	10K	3	$50
K30	100Hz	3.9KHz	±15%F_c	40db at .4F_c & 2.5F_c	500	10K	500	10K	4	$50
K30A	150Hz	99KHz	±15%F_c	25db at .45F_c & 2.2F_c	1K	10K	1K	10K	10	$39
K30B	100KHz	5MHz	±15%F_c	40db at .5F_c & 2F_c	50	300	50	300	11	$55
K31A	4KHz	100KHz	±15%F_c	40db at .5F_c & 2F_c	500	10K	500	10K	3	$50

The bandwidth for any of the above filters can be increased or decreased to specification.

WIDE BAND FILTERS: Bandwidths of ±16% or greater can be obtained by ordering T T standard High pass and Low pass filter sections as a composite network. Select numbers from the Series H and J listings on the next page which give the desired attenuation slopes and combine these numbers. For example to obtain a slope of 40db at 0.65 of the lower freq. cut-off, F_{c1}, (High pass section) and 40db at 1.6 of the upper freq. cut-off, F_{c2}, (Low pass section) use H69B and J59B. Specify the two as K6959. **The high pass series number is first, followed by the low pass number.** Types with dissymmetrical attenuation slopes can be combined. Also specify the three db down cut-off frequencies F_{c1} and F_{c2} and impedance. The price is the sum of the HP and LP section prices.



Telemetering: Refer to series K20, K21A, K30 or K31A. TO ORDER specify IRIG Channel number, source and load impedances.

TO ORDER BANDPASS FILTERS — Specify (1) T T Series No., (2) minus 3db frequencies, (3) source impedance, (4) load impedance.

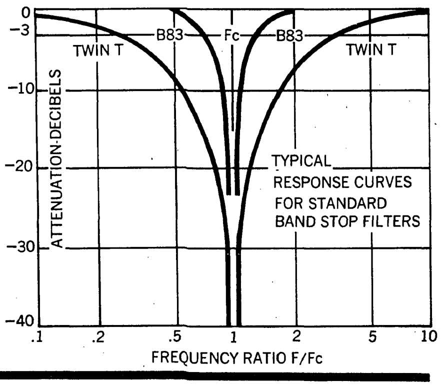
SPECIALS are available for center frequencies from 10Hz upward and 40db to 3db bandwidth ratios as sharp as 1.2:1.

TO ORDER Specials, specify (5) bandwidth and (6) stop band attenuation required in addition to the above data. Terminations are regarded as resistive unless otherwise specified.

BAND REJECT STANDARD FILTERS FOR ANY CENTER FREQUENCY FROM 10Hz TO 5MHz

Series	F_c, Center Freq. Range Min.	Max.	Bandwidth −3db	Attenuation	Impedance Ohms Min.	Max.	Circuit	Case No.	Approx. Price
B83	10Hz	100KHz	.77F_c & 1.3F_c	50 db Notch	600	1 Meg.	L-C	4	$33
D	10Hz	100KHz	.25F_c & 4 F_c	40 db Notch	SEE ORDERING INSTRUCTIONS BELOW		Twin-T	2	$15
E	10Hz	100KHz	.25F_c & 4 F_c	56 db Notch			Twin-T	2	$20
F	10Hz	100KHz	.25F_c & 4 F_c	60 db Notch			Twin-T	2	$30
R20	100Hz	3999Hz	3db Bandwidth to 40db Bandwidth Ratio = 5 or less		10K	50K	L-C	4	$39
R30	4KHz	5MHz			1K	10K	L-C	4	$39

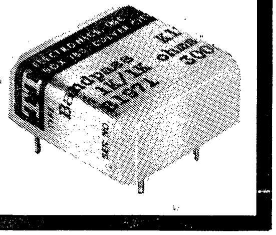
TO ORDER BAND REJECT FILTERS — Specify (1) T T Series No. or Letter, (2) center frequency, (3) source impedance, (4) load impedance. For Series R20 and R30 specify 40db bandwidth. Twin-T prices and cases apply to all filters using capacitor values from 0.1 MFD to 500 MMFD. $C = 1/8.85\, F_{Hz} (R_{source} R_{load})^{1/2}$. C is in farads. Filters with null frequencies as low as 1 Hz are available. Terminations are regarded as resistive unless otherwise specified.



TT ELECTRONICS INC.

P.O. BOX 180/CULVER CITY, CALIF. 90230/Phone (213) 870-6001

TT *miniature* FILTERS



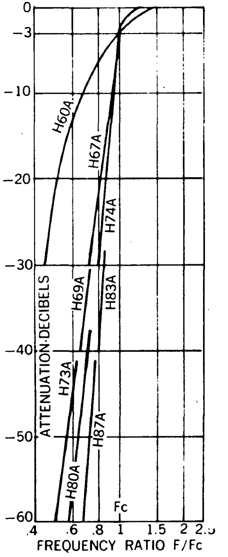
1-2 WEEK DELIVERY FOR STANDARD AND NEAR STANDARD TYPES — ALL GROUPS AVAILABLE IN FLAT PC MOUNTING CASES

HIGH PASS

STANDARD FILTERS FOR ANY CUT-OFF FREQ. FROM 75Hz TO 5MHz

Series	Min. Attn. db	Cut-off Ratio F/F$_c$	Approx. Price	Case Size
H60B	30	.45	$25	75-124Hz CASE 5 125-999Hz CASE 4 1-100KHz CASE 3 - or - 1-10KHz CASE 12 10KHz-5MHz CASE 11
H62B	40	.35	$25	
H64B	50	.25	$25	
H66B	60	.19	$25	
H67B	30	.72	$34	
H69B	40	.65	$34	
H71B	50	.56	$34	
H73B	60	.50	$34	
H74B	30	.79	$43	
H76B	40	.73	$43	
H78B	50	.67	$43	
H80B	60	.58	$43	
H81B	30	.83	$51	
H83B	40	.79	$51	
H85B	50	.73	$51	
H87B	60	.67	$51	

TYPICAL RESPONSE CURVES FOR STANDARD HIGH PASS FILTERS



SPECIALS: Special units available for cut-off frequencies down to 40Hz and above 5MHz.

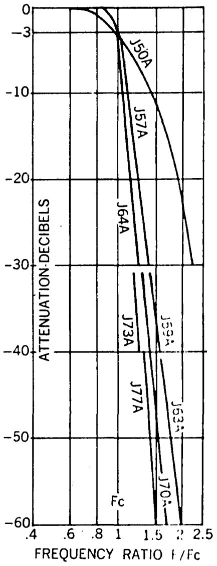
TO ORDER specify (1) T T Series No. (2) minus 3DB freq., (3) impedance, (4) Case No. See table below.

LOW PASS

STANDARD FILTERS FOR ANY CUT-OFF FREQ. FROM 75Hz TO 5MHz (*And from 10Hz to 74Hz)

Series	Min. Attn. db	Cut-off Ratio F/F$_c$	Approx. Price	Case Size
J50B	30	2.2	$25	75-999Hz CASE 4 1-100KHz CASE 3 - or - 1-10KHz CASE 12 10KHz-5MHz CASE 11
J52B	40	2.9	$25	
J54B	50	3.9	$25	
J56B	60	5.3	$25	
J57B	30	1.4	$34	
J59B	40	1.6	$34	
J61B	50	1.8	$34	
J63B	60	2.0	$34	
J64B	30	1.2	$43	
J66B	40	1.4	$43	
J68B	50	1.5	$43	
J70B	60	1.7	$43	
J71B	30	1.18	$51	
J73B	40	1.3	$51	
J75B	50	1.4	$51	
J77B	60	1.5	$51	
*J80B	40	2.0	$49	CASE 4

TYPICAL RESPONSE CURVES FOR STANDARD LOW PASS FILTERS



SPECIALS: Special units available for cut-off frequencies above 5MHz.

TO ORDER specify (1) T T Series No. (2) minus 3DB freq., (3) impedance, (4) Case No. See table below.

PHASE LINEARITY IS REASONABLE. SOME TYPES ARE USED FOR PULSE TRANSMISSION.

SOURCE AND LOAD impedances are equal and resistive for standard HP and LP filters. The insertion loss is less than 0.5db for ±10% matching. Typical Passband flatness within ±0.2db.

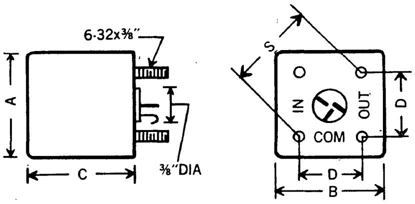
SPECIALS for other impedances and unequal terminations are available. Units with cut-off ratios as sharp as 1.06 (0.94 Highpass) are available.

IMPEDANCE GUIDE — HIGH PASS AND LOW PASS TYPES

Fc —3db	10Hz–50Hz	50Hz–100Hz	100Hz–500Hz	500Hz–5KHz	5KHz–10KHz	10KHz–100KHz	100KHz–500KHz	500KHz–1MHz	1MHz–5MHz
Z MinΩ	10K	10K	5K	1K	500	100	50	50	50
Z MaxΩ	15K	39K	39K	39K	20K	3K	3K	1K	300

CASE DIMENSIONS AND MOUNTING INFORMATION FOR ALL FILTERS

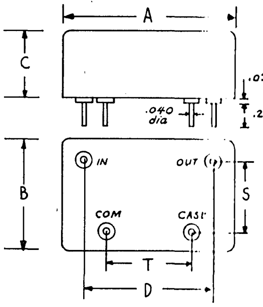
STANDARD CHASSIS TYPE



T T Filters are epoxy encased within hermetically sealed steel cases which reduce stray pickup. The maximum power output is 20 milliwatts for most types. K10 and K11 types are tested at 100MV and B83 types at .77V output for all impedance levels.

CASE	A	B	C	D	S	T	Mounting
STANDARD CHASSIS TYPE							
1	.75	.75	1.38	—	.56	—	(2)4-40 x ⅜
2	1.19	1.19	1.25	.75	—	—	(4)6-32 x ⅜
3	1.31	1.31	1.75	—	1.25	—	(2)6-32 x ⅜
4	1.63	1.63	2.38	1.19	—	—	(4)6-32 x ⅜
5	1.94	1.81	2.44	1.38/ 1.25	—	—	(4)6-32 x ⅜
FLAT PC BOARD TYPE							
10	1.27	1.27	.50	.90	.90	.60	PC PINS
11	1.88	1.44	.50	1.5	1.0	1.0	PC PINS
12	2.00	2.00	.50	1.5	1.5	1.0	PC PINS

FLAT CASES PC BOARD TYPE



TT COVERS THE RANGE —

VLF-LF-MF-HF-VHF

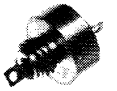
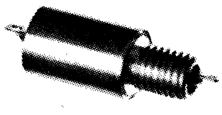
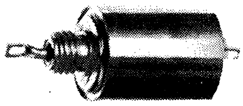
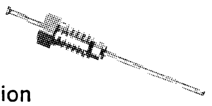
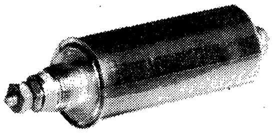
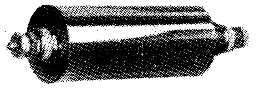
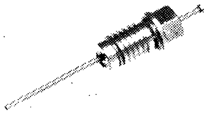
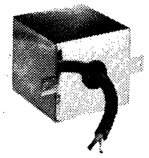
TT ELECTRONICS

INC./P.O. BOX 180/CULVER CITY, CALIF. 90230/Phone (213) 870-6001

EMI/RFI FILTERS

USCC

CENTRALAB
Electronics Division
GLOBE-UNION INC.

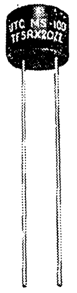
SERIES	DESCRIPTION	
"BUTTON" 1020 and 1021 SERIES	Epoxy or hermetically sealed 50 VDC, 15 amps L section.	
MINIATURE 1000 and 2000 SERIES	50, 100, 200, 300 VDC and 115 VAC 0-400 Hz .06 to 10 amps Pi, L and T sections .187" or .312" thread lengths.	
MINIATURE 2400 SERIES	230 VAC 0-400 Hz .1 to 10 amps Pi, L and T sections	
SUBMINIATURE 3000 SERIES	3112: 100 VDC, 10 amps, L section 3223: 200 VDC, 10 amps, Pi section 3300: 50, 100, and 200 VDC, 10 amps, Pi and Multi-sections 3500: 100, 200 and 500 VDC, 25 amps, Pi section	
GENERAL PURPOSE 5000 SERIES	200, 400 and 600 VDC 115 and 200 VAC 0-400 Hz .5 to 20 amps	
FOR DATA PROCESSING EQUIPMENT 8000 SERIES	120 and 240 VAC 0-60 Hz 1 to 50 amps 20 to 60 db insertion loss at 150 KHz	
FEEDTHRU FILTER/CAPACITORS 9000 SERIES	50, 100 and 200 VDC 10 and 25 amps 1,000 pF to 1.5 Mfd	
SPECIAL/CUSTOM SERIES	Utilizing ceramic or layer wound capacitors; single or multi-circuit units; contact USCC/CENTRALAB, Engineering Department	

©Copyright 1971, U. S. Capacitor Corporation

See Volume III, Section 1500 for USCC/CENTRALAB Ceramic Capacitors

FILTERS AND INDUCTORS

MS* MINIATURE TOROIDAL HIGH Q INDUCTORS



PHYSICAL CHARACTERISTICS

UTC's new MS series of high Q coils are only .23″ high x .35″ diameter. The low profile makes them ideal for high-density packaging requirements. All coils are molded in black epoxy.

Base diameter (.35″) and lead spacing (.2″) fall within TO-5 envelope dimensions.

Leads are .025″ diameter gold-plated dumet, type D per MIL-STD-1276, and are both weldable and solderable.

Q CHARACTERISTICS

Excellent Q in the 10 kHz to 50 kHz range, matching and often excelling the performance of much larger units. Designed for application over the wider range of 1 kHz to 100 kHz. See Q Response Curve.

MIL SPECIFICATIONS

All units have been designed, manufactured and successfully tested to complete MIL-27C environmental requirements. MIL Type TF5RX20ZZ.

TOLERANCE AND TEMPERATURE STABILITY

MS units have an inductance tolerance of ±2% at 0.1V RMS, 1 kHz, 0 DC, 25°C. All have excellent inductance stability with temperature: less than ±2% from −55°C to +105°C.

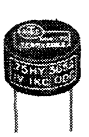
MS UNIT WEIGHT 1.3 GM

Stock Type No.	Ind. Mhy (0 DC)	ma DC Max.*	DCR Ω Max.	Stock Type No.	Ind. Mhy (0 DC)	ma DC Max.*	DCR Ω Max.
MS-1	1	60	1.4	MS-25	25	13	38
MS-5	5	28	7	MS-50	50	9	75
MS-10	10	20	11	MS-100	100	6	132

*The maDC shown is for approximately 5% drop in inductance.

HIGH Q COILS *Designed, Manufactured and Successfully Tested to Complete MIL-T-27C Specifications.*

MINIDUCTORS*



All these ultracompact high Q units are grade 5, hermetically sealed to (MIL-T-27C). Temperature stability rated from ±1% to ±3%, −55°C to +105°C, depending on series.

MM — Ultraminiature epoxy molded toroidal inductors with pin terminals for printed circuit application. Maximum Q at 30 kHz. 7/16″ dia. x ¼″; wt. .07 oz.

MH — Ultraminiature epoxy molded toroidal inductors similar to MM except maximum Q at 100 kHz. Size and wt. as MM.

ML — Ultraminiature hipermalloy cased inductors with epoxy board and pin terminals for printed circuit application. Maximum Q at 800 Hz to 2 kHz, depending on inductance. 7/16″ x 31/64″ x 9/16″; wt. .2 oz.

MO — Miniature epoxy molded inductors with pin terminals for printed circuit application. Maximum Q at 600 Hz to 1500 Hz depending on inductance. ¾″ x 1 1/16″ x 13/16″; wt. 1 oz.

MW — Miniature epoxy molded toroidal inductors with pin terminals for printed circuit application. Maximum Q at 5 to 10 kHz. 23/32 dia. x 13/32″; wt. .25 oz.

UTC Type	Induct., Hys.	UTC Type	Induct., Hys.	UTC Type	Induct., Hys.
ML-0	.15	MM-6	.03	MO-2	2
ML-1	.25	MM-7	.06	MO-5	5
ML-2	.40	MM-8	.12	MO-7.5	7.5
ML-3	.70	MH-1	.0006	MO-20	20
ML-4	1.4	MH-2	.0015	MO-50	50
ML-5	2.5	MH-3	.0025	MO-100	100
ML-6	4.0	MH-4	.006	MW-.05	.05
ML-7	6.0	MH-5	.01	MW-.10	.10
ML-8	10	MH-6	.015	MW-.25	.25
ML-9	25	MH-7	.025	MW-.5	.5
ML-10	60	MH-8	.04	MW-.75	.75
MM-1	.003	MO-.1	.1	MW-1	1
MM-2	.005	MO-.15	.15	MW-1.2	1.2
MM-3	.008	MO-.3	.3	MW-2	2
MM-4	.0125	MO-.5	.5	MW-3	3
MM-5	.02	MO-1	1	MW-5	5

ELECTRIC WAVE FILTERS Designed, Manufactured and Successfully Tested to Complete MIL-F-18327C Specifications.

INTERSTAGE AND LINE FILTERS

Available in stock frequencies listed below (numerical part of type—number is center and cutoff frequency in Hz). Compact shielded cases hermetically sealed to MIL-F-18327C specs. BMI, LMI, BML cases: 1 3/16″ x 1 11/16″ x 1⅝″ h.; wt., 6 oz. BMI-30 & 50, LMI-50 & 100, case ht. 2½″, wt. 9 oz. HMI, HML, LML cases: 1 3/16″ x 1 11/16″ x 2½″ h.; wt., 9 oz. The BMI filters are band pass interstage units designed to operate between a vacuum tube plate (or 10,000 ohms) and a grid. They provide a gain of 2 at center frequency.

BTI units are same as BMI, but 10,000 ohms output.

BML band pass filters, similarly, work into a grid, but have an input impedance of 500/600 ohms. They provide a gain of 9.

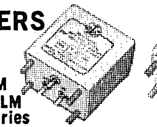
HMI filters are high pass interstage units, with 10K ohm source and load.

LMI filters are low pass interstage units, with 10K ohm source and load.

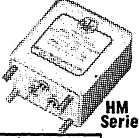
HML filters are high pass with input and output impedance of 500/600 ohms.

LML filters are low pass filters with input and output impedance of 500/600 ohms.

LLP low frequency low pass filter, loss of less than 40 db at 20 Hz. We have 2 LLP types @ 10 Hz & 15 Hz. Source and load 100K ohms.



BM & LM Series



HM Series

UTC Type	UTC Type	UTC Type
BMI-30	BML-1000	LMI-200
BMI-50	BTI-60	LMI-400
BMI-60	BTI-100	LMI-500
BMI-90	BTI-120	LMI-800
BMI-100	HMI-50	LMI-1000
BMI-120	HMI-100	LMI-1500
BMI-150	HMI-200	LMI-2000
BMI-200	HMI-300	LMI-2500
BMI-240	HMI-400	LMI-3000
BMI-300	HMI-500	LMI-4000
BMI-400	HMI-800	LMI-5000
BMI-500	HMI-1000	LMI-10000
BMI-750	HMI-2000	LML-500
BMI-800	HMI-3000	LML-1000
BMI-1000	HML-40	LML-1500
BMI-1500	HML-200	LML-2000
BMI-2000	HML-300	LML-2500
BMI-3000	HML-500	LML-3000
BMI-4000	HML-1000	LML-4000
BMI-5000	LMI-50	LML-8000
BMI-10000	LMI-100	LML-10000
BML-400	LMI-150	LML-12000

MINIFILTERS*

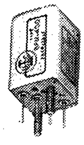
These units provide almost the same characteristics as the standard interstage units listed to the left, although extremely miniaturized. Hermetically sealed to MIL-F-18327C specs. B type case: ¾″ x ¾″ x 1⅛″ h.; wt., 1 oz. H and L cases: 1″ x 1″ x 1⅜″ h.; wt., 2¼ oz. Cutoff frequencies in Hz indicated by type number.

BPM units (Band Pass) have 2:1 gain. Attenuation is approximately 2 db ±3% from center frequency, and 35 db per octave as shown. Input 10,000 ohms, output to grid, tapped for 10,000 ohms to provide for transistor circuits. For tube circuits continuity is on grid side, for transistor use continuity is on input side.

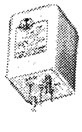
BPH units (Band Pass) attenuation less than 3 db ±5% from center frequency, and 40 db per octave. Source and load 500 ohms.

HPM units (High Pass) are down less than 6 db at cutoff frequency, and more than 30 db at .67 cutoff frequency, 40 db at .6 cutoff frequency. Input and output 10,000 ohms.

LPM units (Low Pass) are down less than 6 db at cutoff frequency, and more than 30 db at 1.5 cutoff frequency, 40 db at 1.65 cutoff frequency. Input and output 10,000 ohms.



BPM Series



HPM & LPM Series

UTC Type	UTC Type	UTC Type
BPH-50000	BPM-2500	HPM-1500
BPH-100000	BPM-3000	HPM-4000
BPM-400	BPM-3200	LPM-200
BPM-440		LPM-300
BPM-500	BPM-4000	LPM-500
BPM-600	BPM-4800	LPM-1000
BPM-750	BPM-5000	LPM-1500
BPM-800	BPM-6000	LPM-2000
BPM-1000	BPM-6400	LPM-3000
BPM-1200	BPM-8000	LPM-5000
BPM-1500	BPM-10000	LPM-6000
BPM-1600	BPM-20000	LPM-8000
BPM-1800	HPM-500	LPM-10000
BPM-2000	HPM-1000	LPM-15000

UNITED TRANSFORMER DIVISION TRW

150 VARICK ST., NEW YORK, N.Y. 10013 • (212) 255-3500 • TWX 710-581-2722

VARI-L CO., INC. / 3883 MONACO PARKWAY/DENVER, COLORADO 80207
TELEPHONE: (303) 321-1511/TWX 910•931•0590

Z-MATCH

VOLTAGE TUNED FILTER

For these (and many other) applications:

- Electrically tuned receivers — no moving parts — remotely tuned;
- Control of filter function by computer;
- Tracking filter for frequency synthesizers and other high distortion sources;
- I.F. Amplifiers with multiple frequencies;
- Phase modulators
- Tunable frequency discriminators;
- Swept receivers for surveillance and intercept;
- Channel selection in receivers and transceivers — ganged to transmitter channel selector;
- Carrier locked receivers for frequency agility.

Vari-L Company, Inc. has applied 18 years' experience in manufacturing of solid-state tuning devices to the often expressed need for a line of high quality, medium cost voltage-tuned filters and is pleased to announce the VTF series (Voltage-Tuned or Varacter-Tuned Filter) described below.

The Vari-L VTF line of filters features the following characteristics: 1. Constant bandwidth (in MHz) and constant insertion loss (output flat to within .25 dB) over the full tuning range. 2. Voltage tuning; no power drain. 3. No hysteresis; high tuning speed; sweepability. 4. Very low VSWR-input and output. 5. Low intermodulation distortion. 6. High power handling. 7. Compact; rugged; insensitive to mechanical shock and vibration. 8. Remotely tunable; programmable; adapted to closed loop operation. 9. Symmetrical passband; true Butterworth "textbook" performance. Request Bulletin #107 for specifications.

TYPES AVAILABLE FROM STOCK

MODEL	TUNING RANGE (MHz)	BANDWIDTH (MHz)	TUNING VOLTAGE (Vdc)	PRICE 1-9	CASE NUMBER
VTF-1.5M	1.5-3.0	.210	1-55	$381.	CD-1
VTF-3M	3.0-6.0	.4	1-55	$347.	CD-1
VTF-6M	6.0-12	.75	1-55	$313.	CD-1
VTF-12M	12-25	1.5	1-55	$279.	CD-1
VTF-25M	25-50	3.3	1-55	$245.	CD-1
VTF-50M	50-100	6	1-55	$225.	CD-2
VTF-100M	100-200	12	1-55	$245.	CD-2
VTF-200M	200-400	25	1-55	$296.	CD-3
VTF-400M	400-800	50	1-55	$347.	CD-3
VTF-800M	800-1400	100	3-55	$398.	CD-4
VTF-1.4G	1400-2400	220	3-55	$450.	CD-4
VTF-2G	2000-2500	180	3-55	$467.	CD-4

SPECIAL WIDEBAND PRODUCTS

The engineering staff which has developed the components shown in this catalog has a diversified knowledge of wide band and other RF components for applications from VLF up into the microwave region. We have made two, four, and eight way power dividers, directional couplers, special antenna couplers, hybrid junctions, and numerous other custom devices to solve difficult circuit problems. We invite your inquiry and will give it prompt and careful attention. A competent technical person is always available for consultation by telephone or visit to your plant.

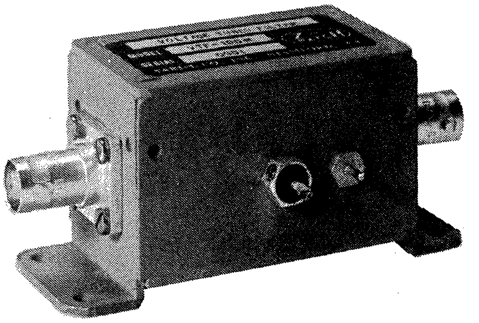


Fig. 12 VTF Filter (Case No. CD-2)

OUTLINE DRAWING

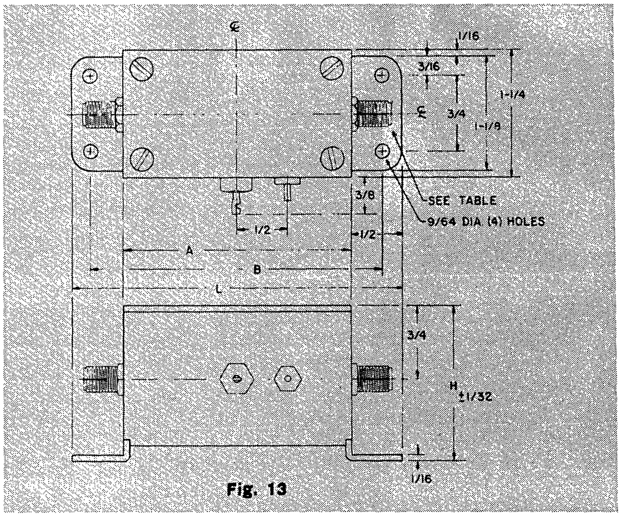


Fig. 13

DIMENSION TABLE					
CASE No.	A DIM.	B DIM.	L DIM.	H DIM.	CONNECTORS
CD-1	3-3/8	4	4-3/8	1-23/32	BNC
CD-2	2-1/4	2-7/8	3-1/4	1-15/32	BNC
CD-3	2-1/4	2-7/8	3-1/4	1-15/32	SMA
CD-4	1-5/8	2-1/4	2-5/8	1-15/32	SMA

NORMALIZED FREQUENCY vs. VOLTAGE FOR OCTIVE RANGE VTF FILTERS

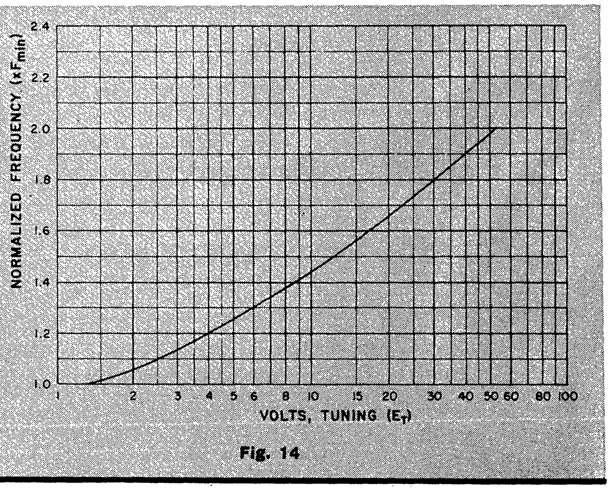


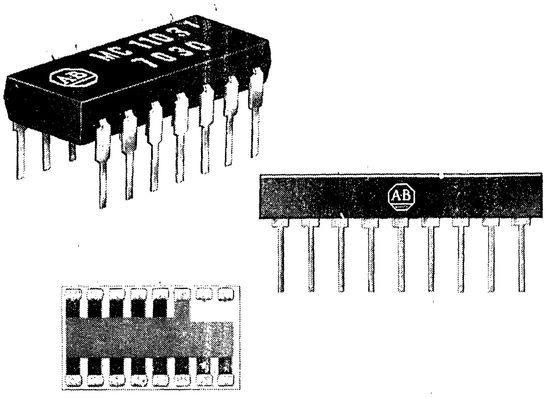
Fig. 14

ALLEN-BRADLEY
Milwaukee, Wisconsin 53204

Cermet Resistor Networks

Allen-Bradley, the leader in quality composition resistive materials, has been producing cermet resistive elements for many years. They are much more compact than networks made of individual matched resistors. Applications include IC logic circuit terminators, pull-up and pull-down resistor arrays, attenuator circuits, voltage dividers or for any job requiring resistors with excellent characteristics and small size. Allen-Bradley cermet networks are available in molded dual in-line or single in-line packages compatible with automatic insertion machines. Tolerances to ±0.5% and temperature coefficients of resistance as low as ±150 ppm/°C. High purity alumina substrates, specially formulated inks and stringent quality assurance procedures insure repeatability. Resistors and capacitors can be joined in same package to provide R-C combinations.

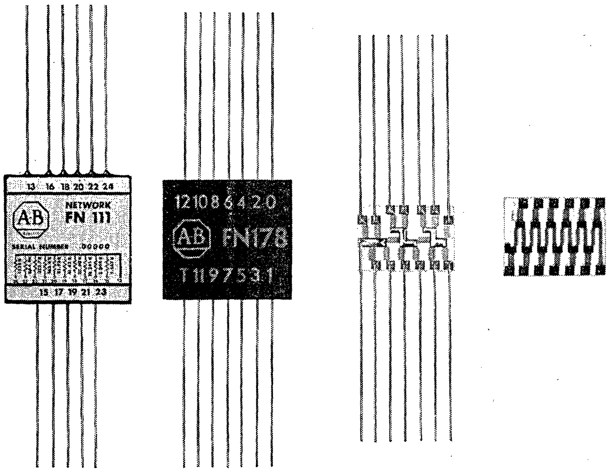
For more information, write for Bulletin 5850.



Precision Thin Film Resistor Networks

Integrated films of chromium cobalt are vacuum deposited on specially selected substrates to make Allen-Bradley precision thin film resistor networks. All resistors are deposited simultaneously. Resistance change due to temperature (TCR) is very low and uniform across the entire substrate (TCR tracking). All interconnections are metal film (no solder or welded joints). Networks available in packaged or unencapsulated forms with or without leads or conformal coating. Absolute tolerances as low as ± 0.01% @ 25°C over the standard resistance range. Standard TCR ± 25 ppm/°C, TCR tracking ± 5 ppm/°C. Applications include any precision electronic equipment requiring close tolerances and/or low temperature coefficient resistors.

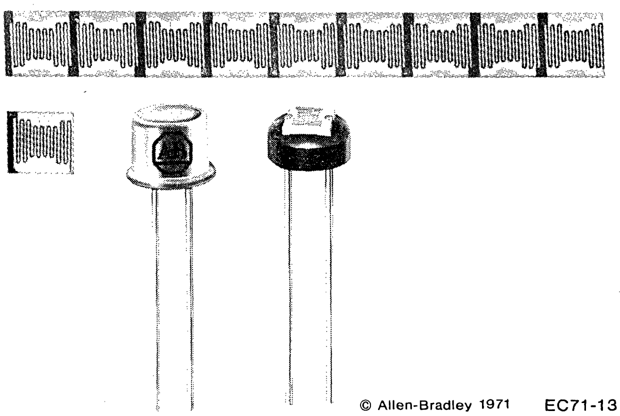
For more information, write for Bulletin 5801.



CdS and CdSSe Photoconductors

Allen-Bradley introduces a new line of cadmium sulfide and cadmium sulfo-selenide photodetectors. These photocells may be produced individually or as part of complex arrays. Three basic materials provide peak spectral responses of 515, 575 and 625 nanometers. On resistance is 1000, 3000 and 7000 ohms at 10 foot-candles. Static dark resistance typically above 100 megohms. Voltage ratings 75 or 100 VDC from —55 to +85°C, standard. Power dissipation typically 75 milliwatts. Standard and custom units available.

For more information, write for Bulletin 5910.



© Allen-Bradley 1971 EC71-13

Plug into AUGAT

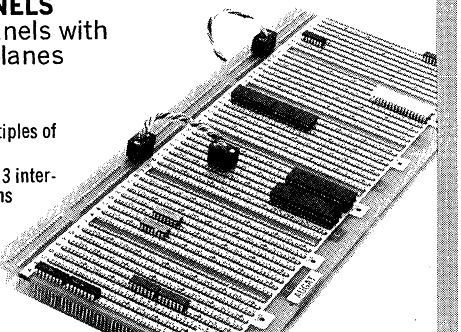
Where new concepts in IC handling originate

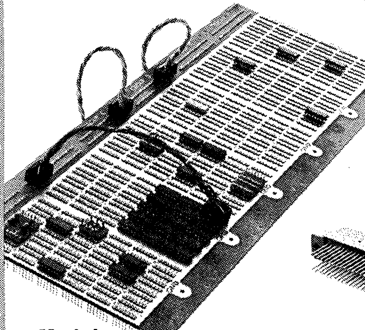
IC PACKAGING PANELS

Wire wrap socket panels with power and ground planes

Universal

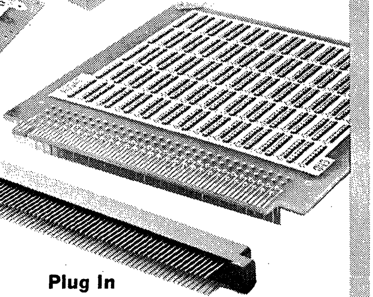
- Modular construction. In multiples of nine rows up to 54
- Each nine row section accepts 3 interfacing plugs for I-O connections
- Accepts any combination of 14, 16, 18, 24, 36 and 40 lead DIP ICs





Modular

- Multiple of 30 patterns up to 180
- Each 30 pattern section accepts 3 interfacing plugs for I-O connections
- Accepts 14 and 16 lead DIP ICs

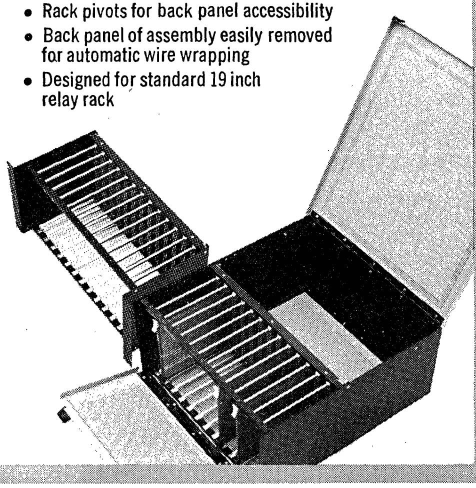


Plug In

- 60 patterns standard
- Edge connector take-off Connector supplied separately
- Accepts 14 and 16 lead DIP ICs

Enclosure and Rack Assembly

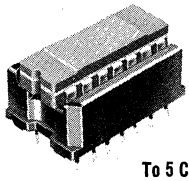
- Rack pivots for back panel accessibility
- Back panel of assembly easily removed for automatic wire wrapping
- Designed for standard 19 inch relay rack

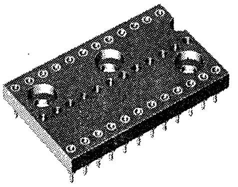


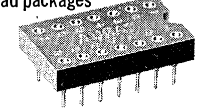
SOCKETS AND PLUG ACCESSORIES

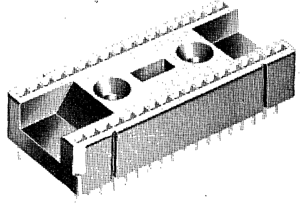
Low Profile Sockets

- PC and wire wrapping style
- For 14, 16, 18, 24, 36 and 40 lead packages
- Accepts all round and flat lead packages



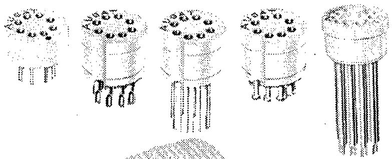






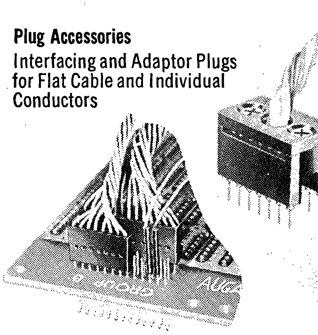
To 5 Case Size Sockets

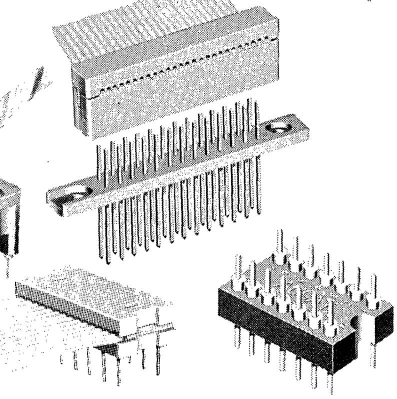
- 6, 8, 10 and 12 contact arrangements



Plug Accessories

Interfacing and Adaptor Plugs for Flat Cable and Individual Conductors

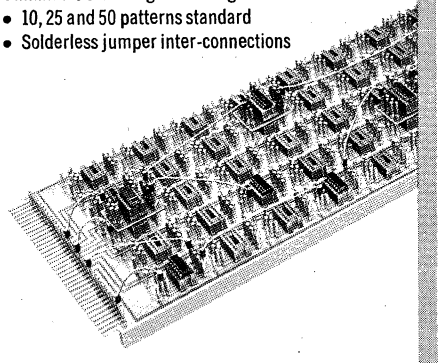




Breadboard and Test Panels

Eliminates soldering or welding IC leads

- 10, 25 and 50 patterns standard
- Solderless jumper inter-connections



Other AUGAT Products:

- Transistor Sockets
- Crystal Sockets
- Relay Sockets
- Lead Sockets
- Test Jackets
- Heat Sinks
- Component Holders
- Clamps
- Battery Holders

AUGAT INC.

Write for Complete IC Folder

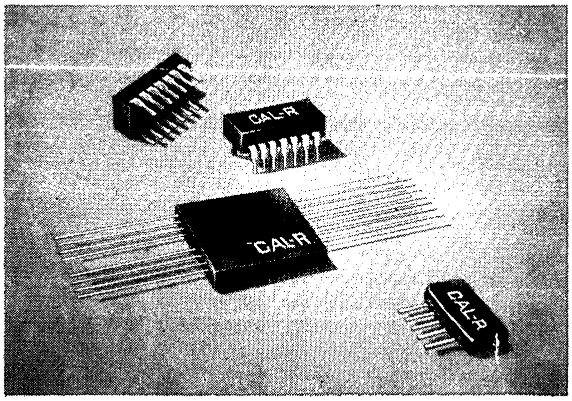
36 Perry Ave., Attleboro, Mass. 02703
Tel: 617/222-2202

CAL-R® HYBRID MICROELECTRONICS DIVISION

PRECISION THICK FILM PASSIVE NETWORKS

CAL-R Thick Film Passive Systems offer a wide variety of dual-in-line packages, single-in-line packages and flat packs including: Digital to Analog/A-D Binary Ladders (through 12-bits), BCD Bipolar Ladders and Precision Resistor Networks.

CAL-R thick film resistor compositions fused to a high purity 96% aluminum substrate insure low thermal gradients, high thermal stability and matched electrical characteristics.



ELECTRICAL SPECIFICATIONS

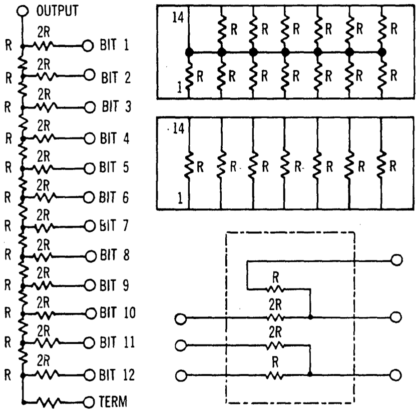
CHARACTERISTICS	DUAL and SINGLE IN-LINE AND FLATPACK RESISTOR NETWORKS	LADDER NETWORKS
Resistance Range	10 ohms to 1 megohm	10 ohms to 500K ohms
Temperature Coefficient	±150 PPM/°C	±50 PPM/°C
Tracking to:	15 PPM/°C	5 PPM/°C

GENERAL SPECIFICATIONS

Operating Temperature Range: −55°C to +125°C
Storage Temperature Range: −65°C to +150°C
Stability To: 25 PPM/year
Settling To: 50 nSec.
Fast Rise Time
Minimum size for maximum efficiency and quality.

All networks are 100% inspected to applicable requirements (MIL-Specs or inhouse).

All networks meet or exceed the performance requirements of MIL-R-1059F when applicable, including the following:
Short Time Overload: (MIL-R-10509F par. 4.6.6, 2.5x rated).
Temperature Cycling: (MIL-R-10509F par. 4.6.4).
Thermal Shock: (MIL-STD-202C, Method 107B, Condition B).
Resistance to Solder Heat:
(MIL-STD-202C, Method 210, Condition B).
Vibration: (MIL-R-10509F par. 4.6.16).



CERMET CHIP RESISTORS

CAL-R chip resistors are designed for use in thick/thin film hybrid applications. Ideally suited where small size, high stability and superior performance are required.

SPECIFICATIONS

Electrical

Resistance Range: 10 ohms to 5.6 megohms
Tolerance:
1% (F), 2% (G), 5% (J), 10% (K) standard and 20% (M)
Power Rating: 100 Milliwatts CR1,
200 Milliwatts CR2 and 250 Milliwatts CR3
Short Time Overload: Less than 0.50% △ R
Temperature Coefficient of Resistance:
±300 PPM/°C, ±150 PPM/°C standard,
±50 PPM/°C available through .56 megohms as measured from −55°C to +125°C with 25°C as reference.

Mechanical

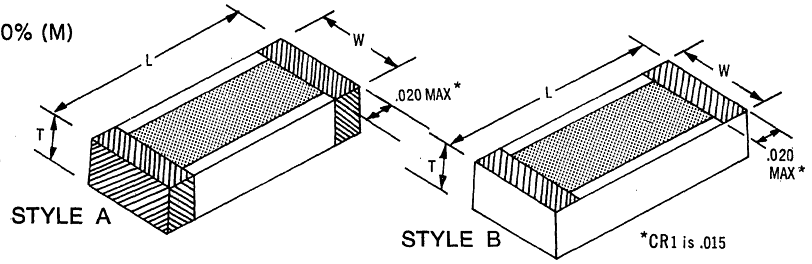
Configuration: Please refer to diagrams
Construction: 96% Alumina substrate with propriety CAL-R Cermet resistance element
Terminations: Palladium silver is standard for Style A.
Platinum gold is standard for Style B.
Other terminations as well as gold backing available.

Environmental

Operating Temperature: −55°C to +125°C
Moisture Resistance: Less than 1% change when tested per method 106 of MIL-STD-202
Life: Less than 1% change when tested per method 108D (+85°C) of MIL-STD-202

CAL-R CHIP RESISTOR DIMENSIONS

Size	Length (L) ±.005	Width (W) ±.005	Thickness (T) ±.003
CR1	.050	.040	.012
CR2	.075	.050	.016
CR3	.10	.050	.016



*CR1 is .015

TERMINATION MATERIAL

A Palladium Silver	B Platinum Gold

CAL-R CHIP RESISTOR NUMBERING SYSTEM

Size	Termination		Value (ohms)	Tolerance	TCR
	Style	Material			
CR1	A	A	1K	±10%	150

(Typ. Part Number)

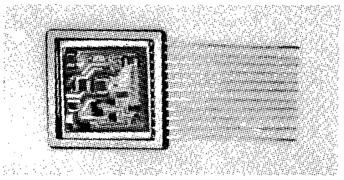
CTS CORPORATION ELKHART, INDIANA HYBRID CIRCUITS

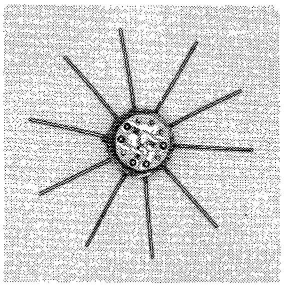
CIRCUITRY TO SPECIFICATION

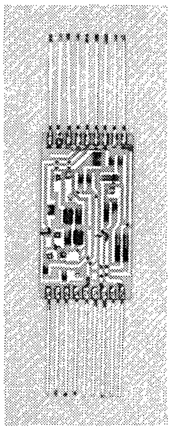
Over ten years of CTS cermet circuitry experience are concentrated in a 65,000 square foot facility in West Lafayette, Indiana, devoted to the manufacture of cermet passive and active circuits.

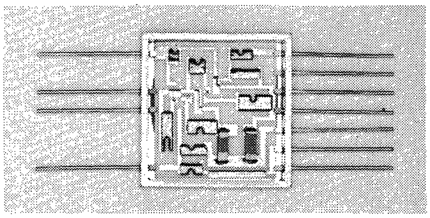
Cermet microelectronics offers many design possibilities to the forward-thinking engineer. Words such as high power, extremely low power, high frequency, precision, miniature size, low noise, and high reliability are all used to describe this concept. Another word "flexibility" should also be included. This is the key to the success of the CTS cermet microelectronics system. In order to provide the customer with an approach most consistent with his application, CTS offers both prototype and production facilities, several construction techniques, numerous packaging methods, three levels of quality control, and reliability data to demonstrate product performance under the environmental conditions you specify.

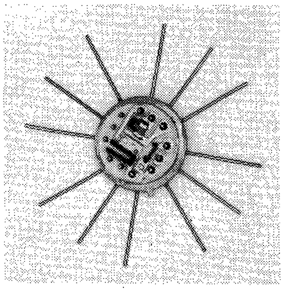
In order to achieve the best product for the lowest cost, CTS offers the flexibility required to optimize each application. Careful analysis of each requirement by our design engineering, production, and quality control personnel enables us to recommend the best product design consistent with your requirements.

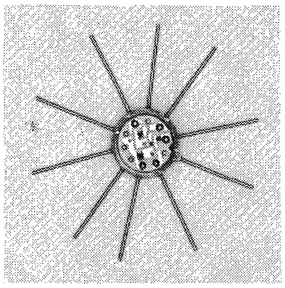


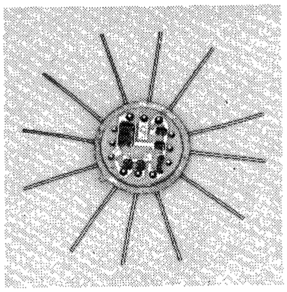


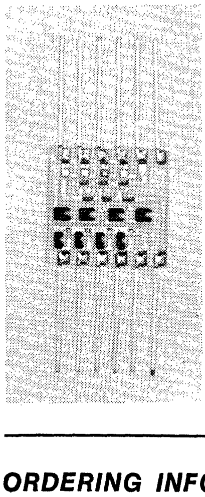


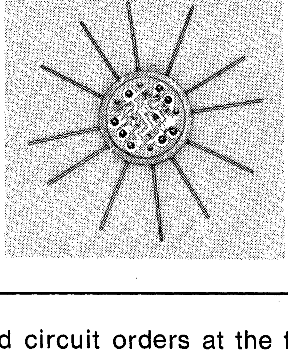


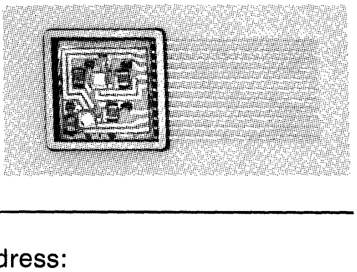












ORDERING INFORMATION: Place hybrid circuit orders at the following address:

CTS Microelectronics, Inc., P.O. Box 1278, Lafayette, Indiana 47902 • Telephone 317-463-2565 • TWX 810-342-1882

DALE®

for Optimum Value in Packaged Networks

THICK FILM MICROCIRCUITS

FEATURES

- Custom design allows you to specify design tolerance, packaging, environmental requirements.
- Engineering assistance for production design.
- Specialists in design of networks for high power dissipation.
- Standard dual in-line packaging or modular packaging with screened silicone coating and choice of lead types.
- Wide choice of pre-conditioning options.

ELECTRICAL CAPABILITIES*

Resistors

Tolerance: As required down to 1/2%
Matching Resistance Ratio: ±0.1%
Temperature Coefficient: ±50-250 PPM/°C
T.C. Tracking: 25 PPM
Resistivity: 10 ohms to 1 Meg./sq.
Resistance: 1 ohm up
Voltage Coefficient: <5 PPM/V
Noise: As low as 25db
Stability: 1%/yr.
Power Dissipation: 20 w/in.^{2} of resistor area or 2 watts/in.^{2} of ceramic

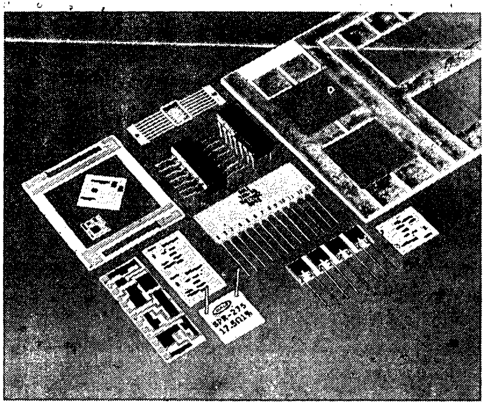
Capacitors

Tolerance: ± 5% **Voltage:** 3 VDC-100VDC **Capacitance:** 10 pf - 100 mfd

PHYSICAL

Capacitors: Screened, Tantalum, Ceramic
Substrates: Alumina, Beryllia
Terminations: Wire Leads, Ribbon Leads or Solder Pads
Conductors and Land Areas: Platinum Gold, Palladium Gold, Gold or Silver.
Crossovers: As required
Packaging: Dual in-line, Module, as required
Coating: Screened Silicone, as required

*For tighter parameters, contact Microcircuit Department.

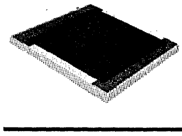


PRECONDITIONING OPTIONS

- Power Aging
- Temperature Cycling
- Temperature & Power
- Temperature Aging
- Short Time Overload
- Thermal Shock
- X-Ray
- Noise
- GARD

To obtain prototypes for your circuit... contact your Dale representative or phone or write Dale at the address below. Dale's Microcircuit Department is geared to assist you with every phase of design—providing the shortest possible leadtime between concept and production ready component.

THICK FILM CHIP RESISTOR



Resistance Range: 100Ω to 300K. 10Ω to 5 Meg. by special order
Tolerance: ±20%, ±10%, ±5%, ±2%, ±1%
Temp. Coefficient: ±200 PPM (−55° C to +150° C) +25° C Reference
Load Life: 1% ΔR, 1000 hours at 80° C
Humidity: 1% ΔR per MIL-STD-202C
Temp. Cycling: −55° C to +150° C, ±0.5% ΔR
Operating Voltage: 100 VDC maximum

PHYSICAL	SIZE CODE	POWER RATING
.050 x .050	550	75mw
.050 x .075	575	100mw
.050 x .100	5100	150mw
.050 x .150	5150	300mw

WIREWOUND and FILM PACKAGED NETWORKS

FEATURES

- Choice of linear wirewound, bobbin wirewound, metal film, carbon film or cermet elements
- Less components to stock or handle
- Reduced inspection time
- Ease of assembly
- Matched resistors cannot be mixed or lost
- Complete environmental protection
- Dale networks meet or exceed requirements of MIL-R-26, MIL-R-93 or MIL-R-10509, depending on type of element used
- Packaged to meet your requirements

GENERAL RESISTOR ELECTRICAL CAPABILITIES

	WIREWOUND	FILM (Carbon & Metal)
Power Rating	.1 to 10 W	.02 to .5 W
Resistance Range	1 ohm to 1.5 Meg.	5 ohms to 5 Meg.
Tolerance	.02% to 1%	.1% to 1%
Tolerance Match	.005%	.05%
Temp. Coefficient	5 PPM/°C from 0° C to +75° C	25 PPM/° C
Temp. Coefficient Match	2 PPM/° C from 0° C to +75° C	7 PPM/° C
Resistance Stability	.005%/yr.	.03%/yr.
Operating Temp.	−65° C to +145° C	−55° C to +175° C

LADDER NETWORKS

- **Output Accuracy:** ± .05% full scale accuracy or ± 1/2 least significant bit, whichever is less.
- **Output Variation with Temp.:** ± .1% full scale accuracy or ± 1 least significant bit, whichever is less.
- **Operating Temp. Range** (For Accuracies Specified Above): −55° C to +70° C (Film Type) −55° C to +125° C (Wirewound Type).
- **Input Resistance** (All inputs connected): 1KΩ to 500KΩ
- **Output Resistance** (All inputs grounded): 250Ω to 125KΩ
- **Insulation Resistance:** 100 Megohms minimum.
- **Terminals:** Solderable or weldable wire leads.
- **Packaging:** Epoxy or Silicone resin potting. Transfer molded, Can be encapsulated. Other types of special packaging available to meet your requirements.

BINARY DIGITAL-TO-ANALOG LADDER NETWORKS

Resistor Parameters for meeting 4 and 8 bit dimensional requirements

	WIREWOUND	FILM
Power Rating	1/8 watt from −55° C to +125° C, derated linearly to 0 at +145° C	1/2 watt from −55° C to +70° C, derated linearly to 0 at +145° C.
Temp. Coefficient	0 ±20 PPM/° C from −55° C to +125° C. Lower T.C.'s available upon request	400 PPM/° C max. T. C.'s available down to 25 PPM/° C
Heat Rise	20° C max. at rated power	60° C max. at rated power

DALE ELECTRONICS, INC., P.O. Box 609 • COLUMBUS, NEBRASKA 68601 • PHONE: 402-564-3131 • TWX: 910-626-8314

HUGHES

HUGHES AIRCRAFT COMPANY
MOS DIVISION

HUGHES TOMORROW

On these two pages you'll find some of the most advanced MOS circuits made. You'll also find they're available off the shelf. Through direct OEM or distributor inventory. The line is more extensive and there's more to choose from:

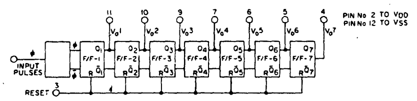
1. More custom devices. 2. More LSI devices. 3. More standard catalog LSI and MSI products.

There's lots here. But just in case you can't find what you want, our sales people can probably get it to you. So call us.

COMPLEMENTARY MOS INTEGRATED CIRCUITS

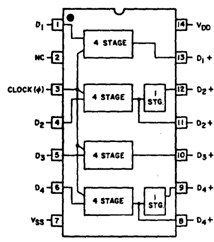
Monolithic medium scale integrated logic circuits. Operating single positive or negative power supply, 6-15 volts. Operating speed to 2 MHz with 10 volts. High noise immunity. High input impedance. Low power dissipation. 14 and 16 pin dual inline package.

HCOS4000D	Dual 3-Input NOR Gate Plus Inverter
HCOS4001D	Quad 2-Input NOR Gate
HCOS4002D	Dual 4-Input NOR Gate
HCOS4004D	7-Stage Ripple Counter/Freq. Divider —TO-5



PIN No 2 TO VDD
PIN No 12 TO VSS
INPUT PULSES
RESET
F/F-1
F/F-2
F/F-3
F/F-4
F/F-5
F/F-6
F/F-7

HCOS4005D	16 Bit Non-Destructive Read/Write Memory
HCOS4006D	18 Stage Static Shift Register

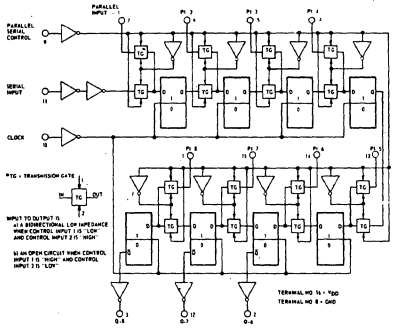


D1
NC
CLOCK (φ)
D2
D3
D4
VSS
VDD
D1+4
D2+5
D2+4
D3+4
D4+5
D4+4
4 STAGE
4 STAGE
4 STAGE
4 STAGE
1 STG.
1 STG.

HCOS4007D	Dual Complementary Pair Plus Inverter
HCOS4008D	4-Bit Full Adder*
HCOS4009D	Hex Buffer Inverting*
HCOS4010D	Hex Buffer Non-Inverting*
HCOS4011D	Quad 2-Input NAND Gate
HCOS4012D	Dual 4-Input NAND Gate

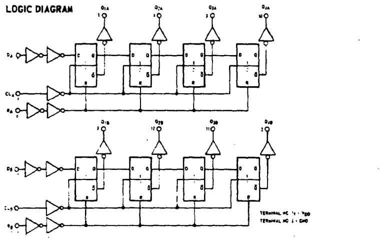
LOW VOLTAGE CMOS are also available in **HCOS7000** series which feature 1.5 volts power supplies.

HCOS4013D	Dual D-Type Flip-Flop w/Set-Reset
HCOS4014D	8 Stg. Parallel Input Serial Output Shift Register*

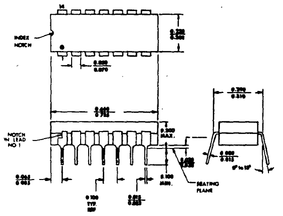


PARALLEL INPUT
PARALLEL SERIAL CONTROL
SERIAL INPUT
CLOCK
TG
*TG = TRANSMISSION GATE
INPUT TO OUTPUT IS a) A BIDIRECTIONAL LOW IMPEDANCE WHEN CONTROL INPUT 1 IS "LOW" AND CONTROL INPUT 2 IS "HIGH"
b) AN OPEN CIRCUIT WHEN CONTROL INPUT 1 IS "HIGH" AND CONTROL INPUT 2 IS "LOW"
TERMINAL NO 16 = VDD
TERMINAL NO 8 = GND

HCOS4015D	Dual 4 Stg. Serial Input Parallel Output -S/R*

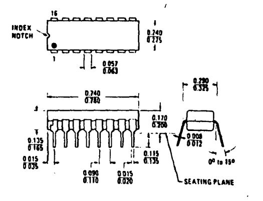


LOGIC DIAGRAM



INDEX NOTCH
SEATING PLANE

14 Pin DIP



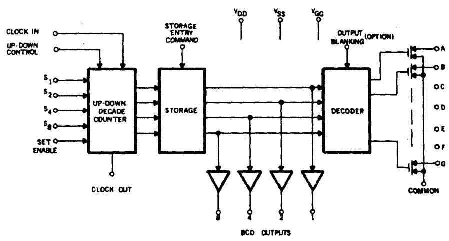
INDEX NOTCH
SEATING PLANE

16 Pin DIP

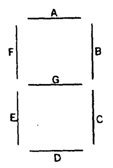
*Note: All parts use the 14 Pin DIP except those designated with (*) then 16 Pin DIP.

UNIVERSAL COUNTER/7 Segment Display Driver

HCTR0107D A synchronous decade counter with controlled count direction and presetting BCD inputs. Independent storage register. BCD coder and seven 30-volt output switches. Diode protected inputs. Monolithic P-channel enhancement mode silicon construction. TTL compatible. V_{DD} —18v, V_{GG} —24v. Package—24 pin DIP, 100 mil pin-to-pin spacing.



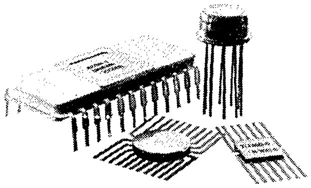
CLOCK IN
UP-DOWN CONTROL
S1
S2
S4
S8
SET ENABLE
STORAGE ENTRY COMMAND
VDD
VSS
VGG
OUTPUT BLANKING (OPTION)
UP-DOWN DECADE COUNTER
STORAGE
DECODER
CLOCK OUT
BCD OUTPUTS
COMMON
OA
OB
OC
OD
OE
OF
OG



For fast order service or information on specs, prices and delivery, use
hughes hot line (800)854-3280
in California (714)548-0671

MOS CIRCUITS

HUGHES
HUGHES AIRCRAFT COMPANY
MOS DIVISION



DYNAMIC SHIFT REGISTER

Product P/N	Description	No. Bits	Power MW/Bit	Max. Op Freq.	V_{SS}	V_{DD}	V_{GG}	V_ϕ	Pkg.
HDSR1024	Single 1024 Bit S/R	1024	.1	10 MHz	+5V	−5V	–	−15V	TO-99
HDSR1025	Dual 512 Bit S/R	1024	.1	10 MHz	+5V	−5V	–	−15V	TO-99
HDSR1026	Quad 256 Bit S/R	1024	.1	10 MHz	+5V	−5V	–	−15V	TO-116
HDSR2164	Dual 64 Bit S/R	128	3.0	10 MHz	+5V	−12V	–	−16V	TO-99
HDSR3066	Triple 66 Bit	198	.4	1 MHz	0V	−10V	–	−15V	TO-100
HDSR4064	Quad 64 Bit	128	.6	1 MHz	+5V	−10V	–	−10V	TO-100

READ ONLY MEMORY/CHARACTER GENERATOR

IROM2560—256x10 read only memory. Available with ASCII coding or custom coding. 500 nsec. access time. TTL compatible. Gate protected. Three chip enables. 28 pin dual in-line package. V_{DD} = GND, $V_{GG} = -12V$, $V_{SS} = +5_V$.

MULTIPLEXERS

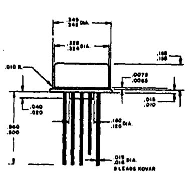
4, 6 & 8 channel switches. +.3/−25v, R_{ON} 250 Ohms, 2v threshold.

HMUL1445	4 channel MOSFET Switch 14 pin flatpack
HMUL2661	6 channel MOSFET Switch Pkg—TO-116
HMUX3705	8 channel Switch with 1 of 8 decoder on chip. Output enable control. TTL compatible. 16 pin dip.

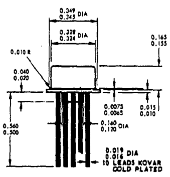
TV SYNCH CIRCUIT

HSUB0525 Digital Video Timing Generator produces horizontal and vertical frequency synchronizing and blanking pulses for raster generation in 525 line video display systems. Automatic interlace. Inputs diode protected. 1.008 MHz input. Outputs: horizontal blank, composite synch, composite blank, video blank and vertical blank. $V_{SS} = +5V$, $V_{DD} = -10V$, $V_{GG} = -15V$, TO-100 Pkg.

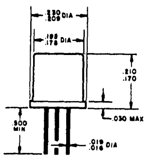
PACKAGE DIMENSION



8 LEAD TO−99



TO 100



TO 72

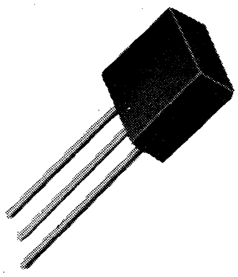
DISCRETE MOSFETS

		BV_{DSB}	V_{TH}	R_{ON}	g_m	Package Type
Insulated Gate FETS					(mmhos)	
HDIG1030	General Purpose Amp	−15v	2v	250	1.4	TO-72
HDIG1886	Electrometer	−15v	2v	250	1.4	TO-72
HDIG8551	Dual Transistor Amp	−30v	2v	600	0.7	TO-99
Diode Protected MOSFETS						
HDGP1000	General Purpose Switch	−20v	2v	220		TO-72
HDGP1001	General Purpose Switch/Amp	−20v	1.8v	30		TO-72
HDSW2106	20 Ohm Switch	−15v	1.8v	20	8.0	TO-72
HDSW3005	Low Leakage 600 Ohm Switch	−30v	2v	600	0.7	TO-72
HDSW8318	General Purpose Switch	−15v	2v	250	1.4	TO-72
HDSW8348	General Purpose Switch	−15v	1.8v	40	4.0	TO-72
HDSW8550	High Level Dual Transistor Switch	−30v	2v	600	0.7	TO-99

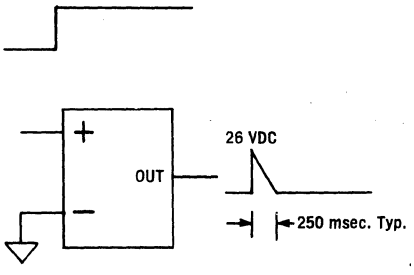
For detailed information or location of your nearest Hughes distributor write or call:
MOS Division, Hughes Aircraft Company, 500 Superior Ave.,
Newport Beach, Calif. 92663, Tel. (714) 548-0671; TWX (714) 910-596-1374.

HUGHES
HUGHES AIRCRAFT COMPANY
MOS DIVISION

LEDEX STANDARD DRIVER CIRCUITS — Off-The-Shelf



LMD - 3 DRIVER
PULSE DIFFERENTIATOR
.310″ x .360″ x .150″

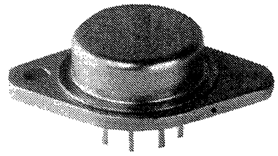


Hybrid microcircuit converts a positive step voltage into a differentiated positive output pulse. Useful as a driver for stepping switches and latching relays to reduce the average power or hold-in current when driving units with pulses of long duration. Upon application of an input pulse or voltage, a differentiated output pulse is produced which returns to zero, maintaining negligible standby power for continuous application of input voltage. Negative differentiation is inhibited on removal of applied voltage.

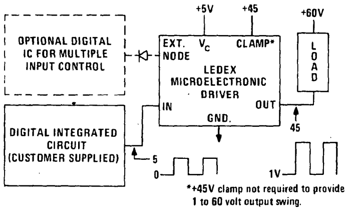
SPECIFICATIONS

	Symbol	Value
Maximum input voltage	V+	35 VDC
Maximum output current	I Out	1.5 Amp
Maximum pulse rate	PRF	2 PPS
Maximum V on drop	V on	3 V
Operating temp. range	T o	0 to +100°C
Storage temp. range	T s	−55 to +150°C
Pulse width	50 msec at 50% amplitude	

Other Voltages and Output waveshapes on request.



LMD-5 POWER DRIVER
Switches 325 Watts

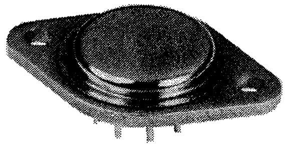

+5V
+45
+60V
OPTIONAL DIGITAL IC FOR MULTIPLE INPUT CONTROL
EXT. NODE
V_C
CLAMP*
LEDEX MICROELECTRONIC DRIVER
IN
OUT
GND.
LOAD
45
DIGITAL INTEGRATED CIRCUIT (CUSTOMER SUPPLIED)
5
0
1V

*+45V clamp not required to provide 1 to 60 volt output swing.

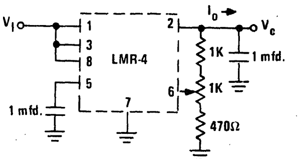
Hybrid power driver, up to 7 amperes, converts low level input signals into levels high enough to drive heavier loads, such as solenoids and motors. Includes conventional DTL input with non-inverting sinking output stage, expander node terminal for logic input control from other sources of system, and negative-going-transient protection in output circuit.

SPECIFICATIONS

Control voltage	+12V
Output voltage	+65V
Continuous current	5 Amp
Pulsed current	7 Amp
Operating temp. range	−65 to +150°C



LMR-4
VOLTAGE REGULATOR
Regulates Up To 150 Watts



TYPICAL CIRCUIT

When you need a precision voltage regulator with a typical line regulation of 0.02%, try the LMR-4. This low profile TO-3 thick film hybrid circuit consists of an adjustable series regulator capable of regulating 8 to 50 volt DC power supplies. It includes an internal FET current source to give you excellent ripple rejection (40 db minimum). The LMR-4 permits the use of smaller, less expensive filter capacitors. It can also be used as a driver for higher current regulators.

SPECIFICATIONS

Parameter	Typ.	Max.
Input Voltage	——	60V
Output Voltage	8 to 50V	
Load current	1 Amp	3 Amp
Line regulation	0.02%	0.2%
Load regulation	0.2%	0.5%
Power dissipation	10 Watts	25 Watts

CUSTOM HYBRID MICROELECTRONICS

Whether it's producing simple driver modules, voltage regulators, complex microelectronic switches or any other custom circuit miniaturization, Ledex is the company that's staffed to help you

Expert Design Assistance We make sure our field people are knowledgeable . . . and that our "inside" people go "outside" when you need them. That's what we have — experienced people who'll jump on a plane on an hour's notice and give you design help.

Fast Prototype Development Your schedules are short. You need accurate custom microcircuitry answers pronto. So we're set up to furnish prototypes fast, normally within four to six weeks, and some within a few days.

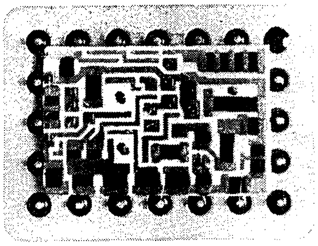
Consistent Production Quality You'll get the kind of quality you're looking for with Ledex microcircuitry. To assure you of consistently high production quality, we use computerized material and process controls.

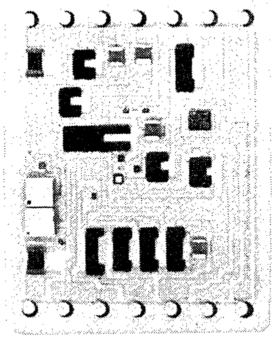
In addition to microelectronics, other major Ledex products include solenoids, stepping motors, and stepping switches. So, when you work with our engineers, you also benefit from our wealth of experience in interfacing microelectronic technology with the application of electromechanical products. Feel welcome to call or write us for engineering assistance. And for information on more Ledex off-the-shelf microcircuits, ask for catalog E-6000.

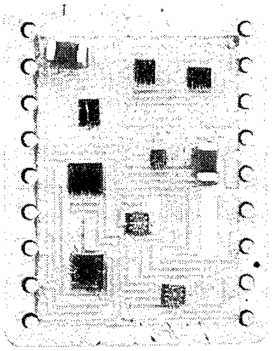
LEDEX

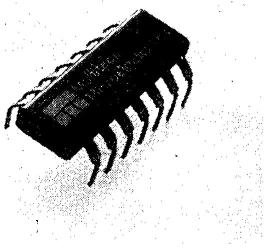
LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891

Multitech Microelectronics





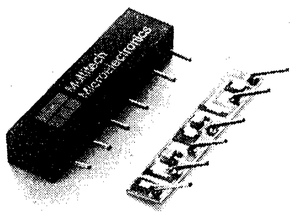


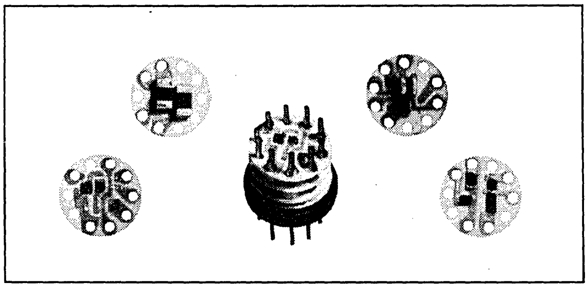


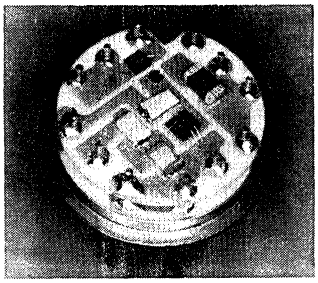
Multitech Microelectronics (a Multitech Company) has established a leadership position in the field of Microelectronic Technology due to superior performance, high reliability and low cost in the design and high volume production of custom microelectronics, hybrid circuits, and passive networks.

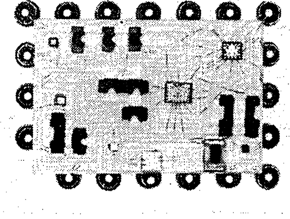
Multitech Microelectronics' comprehensive production and engineering facilities are able to support any hybrid design technique.

Pretesting of chip devices (I.C.'s, MOS-FET & LSI) **over temperature** prior to assembly into the hybrid, assures optimum component performance characteristics and parameters. Multitech Microelectronics engineers will convert existing designs to hybrid or will design the circuit to your performance requirements.









a MULTITECH company

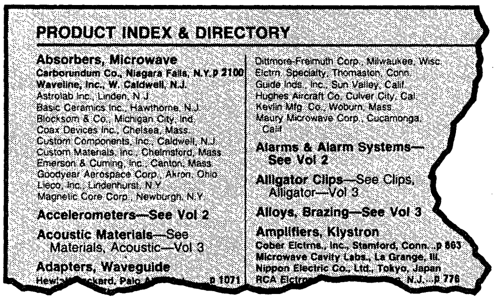
Multitech Microelectronics

583 Monterey Pass Road, Monterey Park
California 91754 Telephone: (213) 283-7773

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y. p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N.J.
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass
Emerson & Cuming, Inc., Canton, Mass.
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.
Accelerometers—See Vol 2
Acoustic Materials—See Materials, Acoustic—Vol 3
Adapters, Waveguide
Hewl ckard, Palo p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co. Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Alarms & Alarm Systems—See Vol 2
Alligator Clips—See Clips, Alligator—Vol 3
Alloys, Brazing—See Vol 3
Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. ..p 863
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctr N.J. ..p 776

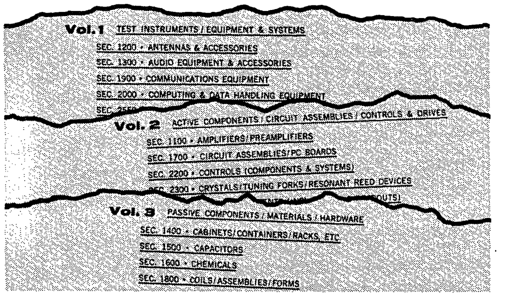
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT
SEC. 255
Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
SEC. 2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES
OUTS)
Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

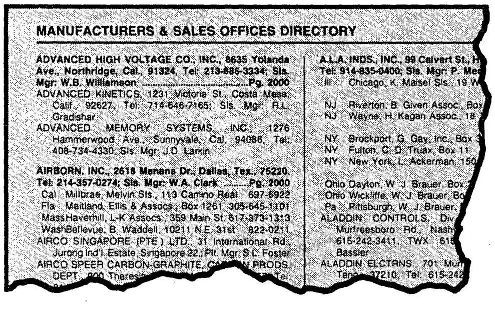
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



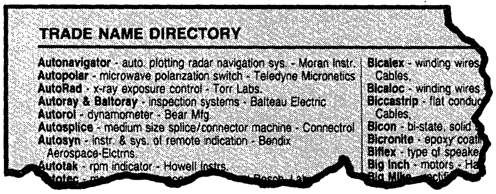
MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal, 94086, Tel: 408-734-4330, Sls. Mgr: J.D. Larkin
AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St. 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE.) LTD., 31 International Rd., Jurong Ind'l. Estate, Singapore 22.; Plt. Mgr: S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C N PRODS. DEPT. 800 Theresi Tel.
A.L.A. INDS., INC., 99 Calvert St., H
Tel: 914-835-0400; Sls. Mgr: P. Me
Ill Chicago, K. Maisel Sls., 19 W
NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18
NY Brockport, G. Gay, Inc., Box 3
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150
Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer, Bo
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-3411, TWX 61 Bassler
ALADDIN ELCTRNS., 701 Mur Tenn. 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires Cables.
Bicaloc - winding wires
Biccastrip - flat condu Cables.
Bicon - bi-state, solid
Bicronite - epoxy coati
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

HIGH PERFORMANCE MONOLITHIC IC AMPLIFIERS

FEATURING THESE UNPRECEDENTED IC SPECIFICATIONS

- ■ $TCV_{OS} \le 0.6$ µV/°C
- ■ CMRR ≥ 120 dB
- ■ 0.1% SETTLING < 1 µsec
- ■ $V_{OS} \le 0.1$ mV
- ■ $I_B \le 350$ pA, $TCV_{OS} < 3$ µV/°C
- ■ $A_{VO} \ge 1{,}000{,}000$

The condensation necessary for this catalog forces omission of many parameters appearing in our full data sheets, which are available by calling our sales offices or distributors.

See Package Outline Drawings Below
Performance and Temperature Range
Function and/or Type Number
SSS for Superior Second Source or Mono for Original Product

Guaranteed (Min./Max.) Specifications ($V_S = \pm15V$, $T_A = 25°C$)

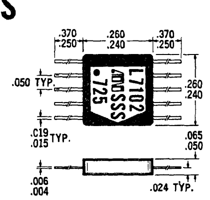
Description			Order Codes	Package Codes	Operating Temperature Range	Input DC				Output DC			Power			Other Features
						V_{OS} max (mV)	I_{OS} max (nA)	I_B max (nA)	CMVR min (Volts)	CMRR min (dB)	V_{out} min (Volts)	A_{VO} min (V/mV)	± V_{max} (Volts)	P_D (mw)	PSRR (dB)	
COMMERCIAL GRADE GENERAL PURPOSE OP AMPS		Compensated	**SSS741C**	J, P	0 to 70°C	6.0	25	100	±12	70	±10	20	±18	85	77	
		Compensated	**SSS307**	J, P	0 to 70°C	6.0	25.0	100	±12	70	±10	25	±18	90	70	
		Uncompensated	**SSS301A**	J, P	0 to 70°C	6.0	25	100	±12	70	±10	25	±18	90	70	
		Uncompensated	**SSS841C**	J, P	0 to 70°C	6.0	25	100	±12	70	±10	20	±18	85	77	
		Dual Compensated	**SSS747C**	J, K, P	0 to 70°C	6.0	25	100	±12	70	±10	20	±18	85	77	
		Dual Compensated	**SSS1458**	J	0 to 70°C	6.0	25	100	±12	70	±10	50	±18	75	77	
		Compensated	**mono OP-05C**	J, P	0 to 70°C	2.0	5	50	±12	80	±10	50	±22	85	80	Low Noise, 1 V/µs
		Compensated	**mono OP-05H**	J, P	0 to 70°C	1.0	2	30	±12	90	±10	100	±22	60	90	Low Drift, Low Noise
MILITARY GRADE GP OP AMPS		Compensated	**SSS741G**	J, P, L	−55 to 125°C	5.0	20	100	±12	70	±10	50	±22	85	77	
		Uncompensated	**SSS841G**	J, P, L	−55 to 125°C	5.0	20	100	±12	70	±10	50	±22	65	77	
		Dual Compensated	**SSS747G**	J, K, P, M	−55 to 125°C	5.0	20	100	±12	70	±10	50	±22	85	77	
		Dual Compensated	**SSS1558**	J	−55 to 125°C	5.0	20	100	±12	70	±10	50	±22	75	77	
		Compensated	**mono OP-05G**	J, P, L	−55 to 125°C	2.0	5	50	±12	80	±10	50	±22	85	80	Low Noise, 1 V/µs
SELECTED PERFORMANCE MILITARY GRADE GP OP AMPS		Compensated	**SSS741B**	J, P, L	−25 to 85°C	3.0	5	50	±12	80	±10	50	±22	85	80	
		Compensated	**SSS741**	J, P, L	−55 to 125°C	2.0	5	50	±12	80	±10	100	±22	85	80	
		Uncompensated	**SSS201A**	J, P, L	−25 to 85°C	2.0	10	75	±12	80	±10	50	±22	90	80	
		Uncompensated	**SSS101A**	J, P, L	−55 to 125°C	1.8	5	50	±12	80	±10	100	±22	90	80	
		Compensated	**SSS207**	J, P, L	−25 to 85°C	2.0	10	75	±12	80	±10	50	±22	90	80	
		Compensated	**SSS107**	J, P, L	−55 to 125°C	1.8	5	50	±12	80	±10	100	±22	90	80	
		Uncompensated	**SSS841**	J, P, L	−55 to 125°C	2.0	5	50	±12	80	±10	100	±22	65	80	
		Dual Compensated	**SSS747B**	J, K, P, M	−25 to 85°C	3.0	5	50	±12	80	±10	50	±22	75	80	
		Dual Compensated	**SSS747**	J, K, P, M	−55 to 125°C	2.0	5	50	±12	80	±10	100	±22	75	80	
		Compensated	**mono OP-05**	J, P, L	−55 to 125°C	1.0	2	30	±12	90	±10	100	±22	60	90	Low Drift, Low Noise
FAST SETTLING OP AMPS	**Commercial**	Compensated	**mono OP-01C**	J, P	0 to 70°C	5.0	20	100	±12	80	±12.5	50	±18	90	80	0.1% settling in less than 1 µs for 5V output. Low Drift
		Compensated	**mono OP-01H**	J, P	0 to 70°C	0.7	2	30	±15	90	±12.5	100	±22	60	90	
	Military	Compensated	**mono OP-01G**	J, P, L	−55 to 125°C	5.0	20	100	±15	80	±12.5	50	±22	90	80	
		Compensated	**mono OP-01**	J, P, L	−55 to 125°C	0.7	2	30	±15	90	±12.5	100	±22	60	90	
LOW LEVEL OP AMPS	**Commercial**	Low Input Voltage	**SSS725C**	J, P	0 to 70°C	1.3	13	110	13.5	100	±12	500	±22	150	100	TCV_{OS} = 1.5 µV/°C
			SSS725E	J, P	0 to 70°C	0.5	5	80	13.5	120	±12.5	1000	±22	120	106	TCV_{OS} = 0.6 µV/°C Low Noise
		Low Input Current	**mono OP-08C**	J, P	0 to 70°C	7.5	0.5	1.5	±12	90	12.0	200	±22	150	90	TCI_{OS} = 3.5 pA/°C
			mono OP-08E	J, P	−25 to 85°C	0.5	0.08	0.35	±12.5	94	12.5	300	±22	120	94	3.0 µV/°C, 1.5 pA/°C Low Noise
	Military	Low Input Voltage	**SSS725B**	J, P, L	−25 to 85°C	0.75	5	80	±13.5	106	±12	1000	±22	120	106	TCV_{OS} = 1.0 µV/°C
			SSS725	J, P, L	−55 to 125°C	0.50	5	80	±13.5	110	±12	1000	±22	120	106	TCV_{OS} = 1.0 µV/°C
			SSS725A	J, P, L	−55 to 125°C	0.10	1.0	70	±13.5	114	±12	1000	±22	120	114	0.6 µV/°C, 20. pA/°C Low Noise
		Low Input Current	**mono OP-08B**	J, P, L	−25 to 85°C	5.0	0.15	0.50	±12	84	12.5	300	±22	120	94	TCI_{OS} = 2.0 pA/°C
			mono OP-08	J, P, L	−55 to 125°C	2.0	0.10	0.35	±12	84	12.5	300	±22	120	94	4.5 µV/°C, 2.5 pA/°C
			mono OP-08A	J, P, L	−55 to 125°C	2.50	0.08	0.35	±12	84	12.5	300	±22	120	94	3.0 µV/°C, 2.3 pA/°C Low Noise
	Replaces 108A-308A	Uncompensated	**SSS308A**	J, P	0 to 70°C	Superior plug-in replacement for LM308A										
		Uncompensated	**SSS108A**	J, P, L	−55 to 125°C	Superior plug-in replacement for LM108A										Low Noise
	Replaces 112-312	Compensated	**SSS312**	J, P	0 to 70°C	Superior plug-in replacement for LM308A										Low Noise Internally Compensated
		Compensated	**SSS112**	J, P, L	−55 to 125°C	Superior plug-in replacement for LM108A										
PRECISION HIGH SPEED COMPARATORS	**Commercial**	—	**mono CMP-01C**	J, P	0 to 70°C	2.8	80	900	13.0	80			±18	175	70	Response Time 100 nsec
		—	**mono CMP-01E**	J, P	0 to 70°C											
	Military	—	**mono CMP-01G**	J, P, L	−55 to 125°C	TO BE ANNOUNCED 7/71										
		—	**mono CMP-01**	J, P, L	−55 to 125°C											

TYPICAL PRICES

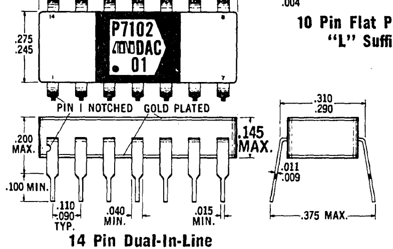
(as of 6/71 — check with sales representative for latest prices)

Order Code	1-9	100-249
SSS741CJ	$ 1.80	$ 1.40
SSS747CK	3.60	2.80
SSS741GJ	5.10	3.95
SSS747GK	7.00	5.45
SSS741BJ	6.60	5.10
SSS747BK	9.80	7.50
mono OP-01CJ	4.70	3.65
mono OP-01HJ	8.50	6.60
mono OP-01GJ	8.80	6.80
mono OP-01J	18.50	14.35
SSS725CJ	9.00	6.75
SSS725EJ	22.50	16.30
SSS725BJ	18.00	13.95
SSS725J	30.00	21.60
SSS725AJ	70.00	50.75
mono OP-08CJ	9.00	6.75
mono OP-08EJ	50.00	38.75
mono OP-08BJ	18.00	13.95
mono OP-08J	38.00	27.55
mono OP-08AJ	75.00	54.40
mono CMP-01CJ	4.25	3.25

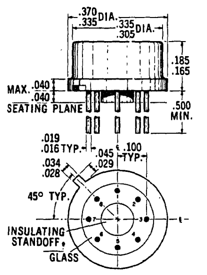
PACKAGE OUTLINES



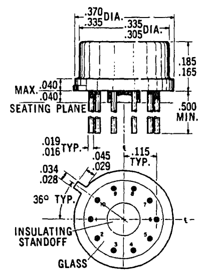
10 Pin Flat Package "L" Suffix



14 Pin Dual-In-Line "P" Suffix, Ceramic



8 Pin Hermetic Case TO-99 "J" Suffix



10 Pin Hermetic Case TO-100 "K" Suffix

PRECISION
MONOLITHICS
INCORPORATED
a Bourns Affiliate

1500 Space Park Drive, Santa Clara, California 95050 • (408) 246-9220 • TWX 910-338-0528 • CABLE MONO

Note: Prices subject to change without notice; consult PMI for latest price and product availability information.

PRECISION MONOLITHICS INCORPORATED
a Bourns Affiliate

DIGITAL/ANALOG AND

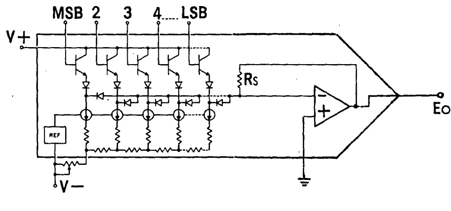
During 1970-71 Precision Monolithics became the acknowledged leader in production of low cost IC D/A converters by introducing the following breakthroughs:

(1) A complete 6 bit 1 μsec D/A converter on a single chip, containing reference, switches, matched resistors, and output amplifier accurate to 7 bits over a wide temperature range; **(2)** A two-chip 10

Tempco for AIM Products
Class for mono, Linearity for AIM Products
Device Number, 2 Digit mono and Module, 1 Digit Hybrid
Number of Bits, AIM Products Only
DAC for D/A, AD for A/D Converter
mono for monolithic, AIM for Hybrid/module

Product Type	Order Codes	Package & Package Option	Temperature Range, Operating	Resolution	Logic Levels Input (D/A's) Output (A/D's) Low	Hi	FS Output (D/A's) FS Input (A/D's)	Linearity Error @ 25°C
MONOLITHIC PRODUCTS								
• World's First 6 Bit Single Chip D/A Converter	mono DAC-01A	M, P	−55 to 125°C	6 Bits	0.5 Volts	2.1 Volts	±5V, ±10V, +10V	0.20% FS
	mono DAC-01	M, P	−55 to 125°C	6 Bits	0.5 Volts	2.1 Volts	±5V, ±10V, +10V	0.40% FS
	mono DAC-01B	M, P	−55 to 125°C	6 Bits	0.5 Volts	2.1 Volts	±5V, ±10V, +10V	0.40% FS
	mono DAC-01C	P, S	0 to 70°C	6 Bits	0.5 Volts	2.1 Volts	±5V, ±10V, +10V	0.40% FS
	mono DAC-01F	M, P	−55 to125°C	6 Bits	0.5 Volts	2.1 Volts	0 to +10V	0.40% FS
	mono DAC-01H	P, S	0 to 70°C	6 Bits	0.5 Volts	2.1 Volts	0 to +10V	0.40% FS
• 8 Bit Single Chip D/A Converter	mono DAC-02	M, Q	−55 to125°C	8 Bits	0.5 Volts	2.1 Volts	±5V, ±10V, +10V	0.15% FS
	mono DAC-02C	Q	0 to 70°C	8 Bits	0.5 Volts	2.1 Volts	±5V, ±10V, +10V	0.20% FS
• 10 Bit Single Chip D/A Converter	mono DAC-03	Q, N	0 to 70°C	10 Bits	0.5 Volts	2.1 Volts	±5V, ±10V, +5V, +10V	0.1% FS
• D/A Summing Amplifier	mono OP-01	See Amplifiers, Previous Page						
• A/D Precision Comparator	mono CMP-01	See Amplifiers, Previous Page						
• 10 Bit Current Source	mono DAI-01	N	−55 to 125°C	10 Bits	0.5 Volts	2.1 Volts	2.046 mA (nom.)	0.10% FS
• 10 Bit Current Source	mono DAI-01B	N	−25 to 85°C	10 Bits	0.5 Volts	2.1 Volts		0.20% FS
• 12 Bit Current Source	mono DAI-02	(Chip only)	−55 to 125°C	12 Bits	0.5 Volts	2.1 Volts		.01 to .02% FS
• 10 Bit Resistor Network	mono DAR-01	N	−55 to 125°C	10 Bits	Matching Network for mono DAI-01			
• 12 Bit Resistor Network	mono DAR-02	(Chip only)	−55 to 125°C	12 Bits	Matching Binary Network for mono DAI-02			
• BCD Resistor Network	mono DAR-03	(Chip only)	0 to 70°C	12 Bits	Matching BCD Network for mono DAI-02			
HYBRID PRODUCTS								
• Two Chip D/A with Output Op Amp Option	AIM DAC-100	Q1	0/70°C; −55/125°C	7 to 10 Bits	0.5 Volts	2.1 Volts	±5V, +10V	.05 to .3% FS
	AIM DAC-100	Q2	0/70°C; −55/125°C	7 to 10 Bits	0.5 Volts	2.1 Volts	±2.5V, +5V	(See Table
	AIM DAC-100	N1	−55 to 125°C	7 to 10 Bits	0.5 Volts	2.1 Volts	±2.5V, ±5V, +5V, +10V	at Right)
	AIM DAC-100	N2	−55 to 125°C	7 to 10 Bits	0.5 Volts	2.1 Volts	±2.5V, ±5V, +5V, +10V	
• Three Chip D/A with Built-in Output Op Amp	AIM DAC-101	Q1	0/70°C; −55/125°C	7 to 10 Bits	0.5 Volts	2.1 Volts	±5V, +10V	.05 to .3% FS
	AIM DAC-101	Q2	0/70°C; −55/125°C	7 to 10 Bits	0.5 Volts	2.1 Volts	±2.5V, +5V	(See Table
	AIM DAC-101	N	−55 to 125°C	7 to 10 Bits	0.5 Volts	2.1 Volts	±2.5V, ±5V, +5V, +10V	at Right)
• Two Chip BCD D/A Converter with Built-in Output Op Amp	AIM DAC-110	Q1		3 Full	0.5 Volts	2.1 Volts	±1V to ±10V	.05 to .3% FS
	AIM DAC-110	Q2		Decimal	0.5 Volts	2.1 Volts	±1V to ±5V	(See Table
	AIM DAC-110	N		Digits	0.5 Volts	2.1 Volts		at Right)
• Two Chip 12 Bit D/A with Output Op Amp Option	AIM DAC-120	N	−25 to 85°C	12 Bits	0.5 Volts	2.1 Volts	±5V, ±10V, +5V, +10V	.02% FS
• Two Chip 8 Bit A/D Converter	AIM AD-080	P	−55 to 125°C	8 Bits	T²L Compatible,		±1V to ±10V	±½ LSB
	AIM AD-080C	P	0 to 70°C		Parallel Out		±1V to ±10V	±½ LSB
MODULES AND PC CARDS								
D/A CONVERTERS								
• 12 Bit + Sign Module	AIM DAC-1300X4ZN	1.5″x2.0″x0.7″	−25 to 85°C	11, 12, or 13 Bits	T²L Compatible		±10V	±½ LSB
• Fast 10 Bit Module	AIM DAC-1000X4ZN	1.5″x2.0″x0.7″	−25 to 85°C	8, 9, or 10 Bits	T²L Compatible		±10V	±¼ LSB
• Multiplying Module	AIM DAM-1000X4ZN	1.5″x2.0″x0.7″	−25 to 85°C	8, 9, or 10 Bits	T²L Compatible		±10V	±½ LSB
• Deglitcher, Schottky Diode	AIM DAD	1.5″x2.0″x0.7″	−25 to 85°C		T²L Compatible		±10V	
A/D CONVERTERS								
• Very Hi Speed Module, 7 thru 10 Bits	AIM AD-1001	Y	−25 to 85°C	7, 8, 9, 10 Bits	T²L Compatible Parallel		To ±5V	±½ LSB
• Hi Speed PC Card	AIM AD-1000	4″x3″x0.4″	−25 to 85°C	7, 8, 9, 10 Bits	T²L Parallel		To ±5V	±½ LSB
• 11 Bit + Sign PC Card Equivalent to A/D	AIM AD-1200	4.5″x3.75″x0.4″	−25 to 85°C	10, 11, 12 Bits	T²L Parallel and Serial		To ±10V	±½ LSB

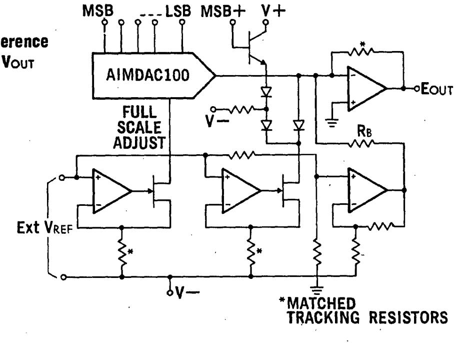
PRINCIPLE BY WHICH MONO™ CONVERTERS OPERATE:



- Current Steering for Fast Response
- Matching Current Setting and Feedback Resistors on Same Chip Makes Voltage Output Independent of Absolute Resistance
- Full Scale Adjust Trimpot to V− Lead Trims I_{FS} to Give Exact E_{OUT}, Without Affecting Dynamic Response

HOW TO:

- Apply External Reference
- Set Any Arbitrary V_{OUT}
- Extend DAC's to Higher Accuracy and Resolution
- Go Bipolar With Accurate Zero Point Track



*MATCHED TRACKING RESISTORS

Note: Prices subject to change without notice; consult PMI for latest price and product availability information.

ANALOG/DIGITAL CONVERTER PRODUCTS

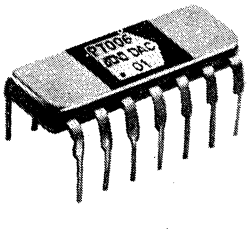
bit D/A converter with .05% **untrimmed** film resistors, accurate over a wide temperature range; **(3)** Fast precise low-cost D/A sum and A/D comparator amplifiers; **(4)** 0.025% automated measurement and sorting over temperature. Further developments will provide similarly high performance low-cost IC units for 12 bit binary and BCD D/A converters, and miniature A/D converters during 1971-2. Watch for and be ready to capitalize on these revolutionary advances for your system!

Max. FS Tempco Error	Settling Time To ½ LSB Typ.	Max.	Total Conversion Time to ½ LSB Typ.	Prices (*As of 2nd Quarter '71 . . . Check with Sales Rep for Latest Prices) §Projected for 1st Quarter '72 1-9	100-249
40 ppm/°C	1 µsec	3 µsec		$180.00*	$121.50*
80 ppm/°C	1 µsec	3 µsec		90.00*	60.75*
120 ppm/°C	1 µsec	3 µsec		60.00*	40.50*
160 ppm/°C	1 µsec	3 µsec		32.90*	22.20*
80 ppm/°C	1 µsec	3 µsec		51.60*	34.85*
160 ppm/°C	1 µsec	3 µsec		25.95*	17.50*
40 ppm/°C	1 µsec	3 µsec		80.00§	55.00§
80 ppm/°C	1 µsec	3 µsec		40.00§	27.50§
40 ppm/°C	1 µsec	3 µsec			
20 ppm/°C	350 nsec			112.50*	79.95*
66 ppm/°C	350 nsec			48.40*	32.65*
	1 µsec			25.00§	15.00§
1 ppm/°C				37.70*	26.15*
1 ppm/°C				30.00§	20.00§
1 ppm/°C				7.50§	5.00§
15 ppm/°C to	100 to 350 nsec				
120 ppm/°C	100 to 350 nsec				
(See Table	100 to 350 nsec				
at right)	100 to 350 nsec		replaces µA722		
15 ppm/°C to	1 µsec	2 µsec			
120 ppm/°C	1 µsec	2 µsec			
(See Table ➤)	1 µsec	2 µsec			
15 ppm/°C to	1 µsec	2 µsec			
120 ppm/°C	1 µsec	2 µsec			
(See Table ➤)	1 µsec	2 µsec			
15 ppm/°C	1 µsec				
40 ppm/°C			8 µsec	120.00§	80.00§
40 ppm/°C			8 µsec	50.00§	33.00§
20 ppm/°C	5 µsec			225.00*	150.00*
40 ppm/°C	300 nsec			210.00*	140.00*
40 ppm/°C	20 µsec			325.00*	215.00*
	100 nsec			50.00§	37.50§
To 15 ppm/°C			1.5 µsec, 7 Bits 4.0 µsec, 10 Bits	260.00*	175.00*
To 15 ppm/°C			1.5 µsec, 7 Bits 4.6 µsec, 10 Bits	225.00*	150.00*
To 10 ppm/°C			# Bits x 1 µsec	325.00*	215.00*

Hermetic Dip 100 up Prices Corresponding to Each

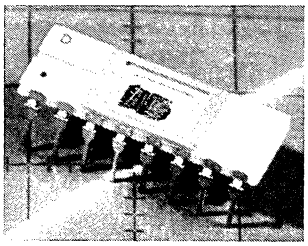
Combination of Linearity/ Tempco are Tabulated in

Matrix at Right



mono DAC-01 World's First Completely Monolithic D/A Converter **$9.95†**

†2000 up, Silicone Dip



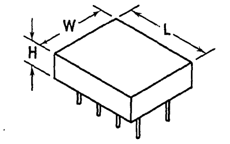
AIM DAC-100 World's First Two-Chip 10 Bit D/A Converter **$15.95‡**

‡2000 up, 0.2% lin, Silicone Dip

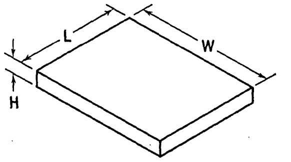
FS Tempco	15 ppm/°C		30 ppm/°C		60 ppm/°C		120 ppm/°C	
Linearity	Code	Price	Code	Price	Code	Price	Code	Price
0.05% FS	AA	$135.00	AB	$87.00	AC	$52.50	AD	$42.00
0.10% FS	BA	100.00	BB	67.00	BC	43.70	BD	34.20
0.20% FS	—	—	CB	55.00	CC	37.80	CD	28.80
0.30% FS	—	—	DB	37.40	DC	30.60	DD	23.80
0.05% FS	AA	148.50§	AB	95.70§	AC	57.75§	AD	46.20§
0.10% FS	BA	110.00§	BB	73.70§	BC	48.10§	BD	37.60§
0.20% FS	—	—	CB	60.50§	CC	41.60§	CD	31.70§
0.30% FS	—	—	DB	40.10§	DC	33.70§	DD	26.20§
0.05% FS	AA	120.00§	AB	70.00§	AC	45.00§	AD	30.00§
0.10% FS	BA	80.00§	BB	40.00§	BC	30.00§	BD	20.00§
0.20% FS	—	—	—	—	—	—	—	—
0.30% FS	—	—	—	—	—	—	—	—

(1) Including 1/16″ P.C. Card (2) 22 Pins/Side

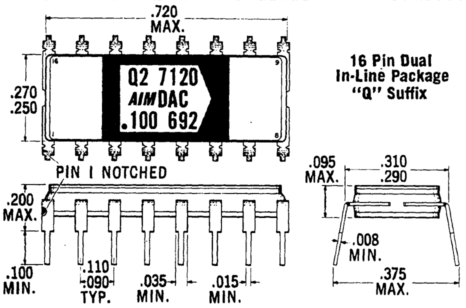
STANDARD MODULE SIZES



STANDARD PC CARD SIZES

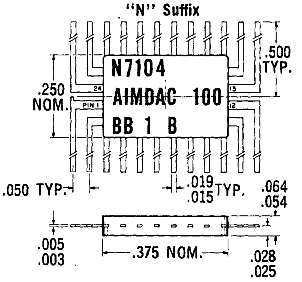


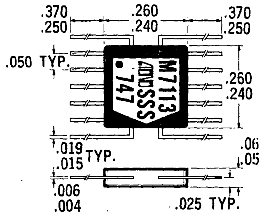
	L	W	H		L	W	H (1)	Connector
Z	2″	1½″	0.7″	V	3.75″	4.5″	7/16″	44 Pin (2)
U	2″	2½″	3/8″	U	3.0″	4.0″	7/16″	44 Pin (2)
X	2″	4″	0.4″	W				



16 Pin Dual In-Line Package "Q" Suffix

24 Pin Flat Package "N" Suffix





14 Pin Flat Package "M" Suffix

PRECISION MONOLITHICS
INCORPORATED
a Bourns Affiliate

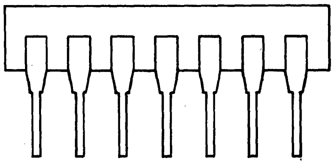
1500 Space Park Drive, Santa Clara, California 95050 • (408) 246-9220 • TWX 910-338-0528 • CABLE MONO

Note: Prices subject to change without notice; consult PMI for latest price and product availability information.

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVENUE, BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Network Products

SOUTHERN ELECTRONICS' line of "Network Products" answer industries requirements for special circuitry. High reliability manufacturing techniques are utilized in packaging MIL-quality discrete components in standardized large volume production.



TO116

TYPICAL APPLICATIONS

"Network Products" are unexcelled for sophisticated applications of complex circuit packaging, where extreme reliability and miniaturization is required. The following are a few typical examples.

DIGITAL LINE TERMINATION ARRAYS
Application: Twisted Pair Termination Coaxial Line Termination

DIGITAL PULL-UP NETWORKS
Application: Unused Gate; Wired or Parallel High Speed Pull-up

ANALOG SCALING NETWORKS
Application: Gain Ranging Series Attenuation Voltage Division

LADDER NETWORKS
Application: Digital to Analog Conversion Analog to Digital Conversion

RC NETWORKS
Application: Line Termination Notch Filter Phase Shift

RCL NETWORKS
Application: Delay Lines

GENERAL SPECIFICATIONS

The following specifications apply to all thick film products of Southern Electronics network operations.

SUBSTRATE

Material: 96% or 99% Alumina
Size: .0025 in.^{2} (.05 x .05) to 4 in.^{2}
Thickness: .010″ to .100″
Surface Finish: Down to 10μ in. CLA

RESISTORS

Material: Thick film, noble metal composition
Range: 1Ω/□ to 10Mμ/□
TCR: ±25, ±50, ±100, ±200 PPM/°C with <10 PPM/°C Tracking
Power Rating: 50 Watts/in.^{2} of resistor area
Current Noise: Down to −36 db
Tolerance: .1% Available
Stability: 1000 hrs. @ 30 W/in.^{2} — ±.25% ΔR Max.
1000 hrs. @ 150°C — ±.15% ΔR Max.
Temp. cycle — ±.10% ΔR Max.
Moisture cycle — ±.15% ΔR Max.
Short term overload — ±.15% ΔR Max.
Shelf life (10,000 Hrs.) — ±.10% ΔR Max.
Solder dip — ±.20% ΔR Max.

CONDUCTORS

Material: Thick film, noble metal compositions, selected to suit individual applications such as, solderability, ultrasonic or thermo-compression bondability, etc.
Platinum Gold
Palladium Gold
Palladium Silver
Silver
Gold
Pt-Pd-Aμ
Resistivity: <.05Ω/□
Adhesion: 2000 to 7500 PSI
Line Width: Down to .005 in.

DIELECTRICS (FIRED ON)

Material: Thick film, glass, glass ceramic and ferro-ceramic compositions with dielectric constant from 5 to 800
T.C.: NPO to ±30%
D.F.: <2% @ 1 KHz
Dielectric Strength: >200V

CAPACITORS (DISCRETE)

Monolithic ceramic chip capacitors manufactured by Southern Electronics are used (See pages 2446 - 2451 EEM)

ENVIRONMENTAL

Southern Electronics' networks meet or exceed all the performance requirements of MIL-R-26, MIL-R-93, or MIL-R-10509 as applicable, including the following:

Temperature Cycling:
MIL-STD 883, Method 1011, Condition C

Thermal Shock:
MIL-STD 883, Method 1011, Condition A

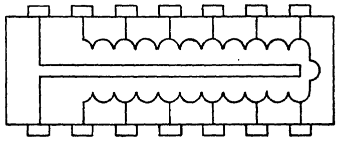
Moisture Resistance:
MIL-STD 883, Method 1004, Figure 1004-1

Soldering Heat:
MIL-STD 202, Method 210, Condition B

SOUTHERN ELECTRONICS CORPORATION
150 WEST CYPRESS AVENUE, BURBANK, CALIFORNIA 91502
PHONE: (213) 846-9302
TWX 910-498-2207

Delay Lines/Chip Resistors

DELAY LINES



Southern Electronics' delay lines incorporate many of the same features used in the manufacture of the previously described networks. Special design tolerance, packaging and environmental requirements are custom engineered to customer specifications.

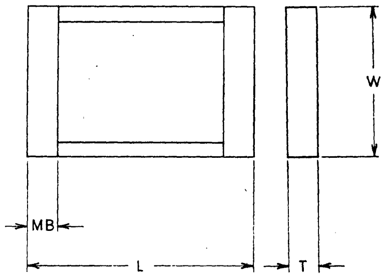
TYPICAL CHARACTERISTICS

Number of Sections: 5 to 100
Tap Delay: 10, 20 ns ±5%
Total Delay: To 1000 ns ±5%
Rise Time: 15 to 25 ns
Impedance: 50 to 500 Ohms ±5%
Term. Resistance: 50 to 500 Ohms ±5%
Pulse Attenuation: 5% Max.
Distortion: 10% Max.

PACKAGING

The units are packaged in dual In-line configurations either molded or conformally coated to customer specifications. Lead material is tin plated copper-nickel (30%) or iron-nickel-cobalt alloy, FSTM F15-61T.

CHIP RESISTORS



Southern Electronics' chip resistors are available in microminiature cross sections as small as .0025 sq. inch x .015 inches thick. Custom values and sizes are available on request.

SPECIFICATIONS

Material: Substrate — Alumina
Resistor — Thick film, noble metal composition
Conductor — Thick film, noble metal composition

Resistance: 5Ω to 30MΩ in Standard EIA Values

Tolerances: ±1% to ±20%

Operating Temperature Range: −55°C to +175°C

Power Derating: From Rated Power at 125°C to 0 Power at 175°C

T.C.R.: ±25 to ±200 PPM/°C

PART NUMBER CODE

SER 0505 - 250 - 101 - K - 1 PG

STYLE
TCR
RESISTANCE
TOLERANCE
TERMINATION

Style	0505	0805	1005	1505
L ±.01	.050	.075	.100	.150
W ±.01	.050	.050	.050	.050
T (Max.)	.015	.015	.015	.015
MB (Min.)	.005	.010	.010	.010
Resistance Range	5Ω to 10MΩ	5Ω to 15MΩ	5Ω to 20MΩ	5Ω to 30MΩ
Power Dissipation @ 125°C	50MW	75MW	100MW	150MW

CODE DESCRIPTION

TCR: Temperature Coefficient in PPM/°C; the First Two Digits are the Significant Figures, the Last Digit is the Number of Zeroes following, i.e. TC 101 = 100 PPM/°C

Resistance: The First Two Digits Represent the Significant Figures and the Last Digit the Number of Zeroes following, i.e. 101 = 100 Ohms

Tolerance:
F = ±1%
G = ±2%
J = ±5%
K = ±10%
M = ±20%

Termination: The Digit Denotes the Termination Style.
1 = Top Surface Only
2 = Wrap Around
3 = Top Surface Bands and Full Back Side

The Following Characters Denote Termination Material.
PG = Platinum Gold
G = Gold
PS = Palladium Silver
S = Silver
Sn63 = Solder Coated with Sn63

Unisem SUBSIDIARY OF UNITED AIRCRAFT CORPORATION
TREVOSE, PENNSYLVANIA 19047

LSI MEMORY DEVICES

MOS RAM's

256 x 1 STATIC RAM

UA2556 −55° to 125°C
UA3556 −25° to 70°C
V_{in} (1): 2.4 min.
(0): 0.8 max.
V_{out} (1): 3.0 min.
(0): 0.4 max.
Operating Power: 1 mW/bit
Access Time: 900 nsec

1024 DYNAMIC RAM

UA2524 −55° to 125°C
UA3524 −25° to 70°C
V_{in} (1): 14 min.
(0): 3 max.
I_{out} (1): 600 μa min.
(0): 1 μa max.
Operating Power: 300 μW/bit
Access Time: 300 nsec

64 x 4 DYNAMIC RAM

UA2564 −55° to 125°C
UA3564 −25° to 70°C
V_{in} (1): 2.4 min.
(0): 0.8 max.
V_{out} (1): 3.0 min.
(0): 0.4 max.
Operating Power: 250 μW/bit
Access Time: 600 nsec
Refresh Frequency: 10 KHz min.

64 x 4 STATIC RAM

UA2664 −55° to 125°C
UA3664 −25° to 70°C
V_{in} (1): 2.4 min.
(0): 0.8 max.
V_{out} (1): 3.0 min.
(0): 0.4 max.
Operating Power: 1.5 mW/bit
Access Time: 600 nsec

MOS ROM's

1024-BIT STATIC ROM

UA2525 −55° to 125°C
UA3525 −25° to 70°C
Memory Organizations:
128 words x 8 bits
256 words x 4 bits
512 words x 2 bits
1024 words x 1 bit
V_{in} (1): 2.4 min.
(0): 0.8 max.
V_{out} (1): 3.0 min.
(0): 0.4 max.
Operating Power: 250 μW/bit
Access Time: 0.6 μsec

2048-BIT STATIC ROM

UA2548 −55° to 125°C
UA3548 −25° to 70°C
Memory Organizations:
256 words x 8 bits
512 words x 4 bits
1024 words x 2 bits
2048 words x 1 bit
V_{in} (1): 2.4 min.
(0): 0.8 max.
V_{out} (1): 3.0 min.
(0): 0.4 max.
Operating Power: 270 μW/bit
Access Time: 750 nsec

3072-BIT STATIC ROM

UA2572 −55° to 125°C
UA3572 −25° to 70°C
Memory Organization:
256 words x 12 bits
V_{in} (1): 2.4 min.
(0): 0.8 max.
V_{out} (1): 3.0 min.
(0): 0.4 max.
Operating Power: 200 μW/bit
Access Time: 750 nsec

4096-BIT STATIC ROM

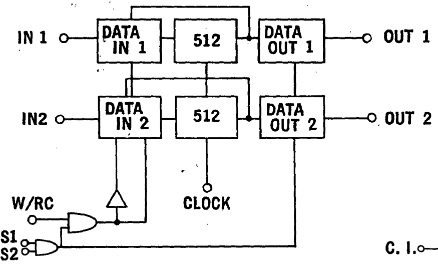
UA2596 −55° to 125°C
UA3596 −25° to 70°C
Memory Organizations:
512 words x 8 bits
1024 words x 4 bits
2048 words x 2 bits
4096 words x 1 bit
V_{in} (1): 2.4 min
(0): 0.8 max.
V_{out} (1): 3.0 min.
(0): 0.4 max.
Operating Power: 100 μW/bit
Access Time: 750 nsec

DUAL 512-BIT DYNAMIC MOS SHIFT REGISTER

UA2552 −55° to 125°C
UA3552 −25° to 70°C
Max. Frequency 2.0 MHz
Power Consumption: 200 μW/bit @ 2 MHz
Clock Requirements: single 0-5 V TTL clock

Worst-case bipolar compatible on input and output.

A dual 512-bit shift register that needs no high-voltage clock; draws one-fifth the power and has one-tenth the clock capacitance of competitive devices. Can be used as a delay line or serial storage in recirculate mode. Both channels continuously recirculate until data input is enabled. Two chip-select inputs allow X-Y matrix selection.

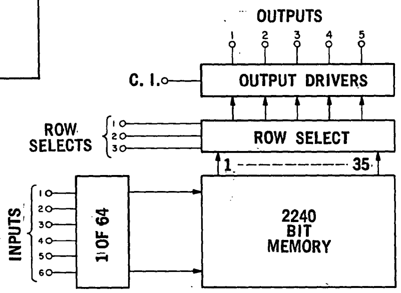


2240-BIT CHARACTER GENERATOR MOS ROM

UA3540 −25° to 70°C
V_{in} (1): 2.4 min.
(0): 0.8 max.
V_{out} (1): 3.0 min.
(0): 0.4 max.
Operating Power: 180 μW/bit
Access Time: 500 nsec

Worst-case bipolar compatible on input and output.

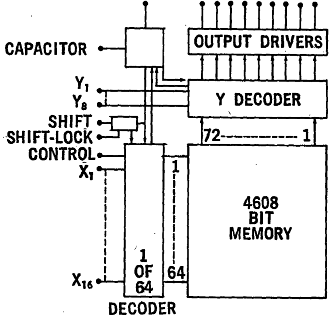
A static 2240-bit ROM specially designed to generate ASCII coded characters for a 5 x 7 raster-scan display.



KEYBOARD ENCODER

UA3533 −25° to 70°C
Input: Single switch closure
Output: Programmable 512 word x 9 bit code
Operating Power: 200 mW

A keyboard encoder capable of accepting 128 coded keys with 4 modes which results in 512 possible 9 bit output codes (4608 bits). Keybounce is eliminated by an internally generated strobe. Other features include: two key rollover, single switch addressing, shift lock with indicator capability, ignores false inputs up to 4 μsec, and bipolar compatible outputs.



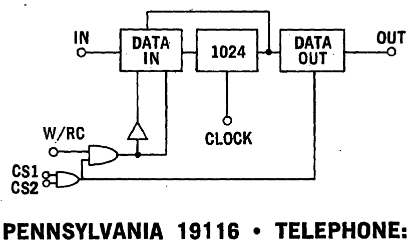
1024-BIT DYNAMIC MOS SHIFT REGISTER

UA2554 −55° to 125°C
UA3554 −25° to 70°C
Max. Frequency: 2.0 MHz
Power Consumption: 200 μW/bit at 2 MHz
Clock Requirements: Single 0-5 V TTL clock

Worst-case bipolar compatible on input and output.

A 1024 bit shift register that needs no high-voltage clock; draws one-fifth the power and has one-tenth the clock capacitance of competitive devices.

Can be used as a delay or serial storage in recirculate mode. Output continuously recirculates until data input is enabled. Two chip-select inputs allow X-Y matrix selection.

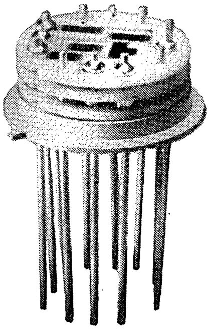


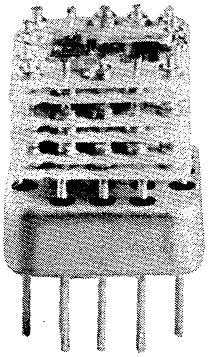
POST OFFICE BOX 11569 • PHILADELPHIA, PENNSYLVANIA 19116 • TELEPHONE: (215) 355-5000 • TWX 510-667-1717

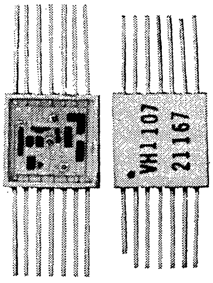
Unisem
SUBSIDIARY OF UNITED AIRCRAFT CORPORATION
TREVOSE, PENNSYLVANIA 19047

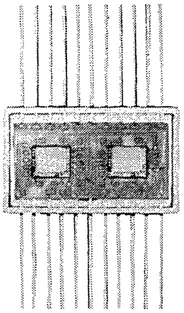
HYBRID MICROCIRCUITS

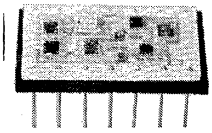
PACKAGING

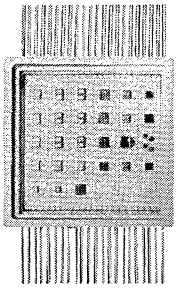

TO5/8


MCP


FLATPACK


HYBRID MEMORY


DUAL-IN-LINE


MULTILAYER

TOTAL CAPABILITY IN HYBRID CIRCUITRY

- Unisem manufactures a broad variety of hybrid microcircuits including simple single wafer flat packs, stacked wafer TO-5's, TO-8's and MCP's, plug-in packages, hermetic and non-hermetic DIP's, custom assemblies and multilayer circuits in which 30 integrated circuits are mounted and interconnected on a single 1″ x 1″ substrate and enclosed in a hermetic package.
- Unisem operates separate prototype and production facilities. Thus, prototype flexibility with fast turnaround is maintained in conjunction with a sophisticated high volume production operation.
- Unisem has a well staffed electrical design section which allows hybrid microcircuits to be thoroughly analyzed, breadboarded and designed with producibility in mind.
- Unisem is quality oriented. Being a sophisticated hybrid supplier, quality and reliability is **built into** every hybrid product. Complete environmental facilities are maintained to perform environmental screening and qualification to MIL-STD-883 on a regular basis.

HYBRID CIRCUITS

STANDARD

- Single and dual phase MOS clock drivers
- Bipolar clock drivers
- Digital-to-Analog converters
- High speed operational amplifiers
- Video and gamma amplifiers

CUSTOM CIRCUITS

- Random logic
- Amplifiers
- Analog arrays
- Sample and Hold circuits
- Line drivers and receivers
- Core drivers
- MOS/Bipolar logic functions

HYBRID MEMORIES

Any of the MOS-LSI devices available from Unisem may be incorporated into hybrid memory modules to perform various functions. For example:

Static and Dynamic RAM's
256 x 2, 256 x 4, 256 x 6, 256 x 8

Read Only Memories — multiple chip ROM packages have been manufactured up to 4096 x 8 and 2048 x 12.

Dynamic Shift Registers in various configurations such as 1024 x 4, 2048 x 2, 4096 x 1, 4096 x 2, etc.

POST OFFICE BOX 11569 • PHILADELPHIA, PENNSYLVANIA 19116 • TELEPHONE: (215) 355-5000 • TWX 510-667-1717

In components, diodes and antennas A.E.L. gives you Electronic Warfare Capability Now

Components

Solid State Switches—0.005 to 18.0 GHz, speeds as high as 10 nanoseconds
Detector Mounts—0.05 to 18.0 GHz
RF Filters—wave guide, coax, high power, low power
Parametric Amplifiers
Video Amplifier, pre amps, post amps
Microwave Electronics
Limiters, Mixers/IF pre amp

Diodes

Widest range in stock for immediate delivery:
- Tuning Diodes
- High Power Multiplier Diodes
- Varactor Diodes
- Video Diodes

Antennas

The most complete line of Broadband Frequency Independent Circularly or Linearly Polarized Antennas from Stock and Custom.

Sub Systems

Integrated RF Assemblies

Hybrid Microelectronic Circuits (HMC®)

Microwave Integrated Circuits

Write or phone for additional information

AEL®

AMERICAN ELECTRONIC LABORATORIES, INC.
P.O. Box 552, Lansdale, Pa. 19446 • (215) 822-2929 □ TWX: 510-661-4976 □ Cable Address: AMERLAB

854 R

ARRA INC.
ANTENNA & RADOME RESEARCH ASSOCIATES

COAXIAL • WAVEGUIDE • SOLID STATE

MICROWAVE

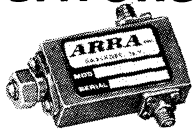
COMPONENTS • ASSEMBLIES • SUB - SYSTEMS

MINIATURE

VARIABLE ATTENUATORS

5 WATTS 3KW PEAK
2 OUNCES
1¾" x 1" x ½"

FROM $170.00 TO $225.00



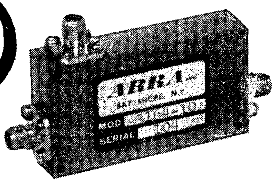
Freq. Range (GHz)	Atten. Range (db)	Maximum VSWR	Max. Ins. Loss (db)	Model No.
2.0-4.0	10	1.8	0.5	4804-10
2.5-4.0	10	1.5	0.5	4804-10X
4.0-8.0	10	1.5	0.5	5804-10
4.0-8.0	20	1.5	0.5	5804-20
6.0-11.0	10	1.5	0.5	5-6804-10
6.0-11.0	20	1.5	0.5	5-6804-20
6.0-11.0	30	1.5	1.0	5-6804-30
8.0-12.4	10	1.5**	1.0	6804-10
8.0-12.4	20	1.5**	1.0	6804-20
8.0-12.4	30	1.5**	1.0	6804-30

** 1.7 VSWR ABOVE 11.0 GHz. Other Models to 18 GHz

MINIATURE

DIRECTIONAL COUPLERS

$100



Freq. Range (GHz)	Coupling (db)	Min. Directivity (db)	Model No.
1.0-2.0	10	20	3164-10
	20	20	3164-20
	30	20	3164-30
2.0-4.0	10	20	4164-10
	20	20	4164-20
	30	20	4164-30
4.0-8.0	10	17	5164-10
	20	17	5164-20
	30	17	5164-30

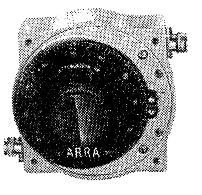
±1.0 db Coupling Deviation
10 Watt Average Power (10 db Models)
3 KW Peak
SMA Female Conectors (3 mm)
0.2 db Max. Insertion Loss (Excluding Coupled Power)

DIRECT READING

VARIABLE ATTENUATORS

100 db RANGE
15 Watts Av. INPUT POWER

Freq. Rge.	Min. Dynamic Atten. Rge. (db)	Attenuation vs. Freq. (±db)	Model No.
0.5-1.0	60	1.0	2952-60
0.5-1.0	100	1.5	2952-100
0.9-1.3	60	1.0	2-3952-60
0.9-1.3	100	1.5	2-3952-100
1.0-2.0	60	1.0	3952-60X
1.0-2.0	100	1.5	3952-100X
1.4-2.4	80	1.25	3-4952-80
2.0-4.0	60	1.0	4952-60X
2.0-4.0	80	1.25	4952-80X

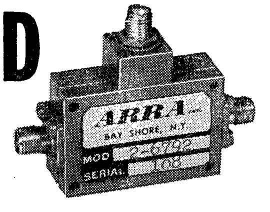


DIRECT READING DIAL
6 db Maximum
INSERTION LOSS

BROADBAND

DIODE MINI-PIN TYPE

SWITCHES



1½" x 1" x ½"

Model 2-6792

500-12400 MHz 5 WATTS

40 db Min. Isolation • 1 db INSERTION LOSS (1.0-9.0 GHz)

VARIABLE ATTENUATORS

VAMP TYPE

500-11000MHz • 10 Watts Average Pwr.
0.5db Max. Insertion Loss • 1.5 Max. VSWR

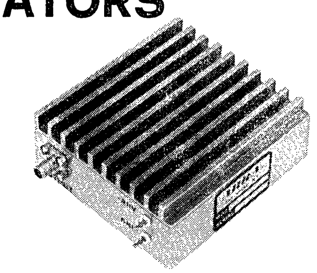
Freq. Rge. (GHz)	Atten. Rge. (db)	Atten. vs. Freq.	Form Factor	Model No.
0.5-1.0	10		0-19	2614-10
1.0-2.0	30		9-19	3614-30
2.0-4.0	50		0-51	4674-50
2.0-4.0	20	±1.5	0-51	4674-20F
4.0-7.0	50		0-39	5684-50
4.0-8.0	20	±1.0	0-39	5684-20F
5.4-11.0	20	±1.5	0-39-2	5-6684-20F
7.0-11.0	50		0-39-2	6684-50
7.0-11.0	20	±1.0	0-39-2	6684-20F

Form 0-39 & 0-39-2: 3" Dia
Form 0-19 & 0-51: 5" Dia.

HIGH POWER

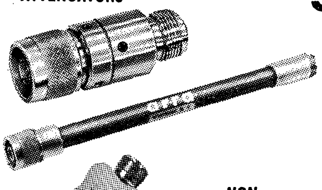
SOLID STATE OSCILLATORS

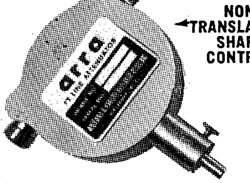
Center Frequency: 500-6000 MHz
Tunable Bandwidth: 10%
Output Power: To 8 Watts
Spurious Responses: Greater than 30 db down
DC Power Requirements: −28 VDC at 500-600 ma Max.
RF Connector: SMA Female
DC Connectors: Solder Terminals
Size: 3½" x 3" x 1⅞" (below 3 GHz)
5½" x 3" x 2" (above 3 GHz)



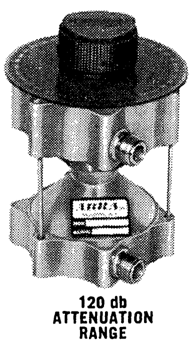
SOME ADDITIONAL DEVICES

FIXED ATTENUATORS

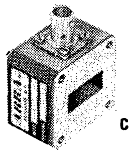


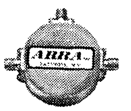


NON TRANSLATING SHAFT CONTROL

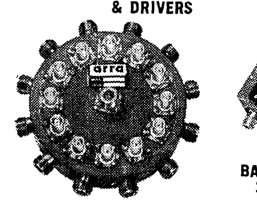


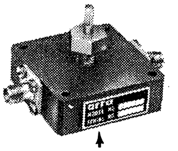
120 db ATTENUATION RANGE





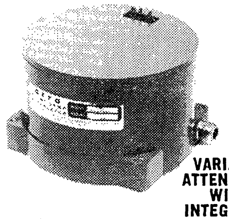
COAXIAL & WAVEGUIDE DIODE SWITCHES & DRIVERS



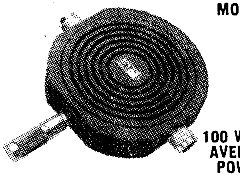


MINIATURE ATTENUATORS 2 OUNCES

BANDS FROM 2-18 GHz



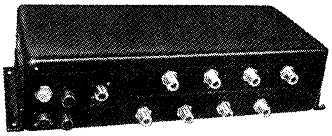
VARIABLE ATTENUATOR WITH INTEGRATED MOTOR



100 WATTS AVERAGE POWER

15 HAROLD COURT • BAY SHORE, N. Y. 11706 PHONE 516-231-8400 • TWX 510-227-6231

RF FILTERS, CONVERTERS, AMPLIFIERS, MULTIPLIERS, SIGNAL SOURCES, MULTICOUPLERS

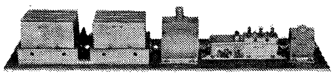


MULTICOUPLERS

Model HFM Series is designed to meet the needs of most systems.

General features:
- High isolation between outputs
- High dynamic range
- Low noise
- Modular construction
- Solid-state
- Octave bandwidth (if desired)

Model PM Series of passive multicouplers provides the ultimate performance in signal distribution.



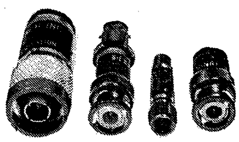
BROADBAND MULTIPLIERS (5-18,000 MHz)

These units utilize solid state devices.

Using the frequency multiplier as the basic tool, lines of Signal Sources, Frequency Synthesizers and Multiplier Chains are now available.

General characteristics:

Frequency Range:	5-18,000 MHz
Bandwidths:	up to 27%
Power Output:	up to 5 watts
Efficiency:	as high as 50%



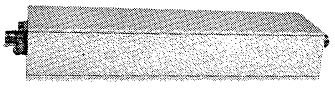
FIXED PAD ATTENUATORS & TERMINATIONS (DC—3 GHz)

FOR TYPES BNC, TNC C, N & OSM CONNECTORS

Integrated line of fixed pad attenuators, terminations and impedance-matching transformers provides means for rapid and accurate division of voltages over the frequency range of DC to 3 GHz, and for the matching of different impedances with minimum loss over a broad frequency band. The unit cost is within the practical price range of the large and small equipment user, as well as the research and experimental user.

General characteristics:

Frequency Range:	DC—3 GHz
VSWR:	1.25:1
Attenuation Accuracy:	±0.5 dB
Impedances (nominal):	50, 75, 90 ohms
Attenuation values:	1, 2, 3, 4, 6, 10, 12, 15, 20 dB (standard)

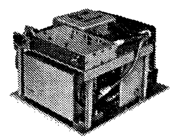


LOG IF AMPLIFIERS

The units are constructed to meet mil and missile applications. Size is approximately 6" x 1⅜" x ¾". Weight is approximately 6 oz. Primary power requirement is +6V @ 125 ma, depending on dynamic range.

General characteristics:

Dynamic Range:	to 80 dB
Center Frequencies:	from 10 to 160 MHz
Bandwidths:	2 to 50 MHz
Accuracies:	to ±1 dB over temperature range
Rise time:	100 ns



CONVERTERS

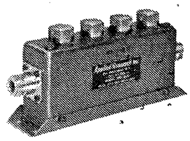
State of the art converters available for military or commercial application throughout the frequency range. All units are constructed to meet mil applications.

TELEMETRY CONVERTERS

These units permit the ready adapting of existing UHF telemetry receiving equipment for use in the 1435 to 1540 and 2200 to 2300 MHz telemetry band with high conversion gain.

General characteristics:

Long term stability:	better than ±.1 PPM over temperature range
Image rejection:	>than 50 dB
Noise figure:	better than 5 dB for 100 mc bandwidth (2.2 to 2.3 GHz)

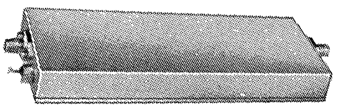


FILTERS (5-12,000 MHz)

Advanced network design techniques have developed filters operating in the frequency range up to 12,000 MHz. With electrical performance approximating theoretical expectations. In addition to Bandpass, Band Reject and Multiplex Filters, advanced network designs are available for antenna couplers, Diplexers, Interdigital Filters and many other types.

General characteristics:

Frequency Range:	5-12,000 MHz
Bandwidths:	up to several octaves
Insertion Loss:	as low as 0.25 dB
Power:	up to 3.5 kW (cw)
Band Reject Notches:	as narrow as ¼ % fo
Band Reject Attenuation:	as great as 75 dB



SOLID STATE RF AMPLIFIERS

(Power, low-noise, broadband, phase matched, linear and high dynamic range)

Constructed to meet mil and missile applications.

General characteristics:

Frequency Range:	up to 4 GHz
Bandwidths:	up to multiple octaves
Phase matching:	to within 1° over an octave
Noise figure:	as low as 1.5 dB
Gains:	up to 120 dB
Power output:	>than 20 watts

For complete details, write or call

Applied Research
INCORPORATED

76 So. Bayles Ave., Port Washington, N. Y. 11050, (516) 883-5700

You've found one source for:

CIRCULATORS & ISOLATORS

Model No.	Frequency Range (gc)	Type	RF Connectors
C3R21	4.4 - 5.0	3 Port	BRM
C4R96	8.2 - 10.0	4 Port	BRM
C3N28	2.75 - 4.0	3 Port	N
C4N94	4.4 - 5.0	4 Port	N
C5N03	5.4 - 5.9	5 Port	N
C2W35	4.4 - 5.0	Isolator	UG149A

DIRECTIONAL COUPLERS & HYBRIDS

Model No.	Frequency Range (mc.)	Coupling Attenuation (db)	RF Connectors
323R31	1 - 2 (gc)	3	BRM
323R62	4 - 8 (gc)	6	BRM
308N2	500 - 1000	20	Type N
313N3	300 - 2000	30	Type N
362A7	30 - 1000	70	1⅝" Flange
382A6	120 - 1000	60	3⅛" Flange

DC OUTPUT DIRECTIONAL COUPLERS

Model No.	Frequency Range (mc.)	Power Range (watts)	RF Connectors
596N2	1700 - 2400	0 - 4	Type N
263N5	2 - 30	0 - 60	Type N
576N6	28 - 1000	0 - 400	Type N
536.63	2 - 30	0 - 1200	Type LC
402A8	28 - 1000	0 - 4000	1⅝" Flange
442A9	28 - 1000	0 - 12000	3⅛" Flange

WAVEGUIDE DIRECTIONAL COUPLERS

Model No.	Frequency Range (gc)	Coupling Attenuation (db)	Overall Length—Inches
WL3A	1.12 - 1.70	30	4¾
WN3B	1.70 - 2.60	30	1⅞
WR4B	2.20 - 3.30	40	1⅞
WS4A	2.60 - 3.95	40	3⅝
WC5A	3.95 - 5.85	50	3⅝
WX6A	8.20 - 12.40	60	1⅞

DUMMY LOADS & TERMINATIONS

Model No.	Frequency Range (mc.)	RF Power Dissipation (watts)	RF Connectors
680R	0 - 10 (gc)	200 (mw)	BRM
601N	0 - 3000	5	N
634N	0 - 3000	150	N
674N	0 - 3000	400	N, 70 ohms
636N	0 - 3000	600	N
638A	0 - 2000	6000	3⅛" Flange

RF FILTERS & WAVEMETERS

Model No.	Frequency Range (gc)	Type	RF Connectors
FCTS504	3.4 - 3.6	Tunable BP	BRM
FCRS201	3.5	Band Reject	BRM
FCLB15B	980	Low Pass	1⅝" Flange
FCTA201	400 - 450	Tunable	TNC
FCTL213	1200 - 1400	Tunable	N
FIWE271	5.3 - 6.3	Wavemeter	C-MB

RF COAXIAL SWITCHES

Model No.	Frequency Range (mc.)	Type	RF Connectors
S21N373	0 - 3000	SPDT	N
S21R563	0 - 5000	SPDT	BRM
S21R383	0 - 5000	SPDT	BRM
S23R383	0 - 3000	DPDT	BRM
S54N473	0 - 3000	Transfer	N
S11N253	0 - 3000	Latching	N

RF WATTMETERS

Model No.	Frequency Range (mc.)	Power Range (watts)	RF Connectors
621N	1 - 100	0 - 120 (mw)	N
651N	25 - 1000	0 - 25, 100, 500	N
612A	44 - 1000	0 - 6000	3⅛" Flange
711N	8 - 1000	0 - 30, 75, 300	N
712N	25 - 1000	0 - 2.5, 5, 10	N
706N	28 - 1000	0 - 400	N

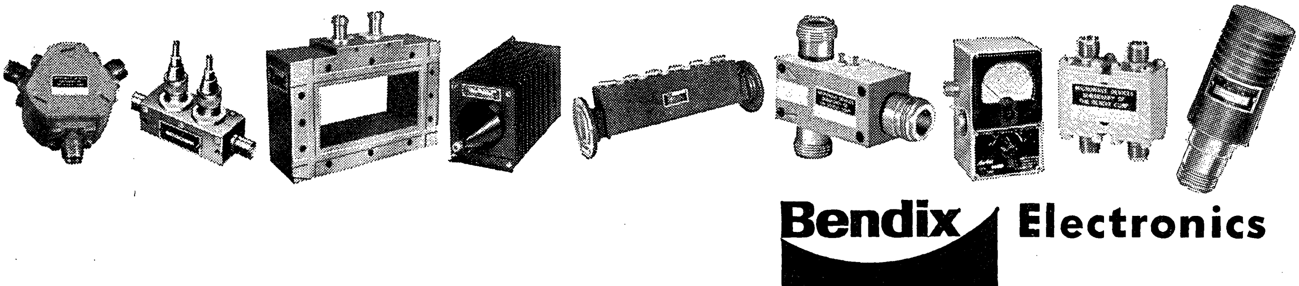
INTEGRATED DEVICES

Device	Model No.	Specifications
Triplexer	FCPC332	3 Channel, 4.7 to 4.9 gc; loss 1.5 db; VSWR 1.5
Coupler-Filter-Switch	CFSA391	200-400 mc., 1 vdc output, low pass SPDT
Dual Preselector	FCBS363	2 Channel, 3.4 to 3.7 gc; loss 1.5 db; VSWR 1.5
Frequency Multiplier	FMSE10	Input Freq. 2.74-3.35 gc, dblr., bdwth. 20%
Circulator-Coupler	C4CN036	4.4-5.0 gc, 4 pt. Cir.
Switch-Coupler	SC2NI83	4.2 gc, Transfer Swt., pwr. & VSWR Monitor

MINIATURE COMPONENTS

Model No.	Frequency Range (gc)	Type	RF Connectors
MDC101	1 - 4	D.C. Block	BRM
MMT104	4 - 8	Monitor Tee	BRM
AFR03	0 - 5	Attenuator	BRM
AMN92	4.4 - 5.0	Variable Atten.	N
PMR03	5.4 - 6.5	Phase Shifter	BRM
PEN32	5.4 - 5.9	Phase Shifter	N

They're all available for fast delivery. Need a special microwave device? We're equipped to modify or build to meet your specific requirements. Write or call for our new catalog: Microwave Devices Division, The Bendix Corporation, Hurricane Rd., Franklin, Indiana 46131. Phone: (317) 736-6136.

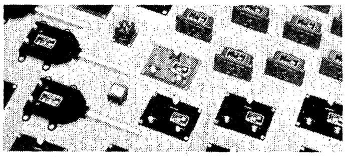


Bendix Electronics

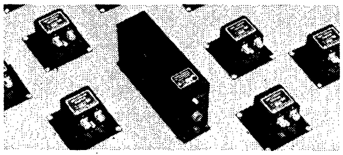
DAICO INDUSTRIES, INC.

ELECTRONIC COMPONENTS AND ASSEMBLIES FOR AIRBORNE AND SHIPBOARD SYSTEMS

COAXIAL SWITCHES



- Diode and reed switching elements ●
- SPST - SP36T ● DC-3000 MHz ●
- High CW and Peak Power (100W- 5KW) ●
- High speed drivers - 20 nanoseconds ●
- Diode fail safe techniques ●
- Computer interface - T^2L ●



ANTENNA COUPLERS

- Broad band variable matching elements ●
- Computer optimized networks ●
- Passive isolation power dividers ●
- Active amplified and matching units ●
- LORAN/VOR/Glideslope/VHF/UHF/L&S Band ●

Custom aircraft ECM devices ● Interface blanking ● Skid Control Monitor/display ● Two bit — three bit — phase shifters ● Step Attenuators — digitally controlled ● Test support equipment

A LEADER IN DIODE SWITCHES/DRIVERS, ANTENNA COUPLERS & AIRCRAFT EQUIPMENT

DAICO INDUSTRIES, INC.

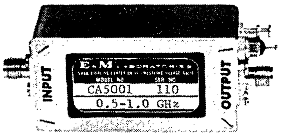
2351 East Del Amo Boulevard • Post Office Box 5225
Compton, Calif. 90220 • 213/631-1143 • 213/636-9767

E & M LABS OFFERS FULL SPECTRUM CAPABILITY

100 MHz
5 GHz
10 GHz
40 GHz

miniature components • solid state devices • integrated packages ferrite devices • filters • amplifiers

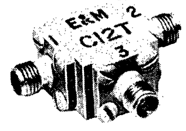
SOLID STATE AMPLIFIERS—OCTAVE/MULTIOCTAVE



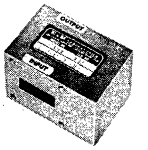
Frequency MHz	Noise Figure db Max.	Gain db Min.	Gain Flatness ± db	Power Output dB Min.	VSWR Max.	Model Number
10 - 500	3.2	25	0.5	+ 3	2.5	CA1005
10 - 1000	4.5	27	1.0	+ 5	2.5	CA1001
500 - 1000	3.0	29	0.75	+10	2.0	CA5001
1000 - 2000	4.5	27	1.0	+ 6	2.5	L1020HN

COAXIAL OCTAVE BANDWIDTH CIRCULATORS/ISOLATORS

Frequency GHz	Isolation dB Min.	Insertion Loss dB Max.	VSWR Max.	Circulator Model Number	Isolator Model Number
0.5 - 1.0	15	0.75	1.45	U30T	U30TI
1.0 - 2.0	18	0.4	1.28	L30T36	L30T30
2.0 - 4.0	18	0.4	1.25	S30T46	S30T30
4.0 - 8.0	17	0.4	1.30	C30T40	C30T30
8.0 - 12.0	18	0.5	1.30	X29T	X29TI
12.0 - 18.0	16	0.6	1.35	Ku30T36	Ku30T30



WAVEGUIDE FULL BANDWIDTH CIRCULATORS/ISOLATORS



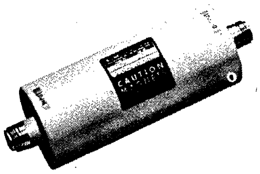
Frequency GHz	Isolation dB Min.	Insertion Loss dB Max.	VSWR Max.	Circulator Model Number	Isolator Model Number
3.95 - 5.85	17	0.5	1.30	C102LY	C102LYI
5.85 - 8.2	17	0.5	1.30	Xb111LY	Xb111YLI
7.05 - 10.0	17	0.5	1.30	XL106LY	XL106LYI
8.2 - 12.4	20	0.3	1.20	X112LY	X112LYI
12.4 - 18.0	17	0.5	1.30	Ku134LY	Ku134LYI
18.0 - 26.5	17	0.5	1.30	K134LY	K134LYI

MINIATURE WAVEGUIDE ISOLATORS

XbM Series	5.85 - 8.20 GHz
XLM Series	7.05 - 10.0 Ghz
XM Series	8.2 - 12.4 GHz
WM Series	13.3 - 14.4 GHz
KM Series	12.4 - 18.0 GHz
KMA Series	18.0 - 26.5 GHz
RM Series	26.5 - 40.0 GHz
Length	½ inch
Bandwidth	200 Mc. (average)
Isolation	20.0 db (average)
Ins. Loss	0.4 db (average)
VSWR	1.15 (average)

E&M LABORATORIES
NORTH HOLLYWOOD, CALIF.
KMA1 101

BROADBAND COAXIAL ISOLATORS



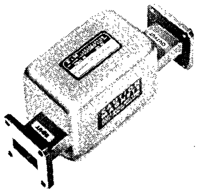
Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Dimensions—Inches Diameter	Dimensions—Inches Length	Model Number
0.5 - 1.0	10	1.5	1.25	9³⁄₁₆	2⅛	U10P
†1.0 - 2.0	15	1.0	1.15	7⁷⁄₁₆	2⅛	L20PS
1.0 - 4.0	10	1.0	1.25	7⁷⁄₁₆	1½	LS10P
†2.0 - 4.0	20	1.0	1.20	6⅞	2⅛	S11PS
3.8 - 11.7	10	1.0	1.30	6⅝	1½	SCX10P
†4.0 - 8.0	15	1.0	1.20	6⅝	2⅛	C20PS
4.0 - 11.0	10	1.0	1.25	7⅝	2	CX10P
†7.0 - 11.0	15	1.0	1.25	5³⁄₃₂	1¾	CX20PS
†8.0 - 12.0	10	1.0	1.25	4⅛	1¾	X20PS

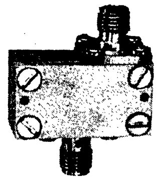
†Magnetically Shielded

BROADBAND WAVEGUIDE ISOLATORS

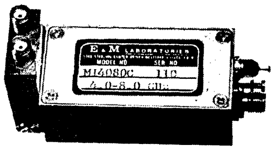
Frequency GHz	Isolation db Min.	Insertion Loss db Max.	VSWR Max.	Length Inches	Model Number
2.6 - 3.95	20	1.0	1.15	14	S103LI
3.3 - 4.9	25	1.0	1.15	8¼	CS110LI
3.95 - 5.85	30	1.0	1.10*	7	C876LI
5.85 - 8.2	30	1.0	1.10*	5	Xb951LI
7.05 - 10.0	30	1.0	1.10*	5	XL920LI
8.2 - 12.4	30	1.0	1.10*	4½	X956LI
10.0 - 15.0	30	1.0	1.15*	5	M111LI
12.4 - 18.0	30	1.0	1.10*	4	Ku915LI
18.0 - 26.5	25	1.0	1.15*	4½	K884LI

*Bilaterally Matched

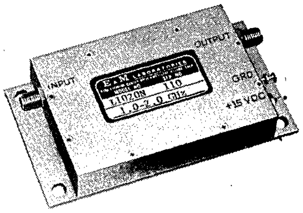




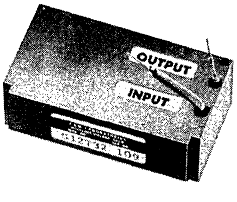
SUBMINIATURE TELEMETRY BANDPASS FILTERS



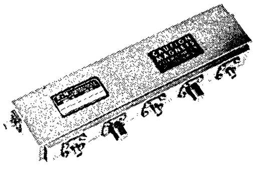
BROAD IF BANDWIDTH MIXER-PREAMPLIFIERS



MICROWAVE AMPLIFIERS



25W TELEMETRY ISOLATORS



MULTI-PORT CIRCULATORS FOR TDA APPLICATIONS

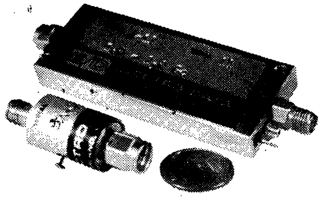
REQUEST COMPLETE PRODUCT CATALOG

Specifications Subject to Change

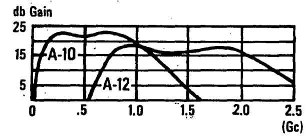
E & M LABORATORIES
A DIVISION OF STERLING SCIENTIFIC INDUSTRIES
5388 STERLING CENTER DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91360 • (213) 889-1470 TWX 910-494-1953

• YIG Devices • Advanced Systems Components • Parametric Amplifiers • RF Subsystems

BROAD BAND MINIATURE AMPLIFIERS



- **Low Noise**
- **Solid State, Miniature Size**
- **New Low Prices**



Typical Gain and Noise Figure vs Frequency

Other Models available having a variety of gain, bandwidth and noise figures.

Send for Bulletin A10/A12

SPECIFICATIONS

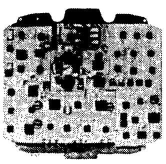
A-10

Frequency Response:
(10 db Gain) 20 to 1000 Mc
(18 db Gain) 50 to 850 Mc
Noise Figure: 5.0 db (Max)
Gain Compression (1 db):
−10 dbm Output
Connectors: 50 OHMS, 3 MM
Bias Requirements: −18V, ±1V, 20Ma
Size: 1½″ Long x ½″ Diameter
Weight: ¾ oz.
Price: $395.

A-12

Frequency Response:
(15 db Gain) 1000 to 2000 Mc
(10 db Gain) 700 to 2200 Mc
Noise Figure: 8 db (Max)
6 db (Typical)
Gain Compression (1 db):
−6 dbm Output
Connectors: 50 OHMs, 3MM
Bias Requirements: −12V, ±1V, 20Ma
Size: ⅜″ Thick x 1″ Wide x 2⅝″ Long
Weight: 5 oz.
Price: $750.

HYBRID MICRO CIRCUITS FOR ADVANCED PRODUCT DEVELOPMENT



Time computer used in PULSAR contains a 3500 transistor element logic on a 1″ x 1″ hybrid substrate.

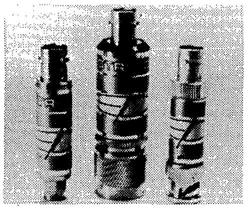
DEVELOPERS OF:

Pulsar.

The first all semiconductor logic, light emitting diode display wrist watch.

For your special requirements:
Contact Marketing Department

TUNNEL DIODE DETECTORS



- **Highest sensitivity**
- **Broadband, flat response**
- **Field replaceable diodes**
- **Low price includes diodes with mount**

SPECIFICATIONS

Type N Input	Freq. Gc.	Tss −dbm	Price
D10	1-12.4	50	$ 95.00
D11	1-2	54	75.00
D12	2-4	54	75.00
D13	4-8	52	75.00
D14	8-12.4	50	75.00
D15	.01-12.4	45	95.00

3 MM Input	Freq. Gc.	Tss −dbm	Price
D30	1-12.4	50	$105.00
D31	1-2	54	95.00
D32	2-4	54	95.00
D33	4-8	52	95.00
D34	8-12.4	50	95.00

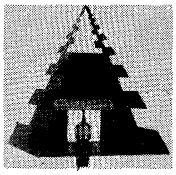
BNC/TNC Input	Freq.	Tss −dbm	Price
D40	100KC-2.5Gc	48	$ 30.00
D41	100KC-4Gc	45	50.00

Ask for Series D Bulletin

LOG PERIODIC ANTENNAS

Broad Band Coverage 1-12.5 Gc. Compact, Rugged, Lightweight Portable.

Measured antenna patterns show only a single main lobe with a 15 db front to back ratio over the entire 1 to 12.5 Gc band.

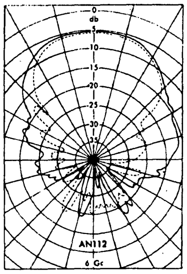


AN112 6¼″ x 6½″ x 8″

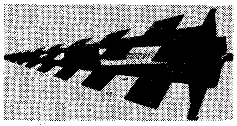
SPECIFICATIONS

- Broad bandwidth — 1 to 12.5 Gc
- High Gain — 11 db (50° beamwidth)
- Linear Polarization 20 db

- High front to back ratio in both horizontal and vertical planes — 15 db.
- Low VSWR — 2: 1 nominal with 50 ohm input.
- Connectors: Type "N" or miniature
- Price, $175 each Bulletin: AN112



Measured typical radiation pattern
Solid, vertical
Dashed, horizontal

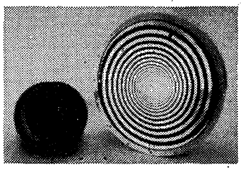


AN112F 1¾″ x 6½″ x 8″

SPECIFICATIONS

- Broad bandwidth — 1 to 12.5 Gc
- High Gain — 8 db (90° bandwidth)
- Linear polarization 15 db
- Price, $175 each
- Bulletin: AN112F

CAVITY BACKED SPIRAL ANTENNAS



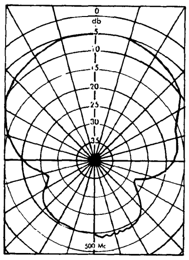
These compact, lightweight antennas are ideal for portable survey applications in the 30 Mc—2 Gc frequency range.

Write for Bulletin AN012-L

- Broadband Coverage UHF Thru L-Band
- Circular Polarization • Lightweight

SPECIFICATIONS

	MODEL AN012	MODEL AN013
Frequency	50 Mc — 2 Gc	30 Mc — 1.5 Gc
Beamwidth	70 to 110°	80 to 120°
VSWR	2:1	2:1
Connector	N Female	N Female
Size	7½″ Dia. x 3¾″ H.	13½″ Dia. x 5″ H.
Weight	1 Lb.	4 Lbs.
Price	$500.00	$750.00



Measured pattern of the AN012-L Circular polarization.

Write for detailed product information

1621 Jupiter
Garland, Texas 75040
214-341-2100

ELECTRO/DATA
INC.

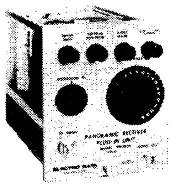
ELECTRO/DATA INC.

- **Microwave Test Equipment**
- **Swept Microwave Receivers**

YIG TUNED SPECTRUM ANALYZER PLUG-INS

Five models cover the entire frequency spectrum from 100 Mc to 40 Gc with greater than decade band tuning ranges. With these units, an ordinary oscilloscope is converted into a pre-selected wide band, microwave receiver which gives a panoramic display of signals on the oscilloscope The entire frequency spectrum or any segment of it, may be displayed in a single sweep.

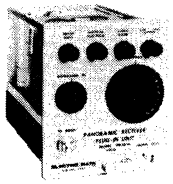
SPECIFICATIONS



MODEL PN 1010 / PN 1010A 100-1000 MC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (−dbm)	Price
PN 1010	.1-1.0	.1-1.0	3-6	40-60	$2,495
PN 1010A	.1-1.0	.1-1.0	3-6	60-80	$2,895

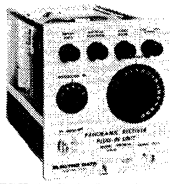
Ask for Bulletin: PN1000



MODEL PN 1011 1000-12,400 MC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (−dbm)	Price
PN 1011	1.0-12.4	.4-11	4-10	45-48	$1,995

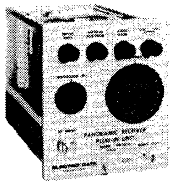
Ask for Bulletin: PN1000



MODEL PN 1012 500-5000 MC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (−dbm)	Price
PN 1012	.5-5.0	.4-4.5	4-7	42-56	$2,195

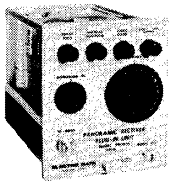
Ask for Bulletin: PN1000



MODEL PN 1013 1.8-25 GC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (−dbm)	Price
PN 1013	1.8-25	1.5-23.5	5	40-55	$2,995

Ask for Bulletin: PN 1013



MODEL PN 1014 10-40 GC

MODEL	Tuning Range (Gc)	Dispersion (Gc)	Resolution Typ. (Mc)	TSS (−dbm)	Price
PN 1014	10-40	2-30	25	30-45	$3,195

Ask for Bulletin: PN 1014

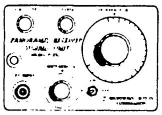
The above units for these Tektronix oscilloscopes: 531A, 532, 533A, 536, 541A, 543A, 543B, 544, 545A, 545B, 546, 547, 549, 551, 555, 556, 581A, 585A

Other units available for 561, 564 series Contact Marketing Department

SPECTRUM DISPLAY UNIT DU-501

This portable, battery operated display unit provides panoramic viewing from 100 Mc to 40 Gc when used with the five plug-ins listed below. Price $3,500.

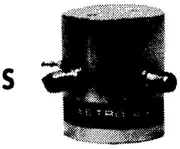
PLUG-IN SPECIFICATIONS



TU-VL501	.10 Gc to 1.0 Gc	Price . . . . $2,600.
TU-LX501	1.0 Gc to 12.4 Gc	Price . . . . $2,000.
TU-VC501	.5 Gc to 5.0 Gc	Price . . . . $2,200.
TU-LK501	1.8 Gc to 25 Gc	Price . . . . $3,000.
TU-XK501	10 Gc to 40 Gc	Price . . . . $3,200.

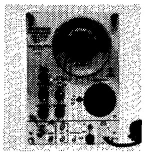
Bulletin: DU-501

YIG FILTERS



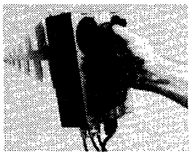
5 models cover from 100 Mc to 40 Gc with greater than decade electronic tuning ranges. Solid state, rugged compact construction.
Bulletin: YIG Filters

PANORAMIC RECEIVER R-10



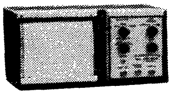
Self contained YIG tuned receiver accurately tunes any selected decade band from 100 Mc to 40 Gc. Price: $3,750. Bulletin: R-10

HAND HELD SURVEY UNIT



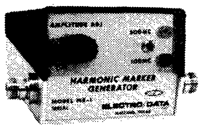
This compact receiver utilizes a YIG tuned RF preselector and sensitive crystal video circuit to cover 1-12.4 Gc. Price $2,900. Bulletin: RLX-100

GRAPHIC RECORDER



The RC-10, electric writing recorder, provides a permanent falling raster display for RFI and spectrum signal analysis. Price $4,375.

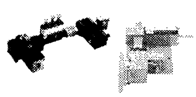
MARKER GENERATOR



MK-1
Covers 1-12.5 Gc. 100/500 Mc spacing. Self contained power supply. Price: $1,295.
Bulletin: MK-1

PARAMETRIC AMPLIFIERS

for operation in L,S,C,X,Ku Bands



E/D's broad design experience in both cryogenically cooled and room temperature low noise amplifier systems ranges from L to Ku band.

Contact Marketing Department

Frequency Sources Inc.

One Sixty Six Middlesex Street
North Chelmsford, Mass. 01863
TEL (617)251-8747 • TWX 710-343-6506

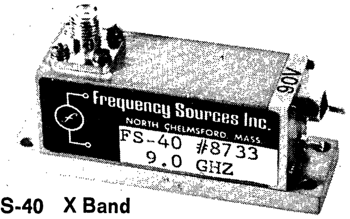
In addition to the standard product lines, Frequency Sources, Inc. offers its advanced engineering capabilities to design and manufacture the most sophisticated oscillators and multipliers. The facilities include modern research, production, and test equipment ranging from network analyzers and automatically controlled precision fabrication machinery to time sharing computer facilities and sophisticated test stations. The Company has instrumentation to test sources for FM residual noise content, rapid FM, pulse operation, and other important operating characteristics.

FSI designs use the latest state-of-the-art components including high FT transistors for fundamental oscillators in C-band, high power S-band transistors for our high power oscillators, Gunn Effect and impatt diodes that can be voltage tuned or mechanically tuned over extremely wide frequencies, YIG devices for linearity and bandwidth and GaAs tuning diodes for low loss circuits.

The services of the Application Engineering Department are available to help you with selection of the proper source. Why not call, write or TWX today.

AVALANCHE DIODE FUNDAMENTAL OSCILLATORS

Fundamental frequencies to 18 GHz
Built-in current control
Fixed, mechanical, or voltage tuned



FS-40 X Band

Model	Frequency Range (GHz)	Tuning Range (MHz)	Power Output (mW)	Harmonic Suppression (dB)	Dimensions (Inches) L	W	H
FS-40	8.0–12.4	100	10	−40	2	¾	1 5/16
FS-210*	6.5–12.4	4000	3	−40	2⅛	2⅛	4¾
FS-42	8.0–12.4	10%	10	−35	2	¾	1⅜

*Operates from −95VDC

VOLTAGE TUNED — HIGH POWER

Bandwidths up to 15%
Extremely fast tuning rates
Linear tuning curve
Power output to 2.0 watts

Frequency Sources Inc.
FS-14G #3715
5.4-5.9 GHZ
TUNE
60V

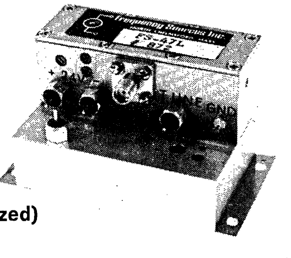
FS-14G C Band

Model	Frequency Range (GHz)	Voltage Tuned Bandwidth	Power Output (mW) (0°C to +60°C)	Harmonic Suppression (dB)	Dimensions (Inches) L	W	H
FS-2M(1)	0.2–0.6	12%	1000	−25	2½	1⅛	1 9/32
FS-2(1)	0.6–1.2	12%	1000	−25	2½	1⅛	1 9/32
FS-2H(1)	0.6–1.2	10%	2000	−25	2½	1⅛	1 9/32
FS-14A	2.3–2.9	325 MHz	250	−40	3 15/16	1⅝	1 5/16
FS-14B	2.8–3.3	400 HMz	200	−40	3 15/16	1⅝	1 5/16
FS-14C	3.1–3.6	450 MHz	200	−40	3 15/16	1⅝	1 5/16
FS-14D	3.5–4.3	500 MHz	200	−40	3½	1⅛	1 5/16
FS-14E	4.2–4.9	500 MHz	175	−40	3½	1⅛	1 5/16
FS-14F	4.9–5.6	600 MHz	125	−35	3½	1⅛	1 5/16
FS-14G	5.4–6.0	600 MHz	100	−35	3½	1⅛	1 5/16
FS-24	7.0–10.0	500 MHz	40	−35	4⅝	1⅛	1 5/16
FS-24M	10.0–11.0	400 MHz	25	−35	4⅝	1⅛	1 5/16
FS-35	15.0–17.0	500 MHz	25	−35	5	1⅛	1 5/16

Note: (1) Units are supplied with externally mounted emitter resistor.

VOLTAGE TUNED — LOW POWER

Bandwidths up to an octave
Extremely fast tuning rates
Rugged compact packages
Low DC power drain



FS-47L
L Band

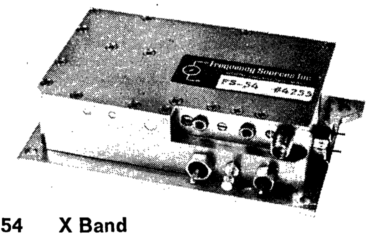
(Linearized)

Model	Frequency Range (GHz)	Voltage Tuned Bandwidth	Power Output (mW) (0°C to +60°C)	Harmonic Suppression (dB)	Dimensions (Inches) L	W	H
FS-6	0.3–1.8	15%	20	−25	2½	⅞	1
FS-6H	0.3–1.8	10%	100	−25	2½	⅞	1
FS-36	.05–1.5	Octave	10	−15	2½	⅞	1
FS-36H	0.5–1.0	Octave	250	−15	2½	⅞	1
FS-47	1.0–2.0	Octave	100	−15	2½	⅞	1
	2.0–4.0	Octave	15	−10	1¼	1 1/16	1 7/16
FS-25	1.8–2.5	200 MHz	20	−25	2½	⅞	1
FS-23	2.5–5.5	15%	25–20*	−35	3	1½	1
FS-18	4.8–11.0	500 MHz	25–3*	−35	3 7/16	⅞	1
FS-18W	8.5–11.0	1100 MHz	1	−35	3 7/16	⅞	1
FS-48(1)	15.0–18.0	1000 MHz	10	−35	5 7/16	1¼	1⅞

*High end of band. (1) Operates with −28VDC supply voltage and positive tuning voltage.
All models have reverse polarity protection and transient overvoltage protection on the supply line.

VOLTAGE TUNED — LOW NOISE

Lowest FM noise
Designed for airborne applications
Many options available
Wide bandwidths



FS-54 X Band

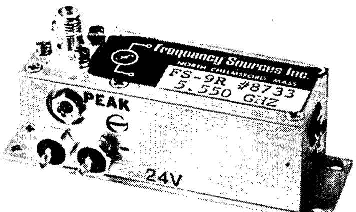
Model	Frequency Range (GHz)	Voltage Tuned Bandwidth	Minimum* Power Output (mW)	FM Noise RMS Deviation in 1 Hz BW Expressed in Hz	Dimensions (Inches) L	W	H
FS-50L	1.5–2.7	15%	150	$F_o \pm 100\ \text{Hz} = 60$ $F_o \pm 10\ \text{KHz} = 1.5$	3⅞	2⅜	1¼
FS-50S	2.0–2.4 3.0–4.0	10%	50,150	$F_o \pm 30\ \text{KHz} = 0.5$ $F_o \pm 100\ \text{KHz} = 0.5$			
FS-53	4.5–6.0	10%	10,30	$F_o \pm 100\ \text{Hz} = 100$ $F_o \pm 10\ \text{KHz} = 4.0$ $F_o \pm 30\ \text{KHz} = 1.0$ $F_o \pm 100\ \text{KHz} = 1.0$	3⅞	2⅜	1¼
FS-54	7.5–11.0	10%	5,10	$F_o \pm 100\ \text{Hz} = 220$ $F_o \pm 10\ \text{KHz} = 6.5$ $F_o \pm 30\ \text{KHz} = 2.0$ $F_o \pm 100\ \text{KHz} = 2.0$	3⅞	2⅜	1¼
FS-55	14–16	2%	5,10	$F_o \pm 100\text{Hz} = 250$ $F_o \pm 10\ \text{KHz} = 8.0$ $F_o \pm 30\ \text{KHz} = 2.5$ $F_o \pm 100\ \text{KHz} = 2.5$	3⅞	2⅜	1¼

*Highest power output is option.

Note: Lower FM noise option available, for example:
FS-54: $F_o \pm 100\ \text{Hz} = 95\ \text{Hz}$
$F_o \pm 10\ \text{KHz} = 3.8\ \text{Hz}$
$F_o \pm 30\ \text{KHz} = 1.1\ \text{Hz}$
$F_o \pm 100\ \text{KHz} = 1.1\ \text{Hz}$

MECHANICALLY TUNED (L-C)

Frequency stability to ±0.1% available
AFC optional on most units
Rugged, compact packages
Lowest cost
Excellent pulse capabilities



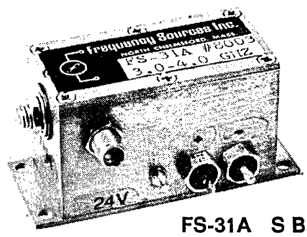
FS-9R C Band

Model	Frequency Range (GHz)	Tuning Range (%)	Power Output (mW)	DC(1) Input (Volts)	Harmonic Suppression (dB)	Dimensions (Inches) L	W	H
FS-7	0.1– 2.0	15	200–50*	24–28	−25	2½	⅞	1
FS-7R	0.1– 2.0	1	250–100*	24–28	−25	2½	⅞	1
FS-5	0.1– 2.0	15	25	20–28	−25	2½	⅞	1
FS-2R	0.2– 1.4	1	1000	40	−25	2½	1⅛	1 9/32
FS-3R	2.0– 4.0	1	60–30*	20–28	−25	3½	⅞	1
FS-14R	2.3– 3.5	1	500	40	−40	3 15/16	1⅝	1 5/16
FS-14L	3.5– 6.0	1	400–150*	40	−40	3½	1⅛	1 5/16
FS-9R	4.0– 6.0	1	40–25*	20–28	−25	2½	⅞	1
FS-1R	4.0– 6.5	1	7–4*	20–28	−25	2½	⅞	1
FS-24R	7.0–10.5	1	100	40	−40	4⅝	1⅛	1 5/16
FS-17R	5.0–11.0	1	40–10*	20–28	−35	3 7/16	⅞	1

Note: (1) Specify voltage desired if range shown. *High end of band.

CAVITY STABILIZED (TRANSISTOR)

Mechanically tuned, wide bandwidth
±0.05% stability −30°C to +71°C
Low DC power input
AFC and oven stabilized options
Fundamental frequencies to 4.5 GHz



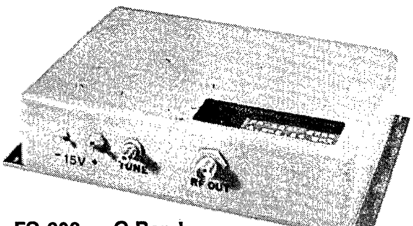
FS-31A S Band

Model	Frequency Range (GHz)	Tuning Range (MHz)	Power Output (mW)	Harmonic Suppression (dB)	Dimensions (Inches) L	W	H
FS-26(2)	1.2–1.5	300	10,50(1)	−40	3	1	1¼
FS-28(2)	1.5–2.3	800	10,50(1)	−35	2½	1	1¼
FS-31(3)	2.0–3.0	1000	10,25(1)	−35	2	1	1¼
FS-31S(3)	2.4–3.2	800	10,20(1)	−35	2	1	1¼
FS-31A(3)	3.0–4.0	1000	10	−35	2	1	1¼
FS-31B(3)	3.5–4.5	1000	10	−35	2	1	1¼
FS-27H(3)	3.6–6.0	500	20	−20	3	1	1¼
FS-37L(4)	4.0–7.5	500	10	−40	2½	1	1⅝
FS-37H(4)	7.5–10.4	600	5	−40	2½	1	1⅝
FS-48R	15.5–16.5	300	5	−35	2½	2	2¼

Notes: (1) Output power level is special option (2) Oven model is FS-44 (3) Oven model is FS-45 (4) Oven model is FS-46

GUNN DIODE FUNDAMENTAL OSCILLATORS

Fundamental frequencies to 18 GHz
Wide tuning bandwidths
Built-in voltage regulator



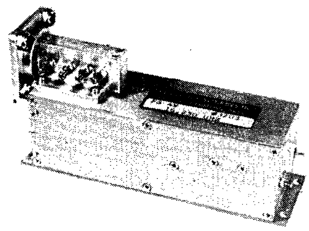
FS-306 C Band

Model	Frequency Coverage (GHz)	Tuning	Tuning Bandwidth	Power Output (mW)	Dimensions (Inches) L	W	H
FS-51*	5.0–11.0	Mech	12%	5,10,25	1¾	1⅛	1⅛
FS-251*	12.4–18.0	Mech	1%	10	1¾	1⅛	1⅛
FS-52	4.8–11.0	Voltage	12%	10	1½	1¼	1 1/16
FS-306	4.2– 5.8	Voltage	1600 MHz	20	4⅝	3⅝	1⅛
FS-307	5.8– 8.0	Voltage	2200 MHz	20	4⅝	3⅝	1⅛
FS-308	8.2–10.0	Voltage	1800 MHz	20	4⅝	3⅝	1⅛

*Voltage regulator on special order

CRYSTAL CONTROLLED

Ultrastable frequency control
High harmonic suppression
Compact, rugged design
Available 0.01 GHz-18.0 GHz
Variety of stability options
Output power to 3 watts



FS-49 Ku-Band

Model	Frequency Range (GHz)	Power 1 Output (mW)	Frequency Stablity (0°C to +60°C)	DC(2) Input (Volts)	Dimensions (Inches) L	W	H
FS-21A	0.01– 0.25	20–10	±.0025%	15	3½	1⅜	1⅛
FS-21B	0.25– 0.45	10–5	±.0025%	15	3½	1⅜	1⅛
FS-38	0.01– 0.45	20–5	1.0 PPM	15	5 1/16	2 31/32	2 25/32
FS-21CLP	0.45– 1.50	20–5	±.0025%	15	5	2½	1 19/64
FS-21CMP	0.45– 1.80	175–10	±.0025%	28	5	2½	1 19/64
FS-21CHP	0.45– 1.80	1000–50	±.0025%	28	5	2½	1 19/64
FS-39	0.45– 1.80	70–1	1.0 PPM	28	6 59/64	3 55/64	2½
FS-220A	1.50– 3.00	3 Watts	±.0025%	+28	6	2½	2
FS-30A	1.80– 2.50	30–20	±.0025%	+28	4 39/64	1⅞	1 9/16
FS-220B	3.00– 4.50	1 Watt	±.0025%	+28	6	2½	2
FS-30	2.50– 6.00	10–5	±.0025%	+15	4 39/64	1½	1 9/16
FS-30HP	2.50– 6.00	60–20	±.0025%	+28	4 39/64	1½	1 9/16
FS-220C	4.5 – 7.0	500	±.0025%	+28	6	2½	2
FS-22	6.00–11.0	15–5	±.0025%	+28	5 39/64	1½	1 9/16
FS-29A	2.50– 6.00	25–5	1.0 PPM	+28	6 3/16	2 31/32	2¾
FS-29B	6.00–11.0	5–2	1.0 PPM	+28	7 3/16	2 31/32	2¾
FS-220D	7.00– 9.6	250	±.0025%	+28	6	2½	2
FS-329	9.60–10.5	100	±.0025%	+28	7	5	2
FS-49	12.40–18.0	2	±.0025%	+28	5	1½	2½
FS-330	12.40–18.0	25	±.0025%	+28	7	2½	2

Notes: (1) Minimum power output — lower figure applies to highest frequency.
(2) Floating input if no sign shown on voltage.

OPTION T (Temperature)

Temperature	Temperature Stability	Long Term Stability	Power Output
−55°C to +55°C	±.003%	2 PPM /Day	Reduced 3 dB
−55°C to +85°C	±.003%	2 PPM /Day	Reduced 3 dB
−10°C to +50°C	±.0005%	1 PPM /Day	Per Table

OPTION O (Oven)

Temperature	Temperature Stability	Long Term Stability	Power Output
−55°C to +55°C	±.00005%	1 PPM /Day	Per Table
−55°C to +85°C	±.00005%	2 PPM /Day	Reduced 3 dB

OPTION TX (Highest Stability, Externally Mounted Module)

Temperature	Temperature Stability	Long Term Stability	Power Output
0°C to +60°C	±1 X 10^{-7}	5 X 10^{-8} / Day	Per Table

RHG
10TH
ANNIVERSARY
1961-1971
CAUTION 400 Hz ONLY

RHG A DEPENDABLE SOURCE FOR MICROWAVE TRANSMITTERS, RECEIVERS AND COMPONENTS

Since 1961, RHG has built and delivered thousands of off-the-shelf and custom made microwave devices and systems to hundreds of satisfied customers. During the next decade, this performance record will be continued and expanded. Call RHG for catalogs and technical information.

RHG's PRODUCT LINE:
☐ Linear IF Amplifiers ☐
☐ Log IF Amplifiers ☐
☐ Mixer-Preamps ☐ Microwave Relay Links ☐
☐ Microwave Receivers & Transmitters ☐

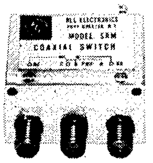
RHG RHG ELECTRONICS LABORATORY • INC

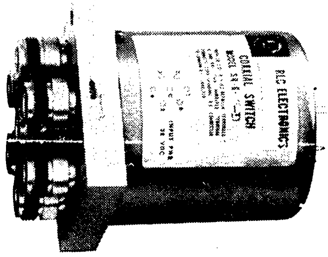
94 MILBAR BOULEVARD ▪ FARMINGDALE
LONG ISLAND ▪ NEW YORK 11735 ▪ (516) 694-3100
Microwave Receivers, Transmitters and Components

PRECISION COAXIAL COMPONENTS

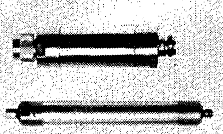
COAXIAL SWITCHES

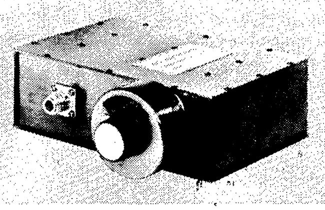
- DC — 18 GHz
- SPDT, Multiposition, and Transfer Designs
- Failsafe or latching
- Isolation to 100 db
- Options include indicators, DC or AC operating voltage, various connector types, miniature construction
- Break-before-make or Make-before-break
- Remote or Manual
- 1 Million Cycles minimum life





COAXIAL FILTERS

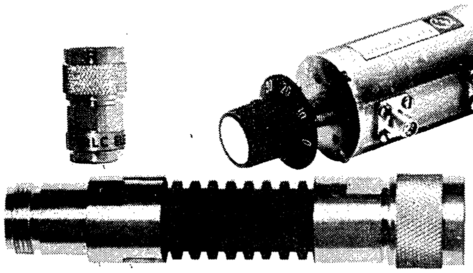




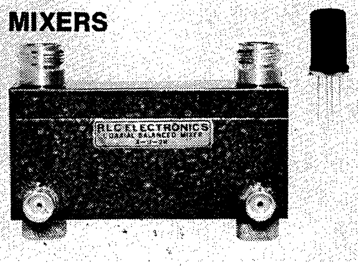
- DC — 18 GHz
- Low Pass, High Pass, Band Pass, and Band Reject Designs
- mw thru 5 KW designs available
- Fixed tuned and tunable versions
- Options include miniature construction, precision designs, various connector types

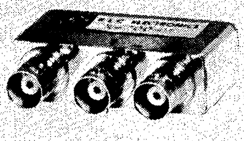
ATTENUATORS and TERMINATIONS

- DC — 12.4 GHz
- Low, medium, and high power designs available
- Fixed, turret attenuators, and continuously variable
- Options include miniature construction, precision designs, various connector types



MIXERS

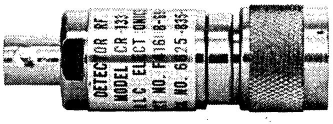




- Double balanced designs thru 2,000 MHz
- Balanced mixers for octave coverage thru 8,000 MHz
- IF output available in single, parallel, or push/pull configuration
- Low conversion loss
- Options include miniature construction, various connector types including circuit board tabs

CRYSTAL DETECTORS

- 1 unit covers 10-12,400 MHz. Usable to 18 GHz
- Available in matched pairs
- Negative or positive output polarity
- Various connector types offered



OTHER COMPONENTS

- Directional Couplers
- Hybrids
- Line Stretchers
- Custom Assemblies

Send for complete 80 page catalog; includes specs, typical data, outline dimensions, and prices.

RLC ELECTRONICS INC.
83 Radio Circle, Mt. Kisco, N.Y. 10549
Phone: 914/241-1334

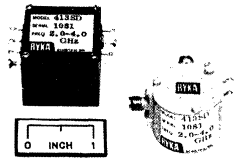
PRECISION MICROWAVE COMPONENTS

RYKA IS NUMBER ONE IN YIG DEVICES!

RECEIVER DESIGNERS

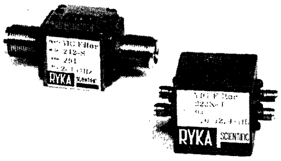
RYKA is number one today in shipments of YIG filters. In less than four years RYKA has become the leader in YIGS for reasons that are important to you. We don't ship off-the-shelf components that you must design your system around. Although we have a broad line of standard components, we work with receiver designers to analyze individual system design parameters. We then propose a YIG preselector, YIG-tuned local oscillator, or combination of RF components which will optimize your particular system design goals. We have a collection of the finest YIG talent available today on our engineering staff. Phone, TWX, or write for help with your present system requirements.

NEW MINIATURE FILTERS



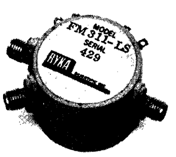
The new RYKA Miniature 4-Stage YIG Filters are supplied in an M413 and an M411 series. The M413 series is designed to operate over a temperature range of 0 - 50°C while the M411 series is designed to meet MIL-E-5400 requirements. Filters in P, L, and S band are 1.1 inches in diameter by 0.85 inches high and weigh 2.7 ounces. The C- and X-band units are 1.25 x 1.25 x 1.2 inches and weigh 4.7 ounces each. Drivers for all bands are 1.2 x 1.2 x 1.0 inches and weigh 1.3 ounces each. These units are ideal for airborne receiver requirements.

RYKA STANDARD FILTERS



RYKA has six complete series of YIG filters covering P through Ku band. The 213, 313, and 413 series are 2-, 3-, and 4-stage devices respectively, operating over a 0 - 50°C temperature range. The 211, 311, and 411 series is designed to meet MIL-E-5400 requirements. RYKA also has a complete line of 2-, 3-, and 4-stage multioctave filters. RYKA's speciality is manufacturing filters to meet unique system requirements—particularly stringent military and airborne environmental specifications.

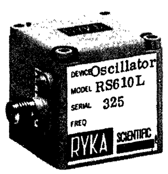
TACAN/DME COMPONENTS



RYKA is the leading manufacturer of TACAN filters. We are presently manufacturing a large quantity of our Model 411LS TACAN Filter. This is a 4-stage filter with frequency range of 950 - 1250 MHz, bandwidth of 30 MHz, insertion loss of 4.0 dB, isolation of 85 dB, size of 1.2 x 1.2 x 1.2 inches and weighs 7 ounces.

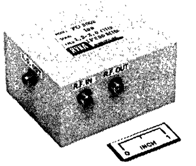
RYKA also supplies filter/mixer combinations such as the FM311-LS for DME sets. This is a 3-stage YIG filter combined with a single or double balanced mixer.

NEW 50 MW OSCILLATORS



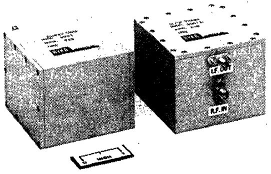
RYKA has recently developed YIG-tuned transistor oscillators which provide 50 mW in P and L band. These units are ideal for receiver designs where the local oscillator power must be high or be divided to feed two or more mixers. The oscillators can be supplied in a 1.4 x 1.4 x 1.4 inch package and weigh less than 13 ounces. The specifications can be improved by enclosing the oscillators in an oven which increases size and weight slightly. RYKA also has S-band oscillators with up to 20 mW output. Write for detailed specifications.

COMBINED COMPONENTS



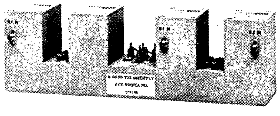
The Model FO 3002 is the solution to an ECM or surveillance receiver designer's tracking problems. This small (10 cubic inches), lightweight (13 ounces) package contains a YIG-tuned local oscillator, a tracking 4-stage YIG filter and dual current drivers which operate from a common control voltage. It is designed to meet MIL-E-5400 and is used in airborne systems. Total power drain is less than 3 watts. This combined package reduces tracking errors in receiver front-end design.

RYKA MINIATURE TUNERS



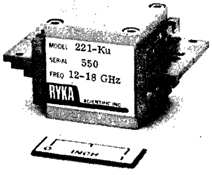
The new RYKA Model 3001 Miniature Microwave Tuner represents a breakthrough in microwave receiver design. This amazing unit weighs only 29 ounces (including power supply) and occupies less than 20 cubic inches. The tuner contains 4 stages of prepostselection, an RF amplifier, a YIG-tuned local oscillator, mixer, and an IF preamplifier. It will tune over an entire octave with a noise figure of less than 10 dB. The tuner can be mounted at the antenna where it provides optimum performance.

TRACKING ASSEMBLIES



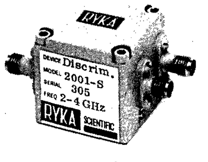
The assembly shown was designed for applications where three channels of information are processed simultaneously. The unit is composed of a fast-switching S-band oscillator, three fast-switching offset tracking filters, and four high-speed current drivers which are located in the base of the assembly. The S-band oscillator provides a minimum of 10 mW over the 2 - 4 GHz region with less than 4 dB power variation. The devices switch to any frequency within the band in 4 msec and settle to within 200 kc of the final frequency.

ULTRA WIDEBAND FILTERS



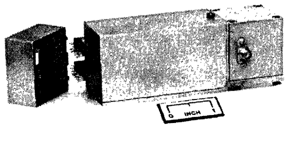
The YIG filter shown is an ultra-wideband unit with stripline connectors for applications in Ku band. This device was developed by RYKA and through our unique proprietary design, 3 dB bandwidths of greater than 250 MHz are achievable over an entire octave. Applications for this device are found in certain ECM system requirements. This unit can be supplied with less than 2 dB insertion loss, isolation of greater than 50 dB, size of 1.4 x 1.4 x 1.4 cubic inches and a weight of 13 ounces.

YIG DISCRIMINATORS



RYKA has pioneered YIG-tuned discriminator development! Our proprietary design eliminates the difficult problem of tracking two stages over an octave frequency range. We have tunable discriminators available in octave frequency ranges from P through Ku band. Typical specifications for Model 2001L would be a peak-to-peak separation of 20 MHz, a peak-to-peak sensitivity at 0 dBm input of 50 mV, limiting level of +10 dBm, size 1.2 x 1.2 x 1.2 inches, and a weight of 7 ounces.

DIGITAL-TUNED FILTERS



The assembly shown is a digitally controlled YIG preselector for microwave receivers. The digitally controlled current driver can be used with any RYKA YIG device. The digital control signal required is 10 bits of positive true logic with voltage states of 0 and +5 volts. This provides an accuracy of 8 bits over the temperature range of 0 to +55°C and 7 bits over the temperature range of −20 to +85°C. The filter/driver package is 1.4 x 1.65 x 4.5 inches and weighs less than 20 ounces.

FREE APPLICATION NOTES

If you are an ECM/EW systems engineer or a receiver designer, you should know about RYKA's capabilities! Our technical staff has an extensive background in YIG applications. Our technical excellence is matched by our production capability which has led to RYKA being number one in YIG device shipments. A majority of the YIG components are designed to meet stringent military specifications and are manufactured in accordance with MIL-Q-9858.

YIG technology is changing very rapidly and RYKA is in the forefront of these developments. Combined components such as filters and LO's or filters and mixers in the same package can give your design an increased performance at lower cost.

We have application notes, design aids, and a vast amount of YIG front-end design information available to our customers. Contact us for notes on using and specifying YIGS!

MANUFACTURERS OF QUALITY MICROWAVE COMPONENTS

RYKA

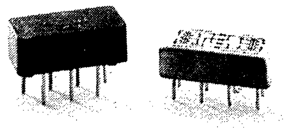
641 N. PASTORIA AVENUE • SUNNYVALE, CALIFORNIA 94086 • Phone (408) 738-0930 • TWX 910-339-9266

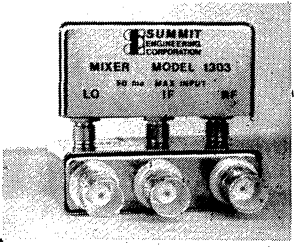
SUMMIT™ ENGINEERING CORPORATION

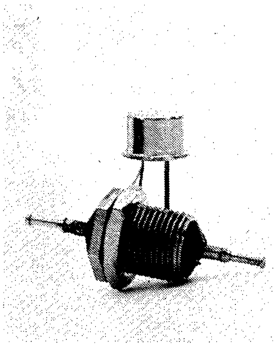
PHONE (406) 587-0636 T.W.X. (910) 975-1950

DOUBLE BALANCED MIXERS

MODEL	FREQ. (MHz)	CONV. LOSS (MAX.)	ISOLATION (MIN.)	PACKAGE
757	.25 to 300	6.5db .5 to 300 MHz 8db .25 to 300 MHz	50db to 10 MHz 40db to 100 MHz 35db to 300 MHz	7 Pin .4 x .8 x .25
760	.25 to 300	6.5db .5 to 300 MHz 8db .25 to 300 MHz	50db to 10 MHz 40db to 100 MHz 35db to 300 MHz	8 Pin (metal) .4 x .8 x .25
753	.4 to 400	7db 5 to 100 MHz 10db .4 to 400 MHz	35db to 100 MHz 25db to 400 MHz	7 Pin .4 x .8 x .25
761	3 to 1,000	7db 10 to 100 MHz 10db 3 to 1,000 MHz	40db to 100 MHz 30db to 1,000 MHz	8 Pin (metal) .4 x .8 x .25
1303	3 to 1,000	7db 10 to 100 MHz 10db 3 to 1,000 MHz	50db to 100 MHz 35db to 1,000 MHz	Coaxial 1 x 2 x .6







BALANCED MIXER

MODEL	FREQ. (MHz)	CONV. LOSS	ISOLATION	PACKAGE
744	.25 to 300	7db	40db	TO-5 4 Lead

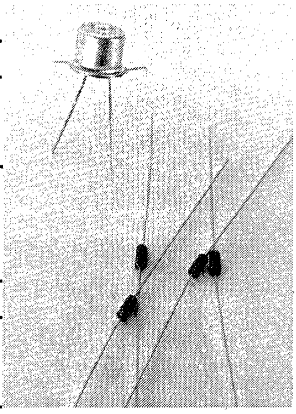
FREQUENCY DOUBLERS

MODEL	f (OUT) (MHz)	INS. LOSS	SUP. 1ST & 3RD	PACKAGE
728	.5 to 1,000	< 15db	> 30db	TO-5 4 Lead
737	.5 to 1,000	< 15db	> 30db	Feed Through
1370	.5 to 1,000	< 15db	> 30db	Coaxial (BNC)

MATCHED DIODES

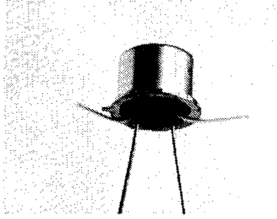
MODEL	MATCH (MAX).	CURRENT RANGE	C (MAX.)	DESCRIPTION
5620	5 mv r.m.s.	20 μa to 20 ma	1.2 p.f.	Pair
5630	5 mv r.m.s.	20 μa to 20 ma	1.2 p.f.	Triplet
5640	5 mv r.m.s.	20 μa to 20 ma	1.2 p.f.	Quad

Matching Diodes is available as a service.



DIODE ASSEMBLIES

MODEL	DIODES	PACKAGE	CONFIGURATION
720	5620 (above)	TO-5 4 Lead	Isolated Pairs
730	5640 (above)	TO-5 4 Lead	Bridge Quad
732	5640 (above)	TO-5 4 Lead	Ring Quad



TRANSFORMERS

MODEL	FREQ. (MHz)	PRIMARY Z	SECONDARY Z	PACKAGE
650	.25 to 300	50 ohms	200 ohms, ct	TO-5 8 Lead
651	.25 to 300	50 ohms	800 ohms, ct	TO-5 8 Lead
658	.25 to 300	4 Independent windings		TO-5 8 Lead

1820 SOUTH SEVENTH AVENUE BOZEMAN, MONTANA 59715

UNITRODE CORPORATION

582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

MICROWAVE DIODES

PIN Microwave Switching Diodes

Featuring low losses, low thermal impedances, low parasitics, low distortion, high voltages, high reliability. For applications from LF through X-band at high and low power. Especially suited for switches, duplexers, TR switches, receiver protectors, digital phase shifters, etc.

Unitrode Microwave Series	Breakdown[1] Voltages ($I_R = 10\ \mu a$)	Total[2] Capacitance (0V, 1GHz)	Series Resistance (100mA, 1 GHz)	Parallel[3] Resistance (100V, 1GHz)	Average[4] Thermal Impedance	Average[4], [5] Power Dissipation	Peak Power Dissipation (1μs pulse)	Carrier[6] Lifetime
	V_B (V) (min.)	C_T (pF) (max.)	R_s (Ω) (max.)	R_p (kΩ) (min.)	θ_A (°C/W) (max.)	P_A (W) (max.)	P_p (kW) (max.)	τ (μS) (min.)
UM 4900	100-1000	3.0	0.5	1	2	75	300	5.0
UM 6000	100-1000	0.5	1.7	15	25	6	30	1.0
UM 6100	100-800	0.7	1.0	12	25	6	30	1.0
UM 6200	100-600	1.2	0.4	10	25	6	30	1.0
UM 7000	100-2000	0.9	0.8	10	11	14	75	2.5
UM 7100	100-800	1.2	0.5	8	11	14	75	2.5
UM 7200	100-600	2.2	0.2	7	11	14	75	2.5
UM 7900	100-1000	0.8	0.8	10	3	50	75	2.5

PIN Microwave Attenuator Diodes

Featuring finely controlled resistance, low thermal impedance, low parasitics, low distortion, high voltages, high reliability. For applications from LF through Ku-band for high and low power. Especially suited for electronically-variable attenuators, filters, modulators, levelers, AGC loops, etc.

Unitrode Microwave Series	Breakdown[1] Voltages ($I_R = 10\mu a$)	Total[2] Capacitance (0V, 1GHz)	Parallel[3] Resistance (1mA, 1GHz)	Average[4] Thermal Impedance	Average[4], [5] Power Dissipation	Peak Power Dissipation (1μs pulse)	Carrier[6] Lifetime
	V_B (V) (min.)	C_T (pF) (max.)	R_p (Ω) (max.)	θ_A (°C/W) (max.)	P_A (W) (max.)	P_p (kW) (min.)	τ (μS) (min.)
UM 4300	100-1000	1.6	75	2.5	65	300	5.0
UM 6300	100-1000	0.3	300	30.0	5	30	1.0
UM 7300	100-1000	0.8	100	15.0	10	75	2.5

Limiter Diode

Featuring low thermal resistance, low parasitics, low distortion, high power, high reliability. For applications from LF througnh VHF as a passive receiver protector. Typical performance 20 dB isolation at 10W incident in 50 Ω system at 100 MHz.

Unitrode Microwave Series	Breakdown[1] Voltage ($I_R = 10\ \mu A$)	Total[2] Capacitance (0V, 1GHz)	Series Resistance (10mA, 1GHz)	Parallel[3] Resistance (0V, 1GHz)	Average[4] Thermal Impedance	Average[4], [5] Power Dissipation	Peak Power Dissipation (1μs pulse)	Carrier[6] Lifetime
	V_B (V) (min.)	C_T (pF) (max.)	R_s (Ω) (max.)	R_p (Ω) (min.)	θ_A (°C/W) (max.)	P_A (W) (max.)	P_p (kW) (max.)	τ (μs) (min.)
UM 7400	70	5.0	0.4	500	12	13	75	1.0

Notes: (All measurements made at 25°C ambient)

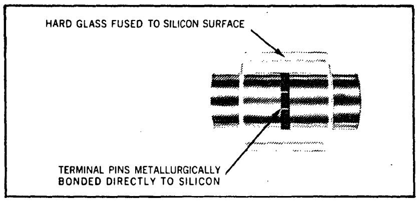
1. Standard breakdown voltages available at 100V, 200V, and in 200V steps to the maximum indicated in the table.
2. Total capacitance is measured at 1 GHz and zero bias and remains relatively constant at all forward and reverse bias levels at frequencies above 100 MHz.
3. Small signal measurement. Equivalent circuit is capacitance C_T in parallel with resistance R_p.
4. Stud mounted diode with single-ended heat sink.
5. Maximum junction temperature $T_J = 175°C$.
6. Measured at 10mA forward bias.

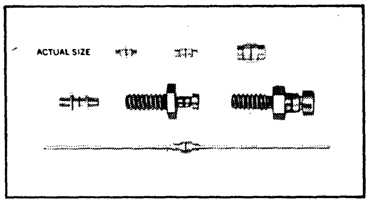
UM 4904 C

Series 4900 | 400 Volts | Style C

Part Numbers indicate diode series, breakdown voltage and package style. The first two digits indicate the diode series, the next two the minimum breakdown voltage in hundreds of volts and the remaining letters, the package style.

Reverse polarity available in stud packages. Part Numbers designated by adding R.


HARD GLASS FUSED TO SILICON SURFACE
TERMINAL PINS METALLURGICALLY BONDED DIRECTLY TO SILICON



Special packaging, such as insulated studs, ribbon leads, and pills for stripline, are also available.

UNITRODE quality takes the worry out of paying less.

WAVELINE.

THE COMPANY THAT'S CHANGING TO SERVE YOU BETTER THREE IMPORTANT WAYS.

1 MICROTECH RIGID AND FLEXIBLE WAVEGUIDE

At it s modern, 30,000 square foot plant in Cheshire, Conn., Microtech manufactures a comprehensive, quality line of flexible waveguides, solid state pin diode switches and attenuators. Microtech's flexible waveguides include:

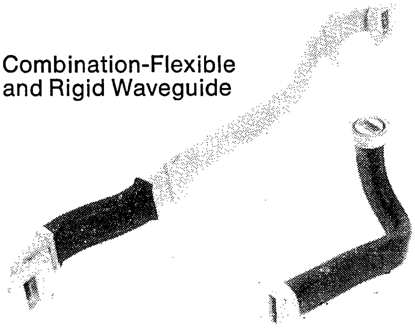
The seamless corrugated type, which can be bent to small radii, is highly stable and assures superior, RF leak-free operation.

The soldered convoluted type, for maximum bending with minimum leakage, is excellent for misalignment applications where moderate vibration prevails. It is particularly efficient and economical in tight-bend radii installations.

The interlocked flexible type, the only flexible waveguide fully interlocked in all four walls, is the strongest type of flexible waveguide. It is excellent for high power applications and provides the added advantage of elongation and compression.

Microtech has deep engineering and manufacturing experience in combining flexible and rigid waveguides to achieve the optimum in a system.

Microtech designs and produces double ridged waveguide assemblies and components, which it supplies in both flexible and rigid types.



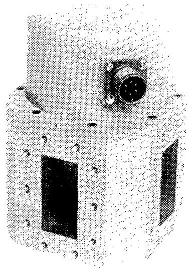
Combination-Flexible and Rigid Waveguide

Flexible Waveguide

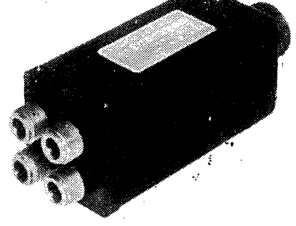
2 RAMCOR WAVEGUIDE, COAXIAL SWITCHES AND ROTATING JOINTS

The broad quality line of Ramcor switches for waveguide and coaxial use in communications and radar, plus Ramcor's rotating joints and radiation detection devices, are now being manufactured at Waveline's modern facility in West Caldwell, N.J.

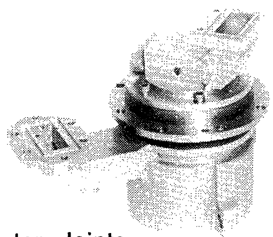
If you have a challenging switching problem, come to Waveline. You can choose from hundreds of types to meet your requirements. Switches range in size from a miniature 6 oz. coaxial unit to a massive 200 lb. water cooled WR650 waveguide unit. Or we can custom design one to help solve your switching problem.



Waveguide Switches



Coaxial Switches



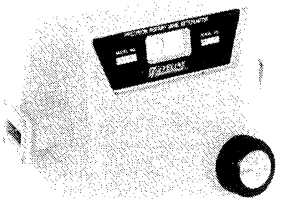
Rotary Joints

3 WAVELINE TEST EQUIPMENT AND SPECIAL ASSEMBLIES

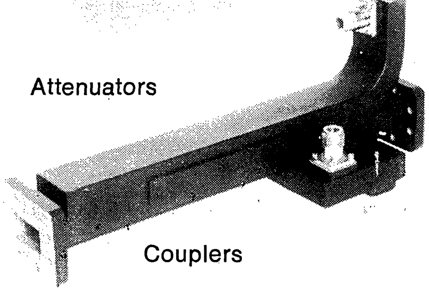
With our unique design capability and a full line of standard and special microwave equipment—test equipment, hardware, adapters, tuners, filters, detectors, transmission line components and forming ability—you have a great systems capability at your disposal. From custom designing through precise, quality controlled manufacture.

Yes, Waveline is changing. For the system designer, multiple product lines to choose from and a highly skilled organization whose comprehensive skills spread across the microwave field. Plus the Waveline mark of quality and service.

waveline



Attenuators



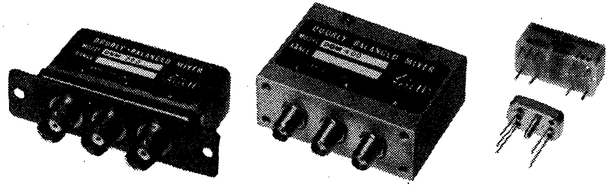
Couplers

For additional technical data on Ramcor and Waveline microwave products, write: Waveline, Inc., P.O. Box 718, West Caldwell, N.J. 07006. Phone: (201) 226-9100, TWX (710) 734-4324 / Microtech Division—Phone: (203) 272-3234

VARI-L CO., INC.
3883 MONACO PARKWAY/DENVER, COLORADO 80207
TELEPHONE: (303) 321-1511/TWX 910•931•0590

Z-MATCH

DOUBLY BALANCED MIXERS



WIDE BANDWIDTH
HIGH ISOLATION
LOW INSERTION LOSS
LOW NOISE FIGURE
FLAT CONVERSION EFFICIENCY
LOW INTERMODULATION PRODUCTS

ADVANTAGES OF BALANCED MIXERS:

Mixing consists of the non linear multiplication of two signals as for example W_{RF}, and W_{LO}. In communication work the object of this process, also referred to as "modulation," is to extract the frequency terms, $W_{IF} = (W_{LO} + W_{RF})$ or $W_{IF} = (W_{LO} - W_{RF})$, corresponding to either up or down conversion respectively.

The semiconductors used to accomplish this function depart from ideal square law operation and, in non balanced mixers, produce undesired output products in addition to the desired IF signal. An additional problem arises when the RF or LO frequencies fall within the bandwidth of the IF amplifiers following the mixer. These fed-through signals can overload the subsequent stages causing blocking or additional troublesome products. The solution to this problem in the past has been carefully to select LO, RF, and IF frequencies so that spurious products and fed-through input signals occurred as much as possible outside the IF band. The IF amplifier was usually designed with a very sharp bandpass characteristic so as to reject troublesome signals near the IF band, and in some cases multiple conversion IF amplifiers were needed.

The balanced mixer greatly reduces these problems for the system designer. The **singly balanced**, or two diode, mixer suppresses **one** of the input signals and its associated **even** harmonic components. The other input signals and its harmonics still come through the mixer along with harmonic sum and difference frequency products. The **doubly balanced** mixer improves still further the suppression of unwanted spurious signals. In this device **both** of the input signals and their **respective harmonics** are greatly suppressed at the IF output port.

Further advantages of the Doubly Balanced Mixer result from its interport isolating properties. For instance, an LO signal applied to the mixer is attenuated at both the RF and IF ports. This attenuation (typically 40 DB) reduces the problem of oscillator re-radiation as well as IF amplifier overloading. Similarly for low IF frequencies this same isolating property tends greatly to reduce the problem of local oscillator pulling. The Shottky barrier diode is ideal for balanced mixers because of its inherent fast turn on, low noise, and highly consistent parameters. In practice the diodes for any given mixer are matched for forward resistance at several points on the EI curve. The use of these devices allows the balanced mixer to handle linearly a wide range of input signal levels. The above information is expanded and illustrated in graphic form in Vari-L Bulletin 106 which is available upon request.

Z-MATCH DOUBLY BALANCED MIXERS are packaged in two ways: 1. laboratory-test-equipment style with coaxial connectors; and 2. as pin types suitable for circuit boards. This permits cable connection during the breadboard phase, and then permanent adaption as a circuit component.

ADDITIONAL APPLICATIONS: MODULATOR / Because one port is coupled to DC, the unit may be used as a pulse modulator with unlimited pulse duration. Insertion Loss is —4 dB at f_{max}, and less at the lower frequencies. The RF input is made to port L, modulation to port X, and the output from port R. Total current should not exceed 50 ma. The modulator will exhibit a 35 dB on/off ratio at f_{max} (greater at the lower frequencies) and a turn-on/turn-off time of less than one nanosecond. As an AM modulator, with the X port used for the modulation-signal input, the mixer has excellent carrier rejection at high frequencies. The carrier may be reinserted after the modulator, or can be caused to feed through the mixer in controlled amounts by the introduction of a DC bias (suitably isolated from the modulation source) into the X port. The bias can be of either polarity, but should not create current in excess of 50 ma.

CURRENT-CONTROLLED ATTENUATOR / By the use of a DC bias as described above, the mixer can function as a current/voltage controlled attenuator. With zero current into the X port the attenuation of an RF signal of frequency up to the specified f_{max} will be at least 35 dB, reducing to approximately 3 dB when the bias current is increased to 10 ma. Response time from full-on to full-off condition is less than one nanosecond. For this service the signal is introduced to the R port and the output taken from the L port.

PHASE DETECTOR / The X port, being DC coupled, makes it possible to extract a DC voltage as a function of the phase difference between two signals. The mixer introduces minimal 1/fnoise because of the inherent low-noise quality of the diodes, and their superior balance makes a DC adjustment of the phase detector unnecessary.

CONSTRUCTION

The mixers housed in the CA style enclosure are moderately priced, of general utility and have coaxial connectors. Standard units listed in the tabular columns are BNC equipped, but parts are carried in stock for fast delivery of corresponding models with TNC connectors. The enclosure is brass, tin-nickel plated and is sealed. The EA style units are epoxy imbedded and are designed for the ruggedness and space economy associated with an encapulsated device. The transformers and connections thereto have the time-proven Vari-L cushioning means and are completely sealed into the epoxy. A small well houses the diodes and permits a final check on matching, and this is then filled with polystyrene foam and sealed with a thin layer of encapsulant. The SPA types are constructed on a glass-seal header with pin connections and are completely shielded. A mounting stud is provided for strength and good grounding. The two "G" terminals are connected to the base internally by the shortest possible path. The case and cover of the CB type units are of cast aluminum, and the diodes are replaceable. This is a deluxe series of mixers which have no equal in this size and price range. Application of model DBM-400A, including a DC-1GHz test sweep generator are described in Vari-L Bulletin 101. The CC series units are housed in a manner similar to the CA units but are smaller. The CC style mixers all have OSM connectors.

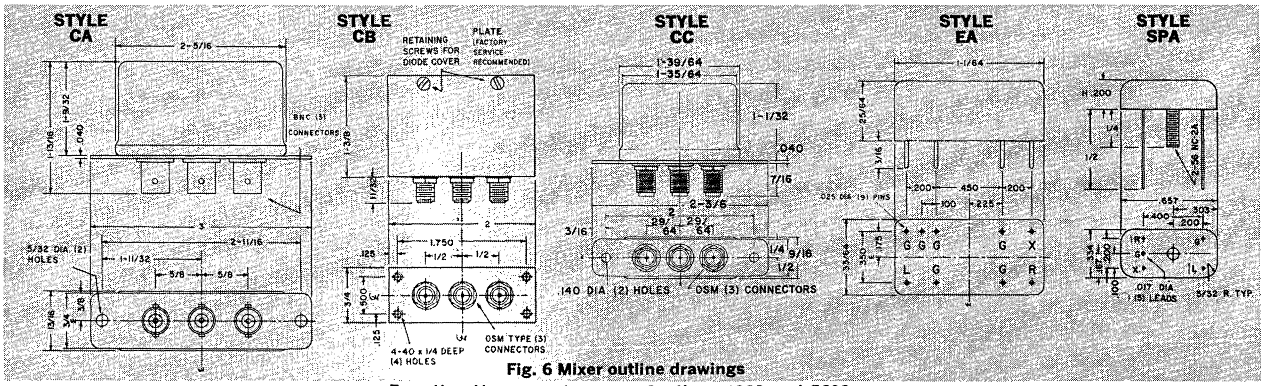


Fig. 6 Mixer outline drawings

For other Vari-L products see Sections 1800 and 5600.

Z-MATCH

VARI-L CO., INC.

3883 MONACO PARKWAY/DENVER, COLORADO 80207
TELEPHONE: (303) 321-1511/TWX 910•931•0590

VARI-L®

DOUBLY BALANCED MIXER SPECIFICATIONS

MODEL	OVERALL FREQUENCY RANGES (MHz)	FREQUENCY BANDS (MHz)	CONV. LOSS SSBNF (Db, MAX.)	LO-RF	ISOLATION (Db, MIN.) LO-IF	RF-IF	PACKAGE STYLE (see outline)	PRICE 1-9	SPECIAL NOTES
DBM-152	R&L: 002-15 X: DC-15	.002-1 1-15	5.5 5.5	50 50	40 40	25 20	EA	$40.00	
DBM-162	R&L: .002-15 X: DC-15	.002-1 1-15	6.0 6.0	45 45	35 35	25 20	EA	$35.00	
DBM-153	R&L: .01-50 X: DC-50	.01-1 1-35 35-50	8.5 5.0 5.5	40 40 40	35 35 30	25 25 20	EA	$30.00	
DBM-163	R&L: .01-50 X: DC-50	.01-1 1-35 35-50	8.5 5.5 6.0	35 35 35	30 30 25	25 20 20	EA	$25.00	
DBM-151	R&L: .05-200 X: DC-200	1-100 .05-200	6.5 7.5	40 35	35 30	25 20	EA	$30.00	
DBM-161	R&L: .05-200 X: DC-200	1-100 .05-200	6.5 8.0	35 30	30 25	20 20	EA	$25.00	
DBM-150	R&L: 5-500 X: DC-500	10-100 5-250 5-500	6.5 7.5 8.5	40 35 30	35 30 25	25 20 20	EA	$30.00	
DBM-160	R&L: 5-500 X: DC-500	10-100 5-250 5-500	6.5 7.5 9.0	35 30 30	30 25 20	25 20 15	EA	$25.00	
DBM-170	R&L: .2-700 X: DC-700	1-100 1-250 .5-500 .2-700	6.5 7.0 7.5 8.0	50 40 35 30	35 30 25 25	30 25 20 20	SPA "H" .200	$60.00	
DBM-171	R&L: .2-600 X: DC-600	1-100 1-250 .5-500 .2-600	6.5 7.0 7.5 8.0	45 35 30 30	35 30 25 25	20 25 20 20	SPA .200	$45.00	
DBM-172	R&L: .2-500 X: DC-500	1-100 1-250 .5-400 .2-500	6.5 7.0 7.5 8.5	40 35 30 30	35 30 25 25	30 25 20 20	SPA .200	$40.00	
DBM-173	R&L: .2-500 X: DC-500	1-100 1-250 .5-400 .2-500	6.5 7.0 7.5 8.5	35 30 30 30	30 30 25 20	25 20 20 20	SPA .200	$35.00	
DBM-174	R&L: .2-400 X: .2-400	1-100 1-250 .2-400	6.5 7.5 8.5	30 30 25	25 20 20	20 20 20	SPA .200	$30.00	
DBM-175	R&L: .2-600 X: DC-600	1-100 1-250 .5-500 .2-600	6.5 7.0 7.5 8.0	45 35 30 30	35 30 25 25	30 25 20 20	SPA* .250	$70.00	
DBM-181	R&L: 300-1750 MHz X: DC-500 MHz	300-1250 1250-1750	8.0 10	35 25	25 10	20 10	SPA .350	$90.00	
DBM-100B	R&L: .2-600 X: DC-600	.5-100 .5-250 .2-500 .2-600	6.5 7.0 8.0 8.5	45 40 30 30	35 30 25 25	25 20 20 20	CA	$45.00	High level, low VSWR highest performance mixer of its type
DBM-100E	R&L: .5-500 X: DC-500	.5-30 30-100 100-500	7.0 7.5 9.0	60 55 35	45 40 30	30 25 25	CA	$85.00	Very high level, low intermodulation type
DBM-110	R&L: 5-600 X: DC-600	10-100 10-250 10-500 5-600	7.0 7.5 8.0 8.5	40 30 30 30	35 30 25 25	25 20 20 20	CA	$38.00	High performance low cost
DBM-111	R&L: .05-200 X: DC-200	1-100 .05-200	6.5 7.5	40 35	35 30	25 20	CA	$38.00	Low frequency companion to the DBM-110
DBM-200	R&L: 5-1000 X: DC-500	10-100 10-250 250-500 5-1000	6.5 7.0 8.0 9.5	40 35 35 30	40 35 30 25	30 25 25 20	CA	$65.00	High level, low VSWR ultra-high performance up to 1GHz
DBM-300B	R&L: 300-1500 X: DC-500	300-1000 1000-1500	8.0 7.0	35 30	30 25	25 10	CC	$125.00	High performance, optimumized for Tacan
DBM-300A	R&L: 300-2000 X: DC-750	300-1000 1000-2000	8.0 9.5	35 30	30 20	25 10	CC	$175.00	High performance optimumized for L Band
DBM-400	R&L: 10-3000 X: 10-1500	30-500 50-1800 10-2800 2800-3000 See Note 1	7.0 8.5 9.0 9.5	40 35 30 25	40 30 20 20	20 20 20 20	CB	$275.00	Best high level full spectrum miniature mixer available
DBM-400A	R: 100-3000 L: 10-3000 X: DC-1000						CB	$295.00	DC coupled equal of the DBM-400
DBM-600	R&L: 10-5000 X: 10-1500	50-4000 10-50 4000-5000	7.5 8.5 10.0	20 35 20	20 25 15	20 35 15		$350.00	Higher frequency equal of DBM-400

PORT IDENTIFICATION: L: LO PORT; R: RF PORT; X: IF PORT. All measurements made in a 50 ohm system with LO power of +7 DBM (5MW). MAX. input power (total): 50 MW. Rated conv. loss and LO-RF figures maintained over a range from −55 to +100C°. Notes for models DBM-400 and DBM-400A: 1. Conversion loss figures apply to RF and/or LO frequencies in the ranges shown and an IF output frequency of 1.0 GHz (750 MHz for DBM-400A) or lower. The X port response extends to 1.5 GHz (1.0 GHz for DBM-400A) with approx. 1 Db increase in conversion loss. 2. (DBM-400 only) for UP conversion with IF frequencies above 1.5 GHz, interchange R and X ports. (R port is now IF output.) Apply the lower frequencies (below 1.5 GHz) to the X port.

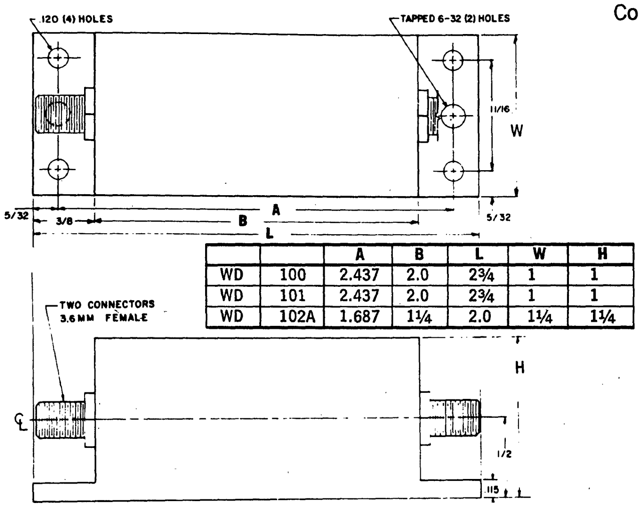
* Potted for high shock and vibration requirements. MAX operating temperature: −55 to +125°C

For other Vari-L products see Sections 1800 and 5600.

VARI-L CO., INC.
3883 MONACO PARKWAY/DENVER, COLORADO 80207
TELEPHONE: (303) 321-1511/TWX 910•931•0590

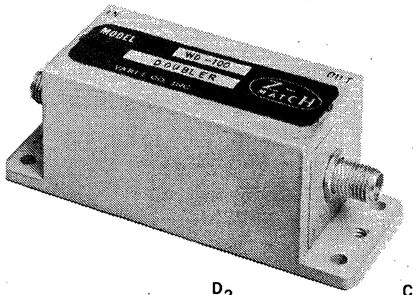
WIDEBAND FREQUENCY DOUBLERS

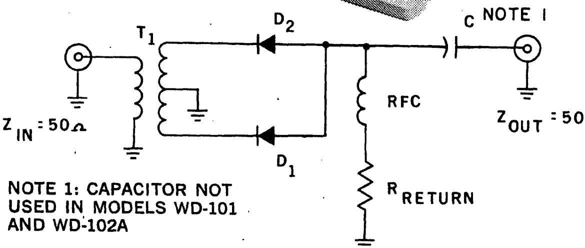
Models WD-100, 101, and 102 were developed as components of laboratory equipment to double the frequency of high-level sweep generators, thus extending their range of usefulness. Since the output of the doubler is of relatively high level, the signal obtained is comparable to that of an expensive BWO unit, and a set-up can be made with existing equipment and appreciable savings are effected. The units, being quite small and compact, are often used as part of the local oscillator source for receivers, so they are recommended both as components of larger equipment and as laboratory test devices. The doublers are housed in extruded aluminum cases and are fitted with 3.6 mm. input and output connectors and have 50 ohm input and output impedances. The circuit employs a custom-designed Z-Match input transformer and two carefully matched Schottky barrier diodes. The output circuit (Model WD-100 only) is isolated for DC by a special chip capacitor. The circuit elements and supporting structure are encapsulated in high-temperature polyurethane foam. Full electrical specifications are listed in the table below. Operating temperature range is −55 to +100°C. Complete specifications in Bulletin #102A.



		A	B	L	W	H
WD	100	2.437	2.0	2¾	1	1
WD	101	2.437	2.0	2¾	1	1
WD	102A	1.687	1¼	2.0	1¼	1¼

Fig. 7 Doubler outline drawing





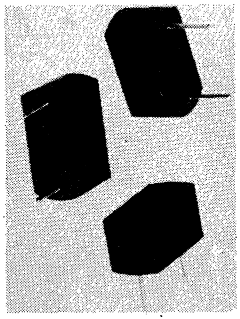
NOTE 1: CAPACITOR NOT USED IN MODELS WD-101 AND WD-102A

Fig. 8 Doubler schematic

DOUBLER SPECIFICATIONS

MODEL	FREQUENCY RANGE INPUT-OUTPUT	IMPEDANCE INPUT-OUTPUT	INPUT POWER NORMAL OPERATION	CONVERSION LOSS	FUNDAMENTAL +3rd HARM. SUPPRESSION	OUTPUT LEVEL VARIATION OVER THE BAND	PRICE 1-9
WD-101	.5-600 MHz 1-1200 MHz	50 ohms 50	+5 to +20DBM	13 dB max.	40 dB min.	±1.5 dB	$ 90.00
WD-100	1-2 GHz 2-4 GHz	50 ohms 50	+5 to +20DBM	15 dB max.	40 dB min.	±1.5 dB	225.00
WD-102A	0.02 to 4.5 GHz 0.04 to 9.0 GHz	50 ohms 50	+10 to +20DBM	14 dB max.	30 dB min.	±1.5 dB	350.00

WIDEBAND R.F. CHOKE



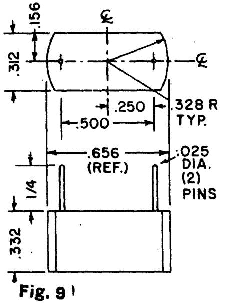


Fig. 9 Choke outline drawing

An RF choke for VHF-UHF circuitry should present a constant high impedance over a wide band of frequencies and should be non-lossy. Ordinary chokes made by winding a few turns of wire on a powdered iron or ferrite core do not fulfill this requirement because their impedance peaks sharply, and even though the actual resonance is placed outside the band the high order of impedance change over the band can be troublesome.

The chokes described below have very low loss, are virtually non-resonant and have a constant impedance over a very wide range of frequencies. They all have DC resistance of less than .1 ohms and will handle up to 2 amperes of current. Despite their small size they are suitable for use in high-power transistor oscillators and amplifiers, where they serve as RF isolators in the DC supply. Additional applications which have been tested are offered in Bulletin 104.

- A. DC isolation in wide band circuits employing Z-Match transformers.
- B. RF decoupling.
- C. Transient and RFI suppression.
- D. DC burnout protection.

Price, 1-9, Models WC-1, WC-2, WC-3, WC-4: $10.50 each. Generous quantity discounts.

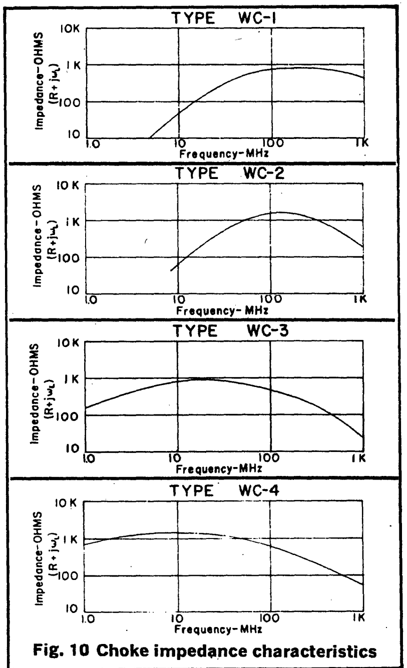
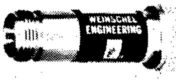


Fig. 10 Choke impedance characteristics

Tomorrow's Microwave Technology Today

Attenuators and Microwave Components – Swept-Frequency Measuring Systems – RF Power Calibration Systems

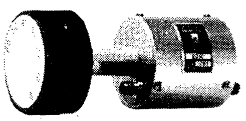


MODEL 1
- dc to 12.4 GHz
- Values up to 60 dB
- 2 watts average power
- 1.25 SWR@12.4 GHz

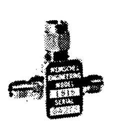
MODEL 9—MINI PAD
- dc to 26.5 GHz
- Values up to 30 dB
- 2 watts average power
- 1.25 inch length, 4 grams
- Stainless steel WPM-2 connectors

MODEL 4M
- dc to 18 GHz
- Values up to 60 dB
- 2 watts average power
- 1.35 SWR@18 GHz

MODEL 21—MINI MEDIUM POWER PAD
- dc to 18 GHz
- 3, 6, 10, and 20 dB
- 8.75 watts average power, 1 kW peak
- WPM connectors
- Aluminum body



MODEL 9010-60—MINI-STEP
- 5 frequency ranges, includes dc-18 GHz
- 5 attenuation ranges, up to 99dB
- 2 watts average power
- 0.05 dB repeatability



MODEL 1515
- dc to 18 GHz
- Outputs within 0.5 dB to 18GHz
- 1 watt CW, 1 kW peak
- Calibration data supplied

MODELS 1410 & 1411
- dc to 12.4 GHz
- SWR are 1.20:1, 1.50:1, and 2.00:1 (50 ohms)
- Type N and 7 mm connectors
- 5 frequencies calibrated

FIXED COAXIAL ATTENUATORS. Weinschel Engineering offers an extensive line of RF coaxial attenuators, including the newest subminiature type. Fixed attenuators are available in a choice of frequency ranges (including dc to 26.5 GHz), attenuation values (to 60 dB), and power ratings. Features are low SWR, long term stability, high quality resistive film, and stainless steel construction. Type N, Type WPM (mate with SMA), and other type connectors are available.

MODEL 9, a breakthrough in broadband design, has a dc to 26.5 GHz range and flat frequency response across the entire band. It is most suitable for system applications with space and weight considerations. SWR is 1.15 at 4 GHz, 1.35 at 18 GHz, and 1.60 at 26.5 GHz.

MODELS 3M and 4M are ideal for applications requiring compact and light weight components. Length is 1.2 in. for 3, 6, 10, and 20 dB, and 1.85 in. for 30, 40, 50, and 60 dB. Model 3M has a dc to 12.4 GHz frequency range and a 1.25 SWR@12.4 GHz

MODEL 21, in 50-ohm system, handles 8.75 W in 3 dB value, 6.25 W in 6 dB value, and 5 W in 10 and 20 dB units. Broadband and small size make it suitable for modern, compact RF systems.

MINIATURE STEP ATTENUATORS. MODEL 9000 Mini-Step series have a diameter of 1.62 in. and are 1.13 to 3.30 in. long, depending upon attenuation range. Size is perfect for panel mounting in compact areas and where space is prime consideration. Attenuation ranges are 0-9 dB, 0-69 dB, 0-99 dB, 0-60 dB, and 0-90 dB. Switch life is over 100,000 revolutions. It is a very suitable component for high reliability systems.

MODELS 93 through 98 are a series of miniature manual and motor-driven step attenuators available in a choice of attenuation ranges (includes 0-129 dB), frequency ranges (includes dc-18 GHz), and coaxial connectors or wave guide. They offer proven performance. Switch life is 1,000,000 steps.

MINI POWER DIVIDER. MODEL 1515 provides a nearly constant 6 dB power division from dc to 18 GHz. Input and output ports are matched. Connectors are stainless steel WPM (mate with SMA).

MISMATCHES AND TERMINATIONS. MODELS 1410 and 1411 Mismatches are available separately or as sets. Accuracy of SWR of Model 1411 is 4% to 8 GHz and 5% to 12.4 GHz. Models 1403 and 1404 Coaxial Terminations, operating from dc to 18 GHz, feature low SWR, e.g., SWR of Model 1404 GPA is 1.04 at 18 GHz.

VARIABLE ATTENUATORS. Weinschel has many versions of variable attenuators for bench or panel mounting. Some operate to 11 GHz. Several have 114 dB attenuation ranges. All feature continuously variable operation, long-term stability, and individual calibration.

ATTENUATION MEASUREMENTS. Weinschel offers a variety of instruments for measuring insertion loss, gain, SWR, and other microwave parameters. Several instruments have become industry standards.

MODEL 1810 RF RATIO METER, with 30-dB dynamic range, permits rapid and accurate broadband swept-frequency attenuation, gain, and SWR measurements. Operates with unleveled source. Overall accuracy is 0.02 dB per 10 dB. Ideal for matching swept RF responses of tested devices with a selected reference. Fixed frequency measurements can be made to 40 dB.

MODEL 1811 RF ATTENUATION CONTROLLER extends, by 30 dB, the measurement range of Model 1810 Ratio Meter, Model BA-5 Attenuation Calibrator, and similar 1-KHz, 100% square wave modulated RF systems. 0.02 dB per 10 dB accuracy is retained. (Also compatible with Model VM-3 to permit 130 dB fixed frequency measurements). It controls signal level in accurate 10, 20, and 30 dB steps at insertion point. Protects main RF line barretter from burnout.

MODEL VM-3 ATTENUATOR AND SIGNAL CALIBRATOR, tuned to 30 MHz, operates from 10 MHz to more than 40 GHz with external source and mixer. It has a 100 dB dynamic range. (With Model 1811, range is extended to 130 dB). Ideal for calibrating output attenuator of a signal generator.

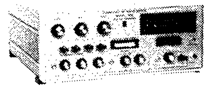
POWER CALIBRATION. MODEL 1805 RF POWER LEVEL CONTROLLER is highly accurate in transferring calibration factors of primary standards to bolometer mounts or secondary power standards. It establishes and maintains constant, known reference RF power levels. DC substituted and bias power is used to maintain precise levels. Selectable dc levels are 0.5, 1.0, 5.0, and 10.0 mW.

MODEL PB-1C SELF-BALANCING RF POWER BRIDGE, a 100% dc substitution bridge, is used with either 100 or 200 ohm thermistor or barretter mounts for precise RF power measurements. Accuracy is 0.1% in the measurement of substituted dc power in the 0.1 to 45 mW range.

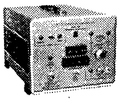
Weinschel offers extensive experience in the development of highly reliable custom designs. Discuss your requirements directly with us, or for a complete catalog, contact

WEINSCHEL ENGINEERING
Gaithersburg, Md. 20760
Tel: (301) 948-3434 TWX: 710-828-9705

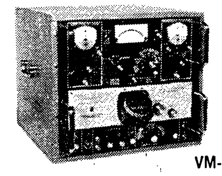
MODEL 940
- dc to 4 GHz, 66 dB range
- dc to 2 GHz, 120 dB range
- 5 watts average power
- Individual calibration, 1 dB increments



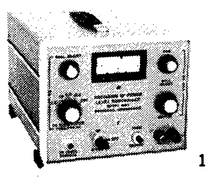
MODEL 1810
- Eliminates need for leveled source
- Output linear in dB
- Built-in 51 dB (RF) substitution attenuator with .02 dB/30 dB accuracy



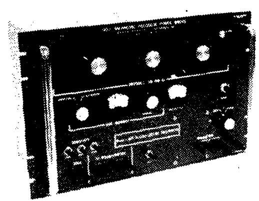
MODEL 1811
- Extends attenuation measuring capability by 30 dB
- Eliminates need for RF substitution attenuators
- Levels source variations to 0.0005 dB/dB (steady state)



VM-3



1805

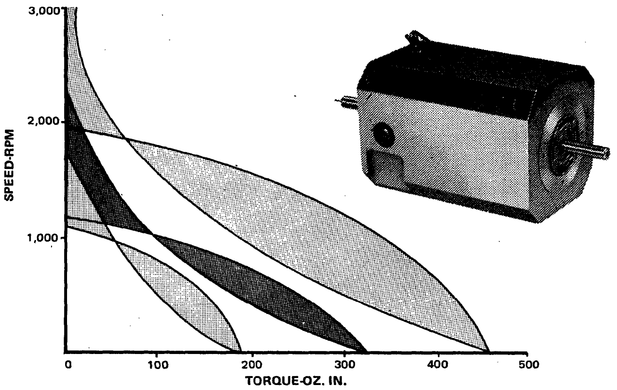


PB-1C

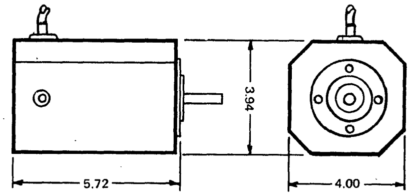
AMETEK / Lamb Electric

DC SERVO MOTORS FOR RELIABLE CONTROL

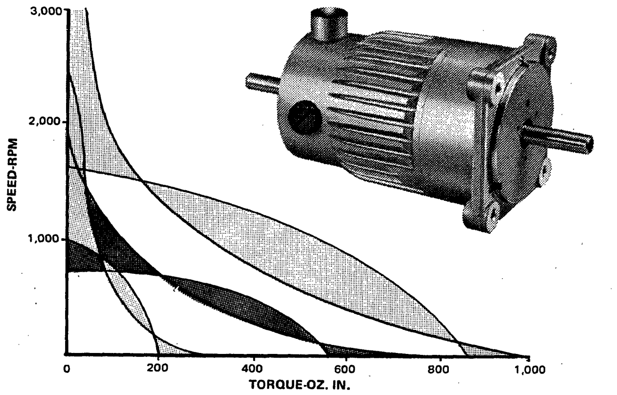
APPLICATIONS: MAGNETIC TAPE DRIVES • PAPER TAPE HANDLERS • CLOSED LOOP SERVO SYSTEMS • VARIABLE SPEED DRIVES . . .



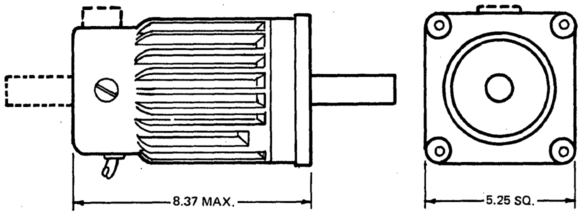
4.0″ Square, Wound Field Servo Motor



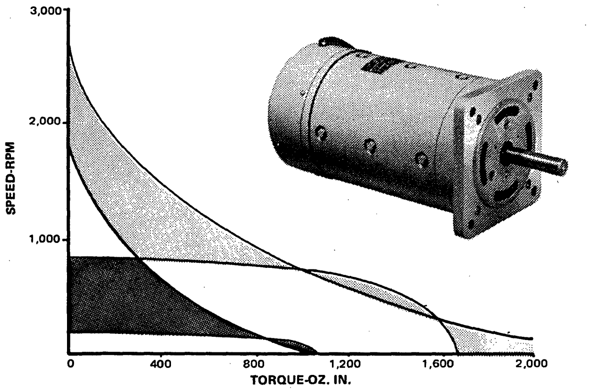
Compact, versatile two pole DC servo motor delivers fast response with smooth acceleration and deceleration to many computer applications. Designed for long life and minimal maintenance to assure dependability in applications requiring extremes in cycling of rotation and torque. Class F insulation systems compensate for high ambient temperatures and severe duty, and low current draw returns power and dollar savings.



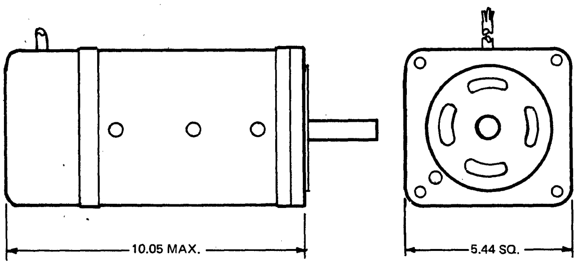
4.37″ Wound Field Servo Motor



Lightweight, compact two pole DC servo motor with quick, smooth response and a proven record in many data processing applications. Cool operation during prolonged periods and heavy cycling insures reliability and minimal maintenance. Standard insulation is Class F. Minor modifications, including mounting and shaft variations, and forced air cooling connection, can be made to customer specifications.

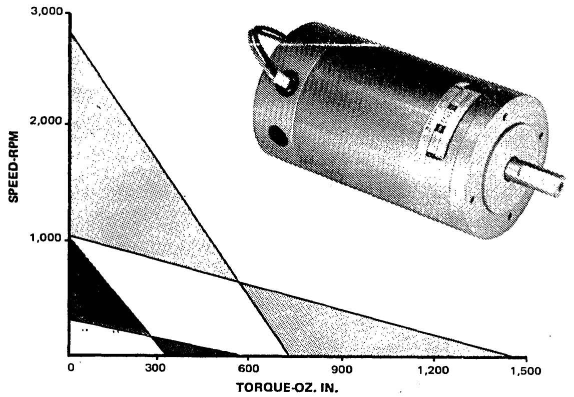


5.5″ Wound Field Servo Motor

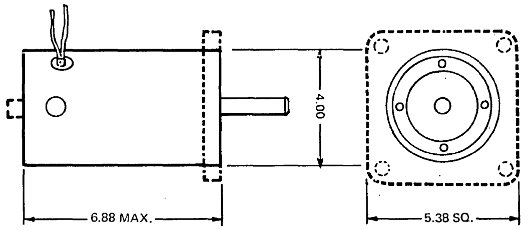


Rugged, powerful four pole DC servo motor engineered for computer tape transports or other applications with similar rigid requirements. Armature diameters are small relative to the field, providing low inertia and great extremes in cycling of rotation, torque and speed. Cool operation minimizes maintenance and prolongs motor life. Both Class A and F insulation available.

PERMANENT MAGNET MOTORS FOR COMPUTER-ORIENTED PRECISION

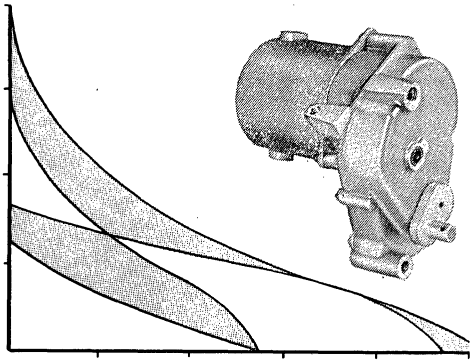


4.0″ Permanent Magnet Motor



Reliable DC permanent magnet motor designed for a variety of applications in data processing, business machines and machine tools. Double shielded, permanently lubricated ball bearings reduce maintenance and assure long operating life of totally enclosed units. Available with standard class F insulation or optional Class H insulation. The unit may be plug reversed. Optional features include forced air cooling and shielded leads.

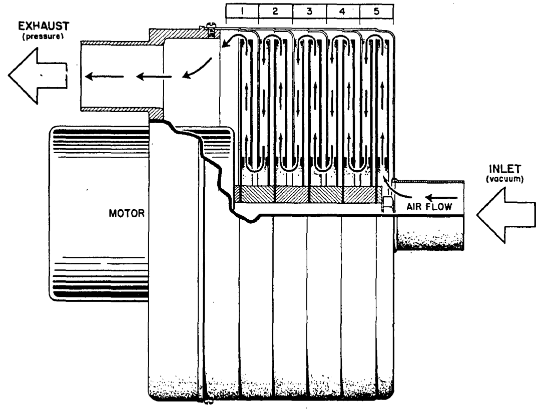
VERSATILE GEAR MOTORS SOLVE THE TOUGHEST TECHNICAL PROBLEMS



1.63″ to 5.5″ Dia. Gear Motors

Gear motors, produced in volume from standard parts, to match specific customer requirements. Operating on either alternating or direct current, these motors are designed to produce heavy torque values in a variety of applications. Motors available in diameters from 1.63″ to 5.5″, with 1, 2 or 3 stage gear trains and choice of ratios from 143:1 to 4.9:1.

Windjammer® BLOWERS PROVIDE AIR SYSTEMS WITH MUSCLE



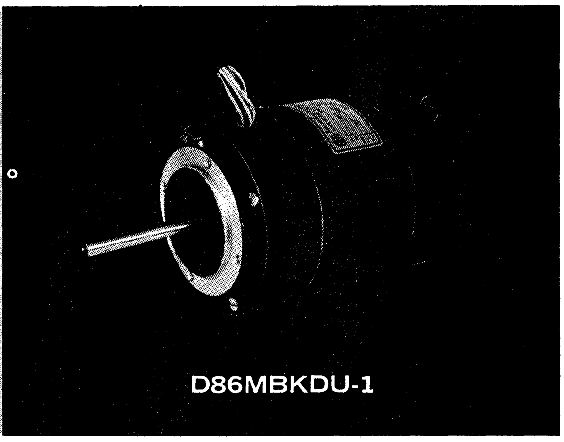
WINDJAMMER blowers produce quiet, efficient working air for a variety of high performance applications, such as hot spot cooling, vacuum supplies and air samplers. Available as either belt driven units, or with direct drive and in one to seven stage modular fan systems, WINDJAMMER blowers provide a wide range of operating characteristics. Shielded, prelubricated ball bearings and the replacement of rotating vanes with rotating fans assures a long life and minimal maintenance. Noise reduction shrouds and induction motors, with balanced components, guarantee quiet, vibration free operation.

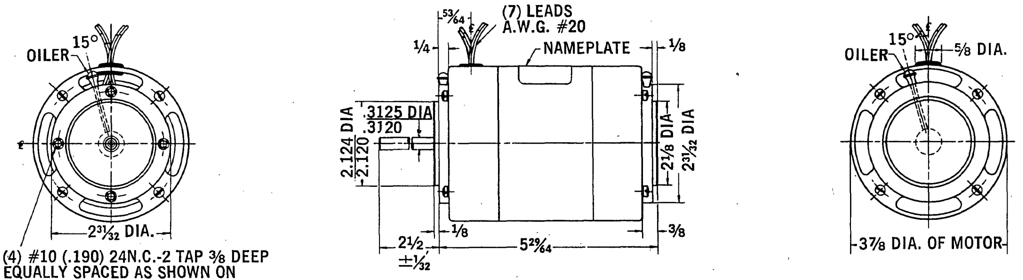
For more information on WINDJAMMER blowers, see AMETEK/Lamb Electric catalog pages in Volume III, Section 2600—Fans/Blowers/Cooling Equipment

AMETEK Lamb Electric
631 LAKE STREET • KENT, OHIO 44240
TEL: (216) 673-3451 • TELEX: 98-6497 • TWX: 801-437-2332

HYSTERESIS SYNCHRONOUS MOTORS

AVAILABLE IN SINGLE SPEED, DUAL AND MULTIPLE SPEEDS




OILER
15°
2³¹⁄₃₂ DIA.
(4) #10 (.190) 24N.C.-2 TAP ⅜ DEEP EQUALLY SPACED AS SHOWN ON A 2.625 DIA. B.C.
⁵³⁄₆₄
(7) LEADS A.W.G. #20
¼
NAMEPLATE
⅛
.3125 DIA
.3120
2.124 DIA
2.120
2⅛ DIA
2³¹⁄₃₂ DIA
⅛
⅜
2½ ±¹⁄₃₂
5²⁹⁄₆₄
OILER
15°
⅝ DIA.
3⅞ DIA. OF MOTOR

HYSTERESIS SYNCHRONOUS SLEEVE BEARING MOTOR
MODEL NO. D86MBKDU-1

SPECIFICATIONS

Model Number	RPM	Amps	Torque - Oz. In. P.I.*	S.T.*	Length (In.)	Dia. (In.)
A42ABM-1	1800	0.05	0.15	0.10	2¹¹⁄₁₆	1¾
A52AZU-1	600	0.12	0.92	0.64	3	2
A60KBU-1	1800	0.40	6.0	8.0	3⅝	3¼
A74LAP-1	3600	0.30	4.1	3.4	4⅛	3⁵⁄₁₆
A80HCU-1	1200	0.40	5.0	8.0	3⁶¹⁄₆₄	3⅞
A88LDU-1	900	1.0	17.5	43.0	5⁶¹⁄₆₄	3⅞
D84QBU-3	1800	1.0	22.2	27	4⁶¹⁄₆₄	3⅞
A118TAU-1	3600	1.9	33.1	76	5¹³⁄₁₆	4⅜
C1112UBU-1	1800	2.3	66.2	90	6¹³⁄₁₆	4⅜
A120LCP-1	1200	0.51	13	14	3	3⅞
A98YAU-1	3600	5.5	85	120	5⁶¹⁄₆₄	5⅜
A912ZBU-1	1800	6.7	170	238	6⁶¹⁄₆₄	5⅜

All motors listed above 115 VAC, 60 Hz Single Phase
* P.I. — Pull in torque, S.T. — Starting Torque

Ashland Hysteresis Synchronous motors are of the highest quality and are designed and manufactured for many years of trouble free operation.

Our type of construction provides rigidity for accurate bearing alignment and close air gap maintenance, so necessary in obtaining quiet and efficient motor operation. Noise and vibration have been eliminated. Peripheral equipment manufacturers using our motors have been able to greatly reduce their wow and flutter levels.

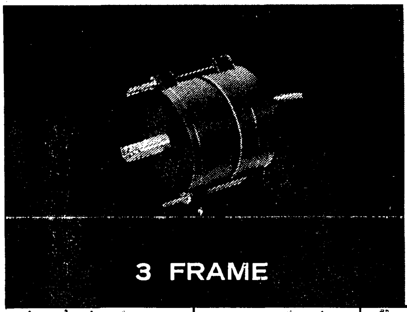
Ashland Hysteresis Synchronous motors can be supplied in numerous speeds, frequencies and voltages. The following pages supply specifications on only a few of our many designs.

AEP MOTORS

IN PHASE WITH INDUSTRY

ASHLAND ELECTRIC PRODUCTS INC.

32-02 QUEENS BLVD., LONG ISLAND CITY, N. Y. 11101 • PHONE (212) 392-4010

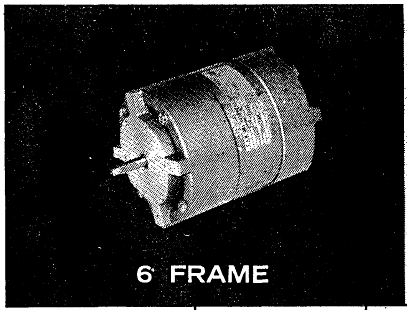


3 FRAME

AEP

3-4-5 FRAME HYSTERESIS SYNCHRONOUS MOTORS

Model Number	RPM	Amps	Volts	Frequency	Phase	Torque - Oz. In. P.I.	S.T.	Length (In.)	Dia. (In.)
A32ACM-1	1200	0.1	115	60	1	0.75	0.75	2.78	1.75
A32ABM-1	1800	0.06	115	60	1	0.20	0.15	2.78	1.75
A405BWM-2	12000	0.1	115	400	3	0.1	0.4	1.75	1.75
A42SAM-1	14400	0.8	115	240	3	3.5	9.0	2.69	1.75
A42PWM-1	3600	1.0	57	120	3	4.5	8.5	2.69	1.75
A42LCM-1	8000	0.4	115	400	1	2.0	2.0	2.69	1.75
A42EBM-1	1500/1800	0.16	115	50/60	1	1.9/1.8	1.6/1.7	2.69	1.75
A52BBADU-1	900/1800	0.21	115	60	1	0.88/0.96	0.72/0.72	3.0	2.0
A54PBLDU-1	6000/12000	1.3	115	400	1	2.7/2.9	2.8/3.2	3.5	2.0
A52HDU-1	1800/6000	0.2	60/200	120/400	2	0.95/1.2	1/3	3.0	2.0
A52MCU-1	8000	1.2	115	400	3	2.3	8.5	3.0	2.0
A50GAU-1	3600	0.15	115	60	1	1.5	1.3	2.56	2.0



6 FRAME

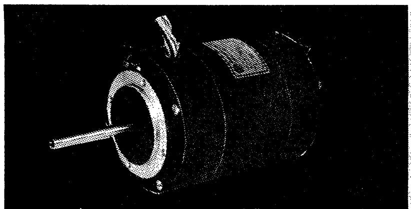
AEP

6-7 FRAME HYSTERESIS SYNCHRONOUS MOTORS

Model Number	RPM	Amps	Volts	Frequency	Phase	Torque - Oz. In. P.I.	S.T.	Length (In.)	Dia. (In.)
A62NBU-1	1500/1800	0.5	115	60	1	12/13.5	16/22	4.12	3.31
A60KBU-1	1800	0.4	115	60	1	5.6	5.6	3.62	3.31
A607EDU-1	900	0.21	115	60	1	5.6	4.0	3.38	3.31
A66LCU-1	1200	0.4	115	60	1	11.2	12	5.12	3.31
A78UBU-1	12000	3.3	115	400	1	7.6	14	5.625	3.31
A72LAEDP-1	900/3600	0.40	115	60	1	5.2/4.9	4.7/3.8	3.75	3.31
A72DCBZU-1	600/1200	0.25	115	60	1	3.2/4.6	1.5/2.2	4.125	3.31
A76LAHBEDU-1	900/1800/3600	0.70	108	60	1	7/8/6	5/5/4	5.125	3.31
A73KBMAU-1	1800/3600	1.0	115	50/60	1	12/11	14/11	4.375	3.31
A73FDKBU-2	750/1500	0.21	220	50	1	7.5/8	10.5/11	4.375	3.31
A707KBGZM-2	6000/12000	0.32	115	400	1	0.9/0.9	1.2/1.3	3.0	3.31
A76NALBU-5	1500/3000	0.80	115	50/60	1	12/12	10/10	5.125	3.31

ASHLAND ELECTRIC PRODUCTS INC.

32-02 QUEENS BLVD., LONG ISLAND CITY, N. Y. 11101 • PHONE (212) 392-4010

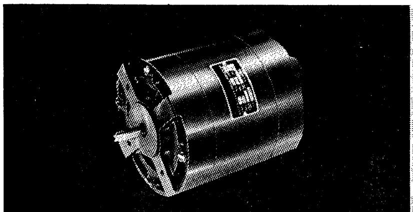


8 FRAME

AEP

8 FRAME HYSTERESIS SYNCHRONOUS MOTORS

Model Number	RPM	Amps	Volts	Frequency	Phase	Torque - Oz. In. P.I.	S.T.	Length (In.)	Dia. (In.)
A84GZU-3	600	0.60	115	60	1	9.0	6.2	4.95	3.875
A86KDU-2	900	0.50	115	60	1	11.5	11.5	5.45	3.875
A88UAU-3	3600	1.70	115	60	1	28.0	30.0	5.95	3.875
A84HCEZU-11	600/1200	0.40	115	60	1	6/8	4/6	4.95	3.875
A86RBU-4	1800	0.60	230	60	1	28.5	44	5.45	3.875
A86KBFZU-1	600/1800	0.40	115	60	2	9/12	13/11	5.45	3.875
A86MBKDU-1	900/1800	0.70	115	60	1	12/12	14/12	5.45	3.875
A86NBLCU-1	1200/1800	0.70	115	60	1	14/14	14/14	5.45	3.875
A84KAGBDDU-1	900/1800/3600	0.60	115	60	1	5/8/6	6/5/4	4.95	3.875

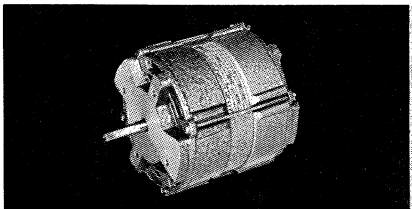


9 FRAME

AEP

9 FRAME HYSTERESIS SYNCHRONOUS MOTORS

Model Number	RPM	Amps	Volts	Frequency	Phase	Torque - Oz. In. P.I.	S.T.	Length (In.)	Dia. (In.)
A98GZKZU-1	300/600	0.60	115	60	2	20/21	12/28	5.95	5.375
A98SCRBU-1	1200/1800	1.6	115	60	1	57/48	40/20	5.95	5.375
A90CZEDHBU-2	450/900/1800	1.0	115	60	1	10/11/9	9/9/8	3.95	5.375
A98YBU-1	1800	6.3	115	60	1	170	210	5.95	5.375
A98TBVAU-1	1800/3600	3.0	115	60	1	79/45	60/34	5.95	5.375
A98SDVBU-1	900/1800	1.8	115	60	1	58/54	41/41	5.95	5.375
A98YAWBU-1Z	1500/3000	4.1	117	50	1	130/70	148/43	5.95	5.375
A98MCQZU-1Z	500/1000	0.7	220	50	1	36/41	23/24	5.95	5.375
A98RAMBCZU-1	300/1800/3600	2.7	115	60	1	13/32/21	7/20/19	5.95	5.375



12 FRAME

AEP

11 - 12 FRAME HYSTERESIS SYNCHRONOUS MOTORS

Model Number	RPM	Amps	Volts	Frequency	Phase	Torque - Oz. In. P.I.	S.T.	Length (In.)	Dia. (In.)
A118UAU-1	3600/3000	2.3	115	50/60	1	27/8	32	5.812	4.375
A116UWU-1	12000	5.0	208	400	3	8.3	120	5.312	4.375
A116PBU-1	3600/1800	5.6	115	60/120	2	13.9	17.5	5.312	4.375
A118TBU-4Z	1500	1.2	220	50	1	55.6	79	5.812	4.375
A1112VASBU-1	3600/1800	2.8	115	60	1	38/38	30/38	6.812	4.375
A1112TALDU-1Z	3000/750	2.9	115	50	1	40/20	27	6.812	4.375
A114KBFCGZU-1	600/1200/1800	0.5	115	60	1	10/8/5	5/4/4	4.812	4.375
A120LCP-1	1200	0.5	115	60	1	12	13	3.50	3.750
A123RAPCP-1	3600/1200	1.2	115	60	1	18/22	18/25	4.25	3.750
A124QCP-2	1200	1.1	115	60	1	35	20	4.50	3.750

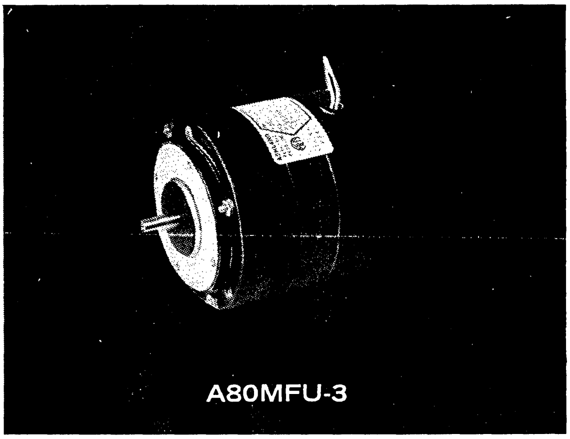
ASHLAND ELECTRIC PRODUCTS INC.

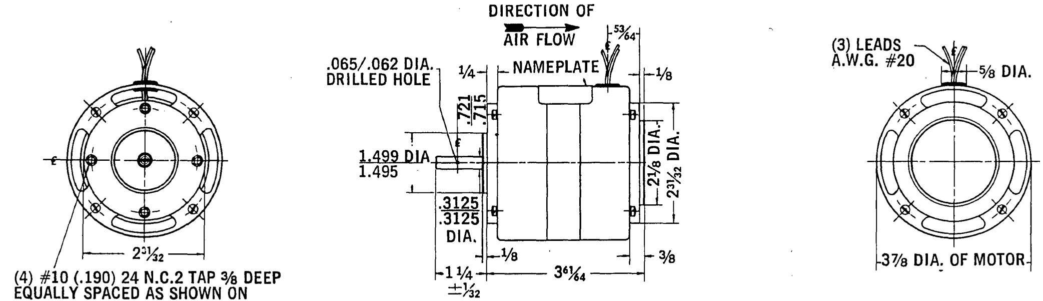
32-02 QUEENS BLVD., LONG ISLAND CITY, N. Y. 11101 • PHONE (212) 392-4010

RELUCTANCE SYNCHRONOUS MOTORS

CAPACITOR START & RUN

MODELS AVAILABLE IN 60 Hz - 400 Hz - VARIABLE FREQUENCY




(4) #10 (.190) 24 N.C.2 TAP 3/8 DEEP EQUALLY SPACED AS SHOWN ON A 2.625 DIA. B.C.
2 21/32
DIRECTION OF AIR FLOW
53/64
.065/.062 DIA. DRILLED HOLE
1/4
NAMEPLATE
1/8
.721
.715
1.499 DIA
1.495
2 1/8 DIA.
2 31/32 DIA.
.3125
.3125
DIA.
1/8
3/8
1 1/4 ±1/32
3 61/64
(3) LEADS A.W.G. #20
5/8 DIA.
3 7/8 DIA. OF MOTOR

RELUCTANCE SYNCHRONOUS BALL BEARING MOTOR
MODEL NO. A80MFU-3

SPECIFICATIONS

Model Number	RPM	Amps	Torque - Oz. In. P.I.	P.O.	S.T.	H.P.	Length (In.)	Dia. (In.)
A80KFU-1	1800	0.4	6	8	8	1/100	3.95	3.875
A82PFU-1	1800	0.8	27	28	18	1/20	4.45	3.875
A88UFU-1	1800	1.9	56	64	22	1/10	5.95	3.875
A82QEU-1	3600	1.1	14	16	10	1/20	4.45	3.875
A110LHU-1	900	0.7	15	27	13	1/75	3.81	4.375
A80MFU-3	1800	0.45	14	16.5	11.2	1/50	3.95	3.875
A112ZZU-1	600	0.33	10	15.5	13.5	1/200	4.31	4.375
A707EHU-1	900	0.23	5	9	8	1/300	3.375	3.31

All motors listed above, 115 VAC, 60 Hz, Single Phase

AEP Reluctance Synchronous motors have become a standard in the field due mainly to their uniformity and excellence of performance.

The advantage of Reluctance motors is the ability to phase, where the motor must synchronize at fixed angular positions.

This type of motor is used in facsimile, timing and various other applications requiring phasing each time the motor is energized. The effective Horsepower output of these motors is dependent on the load inertia. Care must be exercized to select a motor with sufficient torque to overcome this inertia and pull the load into synchronism.

AEP MOTORS

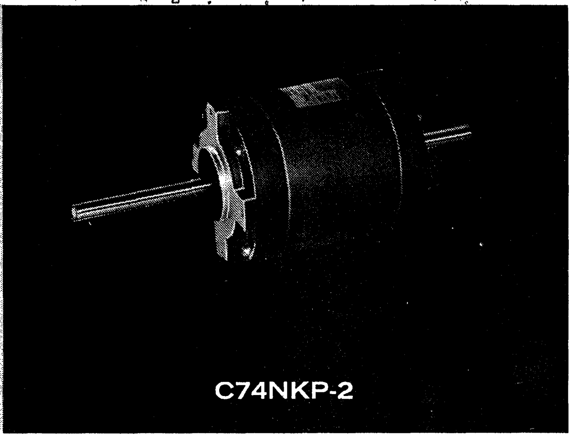
IN PHASE WITH INDUSTRY

ASHLAND ELECTRIC PRODUCTS INC.

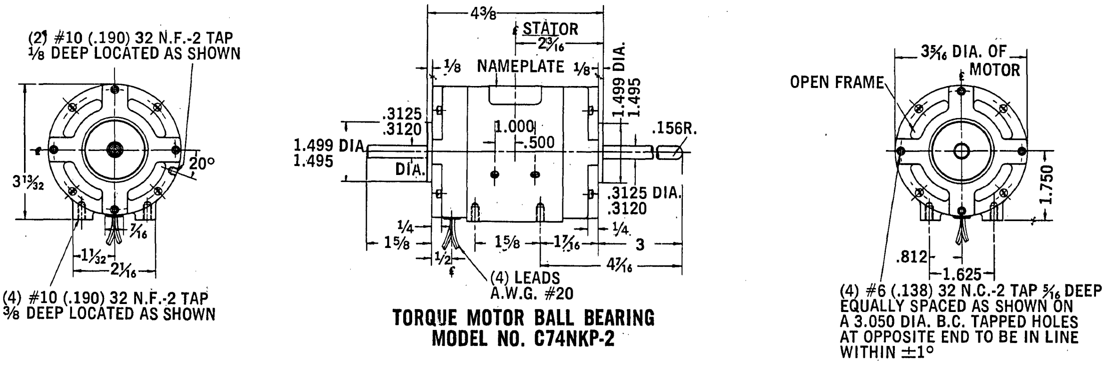
32-02 QUEENS BLVD., LONG ISLAND CITY, N. Y. 11101 • PHONE (212) 392-4010

TORQUE MOTORS

CAPACITOR START AND RUN



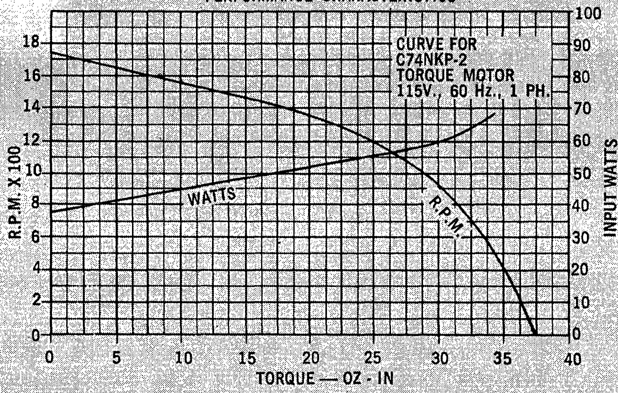
C74NKP-2


(2) #10 (.190) 32 N.F.-2 TAP
1/8 DEEP LOCATED AS SHOWN
3 13/32
20°
7/16
1 1/32
2 1/16
(4) #10 (.190) 32 N.F.-2 TAP
3/8 DEEP LOCATED AS SHOWN
4 3/8
STATOR
2 3/16
1/8
NAMEPLATE
1/8
1.499 DIA.
1.495
.3125
.3120
1.499 DIA
1.495
DIA.
1.000
.500
.156R.
.3125 DIA.
.3120
1/4
1 5/8
1/2
1 5/8
1 7/16
1/4
3
4 7/16
(4) LEADS
A.W.G. #20
3 5/16 DIA. OF MOTOR
OPEN FRAME
1.750
.812
1.625
(4) #6 (.138) 32 N.C.-2 TAP 5/16 DEEP
EQUALLY SPACED AS SHOWN ON
A 3.050 DIA. B.C. TAPPED HOLES
AT OPPOSITE END TO BE IN LINE
WITHIN ±1°

TORQUE MOTOR BALL BEARING
MODEL NO. C74NKP-2

SPECIFICATIONS

PERFORMANCE CHARACTERISTICS



Illustrated here is only one of Ashland's Torque Motors. See next page for more specifications that can be supplied for your applications.

Ashland Torque Motors have met with a great deal of success in military as well as commercial applications. They are presently being used in Tape Recorders, Servo, and Positioning applications and when required, are capable of being locked on the line indefinitely without overheating.

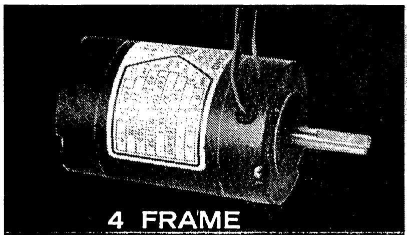
Our high quality of design enables us to produce a motor with an extremely low external flux field, a minimum of hum and less than 1% variation in torque when the rotor is allowed to rotate from zero to 10 RPM at rated voltage.

AEP MOTORS

IN PHASE WITH INDUSTRY

ASHLAND ELECTRIC PRODUCTS INC.

32-02 QUEENS BLVD., LONG ISLAND CITY, N. Y. 11101 • PHONE (212) 392-4010

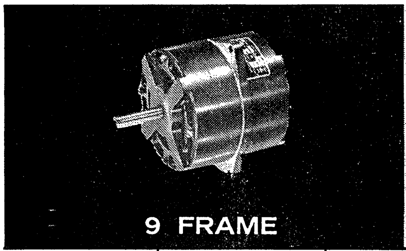


4 FRAME

AEP

3-4-6-7-8 FRAME TORQUE MOTORS

Model Number	No Load RPM	Volts	Frequency	Phase	Amps	Locked Rotor Torque Int.	Locked Rotor Torque Cont.	Length (In.)	Dia. (In.)
A32ALM-1	1100	115	60	1	0.20	3.2	2	2.78	1.75
A44GKM-1	1700	115	60	1	0.11	4	4	3.25	1.75
A42FZM-1	5700	208	400	3	0.07	4	4	2.68	1.75
A41DKM-1	1700	115	60	1	0.09	3	3	2.50	1.75
A64MMP-1	850	115	60	1	0.6	34	34	4.25	3.31
A60KLP-5	1100	115	60	1	0.41	25	12	3.25	3.31
A70KKP-1	1720	115	60	1	0.21	16	16	3.25	3.31
A74NKP-10	1720	115	60	1	1.0	40	20	4.25	3.31
A78PKP-1	1720	115	60	1	1.3	70	50	5.25	3.31
A72QKP-2	1720	115	60	1	1.1	60	20	3.75	3.31
A84NWM-1	1700	208	60	3	0.2	30	15	4.95	3.875
A86GZU-1	550	115	60	1	0.3	14	14	5.45	3.875
A88MMP-1	850	115	60	1	1.0	70	30	5.95	3.875
A82PKU-1	1700	115	60	1	1.1	29	15	4.45	3.875



9 FRAME

AEP

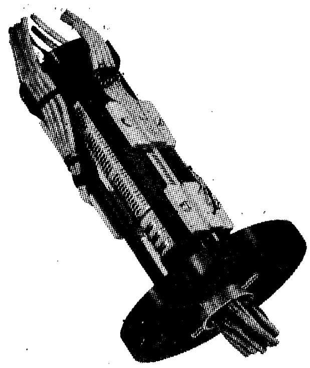
9-11-12 FRAME TORQUE MOTORS

Model Number	No Load RPM	Volts	Frequency	Phase	Amps	Locked Rotor Torque Int.	Locked Rotor Torque Cont.	Length (In.)	Dia. (In.)
A96SLP-1	1125	115	60	1	4.6	300	300	5.45	5.375
A96RMP-1	835	115	60	1	2.5	225	225	5.45	5.375
A98WLL-1	1100	115	60	1	8.0	520	520	5.95	5.375
A98TLL-1	1100	115	60	1	3.4	450	450	5.95	5.375
A92QMU-1Z	700	115	50	1	1.5	143	75	4.45	5.375
A118TKP-1	1440	115	60	1	4.5	153	45	5.81	4.375
A1110KMP-1	720/600	115	50/60	1	2.3	140	53	6.31	4.375
A112TKP-3	1440/1200	115	50/60	1	2.5	120	60	4.31	4.375
A1112SMP-3	720	115	60	1	4.2	350	125	6.81	4.375
A114GZU-1	480	208	60	3	4.0	42	42	4.81	4.375
A122NKP-1	1720	115	50/60	1	0.7	44	16	4.00	3.75
A124PLP-1	1100	115	50/60	1	0.9	85	35	4.50	3.75
A124HLP-1	1100	115	50/60	1	0.4	38	38	4.50	3.75
A120KLP-1	1100	115	50/60	1	0.6	38	16	3.50	3.75

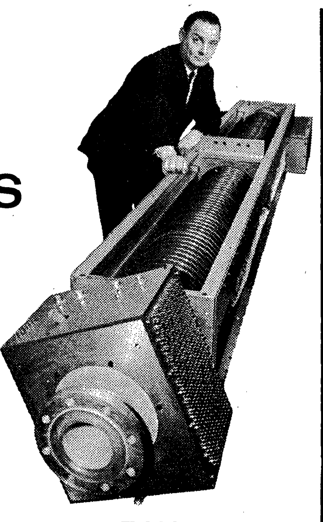
ASHLAND ELECTRIC PRODUCTS INC.

32-02 QUEENS BLVD., LONG ISLAND CITY, N. Y. 11101 • PHONE (212) 392-4010

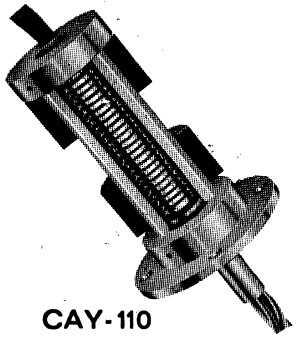
BEARING MOUNTED SLIP-RING ASSEMBLIES



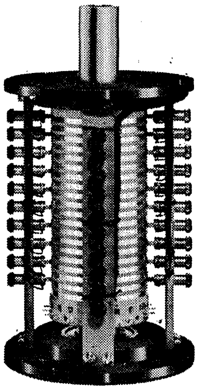
CAY-150
2 to 48 CIRCUITS
1.7″ O.D. 2 AMP RATING



EAY-502
1000 CIRCUITS



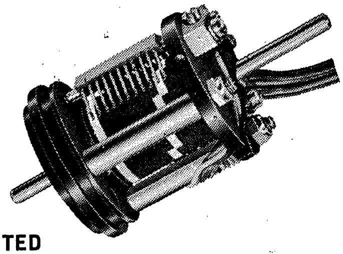
CAY-110
2 to 30 CIRCUITS
1.0″ O.D. 1 AMP RATING



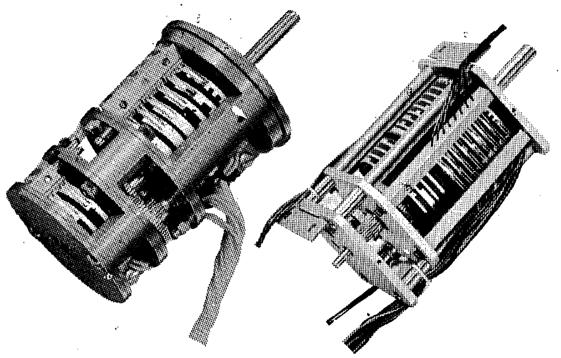
CAY-125
2 to 30 CIRCUITS
5″ O.D. 5 AMP RATING

ROTARY SELECTOR SWITCHES

½″ to 2″ O.D.
2 to 30 POSITIONS
SINGLE & DOUBLE POLE
MAKE BEFORE BREAK OR
BREAK BEFORE MAKE.
LOW TORQUE, NON-DETENTED

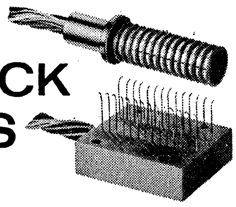


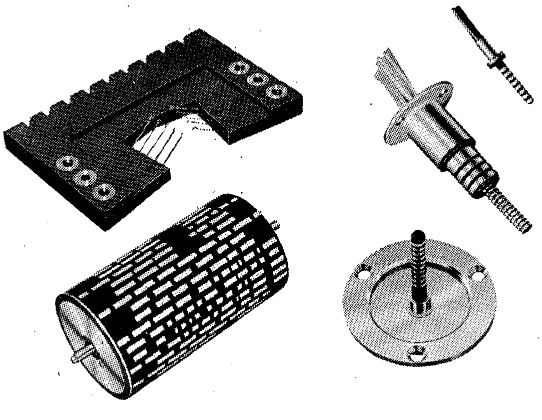
SHAFT POSITION ENCODERS



STANDARD & CUSTOM SINGLE &
MULTI-TURN UNITS
2^3 to 2^9 COUNTS/TURN

SLIP-RING AND BRUSH BLOCK ASSEMBLIES AND SWITCHING COMMUTATORS





Illustrated is a partial selection of the many and varied products available from Airflyte's complete line of rotating components. Airflyte's extensive services and facilities, from research and design to prototype and mass production, enable the manufacture of both standard and modified components, geared to customer specifications and application. Tooling costs can be eliminated in most instances by the availability of a large selection of company-owned jigs, fixtures, dies and molds. Airflyte Electronics invites your inquiry.

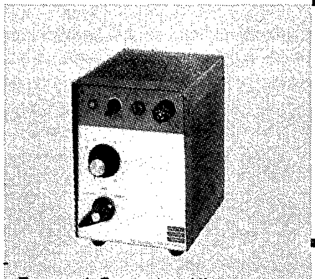
Airflyte Electronics Co.

WRITE FOR CATALOG BOX 207 • BAYONNE, N. J. 07002
PHONE (201) 436-2230 • TWX-710-729-4489

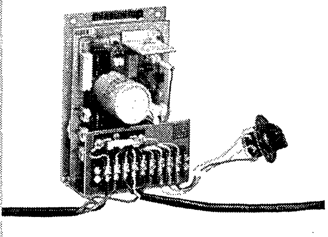
Bodine offers a complete line of fractional hp motors, gearmotors and speed controls

SPEED CONTROLS for Adjustable Speed Drive Systems: A Bodine SCR-type speed control (chassis or encased) converts 50/60 Hz A-c to nearly pure D-c for shunt-wound drives. Makes possible smoother speed control of a Bodine drive (motor or gearmotor) over a wider range of speeds. For single source responsibility and maximum performance, insist on a perfectly matched Bodine motor—Bodine control system. A wide selection in the 1/50 to 1/4 Hp range is available.

The Bodine line, within its horsepower range, is unusually complete. There are over 3500 standard motors and gearmotors, with horsepower ranging from 1/2000 to 1/4. Bodine also builds custom and special motors to your design requirements. Our engineers will be happy to help you pinpoint the right one for your specific application need.

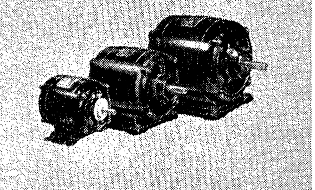


Encased Controls: Nine models are stocked. Some with extended speed range and/or torque control.

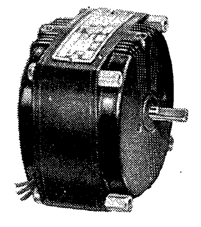


Chassis Control Kits: Four models stocked. Unlimited adaptability. Install in your own enclosure.

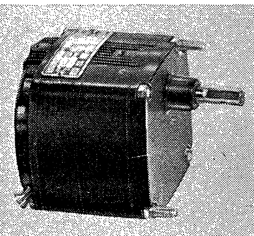
FHP MOTORS & GEARMOTORS: Since 1905 Bodine has manufactured fractional horsepower motors and gearmotors. Close tolerance machining and careful attention to even the smallest detail of construction enables Bodine not only to produce better motors, but to produce them at a lower cost to customers in terms of value received. STOCK Bodine motors and gearmotors are available in all types and sizes within a range of 1/2000 to 1/4 Hp; torques from 0.3 Oz-in. to well over 200 Lb-in.



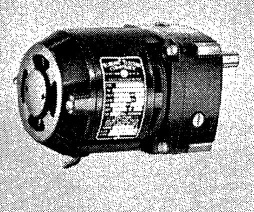
Type N Motors: Three basic sizes; 3.36", 4.50" and 5.68" in diameter. Stock ratings from 1/125 to 1/4 Hp. Almost any type of winding.



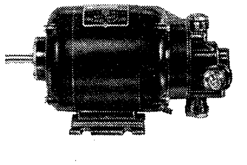
Type K Motors: Permanent-split capacitor instrument motors. Normal slip, high slip and synchronous windings. Stock ratings to 2.4 Oz-in. Only 2.405" square.



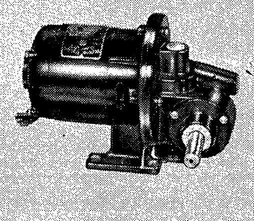
Type K Gearmotors: Permanent-split capacitor instrument gearmotors. Parallel shaft, helical gears. Stock ratings: 2.9-120 Oz-in. at 300-0.9 Rpm. Only 2.405" square.



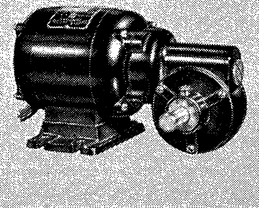
N-1D Gearmotors: Parallel shaft helical and spur gearing. Ratings to 25 Lb-in. Ratios to 900:1. Only 3.41" square.



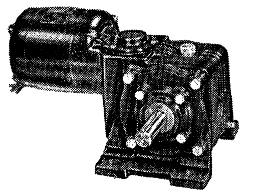
N-1R . . . single or double reduction worm gearmotors. Stock ratings to 5 Lb-in. range. Many ratios.



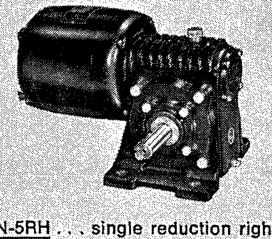
N-1RG . . . double reduction worm gearmotors. Stock ratings to 40 Lb-in. range. Many ratios.



Single reduction, right angle worm gearmotors. 5 frame sizes with stock ratings to 70 Lb-in. range. Ratios to 60:1.



N-3RJ . . . double reduction right angle worm gearmotors for transmitting high torques at low speeds. Stock ratings over 200 Lb-in.



N-5RH . . . single reduction right angle worm gearmotors. Heavy duty reducer for continuous driving of heavy loads. Ample reserve for overloads. Stock ratings over 200 Lb-in.

Call or write for your free copy of Catalog S.

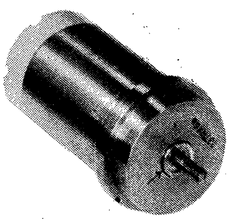
Bodine Electric Co., 2542 W. Bradley Place, Chicago, Ill. 60618

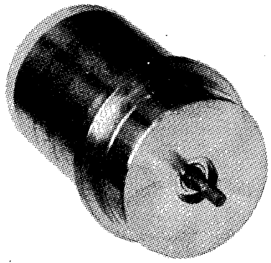
BODINE
fractional/horsepower
MOTORS/SPEED CONTROLS
. . . the power behind the leading products

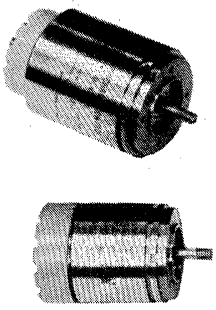
BOWMAR®

ROTATING COMPONENTS

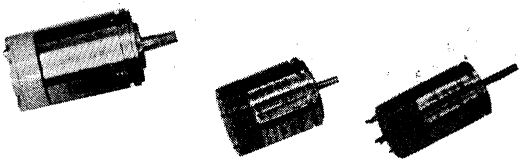
SYNCHROS AND RESOLVERS



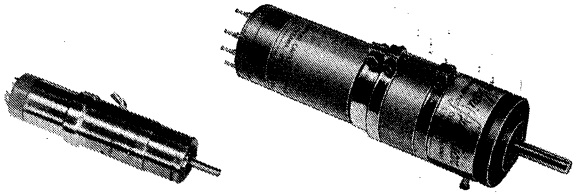




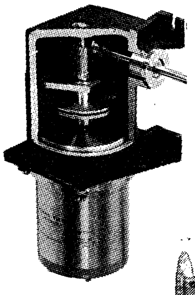
Bowmar manufactures a complete line of 60 and 400 Hertz synchros and resolvers in sizes 8 through 31. These components, as with other Bowmar items, are designed and built to meet stringent military environmental requirements, yet are priced competitively for commercial and industrial applications. Custom designed components and assemblies are available.

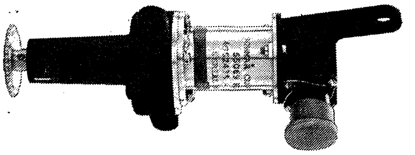


PRECISION CONTROL ASSEMBLIES

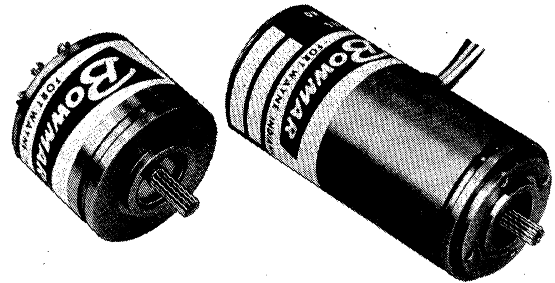


Tandem assemblies of Bowmar components often solve both engineering and cost problems. Combinations of synchros, resolvers, potentiometers, motors and gearheads are readily designed to meet your specific needs.

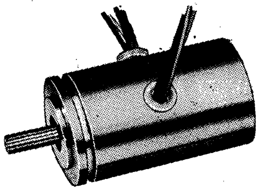


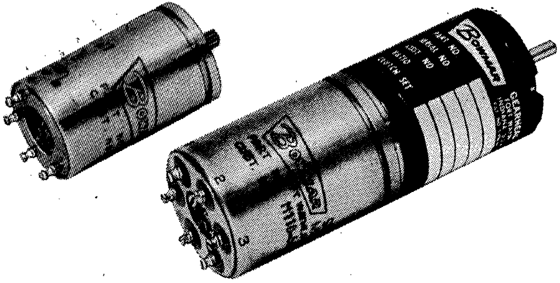


SERVO MOTORS, STEPPER MOTORS AND MOTOR GENERATORS



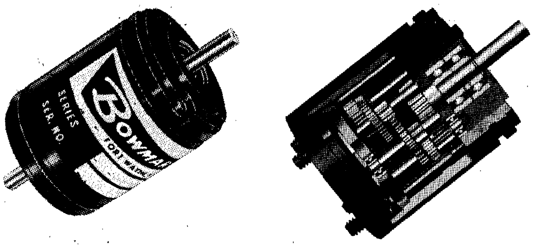
Bowmar servo motors are available in sizes 8 through 23 incorporating the latest techniques in design and manufacturing. Standard units range in power from 2.0 to 60 watts input per phase. These motors are all available with tachometers to satisfy most motor generator requirements.





Bowmar permanent magnet and variable reluctance stepper motors are available in sizes 8 through 23 providing stepping angles of 15°, 30°, 45° and 90°. Standard voltages cover the range of 18 to 28 VDC with speeds up to 900 steps per second.

GEARHEADS AND SPEED REDUCERS



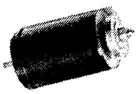
Standard gearheads are available in sizes 8 through 18. Specials in larger sizes are custom designed. Variations available include multiple shafts, concentric shafts, square designs and clamp or screw mountings. Bowmar Electroshift® gearchangers permit multiple ratio selection within a single gearhead.

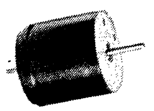
WRITE FOR STOCK LIST BROCHURE

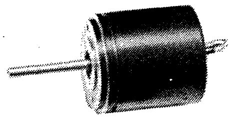
BOWMAR INSTRUMENT CORPORATION
8000 Bluffton Road, Fort Wayne, Indiana 46809 • Tel.: (219) 747-3121 • TWX: 810-332-1510

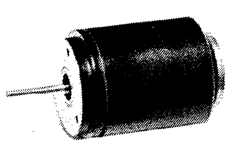
RAPiD/SYN

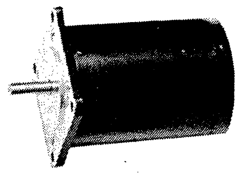
Computer Devices of California manufacture the most complete line of steppers and drivers in the market. Rapid-Syn Steppers feature class H insulation, corrosion resistant rugged construction, precision stainless steel double shielded ball bearing for endurance demanding industrial and military application. Rapid-Syn Steppers are supplied with dampers, heat sinks, gearheads, pulse sources, and a variety of solid state drivers. Every catalog item is available from stock and modified units can be supplied on short notice. Our broad selection, low prices, and rigid quality control systems are setting new industrial standards.

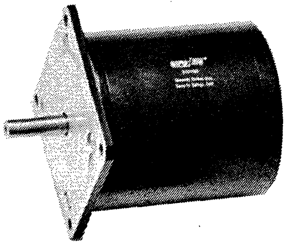












RATINGS AND CHARACTERISTICS FOR RAPID-SYN STEPPERS

Size	Model No.	Type /φ	Step (X°)	Res/φ (ohms)	Input (VDC)	Static Stall Torque (oz. in.)	Detent Torque (oz. in.)	Dynamic Torque (oz. in.)	Max. Response (PPS)	Rotor Inertia (Gm. CM.^{2})	Weight (oz.)	Fig.
8	08M-01	PM/4φ	45	65	28	1.0	0.10	0.35	700	0.3	1.75	1
	08P-02	PM/4φ	90	100	28	0.90	0.10	0.40	350	0.3	1.75	1
	08R-01	VR/4φ	15	100	28	1.0	0	0.48	1200	0.18	1.8	1
	08V-01	VR/3φ	15	60	28	1.3	0	0.50	1100	0.1	1.8	1
11	11M-01	PM/4φ	45	45	28	3.8	0.20	1.50	425	1.2	4.5	1
	11P-01	PM/4φ	90	60	28	2.5	0.20	1.10	240	1.2	4.3	1
	11R-01	VR/4φ	15	55	28	5.8	0	3.25	1040	1.0	4.7	1
	11V-01	VR/3φ	15	80	28	2.75	0	1.75	630	1.0	4.7	1
15	15M-01	PM/4φ	45	30	28	8.1	0.30	4.80	300	5.0	10.0	1
	15P-03	PM/4φ	90	20	28	11.0	0.30	7.0	175	5.0	10.0	1
	15R-01	VR/4φ	15	35	28	8.0	0	4.50	1170	0.7	6.5	1
	15V-01	VR/3φ	15	16	28	5.8	0	2.25	1000	0.6	6.5	1
	15RS-03	VR/4φ	7.5	55	28	8.0	0	5.0	1000	2.2	6.5	1
18	18M-01	PM/4φ	45	40	28	6.0	0.25	3.5	350	4.0	13.0	1
	18P-01	PM/4φ	90	20	28	8.0	0.25	6.0	260	4.0	13.0	1
	18R-01	VR/3φ	15	55	28	11.5	0	8.0	620	5.0	13.0	1
20	20M-01	PM/4φ	45	12	28	15.0	0.40	8.7	300	15.0	26.0	1
	20P-03	PM/4φ	90	12	28	20.0	0.40	9.0	180	10.0	26.0	1
	20R-03	VR/4φ	15	35	28	18.0	0	6.6	625	3.5	20.0	1
	20R-17	VR/4φ	15	12	28	36.0	0	22.0	750	10.0	26.0	1
	20V-01	VR/3φ	15	10	28	50.0	0	13.6	475	10.0	26.0	1
	20V-03	VR/3φ	15	20	28	40.0	0	10.0	400	10.0	20.0	1
	20V-04	VR/3φ	15	15	28	25.0	0	5.0	750	3.5	20.0	1
	20RS-01	VR/4φ	7.5	20	28	30.0	0	10.0	700	12.0	20.0	1
23	23H-02	PM/4φ	1.8	80	28	25.0	1.0	18.0	700	30.0	17.0	1
	23H-05	PM/4φ	1.8	5	28	25.0	1.0	20.0	1000	30.0	17.0	1
	23H-300	PM/4φ	5	3.0	6	25.0	6.0	16.0	350	120.0	30.0	2
	23H-501	PM/4φ	1.8	5	6	42.0	2.0	40.0	450	120.0	20.0	2
	23H-502	PM/4φ	1.8	20	12	45.0	2.0	40.0	425	120.0	20.0	2
	23H-503	PM/4φ	1.8	80	24	50.0	2.0	40.0	425	120.0	20.0	2
	23H-700	PM/4φ	1.8	3	6	75.0	4.0	53.0	480	200.0	30.0	2
	23V-300	VR/4φ	5.0	3.0	6	40.0	0	24.0	420	120.0	30.0	2
34	34H-501	PM/4φ	1.8	20	14	200.0	6.0	120.0	250	550.0	50.0	2
	34H-507	PM/4φ	1.8	150	35	200.0	6.0	120.0	500	550.0	50.0	2
	34H-508	PM/4φ	1.8	10	8	200.0	6.0	120.0	450	550.0	50.0	2
	34H-509	PM/4φ	1.8	4.50	5.5	200.0	6.0	120.0	500	550.0	50.0	2
	34H-510	PM/4φ	1.8	0.50	2.0	200.0	6.0	120.0	350	550.0	50.0	2
	34H-700	PM/4φ	1.8	0.70	3.0	300.0	10.0	200.0	800	1100.0	76.0	2

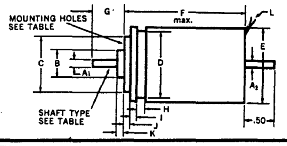
RATINGS & CHARACTERISTICS FOR SYNCHRONOUS MOTORS @ 120 VAC, 60 HZ

								Phase Shift Comp.		
Size	Model No.	Speed (RPM)	Torque (oz. in.)	Res/φ (ohms)	Rated Current (amps)	Rotor Inertia (GM. CM.^{2})	Weight (oz.)	Res. Ohm/Watt.	Cap. MFP/Volt.	Fig.
23	23H-600	72	25	1100	.10	120	20	500/5	.75/300	2
	23H-400	200	20	430	.20	200	30	200/10	1.75/330	2
34	34H-600	72	100	300	.30	550	50	400/25	2.25/330	2

Size	A_1	A_2	B	C	D	E	F	G	H	I	J	K	L	Mounting Holes
08	.0780	.078	.5000	—	.691	.750	1.000	.300	.062	.062	—	.040	No. 32 AWG 12 in.	0-80NF-2B on .589B.C., 120° Apart
11	.1250	.1250	.6250	1.0000	.975	1.062	1.625	.437	.050	.093	.062	.062	No. 28 AWG 12 in.	4-40NC-2B on .812B.C., 90° Apart
15	.1250	.1250	.8750	1.3120	1.345	1.437	1.500*	.437	.078	.093	.132	.040	No. 28 AWG 12 in.	4-40NC-2B on 1.100B.C., 90° Apart
18	.1875	.1250	.9375	1.5620	1.625	1.750	1.875	.437	.078	.093	.132	.040	No. 28 AWG 12 in.	4-40NC-2B on 1.250B.C., 90° Apart
20	.1875	.1250	—	1.750	1.875	2.000	2.500	.625	.093	.125	.250	—	No. 24 AWG 12 in.	None
23	.2500	—	1.500	—	2.125	2.750	2.000	.875	.125	.125	—	.125	No. 22 AWG 12 in.	6-32NC-2B on 1.750B.C., 120° Apart

* F Dim. is 2.1 max. for Models 15P and 15M.

FIG. 1



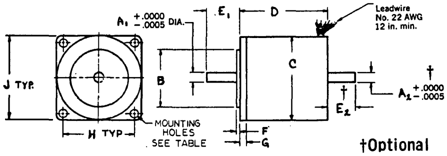


FIG. 2

†Optional

	Size	A_1	A_2 †	B	C	D	E_1	E_2 †	F	G	H	J	Mounting Holes
Ⓐ	23-5XX	.250	.250	1.500	2.218	2.25	.812	.750	.062	.187	1.856	2.225	.200 Dia., 90° Apart on 2.625B.C.
Ⓑ	23-7XX	.250	.250	1.500	2.218	3.25	.812	.750	.062	.187	1.856	2.225	.200 Dia., 90° Apart on 2.625B.C.
Ⓒ	34-5XX	.375	.375	2.875	3.375	2.44	1.187	1.125	.062	.187	2.740	3.250	.218 Dia., 90° Apart on 3.875B.C.
	34-7XX	.375	.375	2.875	3.375	3.69	1.187	1.375	.062	.187	2.740	3.250	.218 Dia., 90° Apart on 3.875B.C.

Ⓐ Also 23H-600 Ⓑ Also 23H-400 Ⓒ Also 34H-600

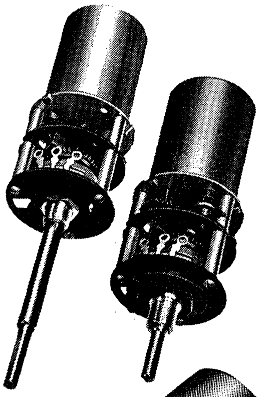
Computer Devices

TEL. (213) 698-2595 TELEX 65-7478
11925 BURKE STREET / SANTA FE SPRINGS, CALIFORNIA 90670

DALE® *for Optimum Value in Electromechanical Products*

REVERSIBLE AC MOTOR DRIVEN POTENTIOMETERS

FOR USE IN ■ Home Entertainment Appliances ■ Instrumentation ■ Controls



FEATURES

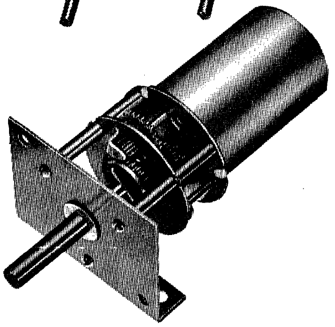
- ■ Available with all standard potentiometers: Single, ganged or with power switch—dimensions change accordingly.
- ■ Magnetic clutch eliminates coasting and allows manual control independent of gear motor inertial load.
- ■ Long life expectancy ■ No lubrication in normal use ■ Operates in any position ■ Special terminal configurations available

SPECIFICATIONS

Operating Voltage: 6, 12, 24, 117 V.A.C., or any specified
Power Input: 5.5 Volt Amperes
Output: Approximately 5.6 R.P.M.
Torque at Potentiometer Shaft: 10 in./oz. minimum (with decoupler); 21 in./oz. minimum (without decoupler).
Reversing: Accomplished by switching capacitor as shown in hysteresis motor circuit diagram below.
Dimensions: Length: 3.275″ (not including shaft) Diameter: 1.531

REVERSIBLE AC GEARHEAD MOTORS

FOR USE WITH ■ Switches ■ Potentiometers ■ Projectors ■ Turret Drives ■ Ribbon Drives ■ Chart Drives ■ Turntable Drives ■ Business Machines ■ Displays ■ Light industrial and consumer product controls



SPECIFICATIONS

MECHANICAL

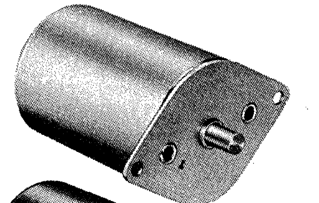
Overall Dimensions: Length: 3.275″ (not including shaft) Diameter: 1.531″
Shipping Weight: .32 lbs.
Will meet normal industrial environmental requirements.
Mounting: Horizontal standard, vertical optional; bracket provided for chassis mounting and mounting control.
Output Torque: 14 in./oz. at 5.3 R.P.M.

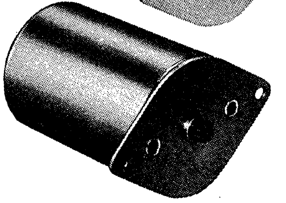
ELECTRICAL

Operating Voltage: 117 volts AC, 60 cycles standard. Available from 6 to 117 volts AC, 60 cycles.
Capacitor size: Dependent on input voltage. (Capacitor not supplied.)

REVERSIBLE AC HYSTERESIS SYNCHRONOUS MOTORS

FOR USE IN ■ Low Power Driving Mechanisms ■ Control Circuits ■ Timers ■ Fans ■ Entertainment Appliances ■ Scanning Devices ■ Stirring Devices ■ Cassette Drives

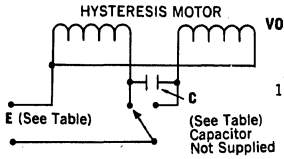




FEATURES

- ■ Output shaft configuration can be specified. Standard units provided with gear.
- ■ Mounting arrangement can be varied to meet customer requirements.
- ■ Self-lubricating bearings.
- ■ Aluminum housing.
- ■ Long life expectancy.
- ■ Reversing accomplished by switching external capacitor as shown in circuit diagram.

CIRCUIT DIAGRAM



E VOLTAGE	C CAPACITANCE	C VOLTAGE
6	170 MFD	20
12	50 MFD	25
24	16 MFD	50
117	.47 MFD	300

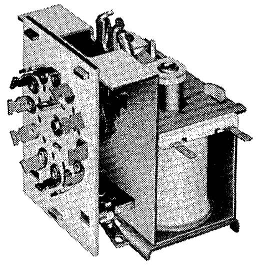
SPECIFICATIONS

Operating Voltage: 6, 12, 117 V.A.C., or any specified.
Power Input: 5.5 Volt Amperes
Output: Approximately 1800 & 3600 R.P.M.
Torque: 0.1 in./oz. min.

AC & DC STEPPING RELAYS

FOR USE IN ■ Control Circuits ■ Television Controls ■ Hi-Fi, Stereo & Radio ■ Appliances ■ Telephone Devices ■ Coin Machines ■ Car Washes ■ Crystal Switching ■ Copy Machines ■ Medical Electronics ■ Computers ■ Coin-operated Laundry Equipment ■ Programmers

FOUR TYPES AVAILABLE ■ Uni-Directional A.C. & D.C. ■ Bi-Directional A.C. and D.C.



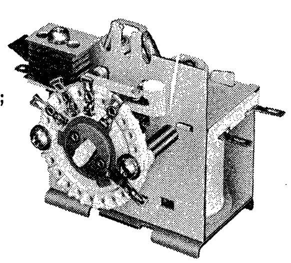
SPECIFICATIONS

ELECTRICAL

Operating Voltage: 6 V, 12 V, 24 V, 117 V (AC or DC)
Power Required: 2.5 watts with Plate Sequence Switch (Fig. A); 4.5 watts with Wafer Sequence Switch (Fig. B).
Contact Arrangement: Single Pole 4, 6, 10, 12 or 13 throw sequence. Auxiliary power switch operates at predetermined position of sequence.
Contact Rating: From Dry Circuit to 1 amp at 24 V.A.C. on Sequence Switch. Optional power switch 5 amps at 117 V.A.C.

MECHANICAL

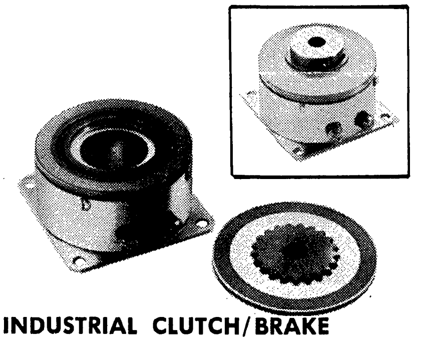
Overall Dimensions: Height: 2.200″
Width: 2.190″
Depth: 2.005″
Shipping Weight: 0.27 lbs. Uni-Directional; 0.40 lbs. Bi-Directional
Will meet normal commercial environmental requirements.
Standard auxiliary power switch may be omitted.
Mounting: Vertical or horizontal using one screw and two locating tabs.



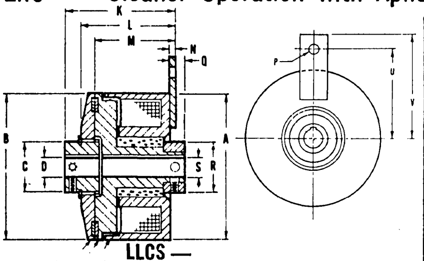
DALE ELECTRONICS, INC., Box 180, Yankton, South Dakota 57078 • Phone: 605—665-9301

100-MILLION-CYCLE APILON®-FACED CLUTCH AND BRAKE

Longer Life • Cleaner Operation with Apilon® (Ceramic Type) Friction Faces

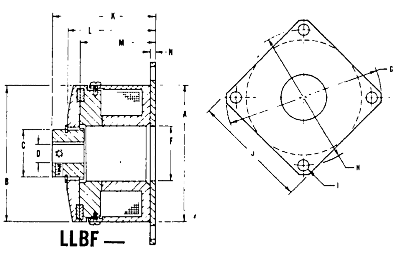


INDUSTRIAL CLUTCH/BRAKE
AVAILABLE WITH ANTIBACKLASH ARMATURE ASSEMBLY.



LLCS —

- Typical life of wear surfaces at least ten (10) times conventional material.
- Life expectancy approximately 120 million cycles (based on work performed per cycle of 144 in. oz. for Size 20 and 288 in. oz. for size 40).

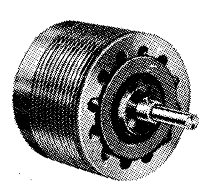


LLBF —

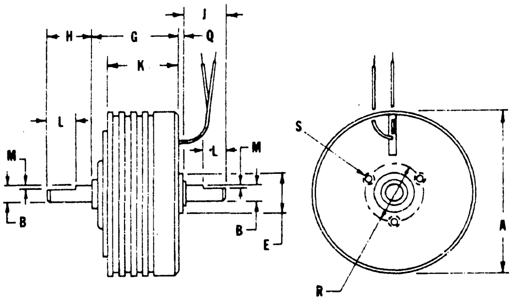
- Dust due to wear products substantially reduced.
- Physically and electrically interchangeable with most conventional units.
- Engineering available to establish life expectancy for specific application.

Model	Torque	Watts	A	B	C	D	F	G	H	I	J	K	L	M	N	P	Q	R	S	U	V
±	Lb. In.	D.C.	.015 .015	.015 .015	.005 .005	Std. with Std. Keyway	.001 .000	.001 .001	.005 .005	.010 .010	.015 .015	.015 .015	.015 .015	.015 .015	.015 .015	.010 .010	.015 .015	.015 .015	Max. with Max. Keyway	.015 .015	.015 .015
10	3	4	1 1/8	1 1/8	5/8	3/16 x 1/16 x 1/32	.437	1.499	1.312	1/8	1 1/8	1	.718	.625	1/16	5/32	3/16	7/16	1/4 x 1/16 x 1/32	3/4	7/8
20	18	6	1 13/16	1 13/16	5/8	3/8 x 3/32 x 3/64	.750	2.436	2.125	3/16	1 13/16	1 3/8	1.156	1.000	1/16	5/32	3/16	5/8	1/4 x 1/16 x 1/32	1 3/16	1 3/8
30	35	8	2 1/8	2 1/8	5/8	3/8 x 3/32 x 3/64	1.000	2.874	2.500	3/16	2 1/8	1 21/32	1.250	1.062	1/16	5/32	1/4	3/4	3/8 x 1/16 x 1/32	1 3/8	1 9/16
40	60	10	2 5/8	2 5/8	1 3/16	1/2 x 3/16 x 3/32	1.061	3.499	3.125	3/16	2 5/8	1 25/32	1.437	1.250	1/16	5/32	1/4	1	3/8 x 1/8 x 1/16	1 9/16	1 3/4

HYSTERESIS CLUTCHES/BRAKES



HYB-HYSTERESIS BRAKES



A continuous slip device capable of providing precise, infinitely adjustable torque control. Units are basically direct current sensitive . . . having excellent reliability, repeatability and linearity. Described below are some of the infinite variations of Hysteresis Brakes manufactured. Also available are a similar wide variety of clutches.

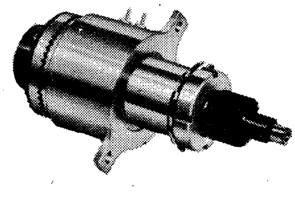
ENGINEERING DATA

Model	Torque (Min.) @ Rated Amp.	Coil Watts @ 24	Dynamic Slip Rating		Recom-mended Max. Speed (Input)	Polar Mom. Inertia Output Oz. In. $Sec.^2$	De-Ener. Torque Drag	Weight (Nom.)
			Intermittent Absorb. Cap'y (10 Min.)	Dissipation Cap'y Max. Avg.				
Model	Oz. In.	V.D.C.	Watts	Watts	RPM	$x 10^{-3}$	Oz. In.	Oz.
20	7	3	30	10	20,000	0.30	0.1	8
30	20	4	45	15	18,000	0.58	0.1	10
35	30	6	80	20	16,000	1.06	0.2	16
40	35	8	160	40	13,500	1.20	0.2	32
45	125	10	320	80	9,000	10.4	0.7	64
50	175	10	480	120	6,500	28.8	1.0	120
55	340	10	600	150	5,000	38.4	2.0	200

DIMENSIONS

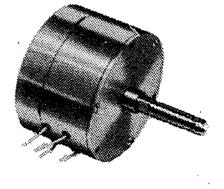
Model	A	B	E	G	H	J	K	L	M	Q	R	S
	+ .015 − .015	.0000 .0005	.0000 .0005	.020 .020	.015 .015	.015 .015	.015 .015	.015 .015	.005 .005	.005 .005	.005 .005	NC-2 x .020 .020
20	1.750	.1875	.5000	.937	.500	.500	.765	.375	.020	.125	.687	4-40 x .125
30	1.953	.1875	.5000	1.000	.500	.500	.812	.375	.020	.125	.687	4-40 x .125
35	2.093	.2500	.6250	1.406	.625	.625	1.203	.375	.030	.062	.937	6-32 x .250
40	2.468	.2500	.6250	1.940	.625	.625	1.718	.375	.030	.109	.937	6-32 x .250
45	3.625	.3750	.8750	2.000	1.000	1.000	1.531	.625	.062	.140	1.250	8-32 x .312
50	4.437	.5000	1.1250	2.530	1.062	1.062	1.984	.625	.062	.156	1.500	10-32 x .562
55	5.484	.5000	1.1250	3.016	1.062	1.062	2.062	.625	.062	.156	1.500	10-32 x .562

SPECIAL ENGINEERED UNITS



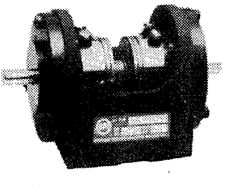
TOOTH TYPE CLUTCH

Special design to meet military reliability for airborne electronics. Specifications include operation in an explosive vapor, temperature, altitude, vibration, salt spray and humidity environments.



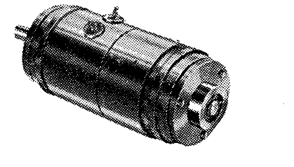
DUPLEX BRAKE

Compact Brake for use in a missile tape drive system. Hysteresis and friction brake with separate coils for excitation applied to a common shaft.



APILON®-FACED CLUTCH BRAKE PACK

Precision pre-aligned clutch/brake package eliminates installation problems. Ball bearing supported shafts permit direct coupling or belt drives. Packs available to house above Commercial Models 10, 20 and 40.



SUBMINIATURE CLUTCH & BRAKE

Ultra precision clutch and brake units, combine excellence in design, materials, workmanship and reliability. All units contain precision ball bearings fully protected from moisture and contamination by special seals. Units meet government specifications for environmental tests. Infinite variations of design and mountings are available.

Delevan
Division

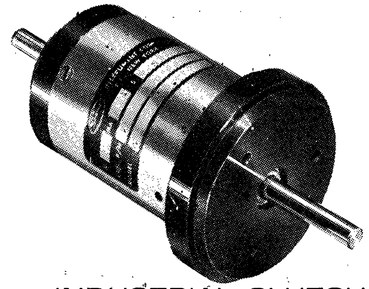
AMERICAN PRECISION INDUSTRIES INC.

270 QUAKER RD. / EAST AURORA, N. Y. 14052
TELEPHONE 716/652-3600 TELEX 091-293
OTHER DIVISIONS OF AMERICAN PRECISION INDUSTRIES INC.: BASCO • DUSTEX • MOELLER INSTRUMENT CO. • OXFORD CORP. • TRUCK EQUIPMENT CO.

ELECTRO-MAGNETIC
CLUTCHES
AND IN-LINE SERVO

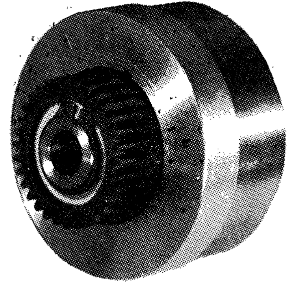
FRICTION HYSTERESIS
BRAKES
ASSEMBLIES

MAGNETIC PARTICLE



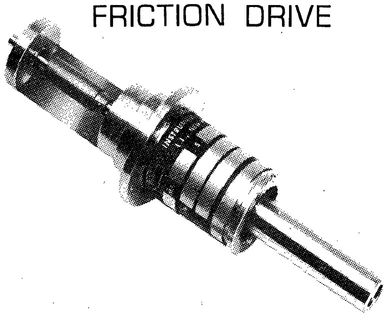
INDUSTRIAL CLUTCH

TENSION CONTROL



HYSTERESIS DEVICE

FRICTION DRIVE



MECHANISM

This new magnetic particle unit, designed for capstan drives, tape transports, card handlers, magnetic memory drives and other computer peripheral applications, is also ideal for a wide variety of uses in general business machines, copy machines, film transports, packaging equipments, reconnaissance cameras and process control in the paper-making and textile fields. Overcoming the deficiencies of both mechanical units and previous magnetic particle units, this new design provides smooth, fast response, high damping, low moment of inertia, high efficiency and long maintenance-free life. Electrical response time is one millisecond, with uniform linear acceleration/deceleration minimizing start/stop shock. Its inherent high damping places it well within accepted oscillation tolerances. Mechanical pickup is also fast and smooth. No special high voltage surges are needed for fast response, eliminating the need for heat dissipation circuits or special control circuits.

This new tension control device using a hysteresis technique, offers several distinct advantages over existing friction devices. Its lack of contacting surfaces gives it a maintenance-free, virtually unlimited life without the necessity for field adjustments. It is useful anywhere that a shaft is required to maintain a set tension over a varying range. The tension control device utilizes a permanent magnet to create the hysterisis effect and does not require electrical power of any sort. It operates without flutter or cogging and is not sensitive to speed changes, maintaining the required tension over a speed range up to 3000 rpm. It is sealed against dust and other contaminants and can be supplied with shaft, pulleys, timing belts or gears and can be factory preset to provide from 2 to 16 oz/in of torque. Tension control is $1\frac{15}{16}$" outside and accommodates a $\frac{5}{16}$" shaft. Completely constructed from corrosion-resistant materials.

This newly developed clutch/drive combination was originally developed for use in batch recording tape systems but has found application in a wide variety of uses — disc memory drive, card feeder, machine tool tape drive or any application that demands fast response time, bi-directional operating capability and precise repeatability. The unit illustrated consists of a clutch/brake combination with friction drive output. Drive applications can be friction, pulley, gear or gear reduction to suit a variety of requirements. It is 3½" long and ⅞" diameter and weighs 5 ounces. Dynamic response time is 1.5 to 3.5 milliseconds, dropout response time is .5 to 2.0 milliseconds. Unidirectional speed is 600 RPM, cycling capability is 33 cycles/second, a lifetime guarantee of 60 million cycles minimum. Input voltage is 24 VDC.

"Dynamic Instrument Corp. a publicly owned OTC corporation has over 15 years experience in the precision, electro-magnetic, electro-mechanical, rotating components and assemblies for industrial, commercial, and military equipment systems. The Omni-Action line of miniature precision electro-magnetic clutches and clutch/brake assemblies is the largest standard line available in the industry today. The ability to design units to exact customer specifications realistically, reliably, and at legitimate prices, whether the requirement be for a positive starting and stopping; power transmission; tension control for wire, thread, or tape; based on the principle of friction, hysterisis, or magnetic particle you can expect a prompt and accurate response to your needs. Contact Jack Gildea extension 27 for prompt discussion of your problem.

OMNI-ACTION
CONTROL DIV.

DYNAMIC INSTRUMENT CORP.

115 E. BETHPAGE ROAD
PLAINVIEW, N. Y. 11803
516 - 694-6000

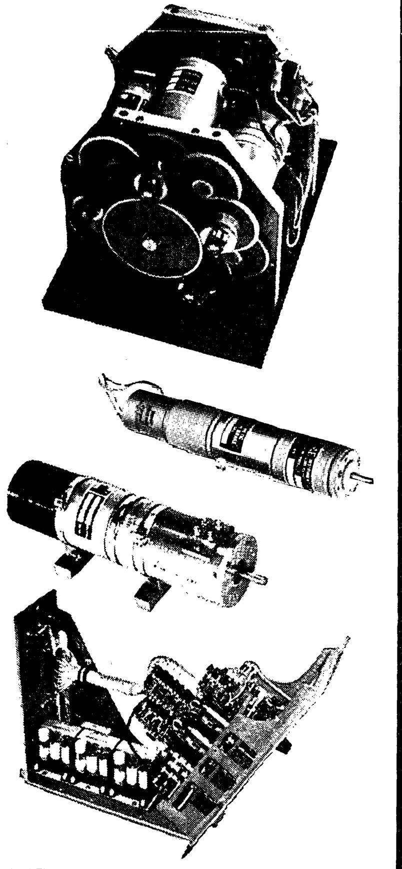
TWX 510-224-6842 CABLE ADDRESS "DYNINST" PLAINVIEW, N. Y.

FAE PRECISION ROTARY COMPONENTS

PRECISION INSTRUMENT PARTS AND COMPONENTS AVAILABLE FROM STOCK!

SPECIAL APPLICATIONS

DESIGNED • DEVELOPED • SUB-CONTRACTED



WE MANUFACTURE—

- CLUTCHES
- BRAKES
- CLUTCH-BRAKES
- DIFFERENTIALS
- GEAR HEADS
- SPEED REDUCERS
- BELLOWS COUPLINGS
- GEAR CLAMPS
- GEAR DEVICES
- SERVO PACKAGING

CUSTOM MADE UNITS—

All components can be custom engineered to your specific applicational requirements and MIL specifications.

EXCELLENT DELIVERY—

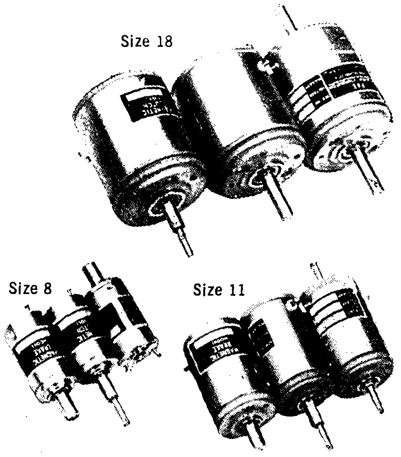
FAE maintains large and complete standard parts inventories. Most popular items are available from stock. Special shafts offer negligible delays.

Engineering Representatives—

FAE Representatives are highly skilled and experienced specialists as well as veteran engineers. Phone or write for immediate service. Consult **eem** for nearest office.

SEND FOR COMPLETE CATALOG ILLUSTRATED WITH DRAWINGS AND DETAILED SPECIFICATIONS

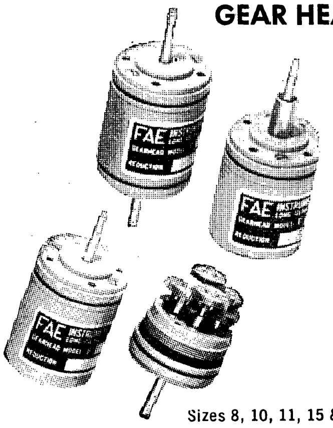
MINIATURE MAGNETIC CLUTCHES • CLUTCH BRAKES • BRAKES



FEATURING—

- ★ Torque range to 100 inch/ounces
- ★ Friction or crown-tooth clutch faces
- ★ Direct action and reverse action types
- ★ Engagement time—3 to 20 milliseconds
- ★ 24-28 Volts, D.C. standard. No delay penalties for special voltages or special shaft configurations.
- ★ Precision ball bearings used throughout
- ★ Designed to meet MIL-E-5272A environmental specifications

GEAR HEAD AND SPEED REDUCERS

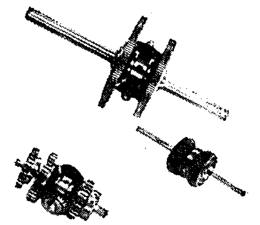


Sizes 8, 10, 11, 15 & 18

FEATURING—

- ★ Precision ball bearings throughout
- ★ Hardened stainless Class II precision gearing
- ★ Large selection of standard ratios. Special exact ratios for timing systems available
- ★ Integral safety slip clutch. Eccentric output shafts, pinion or special output shafts available.
- ★ Special frame sizes, adapters for all non-standard motors

HOLLOW AND SOLID SHAFT PRECISION DIFFERENTIALS

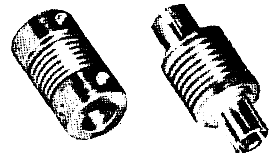


All Sizes to 1/16 Shaft Dia.

FEATURING—

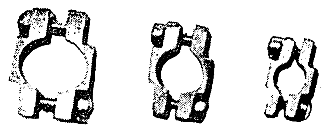
- ★ High accuracy and long life
- ★ Precision ball bearings used throughout
- ★ Hardened stainless steel gearing. Choice of end gears to order
- ★ Simple pinion gear adjustment for desired backlash vs. starting torque
- ★ Zerol 3-bevel, extremely rugged high torque models available
- ★ Sub-miniature 3/32 enclosed planetary type available

PRECISION MINIATURE HARDWARE



Bellows couplings • Split hub and solid hub • Phosphor bronze • Induction soldered Palladium plated • All sizes plus any special.

HARDENED STAINLESS STEEL BALANCED CLAMPS



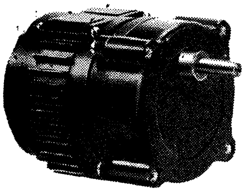
ALL SHAFT AND HUB SIZES AVAILABLE

FAE INSTRUMENT CORPORATION

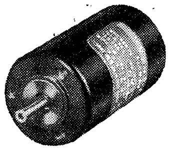
16 NORDEN LANE
HUNTINGTON STA., N. Y. 11746

EASTERN AIR DEVICES, INC.

A.C. FRACTIONAL H.P. MOTORS AND GEARMOTORS

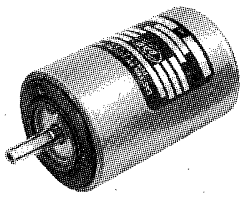


Size 25
synchronous gearmotor—NEMA Type 211 mounting—as much as twice the pull-in torque of standard instrument motors in the same package size and mounting. Diameter 2½″

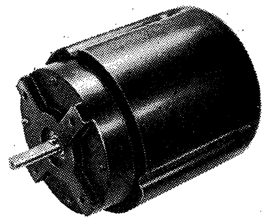


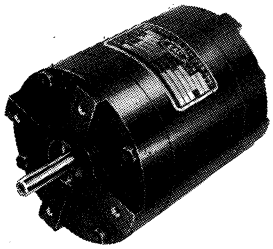
Size 10
induction motor. The most versatile 1″ diameter motor on the market. Ideal for 400 Hz airborne applications due to small size and light weight.

Size 18
TEFC induction motor—widely used in airborne and ground support equipment as a drive motor. Another versatile design suitable for 60 Hz, 400 Hz and multi-frequency applications. Diameter 1¾″

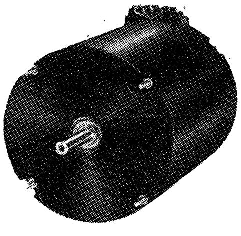


3-speed TEFC hysteresis motor for computer tape transport features extremely low wow and flutter. Single and multi-speed versions of this high power synchronous motor are in use in many high-grade recorder applications. Diameter 3⅞″





Size 34
3⅜″ diameter motor used in tape transport for both capstan drive (hysteresis synchronous) and take up (torque motor) applications. Primary applications are in high quality recorders and computer peripheral equipment.



Size 67
6⅝″ diameter motor. Extremely high efficiencies are possible with this design especially in 400 Hz applications. Of particular significance here, is EAD's ability to build quiet, low speed (1700 rpm) 400 Hz motors and high output blowers without the usual sacrifice of efficiency normally found in high-slip devices.

Seven frame sizes from 1″ to 6⅝″ diameter incorporate the following standard design characteristics:

ELECTRICAL 1) 60 Hz, 400 Hz, dual frequency and variable frequency; 2) single phase, permanent split-capacitor and polyphase; 3) single and dual voltage.

PERFORMANCE INDUCTION—normal slip, high slip and torque motors.

SYNCHRONOUS Hysteresis, Reluctance, Polarized.

MECHANICAL & ENVIRONMENTAL

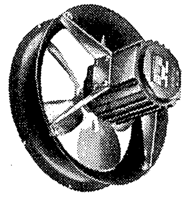
- Wide variety of standard mountings
- Various standard gearhead ratios available
- Multispeed motors
- All motors are designed for manufacture to military specifications where required.

Eastern Air Devices, Inc. DOVER, NEW HAMPSHIRE 03820 • (603) 742-3330

EASTERN AIR DEVICES, INC.

FANS AND BLOWERS

A precision air moving device is no better than the basic motor that supplies its rotary motion. Long experience in custom design of motors for specific applications coupled with our extensive aerodynamic and environmental test facilities assures you of an optimum balance of size, weight and power teamed to produce maximum air delivery. The same thorough engineering, precision workmanship and painstaking quality control which have been responsible for our long standing reputation for absolute dependability combine to produce the highest reliability available for this class of component.

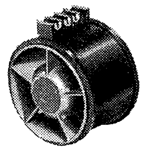


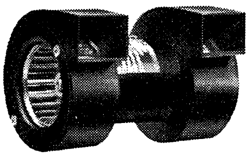
PROPELLER AND TUBEAXIAL FANS

UP to 12″ in diameter, up to 1500 CFM.

VENEAXIAL FANS

Available in 1½″, 2″, 4¾″ diameters from 3 to 500 CFM at high static pressures.

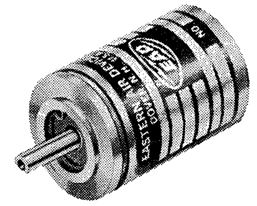




CENTRIFUGAL BLOWERS

A complete line from 3 to 2000 CFM, static pressures up to 10 inches of water.

PRECISION CONTROL COMPONENTS

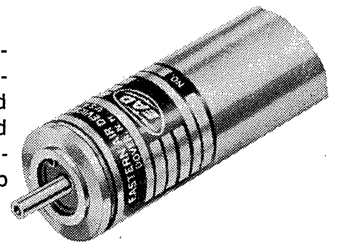


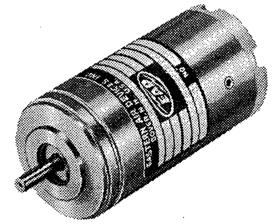
MILITARY & COMMERCIAL SERVOMOTORS

Sizes 8, 10, 11, 15, 18 and 23. Available for 60 or 400 Hz operation with wide selection of standard gearhead ratios.

SERVOMOTOR-GENERATORS

Line includes temperature compensated, integrating tachometers where required. Standard sizes 8 through 23 with and without gearheads. Also available as a tachometer only, up to size 18.





INERTIALLY DAMPED SERVOMOTORS

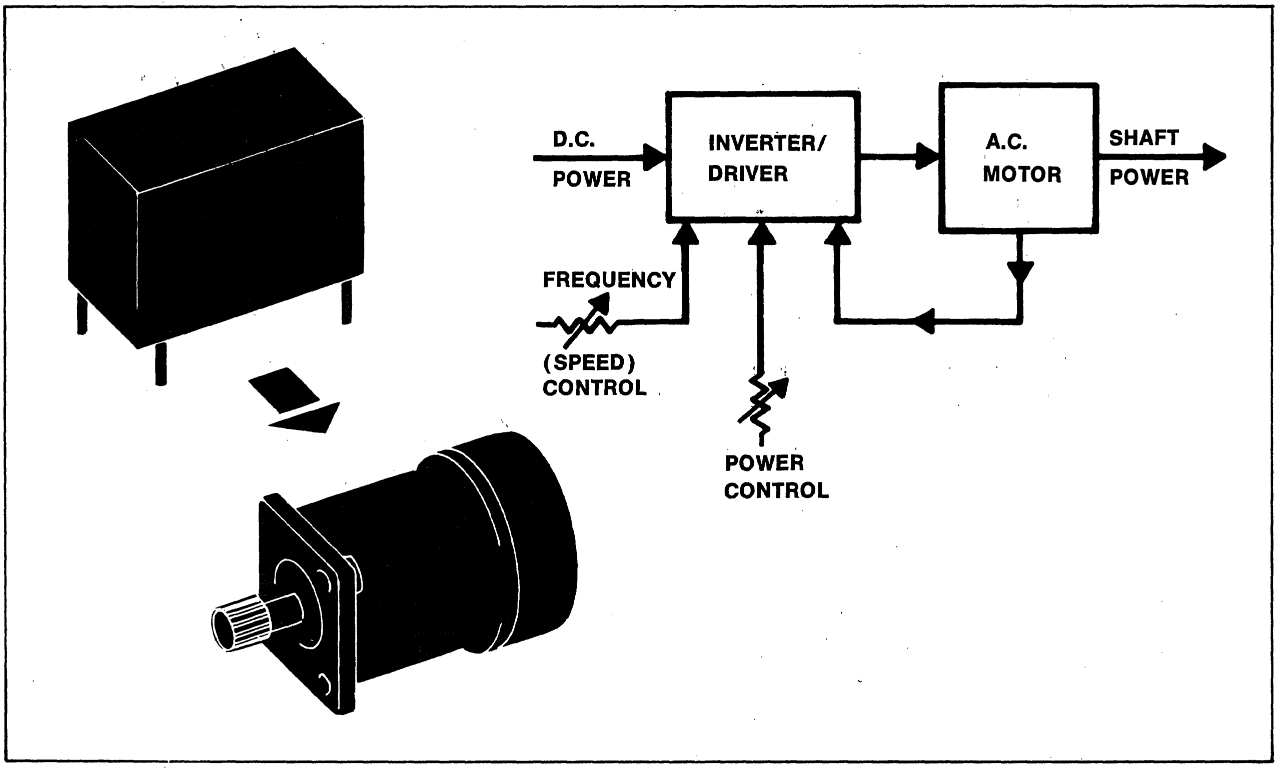
Available with and without gearheads in sizes 8 through 23. Permanent magnet alternators for both military and industrial applications.

Eastern Air Devices has been manufacturing high performance control components in volume production quantities since 1942. Experience gained through serving the exacting requirements of the military and many of the country's leading instrument companies has resulted in an intimate familiarity with production tolerances and quality assurance procedures so necessary to consistently produce components of the highest quality available.

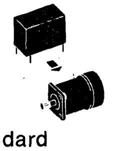
A thorough knowledge of basic application factors has enabled EAD engineers to design and produce a series of standard components capable of optimum output consistent with the high reliability for which EAD is famous. Where special requirements exist, our engineering department has the capability of relating and adapting a vast store of empiracal data to your particular needs.

Eastern Air Devices, Inc. DOVER, NEW HAMPSHIRE 03820 • (603) 742-3330

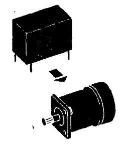
EEMCo MOTOR/INVERTER SYSTEMS



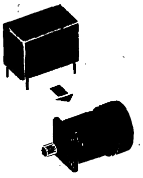
Solid state, high-reliability motor driver/inverters, and high-performance EEMCO motors are design-matched in the EEMCO system of total system responsibility. Single phase, two-phase, and-three-phase inverter/motor systems are available in custom and standard designs to meet a wide variety of special needs.



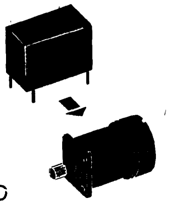
Custom EEMCO inverter/motor systems are finding increasing use in applications where only d.c. power is available, but a.c. motor performance is required. Absence of motor brushes in these a.c. systems, combined with the availability of exact synchronous speed affords the user new latitudes in excellent overall system operations.



Low power, simple circuitry, single phase inverter/motor systems may be provided for applications in smaller equipment, such as small recorders, chopper blade systems, mechanical timer functions, potentiometer drives, etc., where cost and physical size are prime considerations.



Higher power, polyphase systems, such as scanner drives, pump motors, large recorder systems, etc., are met in customer package configurations to user drawings. For prompt consideration of your motor/inverter system requirements, address the Marketing Department of the EEMCO Division, Los Angeles, California, or contact your nearest EEMCO representative.



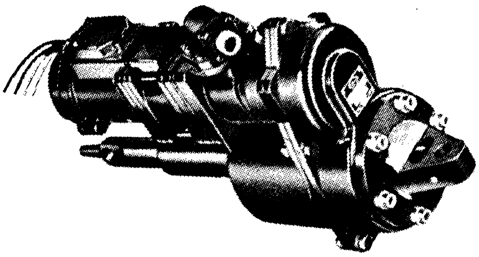
EEMCo *EEMCO DIVISION*

of Datron Systems, Inc.

4585 Electronics Place, Los Angeles, California 90039 (213) 247-7060 TWX: 910-497-2269

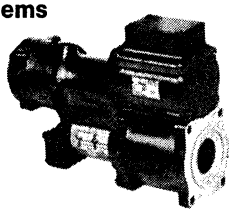
ELECTRO-MECHANICAL COMPONENTS AND SYSTEMS

Linear Actuator Systems



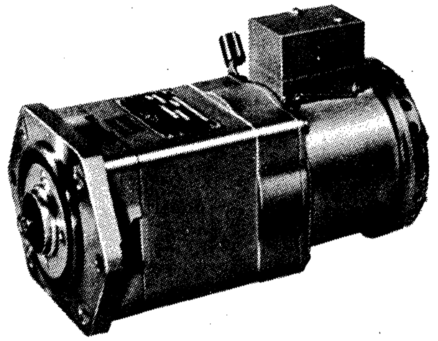
EEMCO offers dependable Linear Actuator Systems, such as the Model D-2227 (illustrated) for various aircraft applications. The D-2227 handles a 12,000 lb. maximum operating load (tension), is driven by a 400 hz. a.c. motor, and weighs 21 lbs. (approx.). Many optional features are available.

Rotary Actuator Systems



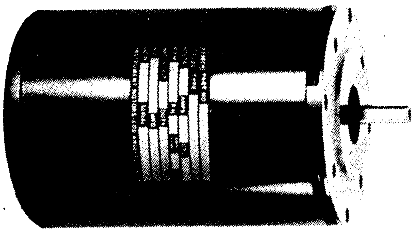
EEMCO Rotary Actuator Systems provide a full line of design features for the most demanding applications. Model D-2076 (illustrated) includes optional 400 Hz. or 28 v.d.c. motor, brake, and R.F. Noise filter. Maximum operating load is 7400 inch lbs., and weight is 12 lbs.

Turbine Engine Starters and Starter-Generators



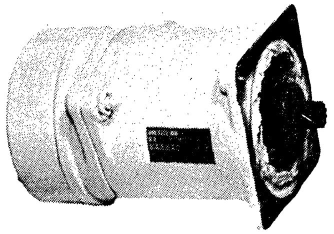
EEMCO Starter Motors and Starter-Generator Systems are available in a wide range of performance parameters, in both standard and custom designs. The 7400 Frame Starter-Generator (illustrated) is available with Starter output up to 3 horsepower, and with Generator output up to 50 amperes.

Special Industrial Motor Products



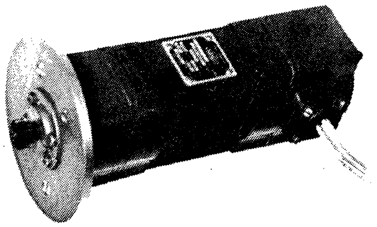
EEMCO Special Industrial Motor Products group includes synchronous motors, induction motors, servo motors, and torque motors for use in the computer, automation, and special industrial fields. Write for catalog information, Product Brochures Number 208 and Number 250.

High Performance Military AC Motor Products



EEMCO features a line of high performance A.C. Motors ranging from a few watts to 15 horsepower. These induction motors are available in 4, 6, and 8 pole, 400 Hz. designs, and may include optional features such as gear reducers, magnetic brakes, thermal protection, and special mounting pads. The A-540 Frame unit is illustrated.

High Performance Military DC Motor Products



EEMCO High Performance Military D.C. Motor Products includes a full line of motors, ranging from a few watts to 8.44 horsepower. Included in the line is the Model C-875C, a special two-speed d.c. motor (illustrated), equipped with a double commutator for both 2900 RPM and 11,000 RPM operation. Explosion-proof designs, brakes, gear reducers, and Radio Noise filters are available.

EEMCO DIVISION

of Datron Systems, Inc.

4585 Electronics Place, Los Angeles, California 90039 (213) 247-7060 TWX: 910-497-2269

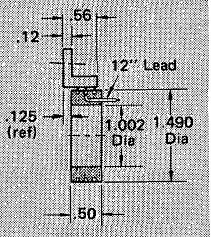
SLIP RING ASSEMBLIES

STANDARD MODELS FROM THE FABRICAST CATALOG with BORE SIZES THRU 8 INCHES

IMMEDIATE DELIVERY SLIP RING ASSEMBLIES

SLIP RING ASSEMBLIES – SEPARATE ROTORS AND BRUSH BLOCKS

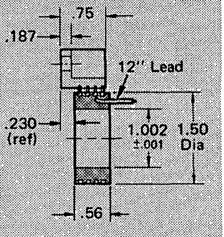
TYPE 1301
3 Ring



.56
.12
12" Lead
.125
(ref)
1.002
Dia
1.490
Dia
.50

1.002 Bore

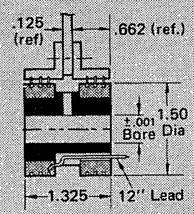
TYPE 1401
4 Ring



.75
.187
12" Lead
.230
(ref)
1.002
±.001
1.50
Dia
.56

1.002 Bore

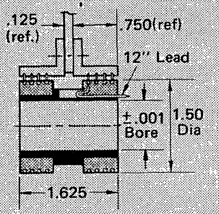
TYPE 1301008
6 Ring



.125
(ref)
.662 (ref.)
±.001
Bore
1.50
Dia
1.325
12" Lead

.752 Bore Max.

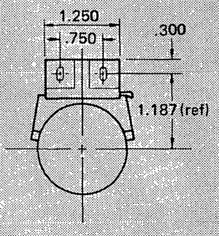
TYPE 1401001
8 Ring



.125
(ref.)
.750(ref)
12" Lead
±.001
Bore
1.50
Dia
1.625

.752 Bore Max.

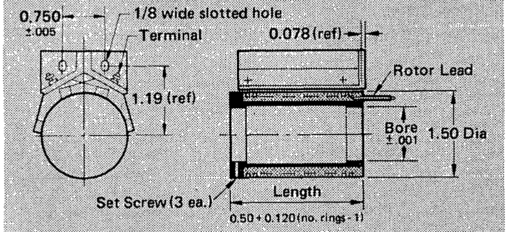
TYPICAL
END VIEW



1.250
.750
.300
1.187(ref)

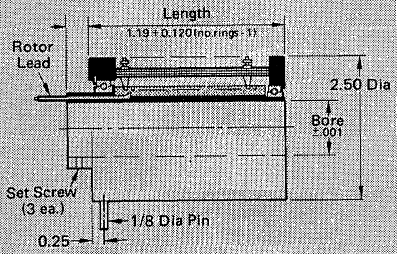
5 amp – 1000 VAC Hi-Pot – .010 ohm Dynamic Resistance – Coin Silver Rings – Silver Graphite Brushes

Slip Ring Assembly Type 1057
Separate Rotor and Brush Block
5 amp – 50 rings max – Bore 1.002 dia max



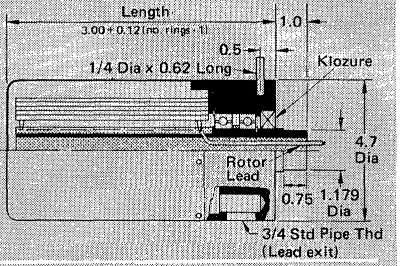
0.750
±.005
1/8 wide slotted hole
Terminal
0.078(ref)
Rotor Lead
1.19 (ref)
Bore
±.001
1.50 Dia
Set Screw (3 ea.)
Length
0.50 + 0.120(no. rings - 1)

Slip Ring Assembly Type 1186
Self-contained – Shaft Mtg
5 amp – 50 rings max – Bore 1.002 dia max



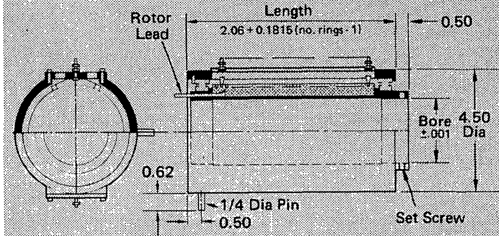
Length
1.19 + 0.120(no.rings - 1)
Rotor
Lead
2.50 Dia
Bore
±.001
Set Screw
(3 ea.)
1/8 Dia Pin
0.25

Slip Ring Assembly Type 1302
Self-contained – Sealed Housing
5 amp – 50 rings max – Solid Bore



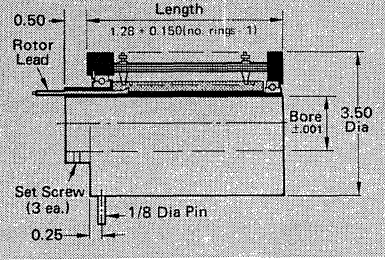
Length
3.00 + 0.12(no. rings - 1)
1.0
0.5
1/4 Dia x 0.62 Long
Klozure
4.7
Dia
Rotor
Lead
0.75
1.179
Dia
3/4 Std Pipe Thd
(Lead exit)

Slip Ring Assembly Type 1067
Self-contained – Shaft Mtg
5 amp – 100 rings max – Bore 2.502 dia max



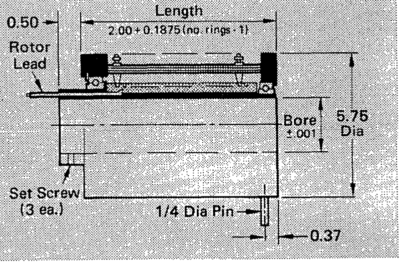
Rotor
Lead
Length
2.06 + 0.1815(no. rings - 1)
0.50
Bore
±.001
4.50
Dia
0.62
1/4 Dia Pin
0.50
Set Screw

Slip Ring Assembly Type 4268
Self-contained – Shaft Mtg
5 amp – 100 rings max – Bore 1.752 dia max



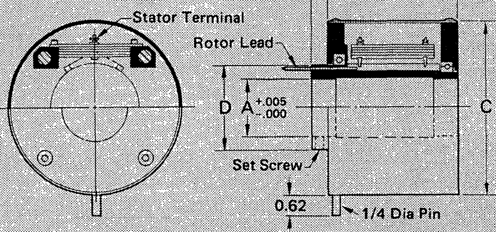
0.50
Length
1.28 + 0.150(no. rings - 1)
Rotor
Lead
Bore
±.001
3.50
Dia
Set Screw
(3 ea.)
1/8 Dia Pin
0.25

Slip Ring Assembly Type 1390
Self-contained – Shaft Mtg
5 amp – 100 rings max – Bore 4.252 dia max



0.50
Length
2.00 + 0.1875(no. rings - 1)
Rotor
Lead
Bore
±.001
5.75
Dia
Set Screw
(3 ea.)
1/4 Dia Pin
0.37

SELF CONTAINED COVERED STATOR TERMINAL SLIP RING ASSEMBLIES



0.50
B
Stator Terminal
Rotor Lead
D
A +.005 -.000
C
Set Screw
0.62
1/4 Dia Pin

TYPE	BORE DIA "A", inches		NO. RINGS MAX	CURRENT	LENGTH "B", inches	Housing Dia "C"	Sleeve Exten. Dia "D"
	Nominal	Range					
1292	SOLID	————	41	5 amp std 2 brushes per ring	.85 + .088 (no. rings - 1)	2.50	2.19
1294	SOLID	————	48		1.12 + .110 (no. rings - 1)	2.25	.87
1295	SOLID	————	200		7.50 + .150 (no. rings - 1)	5.00	2.50
1297	.500	.378 - .565	50		1.25 + '120 (no. rings - 1)	2.75	1.05
1298	1.000	.566 - 1.002	50		1.25 + .120 (no. rings - 1)	3.00	1.30
1272	1.000	1.000 - 1.750	100	10 amp or lo noise 4 brushes per ring	2.00 + .150 (no. rings - 1)	5.25	2.56
1273	2.000	1.750 - 2.625	100		2.00 + .150 (no. rings - 1)	6.25	3.50
1274	3.000	2.625 - 3.750	58		2.00 + .160 (no. rings - 1)	7.50	4.50
1275	4.000	3.750 - 4.750	48		2.00 + .186 (no. rings - 1)	9.00	6.00
1276	5.000	4.750 - 5.750	63		2.00 + .186 (no. rings - 1)	10.50	7.00
1277	6.000	5.750 - 6.750	58		2.00 + .1875 (no. rings - 1)	12.00	8.00
1278	8.000	6.750 - 8.750	58		2.00 + .1875 (no. rings - 1)	15.00	10.00
1282	1.000	1.000 - 1.250	16	50 amp std 100 amp 4 brushes per ring	3.00 + 1.050 (no. rings - 1)	8.00	2.56
1283	2.000	1.250 - 2.000	16		3.00 + 1.050 (no. rings - 1)	9.00	3.50
1284	3.000	2.000 - 3.125	9		3.00 + 1.120 (no. rings - 1)	10.00	4.50
1285	4.000	3.125 - 4.375	8		3.00 + 1.116 (no. rings - 1)	11.50	6.00
1286	5.000	4.375 - 5.375	10		3.00 + 1.116 (no. rings - 1)	12.50	7.00
1287	6.000	5.375 - 6.375	10		3.00 + 1.125 (no. rings - 1)	13.50	8.00
1288	8.000	6.375 - 8.375	10		3.00 + 1.125 (no. rings - 1)	16.00	10.00

PART NUMBER CODING – Specify fully when ordering

Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S / Unshielded - U)
X	X	X	X	X

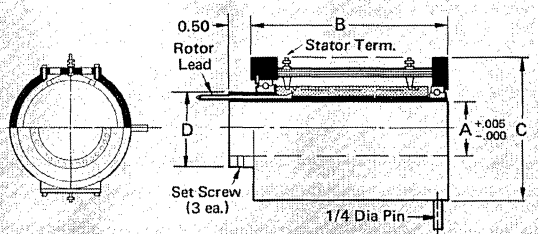
CHARACTERISTICS **HOUSING:** Bell, Bell Spacer and Cover type construction. All other characteristics same as for Self Contained Rigid Housing Slip Ring Assembly.

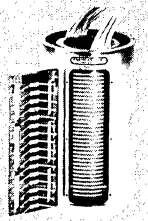
WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. MANUFACTURERS OF SLIP RING ASSEMBLIES

9835 ALPACA STREET, SOUTH EL MONTE, CALIF. 91733 Phone 213/443-3247 (S. El Monte) Phone 213/283-9239 (Los Angeles)

SELF CONTAINED RIGID HOUSING SLIP RING ASSEMBLIES





PART NUMBER CODING – Specify fully when ordering

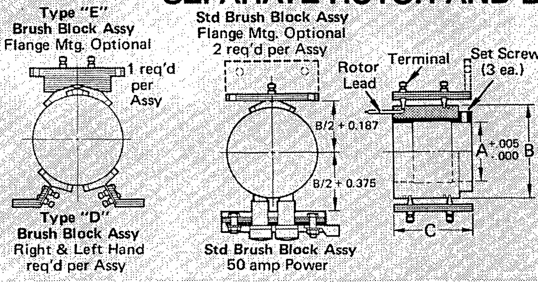
Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S / Unshielded - U)
X	X	X	X	X

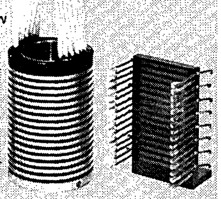
TYPE	BORE DIA "A", inches		NO. RINGS MAX	CURRENT	LENGTH "B", inches	Housing Dia "C"	Sleeve Exten. Dia "D"
	Nominal	Range					
4150	1.000	.000 - 1.002	64	5 amp std 2 brushes per ring	1.19 + .120 (no. rings - 1)	2.50	1.30
4200	1.312	1.000 - 1.312	100		1.19 + .125 (no. rings - 1)	3.00	1.81
4237	1.750	1.312 - 1.752	78		1.19 + .130 (no. rings - 1)	3.37	2.31
4268	2.000	1.750 - 2.002	100		1.28 + .150 (no. rings - 1)	3.62	2.56
4350	2.750	2.250 - 2.752	100	10 amp std or lo noise 4 brushes per ring	1.75 + .150 (no. rings - 1)	4.50	3.50
4400	3.250	2.750 - 3.252	100		1.75 + .160 (no. rings - 1)	5.00	4.00
4462	3.750	3.250 - 3.752	100		1.75 + .160 (no. rings - 1)	5.50	5.00
4500	4.250	3.750 - 4.252	100		1.75 + .187 (no. rings - 1)	6.00	5.50
4600	5.250	4.250 - 5.252	79		1.75 + .165 (no. rings - 1)	7.00	6.00
4700	6.250	5.250 - 6.252	63		1.75 + .186 (no. rings - 1)	8.00	7.00
4800	7.250	6.250 - 7.252	58		1.75 + .187 (no. rings - 1)	9.00	8.00
4900	8.750	7.250 - 8.750	58		1.75 + .187 (no. rings - 1)	11.00	10.00
1271	1.000	.000 - 2.000	15	50 amp std	3.50 + 1.050 (no. rings - 1)	4.50	2.92
1291	3.000	2.000 - 3.252	9	50 amp std	4.50 + 1.120 (no. rings - 1)	6.50	5.00

CHARACTERISTICS

RPM:	**Rigid one piece housing eliminates bearing alignment problems.**
RINGS:	Coin Silver 5 amp rings. Copper 50 amp rings.
BRUSHES:	Silver Graphite Fabricast Grade FAG 180 (80% AG – 20% C) Two brushes per ring. Brushes individually removable and replaceable.
NOISE:	10 Milliohms dynamic resistance max 5 Milliohms max with 4 brushes per ckt.
CURRENT:	Noted in tabulated block. Rating may be doubled with 4 brushes per ckt.
HI-POT:	1200 VAC 60 cycle for 15 seconds.
ROTOR:	One piece steel sleeve. Ring complement vacuum cast on sleeve as unit with epoxy dielectric.
ROTOR LEADS:	5 amp Leads – 20 ga per MIL-W-16878 type "E" 50 amp Leads – 8 ga per MIL-W-16878 type "B"
HOUSING:	One piece steel tubing construction.
COVER:	Easily removable for brush and ring inspection.
BEARINGS:	Shielded or sealed ball bearings.

SEPARATE ROTOR AND BRUSH BLOCK SLIP RING ASSEMBLIES


Type "E" Brush Block Assy Flange Mtg. Optional
1 req'd per Assy
Std Brush Block Assy Flange Mtg. Optional 2 req'd per Assy
Rotor Lead
Terminal
Set Screw (3 ea.)
B/2 + 0.187
B/2 + 0.375
A +.005 -.000
B
C
Type "D" Brush Block Assy Right & Left Hand req'd per Assy
Std Brush Block Assy 50 amp Power



PART NUMBER CODING – Specify fully when ordering

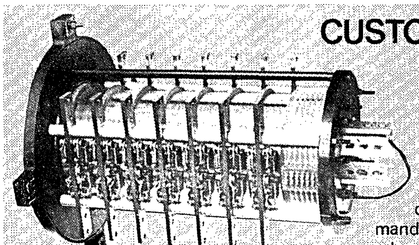
Type	Bore (inches)	No. Rings	Lead Length (inches)	Lead Type (Shielded - S / Unshielded - U)	Type Brush Block
X	X	X	X	X	X

TYPE	BORE DIA "A", inches		NO. RINGS MAX	CURRENT	Slip Ring Dia "B"	LENGTH "C", inches
	Nominal	Range				
2050	SOLID	.000 - .127	18	5 amp std	.500	.625 + .125 (no. rings - 1)
2087	SOLID	.000 - .377	48	5 amp std	.875	.625 + .110 (no. rings - 1)
2112	.375	.000 - .627	100	5 amp std	1.125	.625 + .125 (no. rings - 1)
2150	.750	.620 - 1.002	64	5 amp std	1.500	.625 + .120 (no. rings - 1)
2237	1.250	1.000 - 1.502	78	5 amp std	2.375	.750 + .130 (no. rings - 1)
2268	1.500	1.250 - 1.752	107	5 amp std	2.687	1.000 + .150 (no. rings - 1)
2350	2.000	1.750 - 2.502	100	5 amp std	3.500	1.000 + .150 (no. rings - 1)
2375	2.500	2.370 - 2.875	48	5 amp std	3.750	1.000 + .200 (no. rings - 1)
2462	3.000	2.750 - 3.752	112	5 amp std	4.625	1.250 + .160 (no. rings - 1)
2500	4.000	3.250 - 4.002	108	5 amp std	5.000	1.250 + .187 (no. rings - 1)
2600	5.000	4.000 - 5.002	48	5 amp std	6.000	1.250 + .186 (no. rings - 1)
2700	6.000	5.000 - 6.002	63	5 amp std	7.000	1.250 + .186 (no. rings - 1)
2800	7.000	6.000 - 7.002	58	5 amp std	8.000	1.250 + .1875 (no. rings - 1)
2900	8.000	7.000 - 9.002	58	5 amp std	10.000	1.250 + .1875 (no. rings - 1)
3268	1.000	.750 - 1.187	16	50 amp std	2.687	2.000 + 1.050 (no. rings - 1)
3300	1.500	1.187 - 1.500	6	50 amp std	3.000	2.000 + 1.000 (no. rings - 1)
3350	2.000	1.500 - 2.000	16	50 amp std	3.500	2.000 + 1.050 (no. rings - 1)
3462	3.000	2.000 - 3.125	9	50 amp std	4.625	2.000 + 1.120 (no. rings - 1)
3600	4.000	3.125 - 4.500	8	50 amp std	6.000	2.000 + 1.116 (no. rings - 1)
3700	5.000	4.500 - 5.500	10	50 amp std	7.000	2.000 + 1.116 (no. rings - 1)
3800	6.000	5.500 - 6.500	10	50 amp std	8.000	2.000 + 1.125 (no. rings - 1)
3900	7.000	6.500 - 8.500	10	50 amp std	10.000	2.000 + 1.125 (no. rings - 1)

CHARACTERISTICS

RINGS:	Coin Silver 5 amp rings. Copper 50 amp rings.
BRUSHES:	Silver Graphite. Fabricast Grade 180 (80% AG – 20% C) Two Brushes per ring Brushes individually removable and replaceable.
NOISE:	10 Milliohms dynamic resistance max. 5 Milliohms max with 4 brushes per ckt.
CURRENT:	Noted in tabulated block. Rating may be doubled with 4 brushes per ckt.
HI-POT:	1200 VAC 60 cycle for 15 seconds.
ROTOR:	One piece steel sleeve. Ring complement vacuum cast on sleeve as unit with epoxy dielectric.
ROTOR LEADS:	5 amp Leads – 20 ga per MIL-16878 type "E" 50 amp Leads – 8 ga per MIL-W-16878 type "B"
BRUSH BLOCK:	Glass epoxy. Optional mounting methods shown.

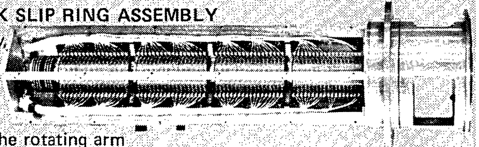
CUSTOM DESIGNED SLIP RING ASSEMBLIES



CUSTOM 7000 AMP SLIP RING ASSEMBLY

This slip ring assembly, as designed and manufactured by Fabricast, Inc., is used to supply 7000 amperes of current to the rotating mandrel of the world's second largest spin forging machine.

CUSTOM 222 TRACK SLIP RING ASSEMBLY



This slip ring assembly, as designed and manufactured by Fabricast, Inc. was used to complete the electrical circuits to the rotating arm of an astronaut carrying centrifuge.

The unit consists of 50 amp. power, 5 amp. instrumentation and 50 megacycle coaxial modules.

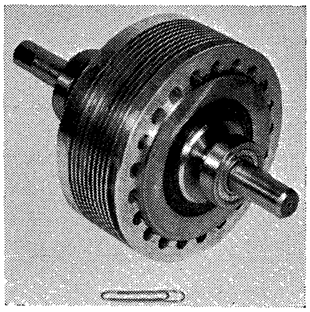
WRITE OR PHONE FOR THE FABRICAST CATALOG

Fabricast, Inc. MANUFACTURERS OF SLIP RING ASSEMBLIES

9835 ALPACA STREET, SOUTH EL MONTE, CALIF. 91733 Phone 213/443-3247 (S. El Monte) Phone 213/283-9239 (Los Angeles)

GEMCOR

ELECTRO
MECHANICAL
COMPONENTS



HYSTERESIS CLUTCHES & BRAKES

offer maximum reliability — smooth clutching — minimum maintenance. They are ideal for tension control and power absorption devices where smoothly variable slip torque is required. Torque is proportional to control current. Clutch-brake combinations also available.

SPECIFICATIONS	MODELS					
	PMC-6 PMB-6	PMC-16 PMB-16	PMC-30 PMB-30	PMC-35 PMB-35	PMC-120 PMB-120	
TORQUE - RATED OZ. IN.	6	16	30	35	120	
OUTPUT INERTIA SLUG FT^2	1.55×10^{-6}	3.03×10^{-6}	5.5×10^{-6}	6.3×10^{-6}	5.4×10^{-5}	
CONTROL WATTAGE	2.5	4.5	5	12	5	
	PMC-175 PMB-175	PMC-325 PMB-325	PMC-.75K PMB-.75K	PMC-1.5K PMB-1.5K	PMC-3K PMB-3K	PMC-5K PMB-5K
TORQUE - RATED OZ. IN.	175	325	750	1500	3000	5000
OUTPUT INERTIA SLUG FT^2	1.5×10^{-4}	2.0×10^{-4}	6.3×10^{-3}	1.26×10^{-2}	2.68×10^{-2}	4.05×10^{-2}
CONTROL WATTAGE	3	7	8.1	17	25	6

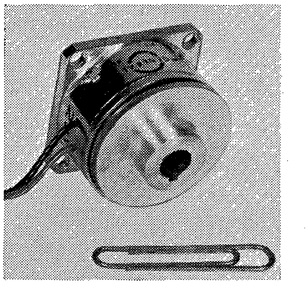
FIXED FIELD TYPE HYSTERESIS CLUTCHES also available. This type does not require commutator and brushes.

FRICTION CLUTCHES & BRAKES — FLANGE MOUNTED

LOW COST • HIGH TORQUE • LOW CONTROL POWER • FAST RESPONSE
MIN. EFFECT BY AMBIENTS

SPECIFICATIONS	MODELS						
	FC-25 FB-25	FFC-35 FFB-35	FFC-60 FFB-60	FFC-160 FFB-160	FFC-480 FFB-480	FFC-960 FFB-960	FFC-3.5K FFB-3.5K
TORQUE - RATED OZ. IN.	25	35	60	160	480	960	3500
OUTPUT INERTIA - SLUG FT.^{2}	1.06×10^{-6}	2×10^{-6}	2.8×10^{-5}	5.11×10^{-6}	1.7×10^{-5}	6.56×10^{-5}	5.86×10^{-4}
CONTROL WATTAGE	3	6	3.6	9	10	10	30

CLUTCH-BRAKE COMBINATIONS AVAILABLE



FAIL-SAFE BRAKES

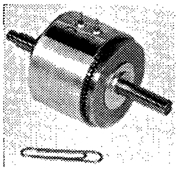
FOR POSITIVE SHAFT BRAKING
WHEN POWER FAILS PREVENTS

CREEPING • COASTING • HUNTING

Torque Ranges 8 to 7000 oz. in.

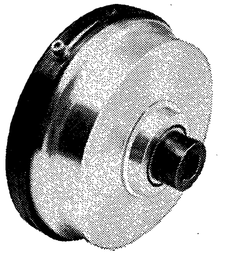
CROWN TOOTH CLUTCHES & BRAKES

MAX. TORQUE — MIN. SIZE
POSITIVE ENGAGEMENT
LOW CONTROL POWER
FAST RESPONSE



DYNAMOMETERS

GEMCOR WILL DESIGN NON-STANDARD INSTRUMENT TYPE DYNAMOMETERS TO CUSTOMER'S EXACT REQUIREMENTS. SUBMIT FULL PARTICULARS.



NEW!

ADJUSTA-TORQ

CLUTCHES & BRAKES

- CONSTANT REPEATABLE SLIP TORQUE
- LIFE LIMITED ONLY BY BEARINGS
- CAN BE RUN IN OIL

USE AS A TORQUE LIMITING SLIP DEVICE, CLUTCH COUPLING, CONSTANT DRAG BRAKE OR IN TENSIONING APPLICATIONS.

POWER SUPPLY UNITS

TO CONVERT A.C. CURRENT TO D.C. FOR OPERATING ALL TYPES CLUTCHES & BRAKES.

VARIABLE AND FIXED VOLTAGES.

COMPACT DESIGN.

SPECIALS

GEMCOR WILL DESIGN NEW UNITS OR MODIFY EXISTING UNITS TO SUIT CUSTOMER'S SPECIAL REQUIREMENTS. THIS SERVICE IS AVAILABLE ON HYSTERESIS, FRICTION, CROWN TOOTH, MAGNETIC PARTICLE AND SUBMINIATURE TYPES.

GENERAL ELECTRO-MECHANICAL CORP.
BUFFALO 7, NEW YORK

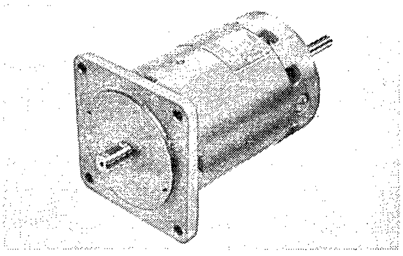
GEMCOR

787 HERTEL AVENUE • BUFFALO NEW YORK 14207 • (716) 876-9685

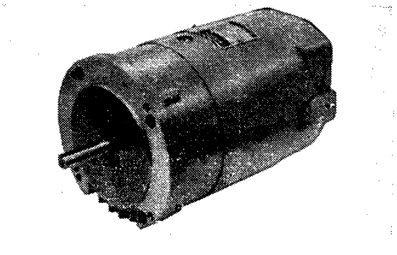
AC and DC MOTORS AND GEAR-MOTORS

DC Motors

Reel-Drive Motors

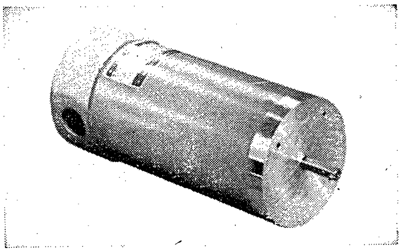


GE's full line of fhp direct-current motors includes three frame sizes widely used for reel drives: 3.4″, 4⅝″, and 6⁵⁄₁₆″ diameters. Special end mountings and shaft extensions meet exacting application requirements. Series, split-series, compound, shunt, and compensated-shunt winding designs offer a broad design choice. Stall torque ratings from 3 to 120 ounce-feet and higher span various application needs, and motor voltage requirements are normally matched to your system design. Write for Bulletin GEC-1795.



For general duty on variable- or constant-speed applications where the power supply is d-c or where a-c/d-c conversion is used for controlled speeds. Also ideal for reversing applications. Type BC direct-current motors will start, accelerate, and run fractional-horsepower devices smoothly and easily. They are available in open, totally enclosed, explosion-proof, and severe-duty enclosures with solid base, round frame, or end mounting in most ratings. Special-purpose type motors are also available for full- and half-wave rectified power drives. For complete information, write for Bulletin GEA-8264.

New Permanent Magnet Motors



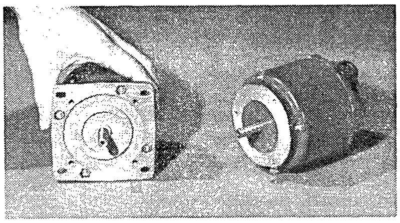
GE's new BPA-34 permanent-magnet motors are smaller and lighter than comparable wound-field motors of the same rating. Permanent magnets replace field windings, eliminating the need for field power supply and the chance of field-winding failure or burnout; and with battery power efficiency is increased, battery drain decreased. Two leads from power supply reduce connect and disconnect time. The motor features double shielded ball bearings and Class B-R insulation system that meets NEMA and USA Standards for Class B, and is recognized by UL for up to 130 C hot spot temperature.

In 3.4-inch-diameter totally enclosed frame, the BPA-34 is available in face, flange, or welded-base design for 115 volts d-c with modifications from 6 volts d-c. Speed-torque is linear, producing a d-c rating of about ⅓ hp at 3450 rpm, ⅕ hp at 1725 rpm, and 1/7 hp at 1140 rpm on a continuous basis.

The BPA-34 is ideally suited for such applications as copy machines, tape reel drives, printers, and filing equipment, and for any other equipment utilizing variable-speed drives or battery power where size and weight are critical.

Synchronous, Reversible

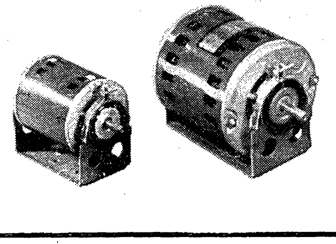
Low-speed Gearless Servo Motors



For servo, stepping, and other low-speed high-torque applications, General Electric provides a line of low-speed, synchronous inductor motors in 4⅛-inch diameter models. These motors provide a choice of 50, 75, 150, 250, or 400 oz. in. torque at exactly 75 rpm without the use of speed-reducing devices. The motors provide fast starting, stopping, and reversing for 50- or 60-cycle applications at either 120 or 240 volts. For complete information write for Bulletin GEC-1294.

Small, Compact, A-c Induction Motors

Provide High Power in a Lightweight Package

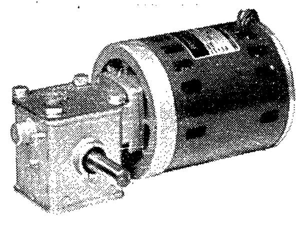


Small in size, but high in reliability, General Electric compact, powerful, a-c induction motors are available in four sizes from 25 mhp to ½ horsepower. These reversible motors provide consistent, quiet, long-life operation in any mounting position. Synchronous motors for constant-speed applications are available in 3- and 3⅞-inch diameter models. Special designs can be provided for various torque motor applications such as tape reel drives. For dimensions, features, ratings, and application information, write for Bulletin GEA-8254.

Typical Electronic Applications: Computer memory drums, tape reels, capstans, disc filers, card stackers, card printers, card punchers, and data cells.

Mina-Gear™ Motors

Small Enough to Fit in Your Hand



A compact, dependable, lightweight line of gear-motors with a flexible range of speeds, ratios, motor types, and frame sizes. These small gear-motors are rated 1/40- to ½-hp with gear ratios of 102:1 to 11:1 with output speeds from 323 to 8 rpm. Mina-Gear motors offer you years of efficient operation, and are ideal for such devices as printing and office machines, medical equipment, door operators, and vending machines, and for many other applications requiring a compact design with relatively high-torque capability. For complete information, write for Bulletin GEA-7839.

For complete information contact your nearby GE Sales Office, or
write to General Electric Co., Section 998-80. Schenectady, N. Y. 12305.

GENERAL ELECTRIC

GRAPHALLOY

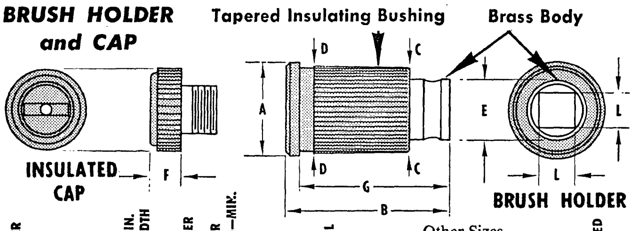
SILVER GRAPHALLOY BRUSHES and BRUSH & SLIP-RING ASSEMBLIES...

GRAPHALLOY BRUSHES

***are used on such equipment as...* SERVO SYSTEMS • SYNCHROS • CHOPPERS • RADAR • GYROS • INVERTERS • THERMOCOUPLE and STRAIN GAGE CIRCUITS • GUIDED MISSILES • PULSE SYSTEMS • DIGITAL COMPUTERS • WAVE GUIDES • SONAR • TRANSDUCERS • TORQUE INDICATORS**

Silver GRAPHALLOY Brushes have been widely used because *of* LOW *and* CONSTANT CONTACT DROP, EXTREMELY LOW ELECTRICAL NOISE *and* LONG LIFE. Over 200 grades are now serving in a wide variety of applications. Silver GRAPHALLOY Brushes on ½"-diameter coin silver slip rings have operated successfully in highly critical electrical circuits at speeds up to 100,000 R.P.M. *Our Engineering Department will assist in determining the exact grade of* GRAPHALLOY *for your needs.* Ask for our Brush Inquiry Form 109.

BRUSH HOLDER and CAP



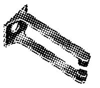
Other Sizes Available

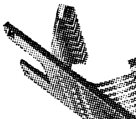
BRUSH HOLDER & CAP NO.	BRUSH SIZE	SUGGESTED MIN. SLIP-RING WIDTH	**MOUNTING HOLE DIAMETER	BRUSH HOLDER TO SLIP RING—MIN.	A	OVERALL LENGTH B	F	C	D	E	G	BROACHED HOLE L
14326	⅛" sq.	3/16"	13/32"	1/16"	.437"	⅞"	3/16"	.404"	.418"	.281"	25/32"	.129"
11509†	5/32" sq.	¼"	13/32"	1/16"	.437"	⅞"	3/16"	.404"	.418"	.281"	25/32"	.160"
11570†	3/16" sq.	¼"	7/16"	1/16"	.484"	⅞"	3/16"	.441"	.451"	.313"	25/32"	.193"
19011†	¼" x 3/16"	5/16"	9/16"	⅛"	.616"	1 5/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256 x .193"
11527†	¼" sq.	5/16"	9/16"	⅛"	.616"	1 5/16"	3/16"	.561"	.573"	.438"	1 3/16"	.256"
14292†	⅜" x ¼"	7/16"	43/64"	⅛"	.718"	1 7/16"	¼"	.672"	.682"	.533"	1 5/16"	.382 x .256"
12166†	⅜" sq.	7/16"	13/16"	⅛"	.921"	1 13/16"	¼"	.813"	.828"	.628"	1⅝"	.382"
31392†	½" sq.	9/16"	1⅛"	⅛"	1.237"	1 13/16"	¼"	1.126"	1.141"	.878"	1 9/16"	.503"
35439†	¾" x ½"	⅞"	1 33/64"	⅛"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"
35440†	¾" sq.	⅞"	1 33/64"	⅛"	1.661"	2 1/32"	5/16"	1.508"	1.528"	1.253"	1 25/32"	.753"

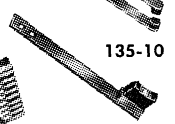
†Shunts are provided. **Mounting hole diameter for brush holder dimension D.

Request and fill in Brush Inquiry Sheet, Form 109, so that we can supply the proper grade of brush material.

BRUSH ASSEMBLIES


135-10


218-21


135-6

CONTACTS

GRAPHALLOY, because of its inherent non-welding and arc-quenching characteristics, is used widely for contacts. Ask for Data Sheet 950.

BUSHINGS, Oil-free

Replace oil-lubricated bushings in synchros, instruments, timers and missiles.

Advantages: 1) Lower friction at room temperatures. 2) No oil to solidify at low temperatures. 3) No oil to carbonize at prolonged elevated temperatures.

*Ask for Data Sheets 270 and 277 on Miniature Bronze-*GRAPHALLOY *Bushings.*

CONNECTORS (garter springs)

These silver-plated coil spring Connectors make for positive electrical connection to the brass body of the brush holder by snapping into the groove on the holder. The connecting lead can be pre-soldered to the Connector.

GARTER SPRING CONNECTORS	BRUSH SIZE	BRUSH HOLDER NO.
127-9	⅛" sq.	14326
127-9	5/32" sq.	11509
127-10	3/16" sq.	11570
127-14	¼" x 3/16"	19011
127-14	¼" sq.	11527
127-18	⅜" x ¼"	14292
127-20	⅜" sq.	12166
127-24	½" sq.	31392
127-32	¾" x ½"	35439
127-32	¾" sq.	35440

CLUTCH FACINGS and CLUTCH GEAR ASSEMBLIES

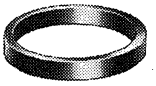
Torque remains same within close operating limits despite changes in temperature and humidity. For instrumentation, guided missiles, constant friction devices.

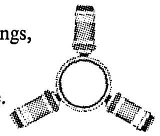
SLIP RINGS
Solid Coin Silver

Standard Coin Silver Slip Rings, both *cylindrical* and *flat* types, are illustrated at right. We recommend the cylindrical type rings with three brushes per ring . . . spaced at 120°. The cylindrical type are designed for press fitting over standard steel shafting. The flat type rings are designed for nesting either on an insulated plate or for molding into insulation. Insulated slip rings of either type or slip-ring assemblies can be furnished with leads attached.

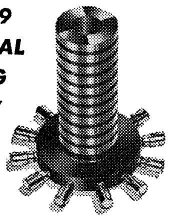
No. 168 Series flat type **to 20" O.D.**

Standard "Flat" rings have ¼" radial contact surface and ⅛" radial spacing between adjacent rings.


No. 116 Series cylindrical type **to 36" O.D.**


Copper Slip Rings, flat or cylindrical, are available.

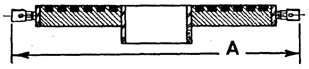
Model 319 CYLINDRICAL SLIP-RING assembly


Solid Coin Silver Rings

MODEL	RINGS	LENGTH
319-4	4	2 9/16"
319-6	6	3 5/16"
319-10	10	4 13/16"
319-14	14	6 5/16"

O.D.
Slip-ring 1⅝"
Terminal 4"
Assembly I.D.: .814"/.813"
Range: Same as for Model 399

Model 409 FLAT SLIP-RING assembly



Solid Coin Silver Rings

MODEL	RINGS	OVERALL O.D.—"A"
409-2	2	5½"
409-4	4	7"
409-6	6	8½"
409-10	10	11½"

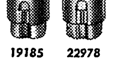
Hub: O.D. 2"
I.D. 1.753"/1.751"
Length 1⅛"
To 5 amps., 125 v.
More rings on application.

SPRING BINDING POSTS

(with or without Insulated Cap)

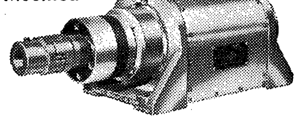
O.D.: ⅜", ½", 17/32"
Lgth.: ⅝", ¾", 23/32"

Also Miniature Spring Type!



Model 399 BRUSH and SLIP-RING assembly

Pedestal Mounted



MODEL	RINGS	bolt slot distances CL to CL WIDTH	bolt slot distances CL to CL LENGTH	**OVERALL LENGTH
399-4	4	4½"	7¾"	13¼"
399-6	6	4½"	8½"	14"
399-10	10	4½"	10"	16"
399-14	14	4½"	11½"	18"

Specifications: Width 6½"–Height 6½". Shaft CL above base 3¼".
Applications: from strain gage or thermocouple up to 5 amperes, 125 volts, 250°F.
Speeds to 5,000 RPM.
Three Silver-GRAPHALLOY Brushes per solid coin silver slip ring.
Extraneous noise level low.
Rugged in design and construction.
Readily connected mechanically and electrically.
Complete coupling provided for 15/16" shaft.
More rings and higher speeds available upon application.

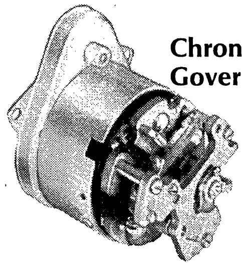
Write for data sheets

CALL ON OUR OVER 50 YEARS OF DESIGN EXPERIENCE FOR HELP IN SOLVING YOUR BRUSH PROBLEMS!

**GRAPHITE METALLIZING CORPORATION : 1036 NEPPERHAN AVENUE
YONKERS, NEW YORK 10702**

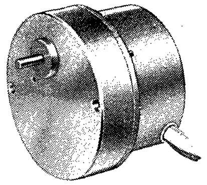
Creative Engineering in Electronic and Electromechanical Timing and Control

Timing, Drive & Stepper Motors



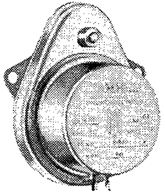
Chronometrically Governed—D.C.

Accuracy: to ±0.1% military; ±0.5% industrial, no load to full load. Many voltage ranges. Speeds: 3600 rpm to 1/144 rpm. Radio interference filtered, if required.



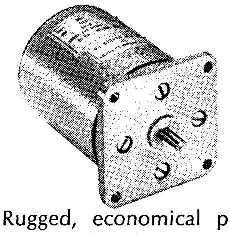
General Duty Synchronous

24 to 240 VAC, 50 or 60 Hz. Torque: 2 oz-in @ 300 rpm direct from rotor. Integral gearing provides speeds as low as 1 rpm. Gear train rated at 100 oz-in. Rotation reversible by changing one connection.



Miniature Reversible Synchronous

12 to 230 VAC, 50 or 60 Hz. Torque .75 oz-in @ 300 rpm direct from rotor. Power input 1.5 watts nominal. Output speeds from 300 rpm to 1/6 rph. 2-coil winding. Reversible. Measures only 1-7/16" x 3/4".

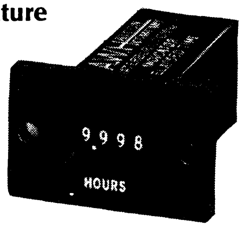


5-volt 4- and 8-Phase Steppers

Rugged, economical permanent magnet construction. Low temperature rise. 3¾°, 7½° and 15° step angles. Pull-out rates to 7500 steps/sec. Maximum working torques to 22.2 oz-in.

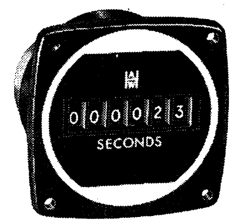
Indicating Devices

Microminiature Elapsed Time Indicators and Events Counters



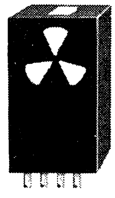
115 VAC, 50 or 60 Hz. Only 37/64" square by 1¼" long. Elapsed time indicators read to 9999 hours then recycle. Events counters count up to 9999 events then recycle. Ideal for warranty and maintenance controls.

Commercial Elapsed Time Indicators



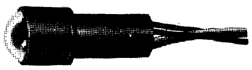
21 standard low-cost models. 6-digit readouts in "hours & tenths," "minutes & tenths" or "seconds." Round or square flange units meet NEMA standard dimensions. 50 or 60 Hz.

Microminiature "BITE" Indicators



"BITE" (Built-In-Test-Equipment) Indicators monitor circuit or system performance to DOD "Systems Readiness" requirements. Respond to pulse as low as 15 MS. Meet MIL-E-5400 H, Class 1-A. Measure only .2" x .4" x .7".

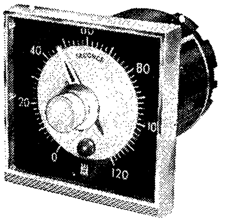
Low Cost Fault Indicators—"BITE"



Operate on same principle as Microminiature "BITE" Indicators but lower in cost. Either manual or electrical reset types. Only .320" dia. x .812" long. DC operation.

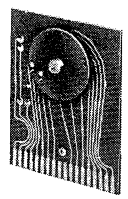
Timing Devices

Time Delay and Interval Timers



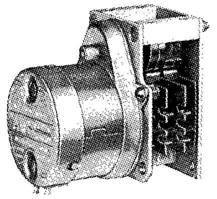
A broad line of AC or DC electromechanical and electronic timers for industrial and military applications. Fixed or adjustable delay times. Many mounting options.

Stepping Switches



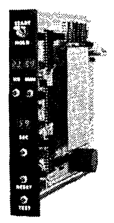
Solenoid operated printed circuit type. 12 or 28 VDC or rectified 115 VAC, 50 or 60 Hz. 3, 4, 5, 6, 10 or 12 positions. Steps up to 15 steps/sec. Can be factory modified to meet specific needs.

Repeat Cycle Timers



Low-cost AC or DC electromechanical and electronic industrial types for loads up to 25 amp. Standard motor-driven timers have up to 12 switches and wide range of cycle times. Electronic timers available in range of adjustable or fixed cycle times.

Time Code Generators



Electronic or electromechanical in IRIG or other specified codes. Available in bench, rack or plug-in modular form. High degree of accuracy in all units. AC or DC.

THE A.W. HAYDON COMPANY

NORTH AMERICAN PHILIPS COMPANY

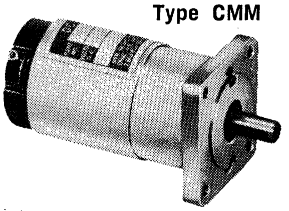
232 North Elm Street, Waterbury, Conn. 06720 Tel. (203) 756-4481 TWX: 710-477-3141
In Europe: Polymotor International · Brussels 1, Belgium

GLOBE **TRW**®

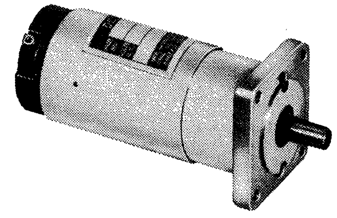
D.C. PERMANENT MAGNET PLANETARY GEARMOTORS (Bulletin A-2029N)

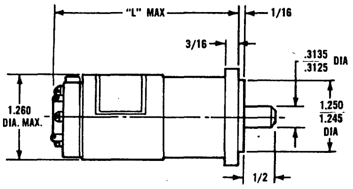
GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

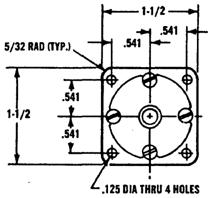
Type CMM



Type CLL







Globe Type CMM and CLL gearmotors are rugged, high-quality units combining Type CMM and CLL commercial motors with a proven planetary geartrain offering 83 standard speed reduction ratios from 4:1 to 46,656:1 with maximum continuous torque up to 1250 oz. in. These gearmotors are designed for application where small size, reliability and high torque are desired.

BASIC MOTOR DATA

Volts	No Load Speed (rpm)	Rated Torque (oz. in.)	Nom. Break-away Torque (oz. in.)	Gear-motor No Load Current Max. (amps)	Max. Current at Rated Torque (amps)	Nom. Stall Current (amps)	Winding Dash Number
TYPE CMM MOTORS							
4	16,000-19,000	.25	6.2	2.22	2.4	24.0	—23
6	18,900-22,500	.5	7.2	1.64	2.3	17.0	—14
6	15,600-18,600	.85	6.0	1.30	2.3	10.0	—6
6	12,000-14,000	.75	4.5	1.12	2.0	9.0	—5
12	18,000-21,400	.50	6.8	.82	1.2	8.7	—24
12	14,500-17,000	.70	4.0	.70	1.2	6.0	—3
12	12,400-14,700	.75	4.7	.61	1.2	5.0	—21
12	11,000-13,000	1.0	4.0	.52	1.2	3.7	—4
24	19,200-22,800	.35	7.3	.47	.60	6.3	—7
24	16,000-19,000	.60	4.8	.37	.60	3.7	—1
24	11,500-14,000	1.0	4.0	.26	.60	2.2	—2
24	10,700-12,700	1.0	4.1	.225	.60	1.8	—8
24	9,600-11,400	1.0	3.6	.22	.50	1.3	—22
24	8,000-10,000	1.0	3.0	.19	.45	1.0	—10
24	6,000-7,000	.8	2.4	.14	.30	.6	—11
50	14,300-17,000	.7	5.4	.16	.30	1.5	—25
50	9,500-11,500	1.0	3.5	.12	.30	.7	—16
50	8,000-10,000	1.0	2.8	.10	.20	.5	—12
50	6,700-8,000	.8	2.5	.08	.16	.4	—15
50	4,600-5,500	.8	1.7	.06	.12	.2	—13
TYPE CLL MOTORS							
6	15,600-18,500	1.0	12.0	1.66	2.7	16.0	—23
6	12,500-14,500	1.3	9.5	1.30	2.4	15.0	—14
6	10,000-12,200	1.6	8.0	1.16	2.6	13.0	—6
6	7,600-9,400	1.6	6.0	.86	2.0	8.0	—5
12	11,500-14,000	1.1	8.0	.73	1.7	7.0	—24
12	9,000-11,000	1.7	5.2	.51	1.2	4.5	—3
24	16,000-19,000	.75	8.8	.53	1.0	7.5	—21
24	14,400-17,000	.85	7.8	.44	.85	6.0	—4
24	12,000-14,500	1.0	7.5	.38	.80	5.2	—7
24	10,400-12,300	1.1	6.2	.32	.75	3.3	—1
24	7,400-8,900	1.6	5.5	.24	.70	2.1	—2
24	6,900-8,200	1.8	3.8	.21	.65	1.6	—8
24	6,200-7,400	1.8	3.4	.19	.60	1.3	—22
24	5,200-6,200	1.2	4.8	.17	.45	1.2	—10
50	7,600-9,400	1.5	7.5	.11	.25	1.1	—11
75	14,000-17,000	1.0	10.0	.14	.29	1.9	—25
75	9,000-11,000	1.7	8.0	.10	.29	1.0	—16
75	8,000-10,000	1.8	6.0	.08	.26	.6	—12
75	6,500-8,000	1.2	5.5	.075	.20	.4	—15
75	4,500-5,300	1.0	2.5	.06	.10	.2	—13

torque: Up to 1250 oz. in. in continuous duty.

voltage: Type CMM — 4 to 50 v.d.c. Type CLL — 6 to 75 v.d.c.

size: 1¼″ diameter. Length depends on gear ratio chosen.

weight: 6 to 14 oz., depending on ratio.

gears: Planetary gearing system. All gears are precision manufactured and heat treated for consistently reliable performance and long life.

backlash: Varies with ratio, but average unit will have less than 3°.

protection: Open type motor is standard. Enclosed types can be provided.

bearings: Motor output shaft has life-lubed ball bearings; geartrain output shaft life-lubed sleeve bearing.

shaft: Standard shaft is precision-ground case-hardened steel.

electrical connection: Solder terminals.

mounting: Units are mounted by means of pilot and four holes in flange.

STANDARD PART NUMBERS AND DATA

Speed Reduction Ratio	Torque Multi-plier	Max. Cont. Torque (oz.-in.)	TYPE CMM GEARMOTOR		TYPE CLL GEARMOTOR	
			Dim. "L"	Part No.*	Dim. "L"	Part No.*
4:1	3.0	5.1	2.86	317A102	3.22	319A100
5:1	3.8	6.5	2.86	317A103	3.22	319A101
16:1	10	17	3.11	317A105	3.45	319A103
30:1	19	32	3.11	317A109	3.45	319A107
64:1	33	56	3.34	317A111	3.69	319A109
80:1	41	70	3.34	317A112	3.69	319A110
100:1	51	87	3.34	317A114	3.69	319A112
125:1	64	109	3.34	317A116	3.69	319A114
150:1	77	131	3.34	317A118	3.69	319A116
180:1	92	156	3.34	317A119	3.69	319A117
320:1	130	221	3.58	317A122	3.92	319A120
500:1	205	349	3.58	317A126	3.92	319A124
600:1	246	418	3.58	317A128	3.92	319A126
1080:1	442	757	3.58	317A135	3.92	319A133
1296:1	530	901	3.58	317A137	3.92	319A135
1600:1	522	887	3.81	317A139	4.16	319A137
2000:1	652	1108	3.81	317A141	4.16	319A139
3000:1	980	1250	3.81	317A146	4.16	319A144
4500:1	1470	1250	3.81	317A153	4.16	319A151
5400:1	1760	1250	3.81	317A156	4.16	319A154
7776:1	2530	1250	3.81	317A161	4.16	319A159

Other speed reduction ratios in multiples of 4, 5 or 6:1 are available. Consult your distributor or the factory.

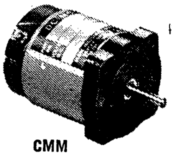
WHEN YOU ORDER

***Part Number.** Units described are standard and may be ordered by part number. Complete part number consists of the basic part number followed by the armature dash number. Consult Globe for other voltages and variations for special applications.

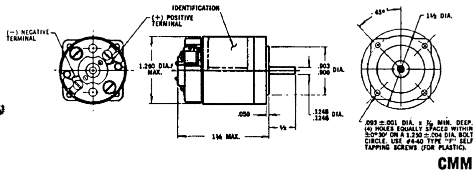
GLOBE **TRW**

D.C. PERMANENT MAGNET MOTORS
Type CMM & CLL (Bulletin A-2009N)

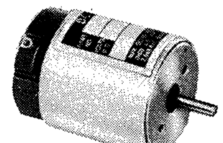
GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY



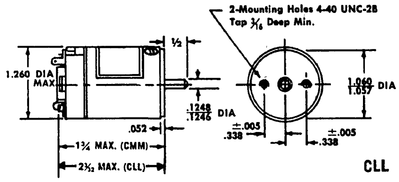
CMM


IDENTIFICATION
(+) POSITIVE TERMINAL
(−) NEGATIVE TERMINAL
1.260 DIA. MAX.
.903 .900 DIA.
.1248 .1246 DIA.
.050
½
1¾ MAX.
45°
1½ DIA.
.093 ±.001 DIA. x ¼ MIN. DEEP. (4) HOLES EQUALLY SPACED WITHIN ±0°30′ ON A 1.250 ±.004 DIA. BOLT CIRCLE. USE #4-40 TYPE "F" SELF TAPPING SCREWS (FOR PLASTIC).

CMM



CLL



CLL

When positive voltage is connected to terminal marked (+) shaft rotates counterclockwise viewed from shaft end.

Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

Globe Type CMM & CLL motors are designed for applications which require small size, reliability and high torque. Planetary geartrains are available in a wide range of speed reductions. Bulletin E-2029N.

rating: CMM: 1/100 hp continuous duty, 8,000 to 18,000 rpm.
rating: CMM: 1/100 hp continuous duty, 8,000 to 18,000 rpm. CLL: 1/65 hp continuous duty at 6,000 to 15,000 rpm. Higher speeds available with reduced performance.
voltage: 4 to 75 v.d.c.
weight: CMM: 3.5 oz. CLL: 5.2 oz.
armature: Vacuum impregnated with fungus-resistant varnish.
magnets: Alnico V
bearings: Double-shielded, life-lubricated ball bearings.
frame: Pole pieces are die-cast into aluminum frame by patented process.
shaft: Precision ground stainless steel.
end bell: Precision molded diallyl phthalate.
electrical connection: Solder terminals.
reversibiity: Motors reverse when terminal voltage is reversed.
mounting: Mounting can be made by tapped holes on front face or with non-magnetic clamp around motor.

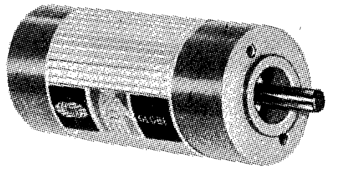
WHEN YOU ORDER

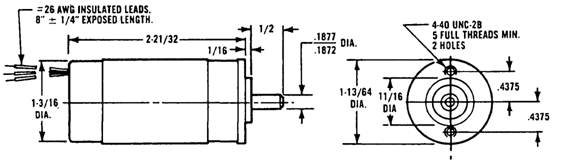
***Part Number.** Units shown above are standard and may be ordered by part number. See the introduction to this catalog section for assistance with selecting the proper unit to meet your requirements. Please consult Globe for variations to suit specific applications.

STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	SPEED (rpm)	TORQUE max. rated (oz. in.)	TORQUE nom. stall (oz. in.)	CURRENT max. no load (amps)	CURRENT max. rated load (amps)	CURRENT nom. stall (amps)	Standard Part No.*
TYPE CMM							
12	14,500-17,000	.70	4.0	.50	1.2	6.0	235A106-3
12	11,000-13,000	1.0	4.0	.35	1.2	3.7	235A106-4
24	19,200-22,800	.35	7.3	.30	.60	6.3	235A106-7
24	16,000-19,000	.6	4.8	.25	.60	3.7	235A106-1
24	11,500-14,000	1.0	4.0	.18	.60	2.2	235A106-2
24	10,700-12,700	1.0	4.1	.17	.60	1.8	235A106-8
24	8,000-10,000	1.0	3.0	.13	.45	1.0	235A106-10
24	6,000-7,000	.8	2.4	.08	.30	.6	235A106-11
50	9,500-11,500	1.0	3.5	.07	.30	.7	235A106-16
50	8,000-10,000	1.0	2.8	.07	.20	.5	235A106-12
50	6,700-8,000	.8	2.5	.05	.16	.4	235A106-15
50	4,600-5,500	.8	1.7	.04	.12	.2	235A106-13
TYPE CLL							
6	15,600-18,500	1.0	12.0	1.4	2.7	16.0	313A102-23
6	12,500-14,500	1.3	9.5	1.1	2.4	15.0	313A102-14
6	10,000-12,200	1.6	8.0	.95	2.6	13.0	313A102-6
6	7,600-9,400	1.6	6.0	.70	2.0	8.0	313A102-5
12	11,500-14,000	1.1	8.0	.52	1.7	7.0	313A102-24
12	9,000-11,000	1.7	5.2	.42	1.2	4.5	313A102-3
24	16,000-19,000	.75	8.8	.36	1.0	7.5	313A102-21
24	14,400-17,000	.85	7.8	.32	.85	6.0	313A102-4
24	14,000-17,000	1.0	7.5	.28	.80	5.2	313A102-7
24	10,400-12,300	1.1	6.2	.23	.75	3.3	313A102-1
24	7,400-8,900	1.6	5.5	.17	.70	2.1	313A102-2
24	6,900-8,200	1.8	3.8	.16	.65	1.6	313A102-8
24	6,200-7,400	1.8	3.4	.14	.60	1.3	313A102-22
24	5,200-6,200	1.2	2.8	.12	.45	1.2	313A102-10
50	7,600-9,400	1.5	7.5	.09	.25	1.1	313A102-11
75	14,000-17,000	1.0	10.0	.10	.29	1.9	313A102-25
75	9,000-11,000	1.7	8.0	.07	.29	1.0	313A102-16
75	8,000-10,000	1.8	6.0	.06	.26	.6	313A102-12
75	6,500-8,000	1.2	5.5	.05	.20	.4	313A102-15
75	4,500-5,300	1.0	2.5	.04	.10	.2	313A102-13

A.C. HYSTERESIS SYNCHRONOUS MOTORS
Type CMC
(Bulletin B-1908N)




=26 AWG INSULATED LEADS. 8″ ± 1/4″ EXPOSED LENGTH.
2-21/32
1/16
1/2
.1877 .1872 DIA.
1-3/16 DIA.
1-13/64 DIA.
11/16 DIA
4-40 UNC-2B 5 FULL THREADS MIN. 2 HOLES
.4375
.4375

Note: Be sure to creck Globe for latest data prior to preparing spec control prints.

Globe Type CMC motors are designed to meet requirements for extremely compact high-performance synchronous motors in high-quality industrial/commercial products. They are ideally suited to such applications as dictating machines, recorders, business machines, industrial timers, tools, and controls.

torque: 0.7 oz. in. at 3,600 rpm sync. 0.75 oz. in. at 1,800 rpm sync.
voltage: 115 v.a.c., 60 cycle.
weight: 7.2 ounces.
rotor inertia: 6.5 gm. cm.^{2}
protection: Protected against dirt, moisture, shock, and vibration.
bearings: Life-lubricated, double-shielded ball bearings.
frame: Thermosetting plastic.
shaft: Precision-ground stainless steel.
electrical connection: Leads are provided.
reversibility: Motor reverses by interchanging wires per schematics.
mounting: Standard mounting is by means of pilot and tapped hole on motor face.

Thermosetting plastic encapsulation provides protection against shock and vibration and is impermeable to dirt and moisture.
Single phase operation requires a phasing capacitor (not furnished by Globe).
Send application details for a Globe recommendation.

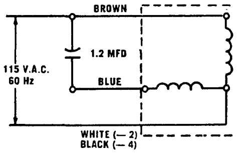
STANDARD PART NUMBERS AND DATA

Voltage (v.a.c.)	Frequency (Hz)	Phase	Speed (rpm)	Torque max. start (oz. in.)	Torque max. sync. (oz. in.)	Current max. (amps)	Power Input max. (watts)	Capacitor (mfd)	Capacitor (w.v.d.c.)	Standard Part No.*
115	60	1	3,600	.70	.70	.12	11	1.2	400	144A110-2
115	60	1	1,800	.75	.75	.12	10	1.2	400	144A110-4

WHEN YOU ORDER

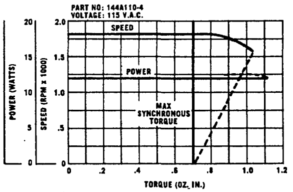
***Parts Numbers.** Units described above are hysteresis synchronous motors and may be ordered by part number. See the introduction to this catalog section for assistance with selecting the proper unit to meet your requirements.

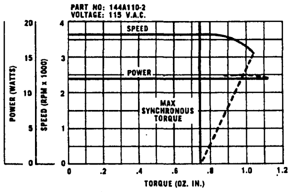
SCHEMATIC WIRING



CW rotation, viewed from shaft end. For CCW rotation, connect line to blue and white (— 2) or to blue and black (— 4).

TYPICAL PERFORMANCE



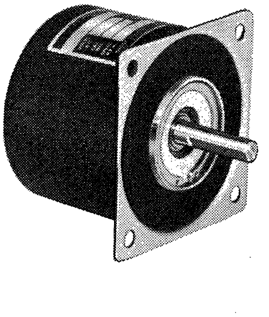


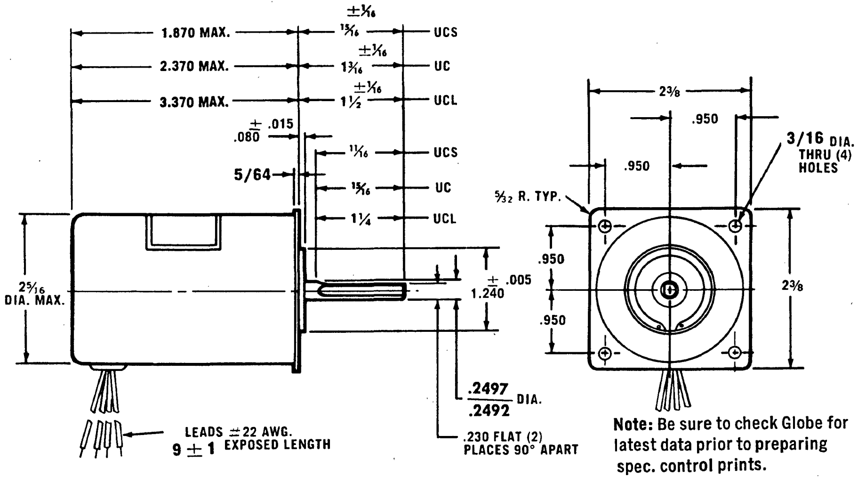
GLOBE TRW

A.C. HYSTERESIS SYNCHRONOUS AND INDUCTION COMMERCIAL MOTORS

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

Type UC (Bulletin B-3608N)





Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

Globe Type UC commercial motors are small precision-made units designed for use in commercial products of high quality. They provide protection against dirt and moisture, and retain all the important qualities of the MIL-spec design.

Three stack lengths are available providing a choice of torque options. They operate on 115 v.a.c., 60 Hz, single phase, 2 or 4 pole. Other voltages, frequencies and torques are available. Spur geartrains can be provided for many speed-torque combinations.

Please submit complete details of your application for an engineering recommendation.

power: At 3,600 rpm continuous, UCS—1/333 hp. UC—1/110 hp. UCL—1/35 hp.

voltage: 115 v.a.c.

size: 2 5/16″ diameter.

weight: UCS—15.3 ounces. UC—25.1 ounces. UCL—34.5 ounces.

rotor inertia: UCS—67 gm. cm.^{2}; UC—123 gm. cm.^{2}; UCL—205 gm. cm.^{2}

protection: Housing is painted black, crinkle finish.

winding: HML insulated magnet wire. Stator is completely molded in an epoxy encapsulation to resist dirt and moisture.

bearings: Chrome steel life-lubed ball bearings. Stainless steel bearing seat.

frame: Aluminum frame is integral with housing.

shaft: No. 303 precision ground stainless steel.

electrical connection: Leads are provided.

reversibility: Motor is reversible.

mounting: Standard mounting is by pilot and four holes in flange.

insulation: Class A UL approved.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

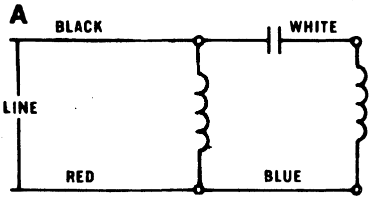
Type	Voltage	Freq. (Hz)	Poles	Phase	Schematic	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Sync. Speed (rpm)	Rated Load @ Sync. Speed (oz.in.)	Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part Number*
UCS	115	60	2	1	A	2.0	200	3,600	0.8	0.8	20	20	186A300-2
	115	60	4	1	B	3.0	150	1,800	1.1	1.1	14	14	186A301-2
UC	115	60	2	1	A	3.0	225	3,600	2.75	2.75	29	31	186A330-2
	115	60	4	1	A	1.5	200	1,800	1.5	1.5	18	20	186A331-2
UCL	115	60	2	1	A	2.5	350	3,600	5.0	5.0	30	41	186A360-2
	115	60	4	1	A	2.0	200	1,800	4.0	4.0	30	34	186A361-2

INDUCTION

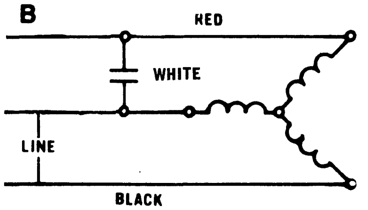
Type	Voltage	Freq. (Hz)	Poles	Phase	Schematic	Phasing Capacitor (mfd.)	Phasing Capacitor (wvac)	Min. Speed @ Rated Load (rpm)	Rated Load (oz.in.)	Min. Pull Up Torque (oz.in.)	Max. Power (watts) No Load	Max. Power (watts) Rated Load	Part Number*
UCS	115	60	2	1	A	2.0	200	3,000	1.5	1.5	19	19	186A300-1
	115	60	4	1	B	2.0	200	1,600	1.25	1.25	11	12	186A301-1
UC	115	60	2	1	A	2.0	200	3,300	2.5	2.5	19	21	186A330-1
	115	60	4	1	A	1.5	200	1,650	2.25	2.25	17	19	186A331-1
UCL	115	60	2	1	A	3.9	225	3,300	5.9	5.9	25	38	186A360-1
	115	60	4	1	A	2.5	350	1,650	4.5	4.5	24	28	186A361-1

For higher torques or watts, consult factory.

SCHEMATIC WIRING



CW ROTATION (VIEWING SHAFT END). FOR CCW ROTATION REVERSE WHITE AND BLUE.



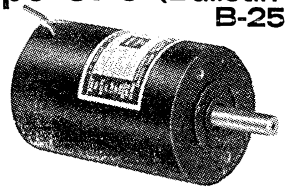
SINGLE PHASE HOOKUP FOR CW ROTATION (VIEWING SHAFT END.) FOR CCW ROTATION REVERSE RED & BLACK.

GLOBE **TRW**®

A.C. HYSTERESIS SYNCHRONOUS AND INDUCTION MOTORS

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

Type CFC (Bulletin B-2508N)



Globe Type CFC motors offer highest quality materials, precision assembly, and extremely compact size with high output. Hysteresis synchronous motors are exact speed units, ideal for times and controls.

Type CFC motors are totally enclosed for dirt and moisture resistance, and have life-lubricated bearings. Single phase operation requires a phasing capacitor (not furnished by Globe.)

Please send complete application data to Globe for an engineering recommendation.

STANDARD PART NUMBERS AND DATA

HYSTERESIS SYNCHRONOUS

Voltage (v.a.c.)	Frequency (Hz)	Phase	Capacitor (mfd)	Capacitor (v.a.c.)	Speed (rpm)	Torque rated load (oz. in.)	Torque stall (oz. in.)	Power no load (watts)	Power rated load (watts)	Schematic	Standard Part No.*
115	60	1	1.0	200	3600	1.40	1.80	14	15	A	138A201-2
115	60	1	3.5	200	1800	2.00	2.25	16	17	B	138A201-4
115	60	1	1.5	200	1200	1.20	1.50	15	16	C	138A201-6

INDUCTION

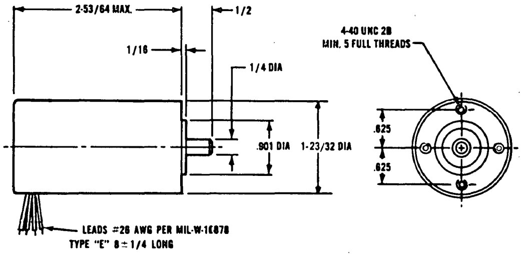
VOLT. (v.a.c.)	FREQ. (Hz)	PH.	Capacitor (mfd)	Capacitor (v.a.c.)	SPEED no load (rpm)	SPEED rated load (rpm)	TORQUE rated load (oz.in.)	TORQUE stall (oz.in.)	POWER no load (watts)	POWER rated load (watts)	SCHEMATIC	STANDARD PART NO.*
115	60	1	1.0	200	3500	3000	1.5	2.5	14	16	A	138A202-2
115	60	1	3.5	200	1700	1550	.75	3.8	16	17	A	139A202-4
115	60	1	1.5	200	1000	800	.5	2.0	15	16	C	138A202-6

Low slip-high torque units available on special request.

torque: To 2.0 oz. in at 1,800 rpm sync.
voltage: 115 v.a.c.
weight: 11.5 ounces.
rotor inertia: 16.8 gm. cm.^{2}
protection: Protected against dirt, moisture, shock, and vibration.
bearings: Life-lubricated, double-shielded ball bearings.
insulation: Class A UL approved.
frame: Thermoplastic.
shaft: Precision ground stainless steel.
electrical connections: #26 AWG leads are provided.
reversibility: Motor reverses by connecting leads per schematics.
mounting: Standard mounting is by means of pilot and tapped hole on motor face.

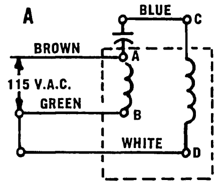
WHEN YOU ORDER

***Part Number.** The units on this page are standard and may be ordered by part number. Complete number consists of the basic part number and speed reduction ratio. Example: 230A395-20 is a 20:1 hysteresis synchronous gearmotor with motor speed of 3600 rpm and a final output speed of 180 rpm. See the introduction to this catalog section for assistance in selection.


2-53/64 MAX.
1/2
1/16
1/4 DIA
.901 DIA
1-23/32 DIA
4-40 UNC 2B MIN. 5 FULL THREADS
.625
.625
LEADS #26 AWG PER MIL-W-16878 TYPE "E" 8 ± 1/4 LONG

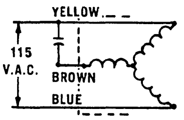
SCHEMATIC WIRING

A



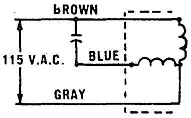
CW Rotation, Viewing Shaft End. for CCW Rotation, Reverse C and D.

B



CW Rotation, Viewing Shaft End. for CCW Rotation, Connect Capacitor to Blue and Brown.

C

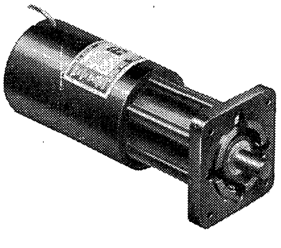


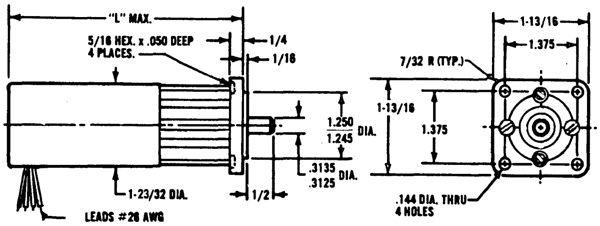
CW Rotation, Viewing Shaft End. for CCW Rotation Connect Line to Blue and Gray.

Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

A.C. HYSTERESIS SYNCHRONOUS & INDUCTION GEARMOTORS

Type CFC (Bulletin B-2528N)





Type CFC planetary gearmotors are lightweight a.c. commercial/ industrial units designed to provide the performance and size advantages of military gearmotors in a lower cost package. Hysteresis synchronous versions can be provided with any of 83 standard planetary geartrains with speed reduction ratios from 4:1 to 46,656:1, and torques to 1250 oz. in.

Type CFC gearmotors offer the same high quality, compact size, and high output as Globe military units. They are totally enclosed and resist dirt and moisture.

torque: To 1250 oz. in. maximum continuous torque.
voltage: 115 v.a.c., 60 Hz.
weight: 18 to 23 ounces depending upon ratio.
gears: Planetary gearing system. All gears are precision manufactured and heat treated for consistently reliable performance and life.
backlash: Varies with reduction ratio but average unit will have less than 3° backlash.
protection: Gearmotor is encapsulated in thermoplastic.
bearings: Output shaft is supported by two lifelubricated sleeve bearings.
lubrication: Motor and geartrain are life-lubricated.
shaft: Precision ground stainless steel.
electrical connection: #26 AWG leads are provided.
mounting: Standard mounting is by four through holes in flange.

STANDARD PART NUMBERS AND BASIC MOTOR DATA

MOTOR	VOLT. (v.a.c.)	FREQ. (Hz)	PH.	SPEED Hyst. Sync. (rpm)	TORQUE rated load (oz. in.)	TORQUE stall min. (oz.in.)	POWER max. no load (watts)	POWER max. rated load (watts)	CAPACITOR (mfd)	CAPACITOR (v.a.c.)	SCHEMATIC WIRING	STANDARD PART NO.*
Hysteresis Synchronous	115	60	1	3600	1.40	1.80	14	15	1.0	200	A	230A395
	115	60	1	1800	2.00	2.25	16	16	3.5	200	B	230A396
	115	60	1	1200	1.20	1.50	15	16	1.5	200	C	230A397
Induction	115	60	1	*	1.5	2.5	14	16	1.0	200	A	230A398
	115	60	1		.75	3.8	16	17	3.5	200	B	230A399
	115	60	1		.5	2.0	15	16	1.5	200	C	230A400

*See Induction table above (Bul. B-2508N) for nominal speeds.

CONTINUED

GLOBE **TRW**®

A.C. HYSTERESIS SYNCHRONOUS AND INDUCTION MOTORS — Type CFC

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 ● TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

RATIOS AND PERFORMANCE

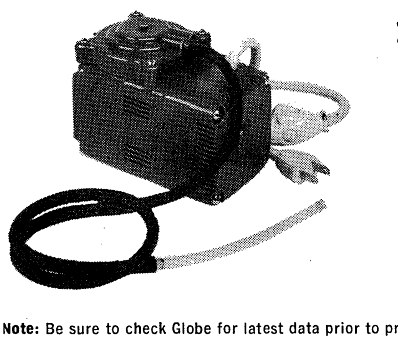
SPEED REDUC-TION RATIO	TORQUE MULTI-PLIER	TORQ max. cont. (oz.in.)	DIM. "L"	GEARMOTOR OUTPUT SPEEDS rpm 3,600 input	rpm 1,800 input	rpm 1,200 input
4:1	3.0	5.1	4.01	900.0	450.0	300.0
5:1	3.8	6.5	4.01	720.0	460.0	240.0
6:1	4.5	7.7	4.01	600.0	300.0	200.0
16:1	10	17	4.25	225.0	112.5	75.0
20:1	13	22	4.25	180.0	90.0	60.0
24:1	15	26	4.25	150.0	75.0	50.0
25:1	16	27	4.25	144.0	72.0	48.0
30:1	19	32	4.25	120.0	60.0	40.0
36:1	23	39	4.25	100.0	50.0	33.33
64:1	33	56	4.48	56.25	28.12	18.75
80:1	41	70	4.48	45.00	22.50	15.00
96:1	49	83	4.48	37.50	18.75	12.50
100:1	51	87	4.48	36.00	18.00	12.00
120:1	61	104	4.48	30.00	15.00	10.00
125:1	64	109	4.48	28.80	14.40	9.60
144:1	74	126	4.48	25.00	12.50	8.333
150:1	77	131	4.48	24.00	12.00	8.000
180:1	92	156	4.48	20.00	10.00	6.666
216:1	110	187	4.48	16.66	8.333	5.555
256:1	105	179	4.68	14.06	7.031	4.687
320:1	130	221	4.68	11.25	5.625	3.750
384:1	157	267	4.68	9.375	4.687	3.125
400:1	164	279	4.68	9.000	4.500	3.000
480:1	197	335	4.68	7.500	3.750	2.500
500:1	205	349	4.68	7.200	3.600	2.400
576:1	236	401	4.68	6.250	3.125	2.083
600:1	246	418	4.68	6.000	3.000	2.000
625:1	256	435	4.68	5.760	2.880	1.920

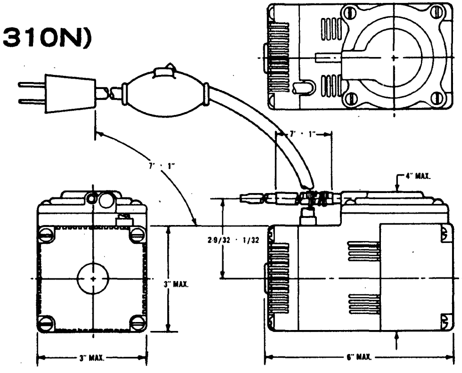
SPEED REDUC-TION RATIO	TORQUE MULTI-PLIER	TORQ max. cont. (oz.in.)	DIM. "L"	GEARMOTOR OUTPUT SPEEDS rpm 3,600 input	rpm 1,800 input	rpm 1,200 input
720:1	295	502	4.68	5.000	2.500	1.666
750:1	306	520	4.68	4.800	2.400	1.600
864:1	352	598	4.68	4.166	2.083	1.388
900:1	370	629	4.68	4.000	2.000	1.333
1024:1	334	568	4.95	3.515	1.757	1.172
1080:1	442	751	4.68	3.333	1.666	1.111
1280:1	416	707	4.95	2.812	1.406	0.938
1296:1	530	901	4.68	2.777	1.388	0.926
1536:1	500	850	4.95	2.343	1.171	0.781
1600:1	522	887	4.95	2.250	1.125	0.750
1920:1	625	1063	4.95	1.875	0.937	0.625
2000:1	652	1108	4.95	1.800	0.900	0.600
2304:1	750	1250	4.95	1.562	0.781	0.521
2400:1	780	1250	4.95	1.500	0.750	0.500
2500:1	815	1250	4.95	1.440	0.720	0.480
2880:1	940	1250	4.95	1.250	0.625	0.417
3000:1	980	1250	4.95	1.200	0.600	0.400
3125:1	1020	1250	4.95	1.152	0.576	0.384
3456:1	1130	1250	4.95	1.041	0.520	0.347
3600:1	1170	1250	4.95	1.000	0.500	0.333
3750:1	1220	1250	4.95	0.960	0.480	0.320
4096:1	1070	1250	5.18	0.879	0.439	0.293
4320:1	1410	1250	4.95	0.833	0.417	0.278
4500:1	1470	1250	4.95	0.800	0.400	0.267
5120:1	1340	1250	5.18	0.703	0.352	0.234
5184:1	1690	1250	4.95	0.694	0.347	0.231
5400:1	1760	1250	4.95	0.667	0.333	0.222
6144:1	1610	1250	5.18	0.586	0.293	0.195

SPEED REDUC-TION RATIO	TORQUE MULTI-PLIER	Tor-que max. cont. (oz.in.)	DIM. "L"	GEARMOTOR OUTPUT SPEEDS rpm 3,600 input	rpm 1,800 input	rpm 1,200 input
6400:1	1680	1250	5.18	0.563	0.281	0.188
6480:1	2110	1250	4.95	0.556	0.278	0.185
7680:1	2010	1250	5.18	0.469	0.234	0.156
7776:1	2530	1250	4.95	0.463	0.231	0.154
8000:1	2100	1250	5.18	0.450	0.225	0.150
9216:1	2390	1250	5.18	0.391	0.195	0.130
9600:1	2520	1250	5.18	0.375	0.182	0.125
10,000:1	2620	1250	5.18	0.360	0.180	0.120
11,520:1	3010	1250	5.18	0.313	0.156	0.104
12,000:1	3140	1250	5.18	0.300	0.150	0.100
12,500:1	3280	1250	5.18	0.288	0.144	0.096
13,824:1	3620	1250	5.18	0.260	0.130	0.087
14,400:1	3780	1250	5.18	0.250	0.125	0.083
15,000:1	3940	1250	5.18	0.240	0.120	0.080
15,625:1	4100	1250	5.18	0.230	0.115	0.077
17,280:1	4520	1250	5.18	0.208	0.104	0.069
18,000:1	4710	1250	5.18	0.200	0.100	0.067
18,750:1	4910	1250	5.18	0.192	0.096	0.064
20,736:1	5430	1250	5.18	0.183	0.087	0.058
21,600:1	5660	1250	5.18	0.167	0.083	0.056
22,500:1	5900	1250	5.18	0.160	0.080	0.053
25,920:1	5790	1250	5.18	0.139	0.069	0.047
27,000:1	7070	1250	5.18	0.133	0.067	0.044
31,004:1	8150	1250	5.18	0.116	0.058	0.039
32,400:1	8500	1250	5.18	0.111	0.056	0.037
38,880:1	10200	1250	5.18	0.093	0.046	0.031
46,656:1	12200	1250	5.18	0.077	0.039	0.026

OUTPUT TORQUE = Torque Multiplier x Motor Torque **TORQUE MULTIPLIER = Reduction Ratio x Efficiency**
TORQUE MAX. CONT. RATING REFERS TO MAXIMUM CONTINUOUS DUTY RATING OF GEARTRAIN

Air Pump (Bulletin C-1310N)





Note: Be sure to check Globe for latest data prior to preparing spec. control prints.

The Globe A.C. Air Pump is a miniature air compressor powered by a Globe Type LC induction a.c. motor. The unit is equipped with a diaphragm-type compressor, and is provided with a plastic air nozzle and flexible hose. Modifications can be made for specific applications, such as air-blast cleaning, small air guns, and vacuum operation.

Units for operation on other voltages with A.C. induction or D.C. permanent magnet motors can be made available.

Send application details for Globe engineering recommendations.

rating: 1 cfm @ 5 psi.
voltage: Standard units for 115 v.a.c., 60 cps, 1 phase.
weight: 3.5 lbs. max. including cord, exhaust tube assembly and fitting.
construction: High-strength molded housing of glass-filled nylon. Fan cooling permits handling at continuous duty. Self-contained motor capacitor.
bearings: Double shielded life-lubricated ball bearings.
exhaust tube assembly: Plastic nozzle and flexible tubing resistant to lubrication oils and trichlorethylene.
electrical connection: Two-conductor male plug on SJT cord with cord-mounted switch. Non-conducting case completely isolates motor from exterior surface.

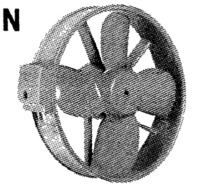
STANDARD PART NUMBERS AND DATA

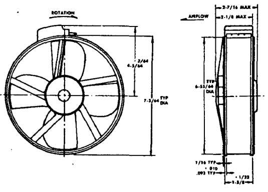
Voltage (v.a.c.)	Frequency (cps)	Phase	Current max. rated (amps)	Standard Part No.*
115	60	1	0.55	206A121

WHEN YOU ORDER

***Part Number.** Units described in this bulletin are standard and can be ordered by part number. However, a variety of types can be supplied to meet exact needs. Please send your application specifications to Globe for an engineering recommendation.

ASTRO FAN
(Bulletin C-6848N)





The TRW/Globe Astro Fan for computer cooling applications resists heat to 360°F. It delivers 270 cfm for flushing main consoles, power supplies and peripheral systems where space and reliability are at a premium. Constructed of glass-fortified polysulfone for maximum thermal and strength characteristics, the Astro Fan has UL Class B recognition. A proven TRW/Globe a.c. motor drives the fan at 3250 rpm and operates in an ambient temperature range from −55° to 100°C. Integral capacitor is totally enclosed. Standard unit operates on 115 v.a.c. 50-60 Hz sources. Units for 230 v.a.c., 50-60 Hz or 50 Hz operation are available.

STANDARD PART NUMBERS AND DATA

GLOBE Part No.	Volts a.c.	Hz	Phase	Full Load Watts	Line Amps	CFM	Thermal Protector
19A2246	115VAC	50-60	1	20	.18	270	NO*
19A2277	115VAC	50-60	1	20	.18	270	YES

* Impedance protected

airflow: 270 cfm @ free air. To reverse airflow, turn fan end-to-end.

voltage: 115 v.a.c. 50-60 Hz standard. Units for operation on 230 v.a.c. 50-60 Hz and 230 v.a.c. 50 Hz sources available.

life: 10,000 hours constant duty life without maintenance.

protection: Impedance protection is standard. Thermal protector optional.

safety provisions: Class B (130°C) UL recognition. Self-extinguishing per ASTM D635. Totally enclosed capacitor.

mountings: Servo rims on each edge permit easy attachment to any panel. Three clamps for fast installation. Astro Fan mounts in any plane.

electrical connections: Tinned brass terminals mate with industry standard plug. Leads are optional.

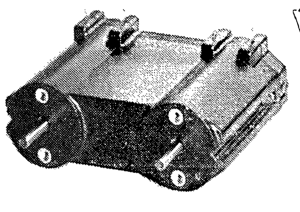
construction: 20% glass-filled polysulfone material with dimensional stability to 360°F. Motor bearings are ABEC 1 life lubricated, double-shielded ball type.

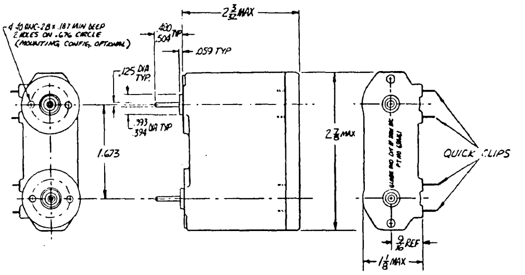
weight: 1.4 lb.

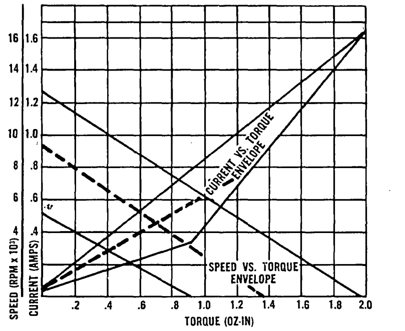
GLOBE TRW®

CASSETTE DRIVE MOTOR

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY




4-40 UNC-2B x .187 MIN DEEP
2 HOLES ON .676 CIRCLE
(MOUNTING CONFIG. OPTIONAL)
2 3/32 MAX
.480
.504 TYP
.059 TYP
.125 DIA TYP.
.393
.394 DIA TYP
1.673
2 7/8 MAX
QUICK CLIPS
9/16 REF
1 1/8 MAX



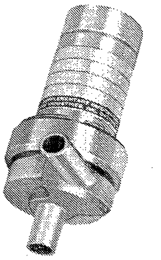
Dual D.C. motor package will directly drive and rewind computer tape cassettes for digital data entry without intervening mechanisms. The center-to-center shaft dimension is tailored for all standard cassette cartridges. Cogging and ripple effects are minimized for smooth operation at low speeds.

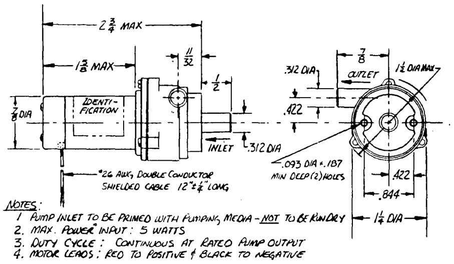
Operation in voltage or current driven modes will not result in demagnetization even under tough duty cycles.

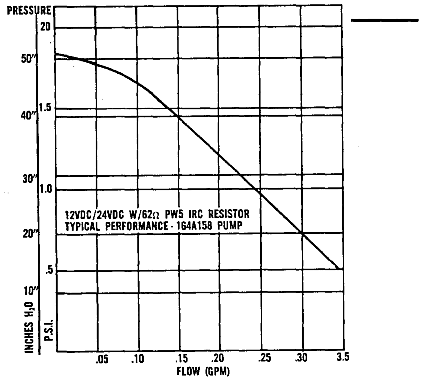
The package will handle a wide range of input voltages (0-24 volts) and drive tapes at speeds of two to over one hundred in/sec. The unit can be used for reel take-up and wind/rewind functions in conjunction with a capstan drive or will direct drive with a tape speed accuracy of ± one percent when combined with a custom designed control circuit.

Housing and end-cap are made of Lexan 500. Self-Lubricating sleeve bearings and ceramic magnet are standard. Ball bearings and Alnico magnet (which will approximately double stall torque for a given armature) are available at slight additional cost. Armature inertia is 7.35×10^{-5} oz. in. sec^2 and nominal armature resistance and inductance is 13.5 OHMS and 8.5 millihenries respectively. Electrical and mechanical time constants range from $t_e = .6$ to .7 milliseconds and $t_m = 20$ to 45 milliseconds depending on armature and magnet option. Life is 1500 hours minimum at 12 v.d.c. at normal rated load of 0.6 oz. in.

INDUSTRIAL COOLANT PUMP




2 3/4 MAX
1 5/8 MAX
11/32
1/2
7/8
.312 DIA
OUTLET
1 1/2 DIA MAX
7/8 DIA
IDENTIFICATION
.422
INLET
.312 DIA
.093 DIA x .187 MIN DEEP (2) HOLES
*26 AWG DOUBLE CONDUCTOR SHIELDED CABLE 12"±1/4" LONG
.422
.844
1 1/4 DIA
NOTES:
1 PUMP INLET TO BE PRIMED WITH PUMPING MEDIA - NOT TO BE RUN DRY
2. MAX. POWER INPUT: 5 WATTS
3. DUTY CYCLE: CONTINUOUS AT RATED PUMP OUTPUT
4. MOTOR LEADS: RED TO POSITIVE & BLACK TO NEGATIVE



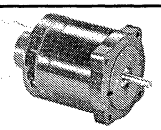
New DC centrifugal pump is operable at 12 VDC or 24 VDC with 62 ohm, 5 watt resistor in series (TRW/IRC part number PW5).

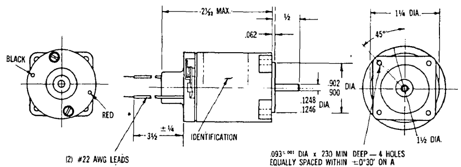
The unit is designed to pump water or 50% solution of water ethylene glycol at the flows and pressures shown on the curve at the right. By reducing the value of the resistor (minimum value 20 ohms before magnetic coupling breaks away), higher flows and pressures are attainable at 24 VDC.

The pump has a magnetic coupling so that no shaft seal is required. The pump parts are made of corrosion-resistant Noryl plastic.

The pump is powered by a Globe type SS motor, ⅞ inch diameter. The complete package is only 1¼ inches by 2¹³⁄₁₆ inches.

NC MOTOR




BLACK
RED
2 1/32 MAX.
1/2
.062
1 1/4 DIA.
45°
.902
900 DIA.
.1248
.1246 DIA.
±1/4
3 1/2
IDENTIFICATION
1 1/2 DIA.
(2) #22 AWG LEADS
.093±.001 DIA x 230 MIN DEEP — 4 HOLES EQUALLY SPACED WITHIN ±0°30' ON A 1.250±.004 DIA. BOLT CIRCLE.

The TRW/Globe Type NC commercial motor is designed for applications requiring small size, high torque and reliability of performance at an economical price. A range of planetary geartrains is available.

weight: 3.5 oz. **length:** 2¹⁄₃₂″. **pilot thickness:** ³⁄₆₄″. **frame:** Integral molded polysulfone. **shaft:** Precision-ground stainless. **end bell:** Precision-molded polysulfone. **electrical connections:** 3½″ leads are standard. **reversibility:** Motor reverses when terminal voltage is reversed. **mounting:** Four-hole mount for self-tapping or machine threads.

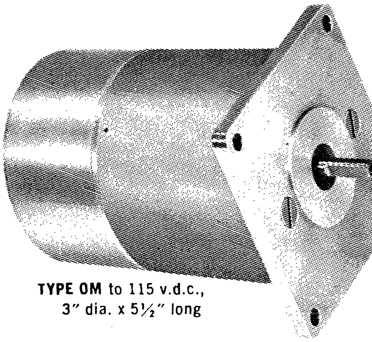
STANDARD PART NUMBERS AND DATA

VOLTAGE (v.d.c.)	NOM SPEED at Max. Rated Load (rpm)	TORQUE Max. Rated (oz.-in.)	TORQUE Nom. Stall (oz.-in.)	CURRENT Max. No Load (amps)	CURRENT Rated Load (amps)	CURRENT Nom. Stall (amps)	Standard Part Number
2.5	6,500-8,300	.75	3.7	1.25	3.7	12	375A100-1
2.5		.7	4.5	1.5	3.7	14.5	375A100-2
6	3,075-4,300	1.5	3.75	.25	1.35	2.7	375A100-3
6		1.3	4.4	.34	1.45	3.6	375A100-4
12	3,075-4,300	1.5	3.7	.13	.68	1.35	375A100-5
12		1.3	4.4	.17	.7	1.8	375A100-6
24	3,075-4,300	1.5	3.7	.07	.35	.7	375A100-7
24		1.3	4.4	.095	.4	.95	375A100-8
115*	7,600-16,900	1.5*	5.5	.1	.23	.52	375A100-9
115*		.7*	7.6	.17	.27	1.15	375A100-10

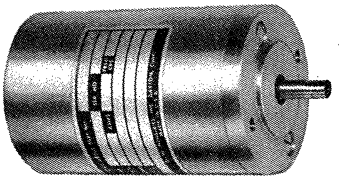
* Suggested for Intermitten Duty Only!

GLOBE TRW

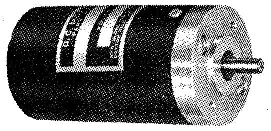
GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY



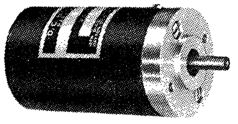
TYPE OM to 115 v.d.c., 3″ dia. x 5½″ long



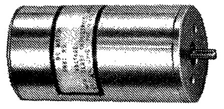
TYPE GRP to 115 v.d.c., 2¼″ dia. x 3¾″ long



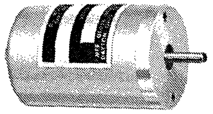
TYPE BL to 115 v.d.c., 1½″ dia. x 2¹⁵⁄₁₆″ long



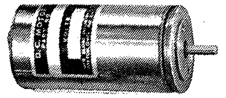
TYPE BD to 115 v.d.c., 1½″ dia. x 2⁹⁄₁₆″ long



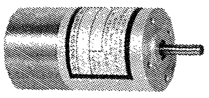
TYPE LL to 75 v.d.c., 1¼″ dia. x 2⅜″ long



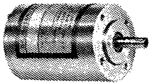
TYPE JM to 115 v.d.c., 1¼″ dia. x 2¹⁄₃₂″ long



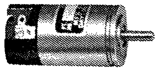
TYPE MM to 50 v.d.c., 1¼″ dia. x 2¹⁄₃₂″ long



TYPE HM to 75 v.d.c., 1″ dia. x 1⁵⁹⁄₆₄″ long

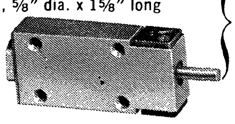


TYPE SS to 50 v.d.c., ⅞″ dia. x 1⅜″ long



TYPE SD to 50 v.d.c., ¾″ dia. x 1⅜″ long

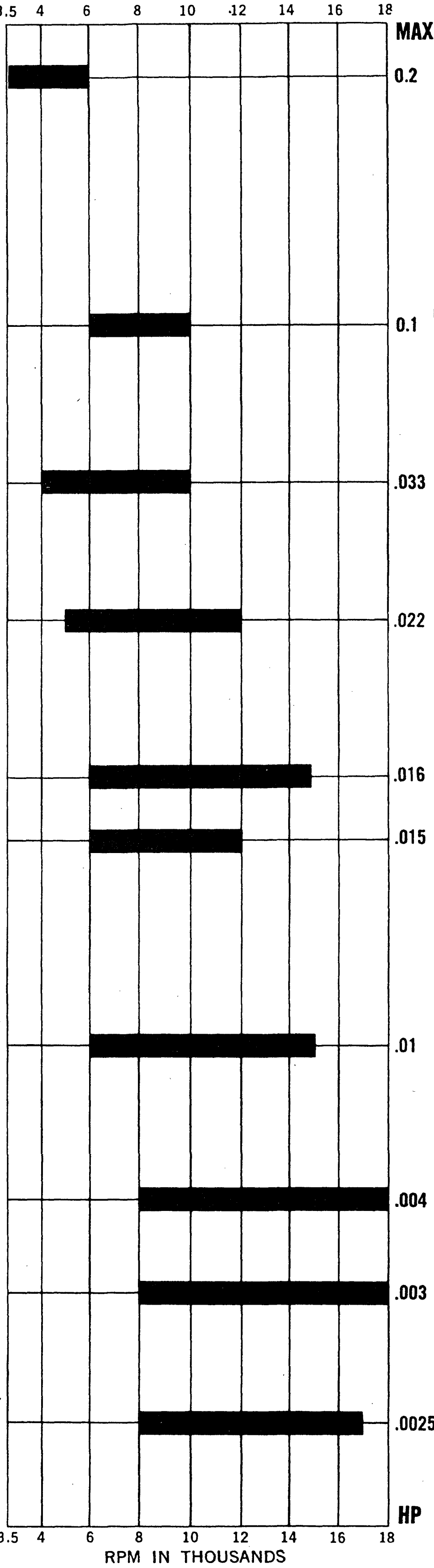
TYPE VT to 50 v.d.c., ⅝″ dia. x 1⅝″ long



TYPE VS to 50 v.d.c., ⅞″ x ⁷⁄₁₆″ x 1⅞″ long

RELATIVE SIZE & DIMENSIONS

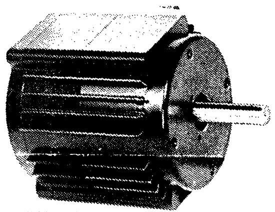
SPEED RANGE AT RATED HP
RPM IN THOUSANDS

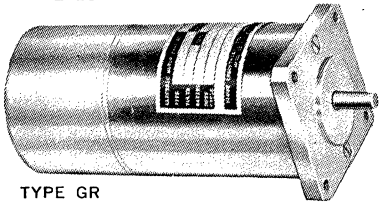


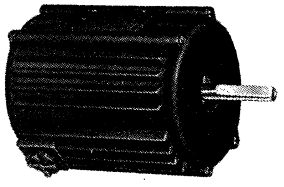
The MIL-spec D.C. motors you need are here!

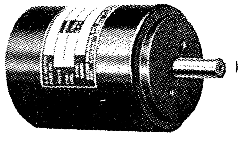
If your MIL-spec d.c. motor needs fall within the parameters shown, a Globe high torque motor or gearmotor will fill the bill. Globe's complete line of compact permanent magnet and wound field motors plus integral planetary geartrains adds up to your best source for precision miniature motors.

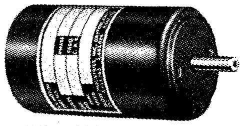
GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

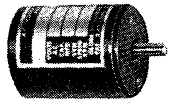

TYPE LC

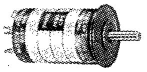

TYPE GR

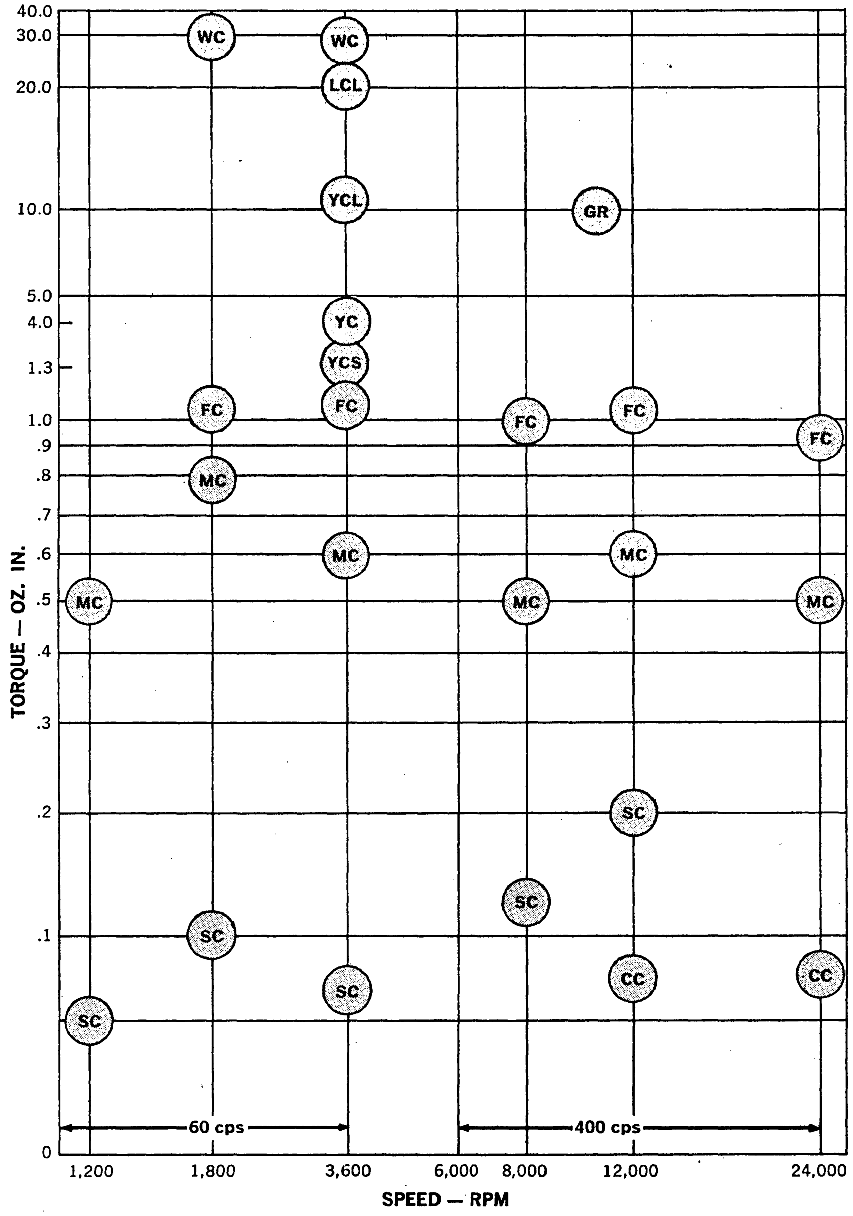

TYPE YCL


TYPE FC


TYPE MC


TYPE SC


TYPE CC



TRW/GLOBE MIL-SPEC A.C. MOTORS COVER THE TORQUE MAP

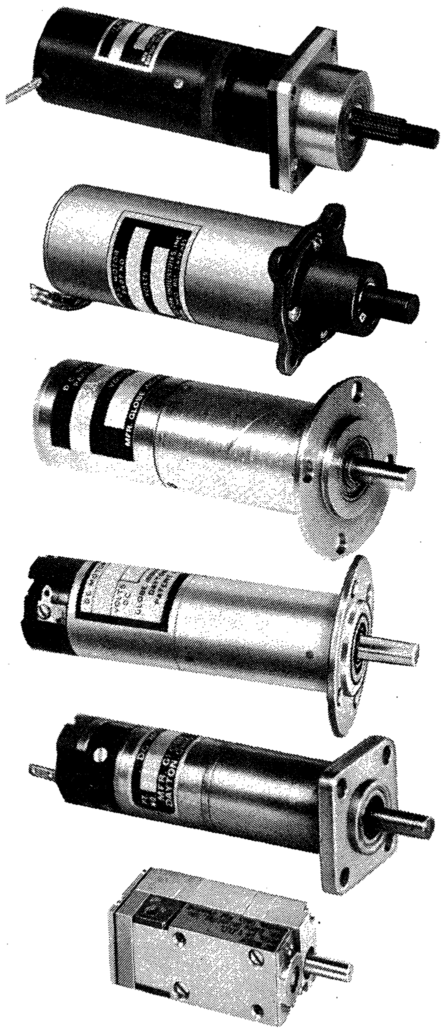
TYPE	DIA. (")	LENGTH (")	VOLTAGE	POLES	WEIGHT (oz.)
WC	3 1/2	4 1/2	115 v.a.c.	Consult Factory	
LC	3 3/4	3 5/32*	to 208 v.a.c.	2, 4	72.0
GR	2 1/4	4 11/32	115 v.a.c./v.d.c.	2	36.0
YCS	2 3/4	1 15/16**	to 230 v.a.c.	2, 4, 6	26.0
FC	1 1/16	2 1/4	to 200 v.a.c.	2, 4, 6, 8	11.5
MC	1 1/4	2 1/4	to 200 v.a.c.	2, 4, 6	6.5
SC	1 1/16	1 5/16	to 200 v.a.c.	2, 4, 6	2.4
CC	21/32	1 3/16	to 26 v.a.c.	2, 4	2.0

*LCL 3 27/32 **YC 2 7/16, YCL 3 7/16

When you need helpful service in precision miniature and small motors, check first with TRW/Globe. Catalog standard a.c. motors are rated above; custom units also available. TRW/Globe hysteresis synchronous motors deliver exact speeds. Induction units produce giant torques for their size. Both types are available with standard integral planetary geartrains to match your speed-torque requirements.

GLOBE **TRW**

GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY



D.C.

TYPE BD & BL PLANETARY

1⅞″ flange: Provides 18 ratios for 1½″ dia. Type BD and BL d.c. motors. Max. length 4$\frac{21}{32}$″. Max cont. output torque to 100 lb. in.

TYPE MM & LL PLANETARY

Provides 18 ratios for 1¼″ dia. Type MM and LL d.c. motors. Max. length 4$\frac{5}{64}$″. Square flange is optional. Max. cont. output torque to 1000 oz. in.

TYPE SS PLANETARY

Provides 21 ratios for ⅞″ dia. Type SS d.c. motors. Max. length 3$\frac{11}{64}$″. Continuous output torque to 300 oz. in.

TYPE SD PLANETARY

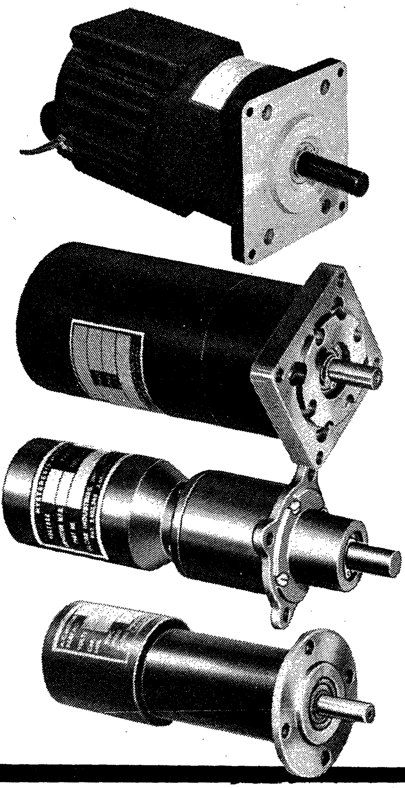
Provides 19 ratios for ¾″ dia. Type SD d.c. motors. Max. continuous output torque to 300 oz. in.

TYPE VT PLANETARY

Provides 35 ratios for ⅝″ dia. Type VT d.c. motors. Max. length 3″. Max. output torque to 50 oz. in.

TYPE VS SPUR

Provides 62 ratios for $\frac{7}{16}$″ x ⅞″ Type VS d.c. motors. Max. output torque to 35 oz. in. Side-by-side version is ⅞″ x ⅞″ x 2¼″ long.



A.C.

TYPE LC PLANETARY

Available with 11 standard ratios from 12:1 to 1800:1. Torque to 200 lb. in. continuous duty and to 600 lb. in. intermittent duty.

TYPE FC PLANETARY

Provides 18 odd and 83 even ratios for 1$\frac{11}{16}$″ dia. Type FC a.c. motors. Max. length 4$\frac{3}{32}$″. Max. continuous output torque to 1250 oz. in.

TYPE MC PLANETARY

Provides 83 even ratios, or 18 odd ratios for 1¼″ dia. Type MC a.c. motors. Max. length 4$\frac{3}{16}$″. Square flange is optional. Max. continuous output torque to 1000 oz. in.

TYPE SC PLANETARY

Provides 21 ratios for 1$\frac{1}{16}$″ dia. Type SC a.c. motors. Max. length 3$\frac{7}{32}$″. Max. continuous output torque to 300 oz. in.

Mil-Spec Gearmotors

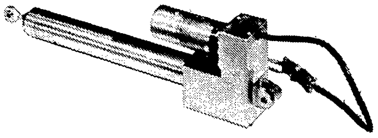
TRW/Globe MIL-Spec motors may be fitted with integral geartrains of planetary or spur gear design. Standard units, mated to the proper motor, can produce almost any desired speed. Torque multiplication possibilities are enormous because of the efficiency and ruggedness of TRW/Globe's planetary design. Geartrain capacities extend through 1/5 hp.

GLOBE TRW

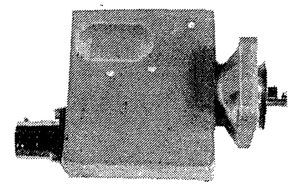
GLOBE DIVISION OF TRW INC.
2275 Stanley Ave., Dayton, Ohio 45404, U.S.A.
TEL. 513 228-3171 • TWX: 810 459-1642
TELEX 288224 CABLE GLODAY

Linear Actuators (Tension or Compression)

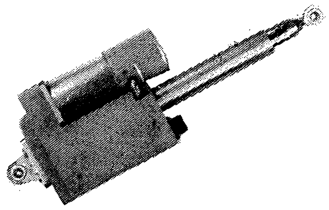
TRW/Globe linear actuators are furnished specifically to meet your package size and performance requirements. Because they incorporate one or more TRW/Globe a.c. or d.c. motors, gear boxes and other components, we exercise control over design, manufacturing and testing.



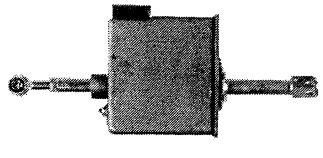
PART NO. 65A106
rated voltage: 28 v.d.c.
rated load: 500 lbs.
stroke length: 6 in.
travel rate: .167 in. per sec.



PART NO. 65A117
rated voltage: 115 v.a.c., 400 Hz, 1 phase
rated load: 80 lbs.
stroke length: ⅛ in.
travel rate: .167 in. per sec.



PART NO. 65A119
rated voltage: 28 v.d.c.
rated load: 600 lbs.
stroke length: 8.46 in.
travel rate: .7 in. per sec.

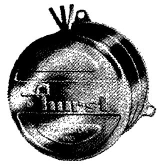


PART NO. 65A127
rated voltage: 28 v.d.c.
rated load: 7 lbs.
stroke length: 1.53 in.
travel rate: .21 in. per sec.

hurst MFG.CORP., *HEAVY DUTY SYNCHRONOUS MOTORS*

MOTOR DIVISION, DEPT. 372 —Princeton, Indiana 47570 (812) 385-2564

SERIES S HYSTERESIS SYNCHRONOUS



MODEL SM 1800 RPM Thru 1/3 RPM
Motor Torque, 40 oz.-in.
at 1 RPM (Unidirectional)

This compact motor is engineered for tough jobs demanding accurate timing. It has excellent shock and vibration resistance and will start instantly at full torque (40 ounce-inches at 1 RPM). It will not overheat during continuous duty or in a stalled position.

A wide range of output speeds is available for all applications.

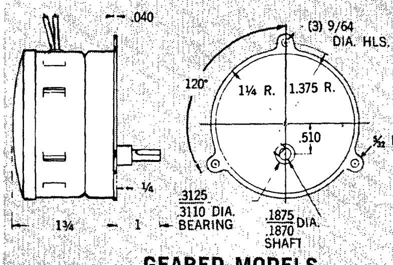
STOCK SPEEDS: RPM: ½-1-2-3-4-5-6-10-15-30-60 CW ROTATION

CCW Rotation . . . Built-to-Order

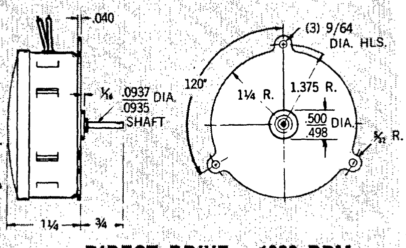
For Other speeds "Built-to-Order" Contact Factory

SPECIFICATIONS:

Dimensions	2½" x 1¾" depth
Torque	40 Oz.-In. at 1 RPM
Output Speeds	1800 RPM Thru ⅓ RPM
Duty	Continuous
Weight	12 ozs.
Shaft Size	Stainless Steel 3/16" dia. flatted (1800 RPM . . . 3/32" Dia., ¾" Length)
Shaft Length	1" Standard
Mounting	(3) 9/64" dia. holes (spaced 120°)
Power	5 watts
Rotation	Clockwise or Counter Clockwise
Temp. Rise	40°C above ambient
Voltage	115 v AC, 60 Hz.
Gearing	Brass gears and heat treated steel pinions, hardened wheel shafts running in bronze bearings packed with grease for lifetime lubrication.

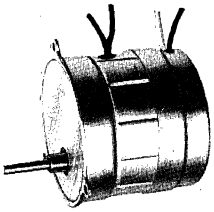


GEARED MODELS



DIRECT DRIVE — 1800 RPM

SERIES C HYSTERESIS SYNCHRONOUS



MODEL CA 1200 RPM Thru ⅓ RPM
Motor Torque
100 oz.-in. at 1 RPM
(Reversible Capacitor included)

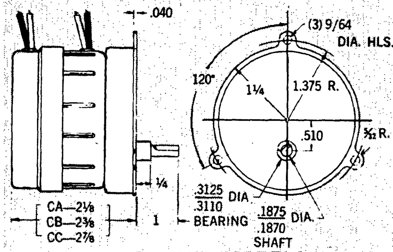
Reversible, model CA features a 1200 RPM rotor speed for quiet performance. Materials include the finest obtainable bronze bearings, brass gears, hardened steel pinions and wheel shafts, stainless steel output shaft. A wide range of output speeds is available for all applications.

STOCK SPEEDS: RPM: ⅓-½-1-1½-2-2½-3-4-5-6-8-10-12-15-16-20-24-25-30-32-33⅓-40-48-50-60-64-80-100-120-150-160-200-240-400-600-800-1000

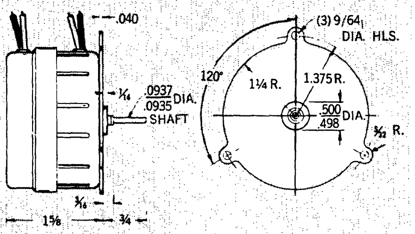
FOR OTHER SPEEDS
"Built-to-Order" Contact Factory

SPECIFICATIONS:

Capacitor	.5 MFD
Motor Dimensions	2½" dia. x 2⅛" long
Torque	100 oz.-in. at 1 RPM
Output Speeds	1200 RPM Thru ⅓ RPM
Duty	continuous
Weight	15 ozs.
Power	5 watts
Rotation	reversible
Temp. Rise	40°C above ambient
Gearing	Brass gears and hardened steel pinions
Output Shaft, Stainless Steel	3/16" dia. x 1" long flatted (1200 RPM 3/32" dia. ¾" len.)
Mounting	(3) 9/64" dia. holes spaced 120°
Voltage	115 Vac., 60 Hz.



GEARED MODELS



DIRECT DRIVE — 1200 RPM

MODEL CB 100 OUNCE-INCHES AT 1 RPM FROM 15 RPH THRU ⅓ RPH

Model CB embodies the same basic motor as the CA, except for case size (¼" longer)to admit gearing from 15 revolutions per hour down to ⅓ revolutions per hour. For speeds slower than ⅓ RPH, model CC is required. The larger case size of model CB allows the gearing unit to be completely sealed, thus adding greatly to the life of the motor as compared to those with exposed gearing units.

Specifications for model CB motors are identical to model CA with the following exceptions:

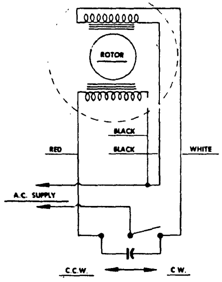
Dimensions	2½" dia. x 2⅜" depth
Output Speeds	15 RPH THRU ⅓ RPH
Weight	17 ozs.

MODEL CC 100 OUNCE-INCHES AT 1 RPM FROM 8 RPD THRU ¼ RPD

Shaft speeds as slow as 1 revolution every 4 days are available in model CC motors. This unit, including the gear train, is engineered and carefully built to withstand rugged use. It is completely sealed and lubricated for the lifetime of the motor. Model CC embodies the same basic motor as the CA, except for case size.

Specifications for model CC motors are identical to model CA with the following exceptions:

Dimensions	2½" dia. x 2⅞" depth
Output Speeds	8 RPD THRU ¼ RPD
Weight	20 ozs.



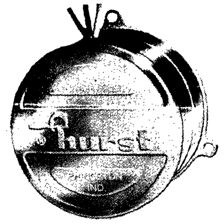
S.P.D.T. REVERSING DIAGRAM

hurst MFG. CORP., HEAVY DUTY SYNCHRONOUS MOTORS

MOTOR DIVISION, DEPT. 372—Princeton, Indiana 47570 (812) 385-2564

SERIES D

HYSTERESIS SYNCHRONOUS



MODEL DA 3600 RPM Thru ⅔ RPM

Motor Torque
150 OZ.-IN. AT 1 RPM
(Reversible, Capacitor Included)

Reversible (with SPDT switching) this heavy duty motor maintains complete timing accuracy in both clockwise and counter-clockwise directions. Completely enclosed case measures only 2½" in diameter by 1¾" in length. Will not overheat during CONTINUOUS operation.

STOCK SPEEDS: RPM-1-2-4-6-8-10-12-20-30-60-120
FOR OTHER SPEEDS
"Built-to-Order" Contact Factory

SPECIFICATIONS:

Capacitor	.5 MFD
Motor Dimensions	2½" dia. x 1¾" depth
Torque	150 Oz.-In. at 1 RPM
Output Speeds	3600 RPM Thru ⅔ RPM
Duty	continuous
Weight	14 ozs.
Shaft	stainless steel 1" len. 3/16" dia. flatted (3600 RPM ¾" Len. 3/32" dia.)

Temp. rise 40°C above ambient

MODEL DB 40 RP HOUR THRU 1 RP HOUR "BUILT-TO-ORDER"

The DB motor is a capacitor type unit having the same specifications as the Model DA except for case size (¼" longer) to admit gearing from 40 RPH thru 1 RPH. For speeds slower than 1 RPH, the Model DD is required.

DB specifications are the same as for the Model DA with the following exceptions:

Dimensions	2½" dia. x 2" depth
Output speeds	40 RPH Thru 1 RPH
Weight	16 ozs.

Temp. rise 40°C above ambient

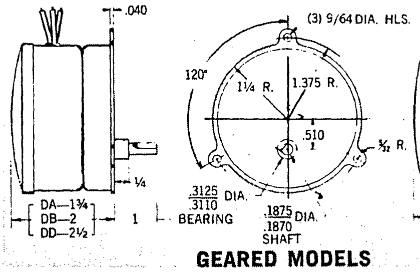
MODEL DD 42 RPDAY THRU ⅔ RPDAY "BUILT-TO-ORDER"

Model DD motors are available in speeds ranging from 42 revolutions per day down to 1 revolution every 36 hours (⅔ RPD). As in all HURST motors, both gear train and motor are in one compact case, completely sealed and lubricated for the lifetime of the motor.

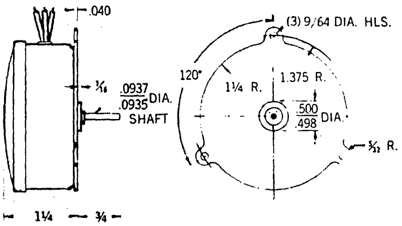
DD specifications are the same as for the Model DA with the following exceptions:

Dimensions	2½" dia. x 2½" depth
Output Speeds	42 RPD THRU ⅔ RPD
Weight	20 ozs.

Temp. rise 40°C above ambient


.040
(3) 9/64 DIA. HLS.
120°
1¼ R.
1.375 R.
.510
5/32 R.
.3125
.3110 DIA.
BEARING
.1875
.1870 DIA.
SHAFT
DA—1¾
DB—2
DD—2½
1
¼

GEARED MODELS


.040
1/16
.0937
.0935 DIA.
SHAFT
(3) 9/64 DIA. HLS.
120°
1¼ R.
1.375 R.
.500
.498 DIA.
5/32 R.
1¼
¾

DIRECT DRIVE—3600 RPM

SPECIFICATIONS:

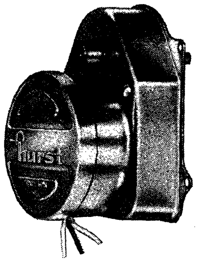
Capacitor	.5 MFD
Torque	100 oz.-in. at 1 RPM
Power	5 watts
Temp. Rise	40°C above ambient
Voltage	115v A.C., 60 Hz.
Stainless Steel Shaft	¼" dia. 1 3/32" Len

Other shafts available

(Other speeds available on special order can also be supplied with double ended shaft)

MODEL DA-H

HYSTERESIS SYNCHRONOUS



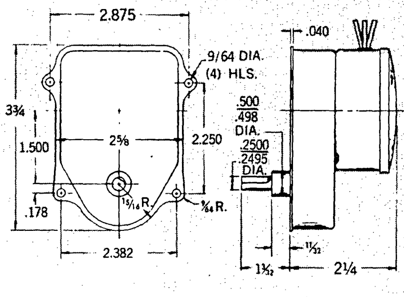
MOTOR TORQUE..100 Ounce-Inches at 1 RPM
(Reversible)
Capacitor Included

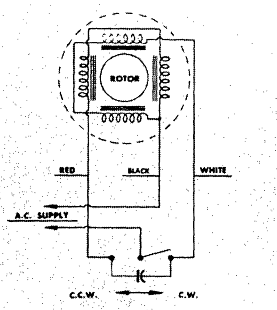
Available speeds built-to-order:

RP HOUR	RPM	RPM	RPM-4-5
1-2-2½-10	¼-⅓-½-⅔	1-1½-2-3	6-8-10-12-15

HEAVY DUTY GEARING FOR LONGER SERVICE LIFE

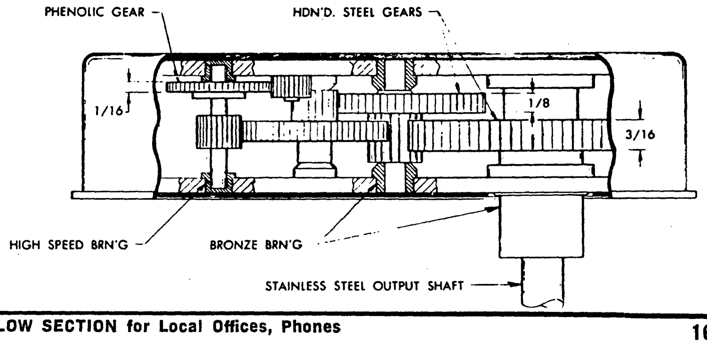
- All gearing used in the type DA-H is precision cut to A.G.M.A. Class 7 tolerances and carefully inspected for concentricity and tooth form.
- Phenolic gears are used in the first stage for long wearing qualities and to obtain low noise level at high speeds. Intermediate gears are made of a special gear alloy for the proper combination of wear and strength properties required.
- Output gears, and in most cases the preceding gear, are made of heat treated steel for maximum strength and torque capacity as well as long life under heavy loading.
- All pinions are made of high strength alloy steel and heat treated. Gears and pinions are assembled on ground and hardened shafts.
- Bearings of the higher speed gears are made of a special material for quiet operation. Bearings near the output are made of high quality bearing bronze.
- The sturdy ¼" diameter output shaft is of stainless steel and rotates in two large bronze sleeve bearings, spaced for maximum support. The output shaft is located so that a double ended shaft can be provided for special applications.


2.875
9/64 DIA.
(4) HLS.
.040
3¾
1.500
2⅝
2.250
.178
15/16 R.
3/64 R.
2.382
.500
.498
DIA.
.2500
.2495
DIA.
11/32
1 3/32
2¼


ROTOR
RED
BLACK
WHITE
A.C. SUPPLY
C.C.W.
C.W.

S.P.D.T. REVERSING DIAGRAM

MODEL DA-H HEAVY DUTY GEARING

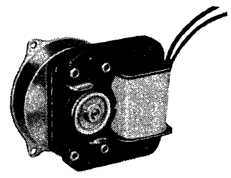

PHENOLIC GEAR
HDN'D. STEEL GEARS
1/16
1/8
3/16
HIGH SPEED BRN'G
BRONZE BRN'G
STAINLESS STEEL OUTPUT SHAFT

hurst MFG.CORP., *HEAVY DUTY SYNCHRONOUS MOTORS*

MOTOR DIVISION, DEPT. 372 —Princeton, Indiana 47570 (812) 385-2564

SERIES E

HYSTERESIS SYNCHRONOUS



MODEL EA

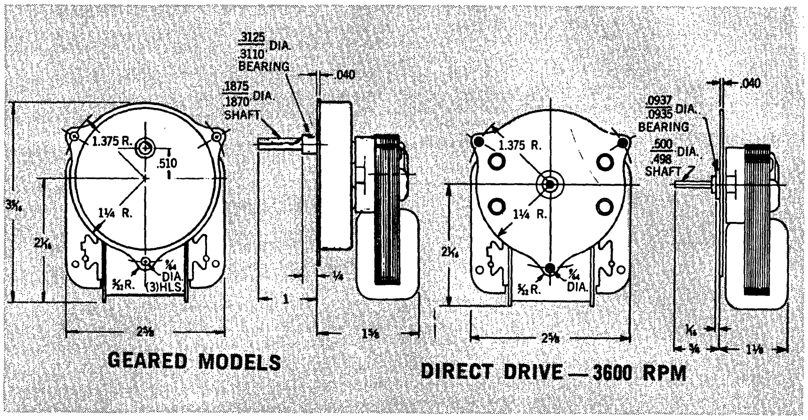
3600 RPM THRU ⅔ RPM
MOTOR TORQUE 150 OZ.-IN. at 1 RPM
Unidirectional, CW or CCW Rotation

E Series motors are open frame, shaded pole construction and are extremely cool running, 150 ounce-inch torque rating at 1 RPM . . . superior materials including bronze bearings, brass gears, hardened steel pinions and wheel shafts, stainless steel output shaft. Recommended when a dependable, low-cost timing motor is required.

STOCK SPEEDS: CW ROTATION: 1-2-4-6-8-10-12-20-30-60-120-3600
For other speeds or CCW Rotation
"BUILT-TO-ORDER" CONTACT FACTORY

SPECIFICATIONS:

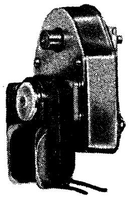
Dimensions	3⁵⁄₁₆" L. x 2⅝" W. x 1⅝" H.
Motor Torque	150 oz.-in. at 1 RPM
Duty	continuous
Weight	19 ozs.
Power	10 watts
Rotation	clockwise or counter clockwise
Temp. Rise	40°C above ambient
Gearing	Brass gears, hardened steel pinions
Output Shaft	³⁄₁₆" dia. x 1" long flatted
Output Shaft	3600 RPM only, ³⁄₃₂" x ¾" long
Mounting	(3) 9/64" dia. holes spaced 120°
Voltage	115 Vac, 60 Hz.


.3125
.3110 DIA.
BEARING
.040
.1875
.1870 DIA.
SHAFT
1.375 R.
.510
1¼ R.
3⁵⁄₁₆
2¹⁄₁₆
⁵⁄₃₂ R.
⁹⁄₆₄ DIA.
(3)HLS.
¼
1
2⅝
1⅝
.0937
.0935 DIA.
BEARING
.040
.500
.498 DIA.
SHAFT
1.375 R.
1¼ R.
2¹⁄₁₆
⁵⁄₃₂ R.
⁹⁄₆₄ DIA.
2⅝
¹⁄₁₆
¾
1⅛

GEARED MODELS **DIRECT DRIVE — 3600 RPM**

MODEL EA-H

HYSTERESIS SYNCHRONOUS



(HEAVY DUTY GEARING)

MOTOR TORQUE . . .100 oz.-in. at 1 RPM
Unidirectional . . . CW or CCW Rotation
Built-to-Order
(Also available with Double Ended shaft)
AVAILABLE SPEEDS: RP HOUR . . .1-2-2½-10
RPM: ¼-⅓-½-⅔-1-1½-2-3-4-5-6-8-10-12-15
HEAVY DUTY GEARING FOR LONGER SERVICE LIFE

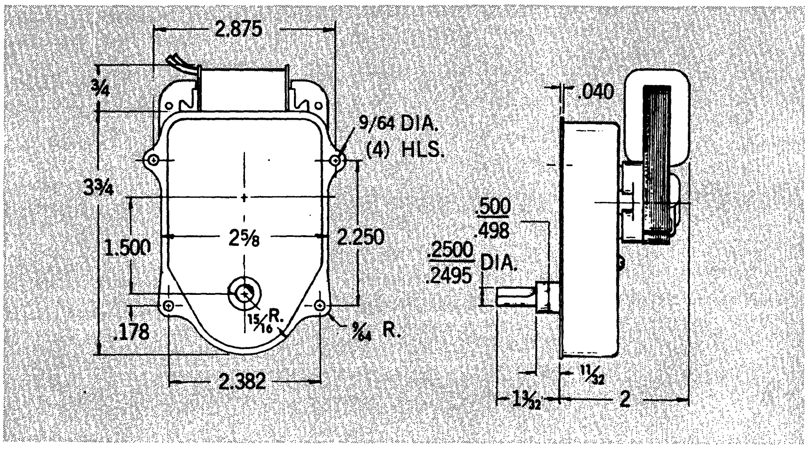
- All gearing used in the type EA-H is precision cut to A.G.M.A. Class 7 tolerances and carefully inspected for concentricity and tooth form.
- Phenolic gears are used in the first stage for long wearing qualities and to obtain low noise level at high speeds. Intermediate gears are made of a special gear alloy for the proper combination of wear and strength properties required.
- Output gears, and in most cases the preceding gear, are made of heat treated steel for maximum strength and torque capacity as well as long life under heavy loading.
- All pinions are made of high strength alloy steel and heat treated. Gears and pinions are assembled on ground and hardened shafts.
- Bearings of the higher speed gears are made of a special material for quiet operation. Bearings near the output are made of high quality bearing bronze.
- The sturdy ¼" diameter output shaft is stainless steel and rotates in two large bronze sleeve bearings, spaced for maximum support. The output shaft is located so that a double ended shaft can be provided for special applications.

SPECIFICATIONS:

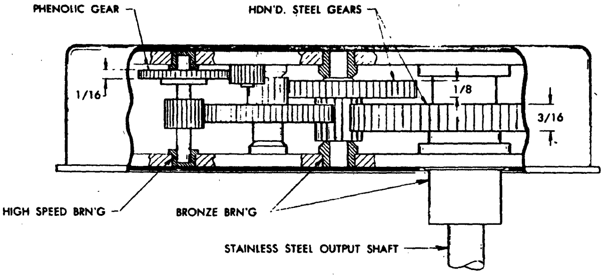
Motor Torque	100 oz.-in. at 1 RPM
Duty	continuous
Power	10 watts
Rotation	clockwise or counter clockwise
Temp. Rise	40°C above ambient
Voltage	115v A.C., 60 Hz.

Stainless Steel Shaft ¼" dia., 1³⁄₃₂" len. Other shafts available.

(Other speeds available on special order can also be supplied with double ended shaft)


2.875
¾
9/64 DIA.
(4) HLS.
3¾
1.500
2⅝
2.250
.178
¹⁵⁄₁₆ R.
⁵⁄₆₄ R.
2.382
.040
.500
.498
.2500
.2495 DIA.
¹¹⁄₃₂
1³⁄₃₂
2

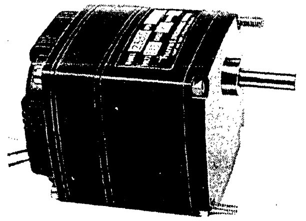
MODEL EA-H Heavy Duty Gearing


PHENOLIC GEAR
HDN'D. STEEL GEARS
1/16
1/8
3/16
HIGH SPEED BRN'G
BRONZE BRN'G
STAINLESS STEEL OUTPUT SHAFT

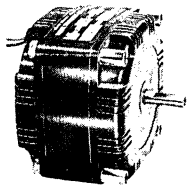
hurst MFG.CORP., *HEAVY DUTY SYNCHRONOUS MOTORS*

MOTOR DIVISION. DEPT. 372—Princeton, Indiana 47570 (812) 385-2564

NEW hurst K-det SERIES



GEARED



DIRECT DRIVE
1800 RPM

SYNCHRONOUS, GEARED AND DIRECT DRIVE REVERSIBLE INSTRUMENT MOTORS

Designed for continuous duty applications requiring exceptional reliability, compact size and high output torque.

The motor is totally enclosed, which provides adequate protection against certain environmental hazards.

GEARED MODELS

"Heli-spur" gearing, a new concept in instrument motor gearing, is used for the K-det Series. The primary gear stage is "HELICAL" to provide quiet operation. Secondary gears are precision machined steel "SPUR" with the heavier load carrying gears case hardened for longer service life.

The gear train is made up of individual gear and pinion assemblies, rotating on hardened ground steel studs, accurately located and supported in the gear housing castings.

Sealed ball bearings are used on the rotor shaft. The stainless steel output shaft is supported by bronze inboard and output bearings with axial thrust provisions.

All motors are sealed and require no maintenance lubrication.

"DROP-IN" REPLACEMENT FOR OTHER MOTORS OF THIS TYPE

SPECIFICATIONS:

Torque: Gear Train Rating 250 oz.-in. at 1 RPM

Dimensions: See Dimensional Drawings

Duty: Continuous

Shaft Size: Stainless Steel ¼" dia. x 1" length, flatted (geared models) Direct Drive $\frac{3}{16}$" dia. ⅝" len. flatted

Power: 115v A.C., 60 Hz.

Rotation: All motors are reversible and provided with three color coded leads (Capacitor included).

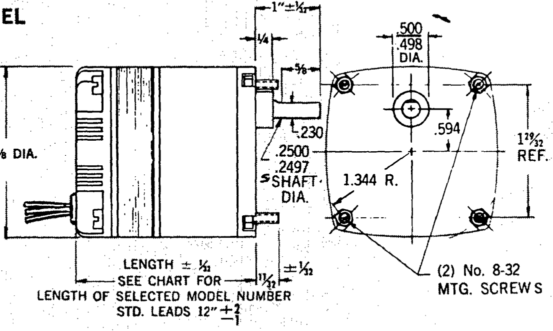
Output speeds: 1 RPM Thru 1800 RPM

Mounting: On all geared motors 2 of the 4 frame screws are extended for face mounting (see dimensional drawings). The output shaft bearing on the gear motor models is extended to provide a pilot for locating motor when mounting.

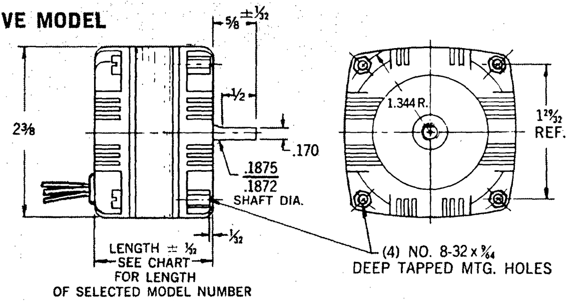
Gearing: Combination 'Helical" and "Spur."

Temp. Rise ....40°C

GEARED MODEL


1"±1/32
1/4
5/8
.500
.498
DIA.
2⅜ DIA.
.230
.2500
.2497
SHAFT DIA.
.594
1 29/32
REF.
1.344 R.
LENGTH ± 1/32
SEE CHART FOR
11/32
±1/32
LENGTH OF SELECTED MODEL NUMBER
STD. LEADS 12" +2 −1
(2) No. 8-32
MTG. SCREWS

DIRECT DRIVE MODEL


⅝ ±1/32
1/2
2⅜
.170
.1875
.1872
SHAFT DIA.
1/32
1.344 R.
1 29/32
REF.
LENGTH ± 1/32
SEE CHART
FOR LENGTH
OF SELECTED MODEL NUMBER
STD. LEADS 12"
(4) NO. 8-32 x 9/64
DEEP TAPPED MTG. HOLES

Stock Motors (Other Speeds Built to Order)

RPM	HURST Model No.	Length	Rated Torq. Oz. - In.
1	2535	$2\frac{17}{32}$	250
1.5	2625	$2\frac{17}{32}$	200
2	2536	$2\frac{17}{32}$	150
3	2537	$2\frac{17}{32}$	100
6	2540	$2\frac{17}{32}$	50
6	2541	$3\frac{1}{32}$	95
10	2542	$2\frac{17}{32}$	30
10	2543	$3\frac{1}{32}$	72
15	2546	$2\frac{17}{32}$	20
15	2547	$3\frac{1}{32}$	48
25	2552	$2\frac{17}{32}$	12
25	2553	$3\frac{1}{32}$	29
30	2554	$2\frac{11}{32}$	12
30	2555	$3\frac{1}{32}$	27
* 60	2556	$2\frac{11}{32}$	6.4
60	2557	$3\frac{1}{32}$	15
100	2559	$2\frac{7}{8}$	8.9
150	2560	$2\frac{7}{8}$	5.9
200	2561	$2\frac{7}{8}$	4.4
300	2562	$2\frac{7}{8}$	2.9
DIRECT DRIVE			
*1800	2587	$1\frac{11}{16}$	.28
1800	2588	$2\frac{3}{16}$	.6

*Non-Stock Speeds

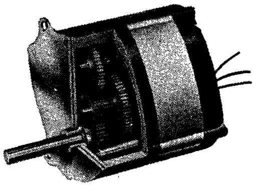
WHEN ORDERING, USE MODEL NUMBER

hurst MFG.CORP., *HEAVY DUTY SYNCHRONOUS MOTORS*

MOTOR DIVISION, DEPT. 372 —Princeton, Indiana 47570 (812) 385-2564

SERIES G

HYSTERESIS
SYNCHRONOUS



REVERSIBLE INSTRUMENT MOTOR MOTOR TORQUE 600 OZ.-IN. AT 1 RPM

MODEL GA

The Hurst GA is designed for long life and higher torque applications. Offers instrument manufacturers the advantages of high performance as well as economy.

All HURST gearing is precision cut to close tolerances in our own Gear Department, utilizing the latest equipment and techniques for production and inspection.

The gears, pinions and bearings, in a high-reduction gear unit, operate at widely different rotational speeds and loads, depending upon their location in the reduction sequence. Therefore, the design and selection of material for each gear in the Model GA gear train provides optimum performance for its unique speed and loading to evenly balance with the other components of the gear unit.

The HURST "Balanced Design" gearing design allows a maximum balance of strength and durability for all gear components in a minimum of space.

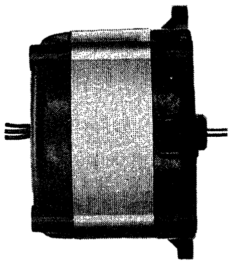
Phenolite gears are used in the first stage of all HURST motors for low noise level.

Intermediate gears are made of a special alloy for proper balance of wear and strength.

Output gears are heat-treated alloy steel for maximum torque capacity and long life.

Gears near the output end of the gear train run in bearings of special alloy bronze for added strength and durability. Higher speed gears are attached to hardened and polished steel pivots, which run in inserted bearings, one on each end of the pivot.

MODEL GA
DIRECT DRIVE 3600 RPM



Shaft ¾″ len. x ⅛″ dia.

SPECIFICATIONS

Torque	600 oz.-in. at 1 RPM	Capacitor	1.0 MFD ±5%
Power Requirements	10 watts at 115v A.C. 60 Hz.	Duty	continuous
Shaft	stainless steel 1″ len. ¼″ dia. flatted 3600 RPM ¾″ len. ⅛″ dia.	Temp. Rise	40°C above ambient
		Rotation	reversible
		Weight	2¼ lbs.

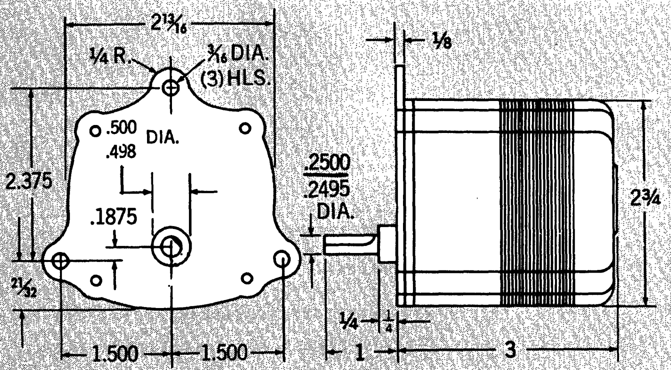
NO MAINTENANCE LUBRICATION REQUIRED

Special journal bearings, fabricated from high quality bronze alloy with special grease reservoirs, provide long, trouble-free life with no maintenance lubrication required.

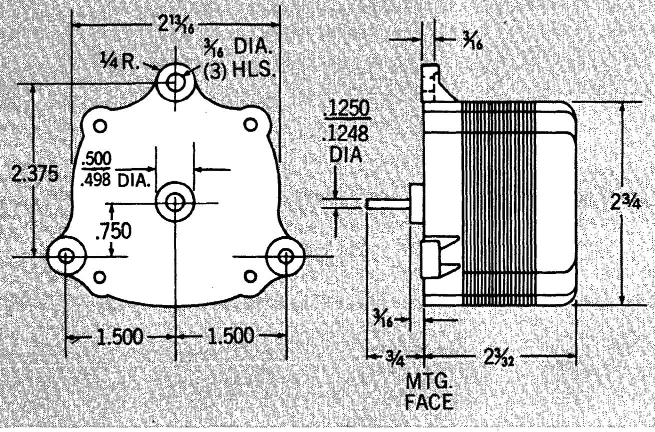
STOCK SPEEDS: RPM-1-2-3-4-5-6-10-18-30-60-100-120-150-180-225-300-3600

For other speeds, Contact Factory

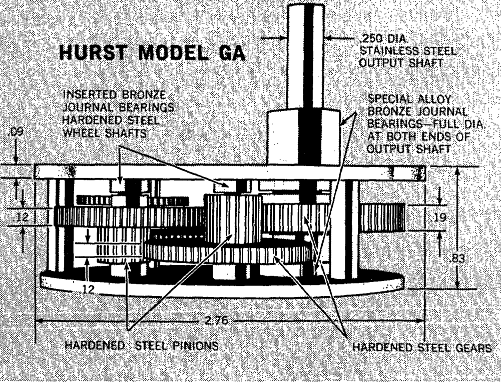
GEARED


2¹³⁄₁₆
¼ R.
³⁄₁₆ DIA.
(3) HLS.
.500
.498
DIA.
2.375
.1875
²¹⁄₃₂
1.500
1.500
⅛
.2500
.2495
DIA.
2¾
¼
¼
1
3

DIRECT DRIVE 3600 RPM


2¹³⁄₁₆
¼ R.
³⁄₁₆ DIA.
(3) HLS.
2.375
.500
.498 DIA.
.750
1.500
1.500
³⁄₁₆
.1250
.1248
DIA
2¾
³⁄₁₆
¾
2³⁄₃₂
MTG.
FACE

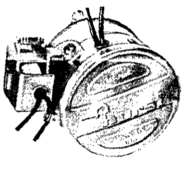
HEAVY DUTY GEARING


HURST MODEL GA
.250 DIA.
STAINLESS STEEL
OUTPUT SHAFT
INSERTED BRONZE
JOURNAL BEARINGS
HARDENED STEEL
WHEEL SHAFTS
SPECIAL ALLOY
BRONZE JOURNAL
BEARINGS—FULL DIA.
AT BOTH ENDS OF
OUTPUT SHAFT
.09
.12
.19
.83
.12
2.76
HARDENED STEEL PINIONS
HARDENED STEEL GEARS

hurst MFG.CORP., *HEAVY DUTY SYNCHRONOUS MOTORS*

MOTOR DIVISION, DEPT. 372—Princeton, Indiana 47570 (812) 385-2564

SERIES PC
HYSTERESIS SYNCHRONOUS



SPECIFICATIONS:

Dimensions ....2½" dia. x 2" depth
Clutch Actuator ....⅞" H. x 1³⁄₁₆" W.
Output Shaft ....³⁄₁₆" dia. x 1" L., flatted

MOTOR TORQUE:

PC-DA ....120 Ounce-Inches at 1 RPM
PC-SM .... 40 Ounce-Inches at 1 RPM

Output Speeds:
PC-DA ....600 RPM Thru 1 RPM
PC-SM ....300 RPM Thru ½ RPM
Temperature Rise ....40°C above ambient
Weight ....1 lb. 4 oz.
Mounting ....(3) holes 9/64" dia.
Voltage ....115 v AC, 60 Hz.

BRAKE AND CLUTCH MOTORS

NOTE: STANDARD ACTUATOR COIL—115V AC—60 Hz. WILL BE SUPPLIED UNLESS OTHERWISE SPECIFIED—

STARTS AND STOPS IN 20 MILLISECONDS

For extremely fast starts and stops, motors run continuously with clutch and brake controlled by switching actuator only. The positive clutch will start the output shaft within 20 milliseconds and the brake will stop output shaft within ⅕° at 1 RPM or within 12° at 60 RPM. Other speeds proportional.

Motors can be furnished to operate on any AC voltage. The actuator can be furnished to operate on any voltage, AC or DC. Motor and actuator can be supplied in any voltage combination, if the motor is AC.

MODEL PC-DA

MOTOR TORQUE.................120 OUNCE-INCHES AT 1 RPM
(Reversible)
Capacitor Included
STOCK SPEEDS: RPM-1-2-4-6-8-10-12-20-30-60-120

Stock Motors and Actuators 115 v. 60 Hz.

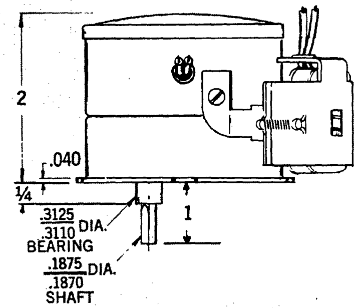
MODEL PC-SM

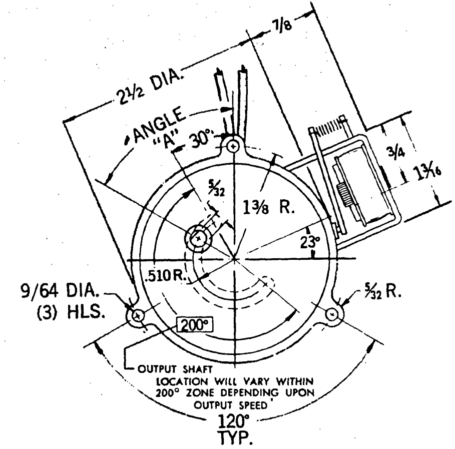
MOTOR TORQUE..................40 OUNCE-INCHES AT 1 RPM
(Unidirectional)
CW or CCW Rotation
STOCK SPEEDS: RPM: ½-1-2-3-4-5-6-10-15-30-60
Model PC-SM, CW Rotation only on Stock Motors
CCW Rotation . . . Built-to-Order

Stock Motors and Actuators 115 v. 60 Hz.

FOR OTHER SPEEDS
MOTOR OR ACTUATOR VOLTAGES OR FREQUENCIES
CONTACT FACTORY

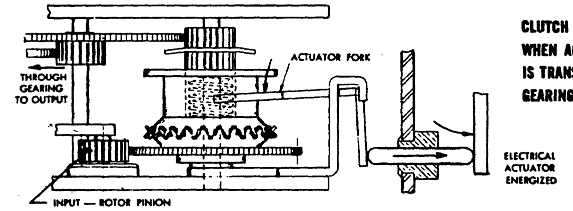
The HURST Positive Clutch has been life tested for over two million operations without failure and was designed to fill the many requests for dependable, fast start-and-stop applications.


2
.040
¼
.3125
.3110 DIA.
BEARING
.1875
.1870 DIA.
SHAFT
1

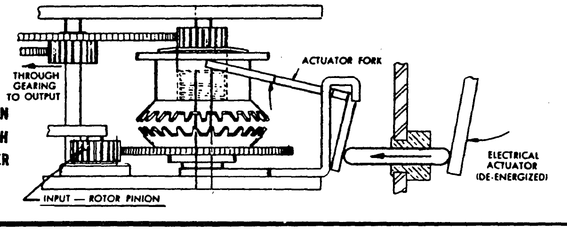

⅞
2½ DIA.
ANGLE "A"
30°
¾
1³⁄₁₆
⁵⁄₃₂
1⅜ R.
23°
.510 R.
9/64 DIA.
(3) HLS.
⁵⁄₃₂ R.
200°
OUTPUT SHAFT LOCATION WILL VARY WITHIN 200° ZONE DEPENDING UPON OUTPUT SPEED
120° TYP.

SPEED IN R.P.M.		ANGLE "A"
PC SM	PC DA	
½	1	45°
⅔	1⅓	45
¾	1½	40
⅞	1¾	40
1	2	40
1⅕	2⅖	40
1¼	2½	40
1½	3	36½
1⅔	3⅓	40
2	4	40
2¼	4½	40
2⅖	4⅘	94½
2½	5	40
3	6	100
3¾	7½	102
4	8	100
5	10	100
5½	11	90
6	12	100
7	14	100
7½	15	100
8	16	100
8⅓	16⅔	100
10	20	100
12	24	154½
15	30	166
16	32	166
16⅔	33⅓	156
18	36	166
20	40	156
22½	45	166
24	48	185
25	50	166
28	56	166
30	60	166
40	80	166
45	90	154½
50	100	166
60	120	214½
72	144	214½
80	160	210½
90	180	219½
96	192	205½
100	200	225½
120	240	225½
125	250	210½
150	300	205½
180	360	214½

POSITIVE CLUTCH & INSTANTANEOUS BRAKE MECHANISM

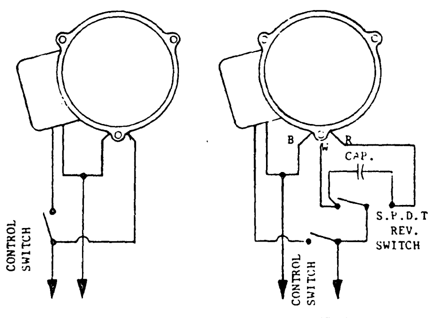

THROUGH GEARING TO OUTPUT
ACTUATOR FORK
ELECTRICAL ACTUATOR ENERGIZED
INPUT — ROTOR PINION

CLUTCH ENGAGED BY INTERNAL SPRING WHEN ACTUATOR IS ENERGIZED. POWER IS TRANSMITTED THROUGH CLUTCH AND GEARING TO OUTPUT SHAFT.


THROUGH GEARING TO OUTPUT
ACTUATOR FORK
ELECTRICAL ACTUATOR (DE-ENERGIZED)
INPUT — ROTOR PINION

CLUTCH DISENGAGED—BRAKING ACTION APPLIED TO GEARING—LOWER CLUTCH PLATE ROTATES FREELY WITH NO POWER TRANSMISSION THROUGH CLUTCH

WIRING DIAGRAMS


CONTROL SWITCH
B
R
CAP.
S.P.D.T. REV. SWITCH
CONTROL SWITCH

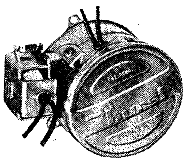
PC-SM UNIDIRECTIONAL

PC-DA REVERSIBLE

hurst MFG.CORP., *HEAVY DUTY SYNCHRONOUS MOTORS*

MOTOR DIVISION, DEPT. 372 —Princeton, Indiana 47570 (812) 385-2564

SERIES AR



HYSTERESIS SYNCHRONOUS

AUTOMATIC OR MANUAL RESET

MODEL AR-SM..............MOTOR TORQUE 40 oz-in. at 1 RPM (Unidirectional) CW or CCW Rotation

MODEL AR-DA..............MOTOR TORQUE 100 oz-in. at 1 RPM (Reversible) Capacitor Included

Model AR-SM and Model AR-DA motors utilize a planetary type clutch to provide positive action and long life. The clutch operates directly upon the output shaft and, when de-energized, the shaft is completely free for manual or automatic reset. The addition of an external return spring to the output shaft will provide automatic reset operation on either model AR-DA or AR-SM motors.

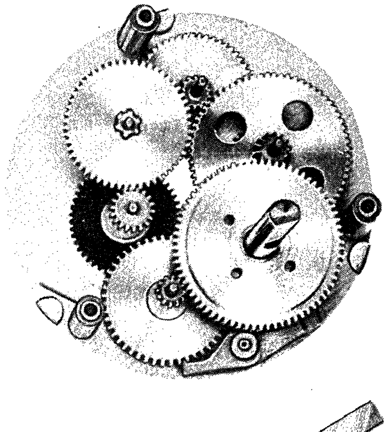
HURST AR MOTORS are designed for heavy-duty applications and will easily handle rated torque on either AR-DA or AR-SM (either direction rotation).

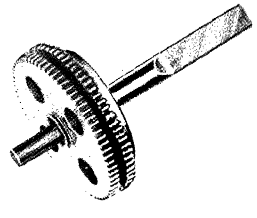
Motors can be furnished to operate on any AC voltage. The actuator can be furnished to operate on any voltage, AC or DC. Motor and actuator can be supplied in any voltage combination, if the Motor is AC.

STOCK SPEEDS ....MODEL AR-SM—CW Rotation
RPM: 1-4-6-10-30-60
CCW Rotation Built-to-order

STOCK SPEEDS ....MODEL AR-DA
RPM-1-4-6-10-30-60
Reversible

For other speeds "Built-to-Order'
Contact Factory





SPECIFICATIONS:

Dimensions ....2½" Dia. x 2" Depth
Clutch Actuator ....⅞" H. x 1³⁄₁₆" W.
Output Shaft ....³⁄₁₆" Dia. x 1" L. flatted
Temp. rise 40°C above ambient

MOTOR TORQUE:
AR-DA ....100 oz.-in. at 1 RPM
AR-SM ....40 oz.-in. at 1 RPM
Voltage . . . 115 Vac, 60 Hz.

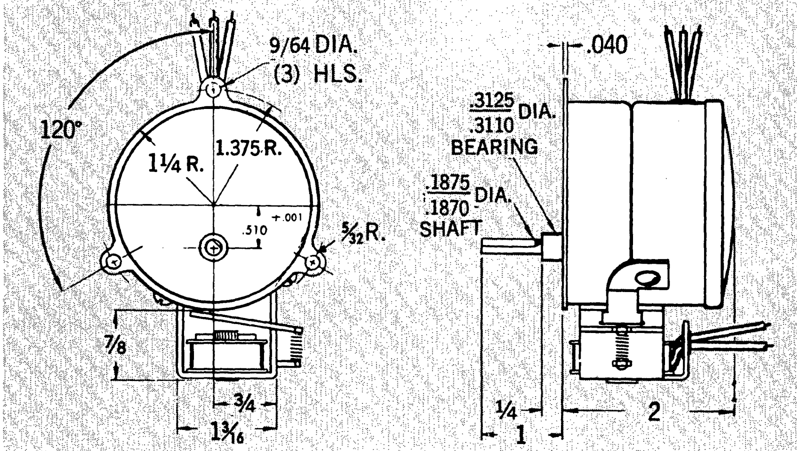
Available Output Speeds:
AR-DA ....120 RPM Thru 12 RPH
AR-SM ....60 RPM Thru 6 RPH

Weight ....1 lb., 6 ounces
Mounting ....(3) holes 9/64" diameter
Accuracy........Within less than ⅕ second at 1 RPM with increasing accuracy at higher speeds.
Maximum error in seconds $= \frac{.15625}{RPM}$

NOTE: STANDARD ACTUATOR COIL—115V AC—60 Hz. WILL BE SUPPLIED UNLESS OTHERWISE SPECIFIED—

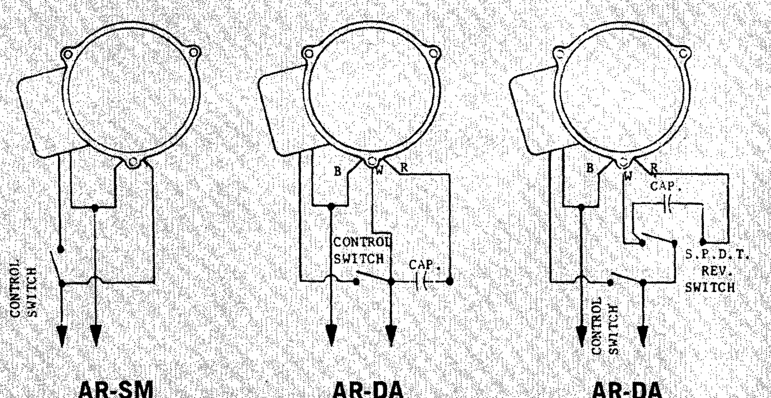
DIMENSIONS:

MODELS AR-SM, AR-DA



WIRING DIAGRAMS

MOTOR RUNS CONTINUOUSLY, OUTPUT SHAFT CONTROLLED BY ACTUATOR



AR-SM UNIDIRECTIONAL

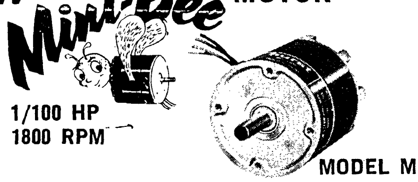
AR-DA UNIDIRECTIONAL

AR-DA REVERSIBLE

hurst MFG.CORP., HEAVY DUTY SYNCHRONOUS MOTORS

MOTOR DIVISION, DEPT. 372—Princeton, Indiana 47570 (812) 385-2564

NEW Mini-Bee MOTOR



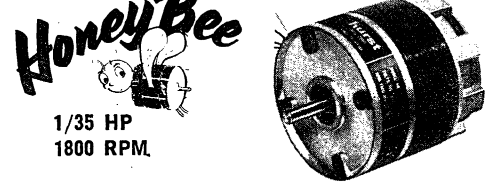
1/100 HP
1800 RPM

MODEL MB

HYSTERESIS SYNCHRONOUS MOTOR
LOCKED ROTOR TORQUE 6 OZ. IN. (1800 RPM)

The new "Mini-Bee," like the popular larger model, the "Honey-Bee," is constructed with the inverted rotor design for superior angular velocity characteristics. The resulting "flywheel" effect greatly reduces the flutter in all magnetic tape applications. The "Mini-Bee" is also ideally suited for numerous other direct drive applications where synchronous characteristics are advantageous in the power range of 1/100 HP.

NEW HIGHER TORQUE Honey Bee



1/35 HP
1800 RPM

MODEL HB

HYSTERESIS SYNCHRONOUS MOTOR
LOCKED ROTOR TORQUE 23.5 OZ. IN. (1800 RPM)
REVERSIBLE. CAPACITOR INCLUDED
ALSO AVAILABLE AT 900 RPM, 1200 RPM AND DUAL SPEED, 900/1800 RPM

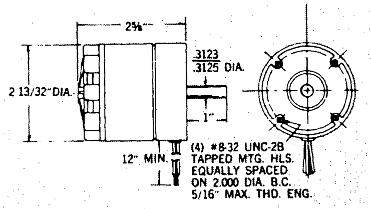
A new, smaller version of the popular HURST "Honey Bee" for

CASSETTE DRIVES
VIDEO RECORDING
INSTRUMENTATION
TAPE RECORDING
DATA HANDLING
TELEMETERING

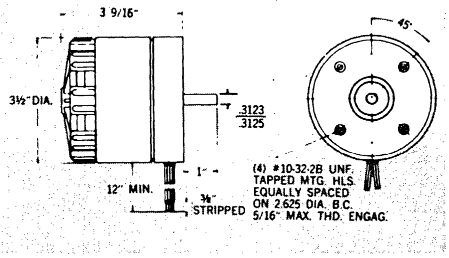
SPECIFICATIONS MODEL MB

Speed	1800 RPM	Capacitor	2.0 MFD 330 Vac
Power Rating	1/100 HP	Voltage	115 Vac, 60 Hz.
Locked Rotor Torque	6 Oz.-In.	Dimensions	2$\frac{13}{32}$" Diam. x 2⅝"
Pull-In Torque	5.25 Oz.-In.	Lead Length	12"
Pull-Out Torque	5.50 Oz.-In.	Sealed Ball Bearings	
Temp. Rise	40°C Full Load	Reversible, Capacitor Included	
Shaft $\frac{5}{16}$" Diam. x 1" Length, Stainless Steel			

DIMENSIONS: MODEL MB


2⅝"
.3123
.3125 DIA.
2 13/32" DIA.
1"
12" MIN.
(4) #8-32 UNC-2B TAPPED MTG. HLS. EQUALLY SPACED ON 2.000 DIA. B.C. 5/16" MAX. THD. ENG.

MODEL HB


3 9/16"
45°
3½" DIA.
.3123
.3125
1"
12" MIN.
⅜" STRIPPED
(4) #10-32-2B UNF. TAPPED MTG. HLS. EQUALLY SPACED ON 2.625 DIA. B.C. 5/16" MAX. THD. ENGAG.

SPECIFICATIONS MODEL HB

	1800 RPM	1200 RPM	900 RPM
Locked Rotor Torque	23.5 Oz.-In.	17.6 Oz.-In.	14.1 Oz.-In.
Pull-In Torque	16.8 Oz.-In.	12.6 Oz.-In.	10.1 Oz.-In.
Pull-out Torque	17.0 Oz.-In.	12.8 Oz.-In.	10.2 Oz.-In.
Temp. Rise Full Load	40°C	40°C	40°C
HP Rating	1/35	1/70	1/115
Watts	70	50	40

Shaft $\frac{5}{16}$" dia. x 1" len. stainless steel
Lead length: 12"

RECOMMENDED TORQUE LOADING FOR AVERAGE APPLICATIONS FOR ALL GEARED MOTORS

- UNIFORM TORQUE LOADS
  Torque Rating 100% of Available Motor Torque
- VARIABLE TORQUE LOADS
  Torque Rating 67% of Available Motor Torque
- INTERMITTENT TORQUE LOADS
  Torque Rating 50% of Available Motor Torque
- SHOCK AND RECOIL LOADS
  Torque Rating 40% of Available Motor Torque

AVAILABLE MOTOR TORQUE OZ. IN. FOR ALL GEARED MODELS (115 VAC. 60 Hz.)

STOCK MOTORS	Maximum Gear Train Loading Do Not Exceed	RPM																											
		⅓	½	1	1½	2	2½	3	4	5	6	8	10	12	15	16	20	24	25	30	32	33⅓	40	48	50	60	64	80	100
MODEL SM	100 oz. in.		80	40		20		13	10	8	6.6		4		2.6					1.3						.66			
MODEL CA		300	200	100	66	50	40	33	25	20	16	12	10	8.3	6.6	6.2	5	4.1	4	3.3	3.1	3	2.5	2	2	1.6	1.5	1.2	1
MODEL DA				150		75			37		25	18	15	12			7.5			5						2.5			
MODEL EA				150		75			37		25	18	15	12			7.5			5						2.5			
MODEL GA	600 oz. in.			600		300		200	150	120	100		60							20						10			6
MODEL PC-SM	100 oz. in.		80	40		20		13	10	8	6.6		4		2.6					1.3						.66			
MODEL AR-SM				40		20		13	10	8	6.6		4		2.6					1.3						.66			
MODEL PC-DA				120		60			30		20	15	12	10			6			4						2			
MODEL AR-DA				100					25		16		10							3.3						1.6			
MODEL K	250 oz. in.			250	200	150		100			50 118 *		30 72 *		20 48 *				12 29 *	13 27 *						15			8.9

STOCK MOTORS	Maximum Gear Train Loading Do Not Exceed	RPM									
		120	150	160	200	240	300	400	600	800	1000
MODEL SM	100 oz. in.										
MODEL CA		.83	.66	.62	.5	.41		.25	.16	.12	.1
MODEL DA		1.2									
MODEL EA		1.2									
MODEL GA	600 oz. in.	5	4				2				
MODEL PC-SM	100 oz. in.										
MODEL AR-SM											
MODEL PC-DA		1									
MODEL AR-DA											
MODEL K	250 oz. in.		5.9		4.4		2.9				

NOTES:

(A)—All Hurst motors are lubricated and sealed at the factory. No maintenance lubrication is required. Specially selected synthetic lubricants are used, as requirements vary at different load bearing surfaces.
Properties such as temperature range, viscosity, extreme pressure lubricity, compatibility, etc. are considered and the proper lubricant is selected to provide the optimum characteristics for each point.

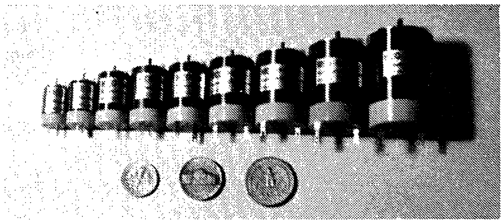
(B)—The speeds of 6 RPM, 10 RPM, 15 RPM, 25 RPM and 30 RPM are available in two torque ranges in the Model K motor, as noted with asterisk.

NOTE: For other speeds, frequencies, voltages or special requirements contact Factory.

HURST Mfg. Corp. reserves the right to make changes without notice, in materials, specifications, prices, and to discontinue models, without obligation.

HICO-MAXON

MINIATURE PRECISION DC MOTORS

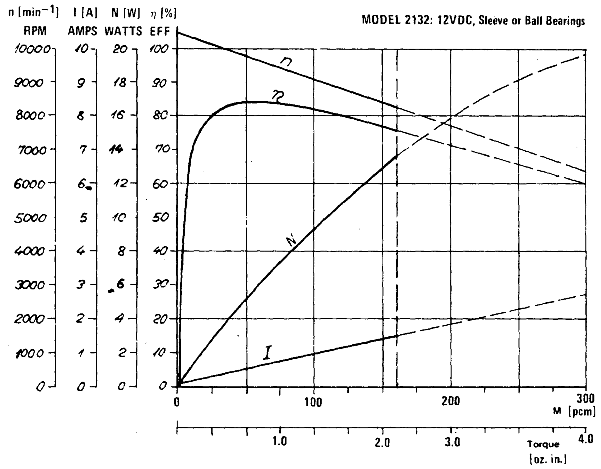


OUTSTANDING FEATURES:

- Moving Coil, ironless low inertia armature.
- 9 sizes of optimum Swiss quality.
- Extra long life, 3,000–10,000 hours.
- Efficiency, 80–90%, depending upon type.
- Large sleeve or ball bearings available.
- Highest torque-to-size available.
- 5–13 bar commutator; trifurcated brushes.
- –20°C. to +65°C.; 1,000–20,000 rpm.
- Diameters from .47″ to 1.3″.

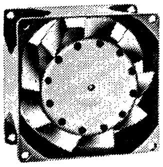
INFINITE APPLICATIONS: Cassette & servo drives; battery or DC powered instruments, recorders, etc.; even as quality tach generators.

TYPICAL CHARACTERISTIC CURVES:

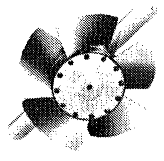


HICO-EBM

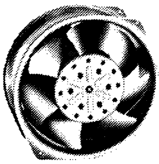
GREATER COOLING RELIABILITY



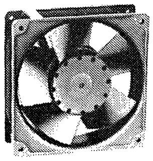
MINIKOOL – AS 75–2W



UNIFAN AS 113–2W



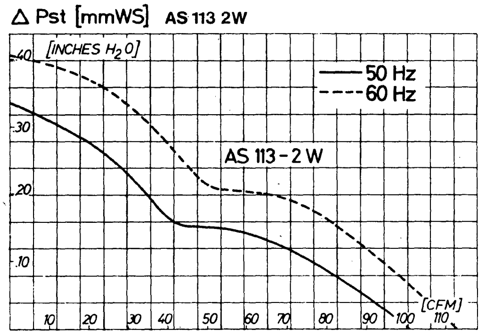
JETSTREAM – AS 130–2W



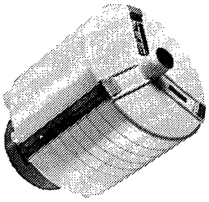
HIKOOL AS 113-21

- Higher performance in small packages. QUIETER.
- ALL-METAL, totally dust & magnetically shielded construction.
- Larger ball and sleeve PERMILUBE BEARINGS.
- Enclosed coils.
- 50/60 Hz & 120/220 VAC.
- Impedance protected.
- Completely INTERCHANGEABLE.
- Competitively priced.

TYPICAL AIR PERFORMANCE CHARACTERISTICS

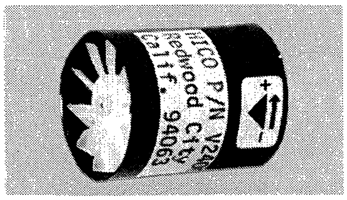


HICO-ACI



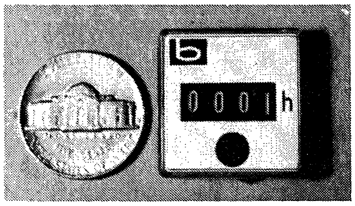
- Multi-stage, 2-8, EXHAUSTER-BLOWERS.
- Higher efficiency.
- Long life ball bearings.
- QUIETER, glass resin molded cases.
- Ideal tape or film air handler, medium vacuum or pressure sources.

HICO MICRO-KOOL



- 1″ Diameter, Tubeaxial Fan; 1-1/4″ long.
- 4-6 CFM; 2,000+-hour LIFE; 6 configurations.
- Low commercial prices.
- APPLICATIONS: COOLING electronics, optics. EXHAUSTING. As a GENERATOR: Air Sampling & Monitoring.

HICO-BAUSER



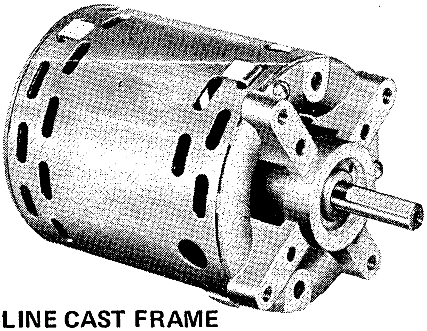
- Elapsed Time Indicator; SUBMINIATURE.
- 0-9999 hours with running indicator.
- Under 1″ sq. X 3″ deep. 120 VAC/60 Hz, 2W.
- 60°C.; Molded case; 1-year guarantee.
- Handsome grey-silver. Commercially priced.

HICO

Horizons International
E. Fuller at Middlefield
Redwood City, CA 94063
PH: (415) 369-7900 TWX: 910-378-5429

Contact local agents or write for specifications.

COMPUTER-RATED FRACTIONAL HORSEPOWER MOTORS



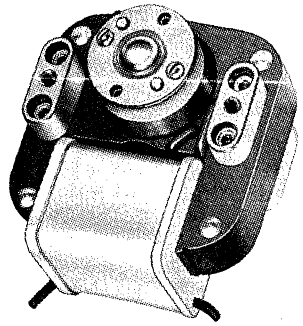
B-LINE CAST FRAME INDUCTION MOTORS
Permanent Capacitor
Reluctance Synchronous

DC SHUNT MOTORS

When Howard rates a motor 1/20 hp, we're not about to under-power your system with a 1/25 hp motor. We always True Rate our fhp motor this way. Our computer guarantees it . . . and your products benefit.

A-LINE SHELL FRAME INDUCTION MOTORS
Permanent Capacitor
Capacitor Start
Reluctance Synchronous
Hysteresis Synchronous

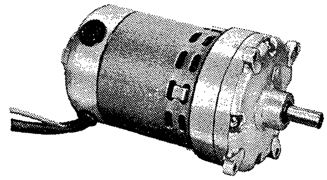
SHADED POLE MOTORS
U-Line Unit Bearing
K-Line Skeleton—Conventional Bearing

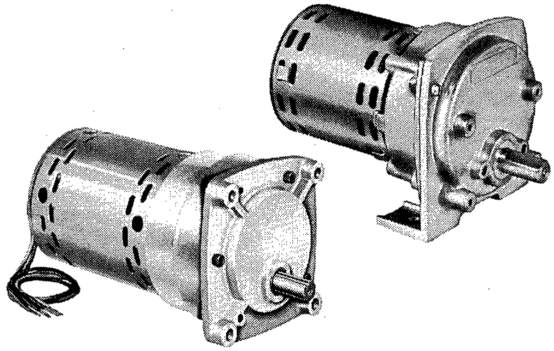


UNIVERSAL MOTORS
B-Line Cast Frame
D-Line Cast Case
A-Line Shell Frame

MANY STANDARD MODELS AVAILABLE FROM STOCK

COMPUTER-MATED GEARMOTORS



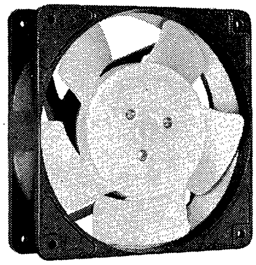


Howard gear trains and motors are computer-mated and computer-rated. This means that when Howard matches and rates a gearmotor, it's a true rating for your job. It means, too, that no Howard Gearmotor will ever destruct or destroy itself . . . or your system.

INDUCTION • UNIVERSAL AC/DC
RELUCTANCE SYNCHRONOUS • SHADED POLE

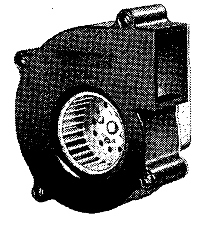
MANY STANDARD MODELS AVAILABLE FROM STOCK

LONG LIFED FANS & BLOWERS



Howard Fans and Blowers have an engineered lifespan of 10 years. Yet our customers report the fans are still blowing strong 12 or even 14 years after installation. More than 10 million successful installations.

- Unit Bearing motor
- Indestructible nylon blades
- UL yellow card listing
- All metal construction
- Fans standard mount on 4-1/8" centers

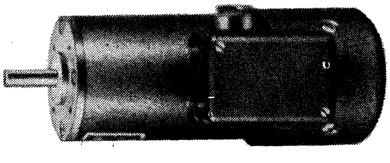


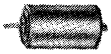
MANY STANDARD MODELS AVAILABLE FROM STOCK

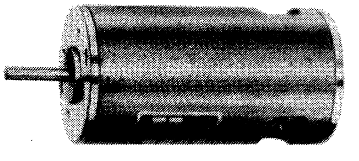
CALL OR WRITE
FOR COMPLETE CATALOGS
AND TECHNICAL ASSISTANCE

HOWARD
MSL
HOWARD INDUSTRIES
A DIVISION OF MSL INDUSTRIES, INC.
2420 18th STREET, RACINE, WISCONSIN 53403
414-632-2731 TWX 910-271-2387

MOTORS • MFG. BY ITT







3 ϕ

Reversible, asynchronous motor, high starting torque with ball bearings. 3000 RPM 2 pole, 1500 RPM for 4 pole. Cooled by built-in fan, steel case, continuously rated @ 220V standard, 110V available.

Motor No.	DR42	DR52	DR62	DR72
Dia. x Length	1.5 x 3+	2 x 4+	2.5 x 4+	3 x 6
Shaft Dia.	.200	.200	.275	.393
Torque In.-Oz.	0.5 . . . 4.2	1 . . . 9	2.7 . . . 20	Max. 26
Output Watts	0.5 . . . 0.8	1 . . . 18	2.5 . . . 44	Max. 25/44

SINGLE ϕ

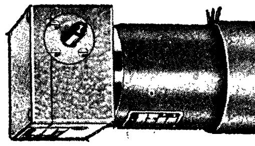
Reversible, capacitor start/run asynchronous motor, star or delta coils. High start torque, 3000 RPM 2 pole, 1500 RPM 4 pole.

Motor No.	KD42	KD52	KD62	KD72
Dia. x Length	1.5 x 3+	2 x 4+	2.5 x 4+	3 x 6+
Shaft Dia.	.200	.200	.275	.393
Rated Torque	0.13 . . . 2.8	.55 . . . 7	1.4 . . . 18	16 . . . 36
Output Watts	0.12 . . . 5.5	0.5 . . . 13	1.5 . . . 35	16 . . . 72

SYNCHRONOUS

Reversible, capacitor start/run single phase permanent magnet squirrel cage armature, ball bearing, built-in fan, steel housing, no slip multi-slotted stator. 3600 RPM for 2 pole, 1800 RPM for 4 pole.

Motor No.	SY42	SY52	SY62
Dia. x Length	1.5 x 3+	2. x 4+	2.5 x 4+
Shaft Dia.	.200	.200	.275
Rated Torque	1.3 . . . 2.7	2.2 . . . 7.2	3.9 . . . 11
Input Power W.	19 . . . 25	15 . . . 45	35 . . . 70



All listed motors are available with gear boxes. Spur gear or worm gear in-line or right angle drive.

HI-PERFORMANCE BATTERY MOTORS

Iron free armature. Fast start and stop, low inertia, highly efficient @ 50% of input.

Motor No.	GK22	GK26	GK32
Dia. x Length	.8 x 1.4	1 x 2.3	1.3 x 3
Shaft Dia.	.078	.078	.118
RPM No Load	12000	12000	15000
Output Watts	2	4	7
Voltage (Specify)	3 to 24	3 to 27	6 to 60

LOW COST DC

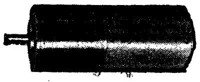
Automatically produced iron shielded motor, printed circuit or standard commutator. Varying iron segment lengths.

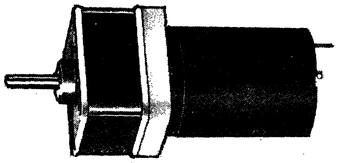
Motor No.	GVE30 x 5/5	GVE30 x 10/3	GVE30 x 10/5	GVE30 x 16/5	GVE30 x 20/5	GVE30 x 25/5
Dia. x Length	.87 x 1.2	.87 x 1.3	.87 x 1.6	.87 x 1.8	.87 x2	.87 x 2.2
Shaft Dia.	.078	.078	.078	.098	.098	.098
Torq. Max. In.-Oz.	.35	.48	.76	1.2	1.5	1.8
RPM Max.	8000	6000	10000	10000	10000	10000
Voltage (Specify)	3 to 24	3 to 24	3 to 24	3 to 24	3 to 24	3 to 24

HIGH QUALITY DC

GR motors, ball bearing, permanent magnet, dynamically balanced, steel housed. All rated at 3000 RPM.

Motor No.	GR21 x 15	GR26 x 30	GR32 x 45	GR42 x 45	GR52 x 60
Dia. x Length	.82 x 1.7	1. x 2.6	1.3 x 3.8	1.7 x 3.8	2 x 4.5
Shaft Dia.	.118	.118	.196	.196	.196
Input Max. Watts	1.3	2.8	10	10	32
Output Power W	0.7	1.2	4.5	5	20
Torque In.-Oz.	.32	.59	2.08	2.36	9.02
Voltage (Std.)	9. 12, 24	12, 24	24, 60	24, 110	60, 220



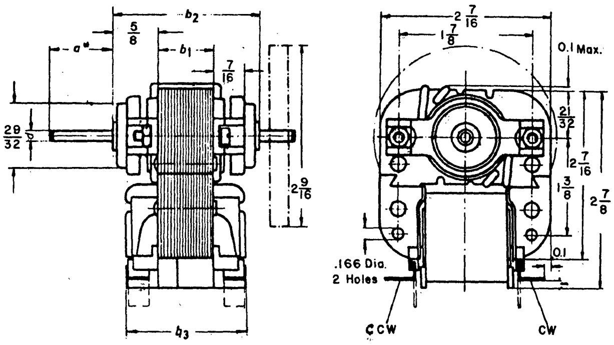


All DC motors are available with spur or worm gear reducers. Ratios varying from 5 to 75000:1 available. Also available are speed control by tach-generators or contact governor.

SHADED POLE ASYNCHRONOUS MOTOR

Single Phase, 2 pole self-starting asynchronous motor, bronze bushing with permawick lubrication. Motors are maximum temperature rise of 70°C with 1.1 times normal voltage with unhindered heat dissipation. All parts corrosion resistant. Standard designs for 110 or for 220 volt operation (specify). 60 Hz continuous duty. Fans available. Clockwise or CCW rotation available. Speed no load 3400 RPM.

Motor No.	Dimensions b_1	b_2	b_3	Shaft Dia.	Rated Torque In.-oz.
EM3010	.4	1.45	1.3	.177	.39- .53
EM3015-01	.6	1.85	1.45	.177	1.0 - 1.6
EM3020	.8	2.2	1.65	.177	1.4 - 3.3
EM3025	1.0	2.4	1.85	.177	2.1 - 4.5
EM3030	1.2	2.7	2.1	.177	4.3 - 5.9
EM3038	1.5	3.0	2.4	.268	5.4 - 7.7
EM3045	1.8	3.2	2.6	.296	6.0 -10.8



SEE ITT JENNINGS RELAYS & SWITCHES

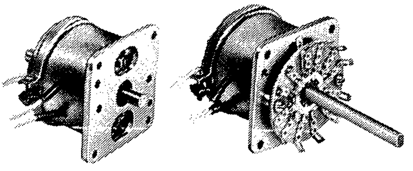
ITT Jennings Industrial Products
Division of International Telephone and Telegraph Corporation
P.O. Box 1278 — 970 McLaughlin Avenue
San Jose, California 95108
Phone: (408) 292-4025
TWX: 910-338-0159 — TELEX: 34-6311

© ITT Jennings 1969 — Printed in U.S.A.

JENNINGS ITT

LEDEX STEPPING MOTORS, SERIES 50

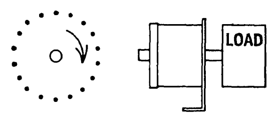
torque to 246 ounce inches



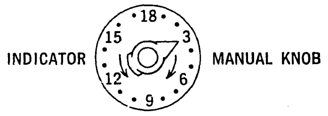
New Self-Pulsing Models

New Series 50/12S, 12-position, step motor has built-in pulsing contacts, so you simply apply DC voltage to make it step. Self-pulsing model is also available with notch control deck and flatted shaft extension. Add switch decks and you have a combination power positioner and self homing stepping switch. Details in Catalog D-7001.

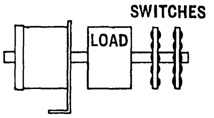
With a **unidirectional** Series 50 you can . . .



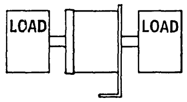
drive your load remotely through a series of short steps and stop at any one of 10, 12, 18, or 24 positions.



or add a knob for manual reset in either direction . . .

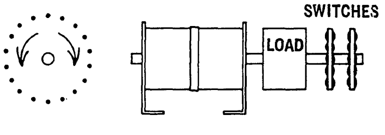


or add rotary switches for a combination power positioning drive and a step or program switch

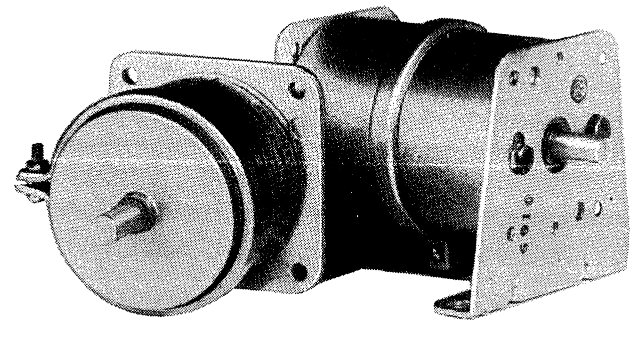


or use shaft extensions on each end to direct-couple two loads and drive them in the same direction at the same time.

With a **bidirectional** Series 50 you can do all this . . . plus **remotely position** loads CW or CCW.

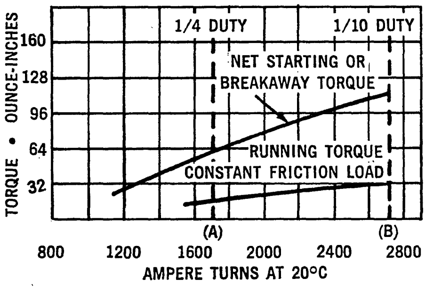


All working parts are completely enclosed. Minimum life is 3 million steps. For bidirectional, 3 million in each direction. And, the Series 50 works on simple square wave input pulses . . . so you don't need expensive logic circuitry.

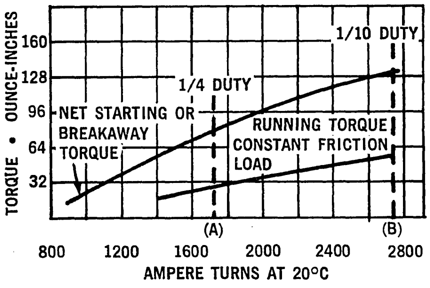


72 stock models for quick prototype starts

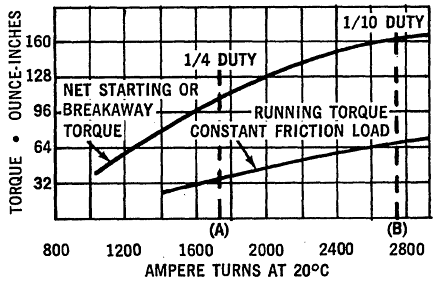
10 POSITION, 36° STEP INCREMENTS



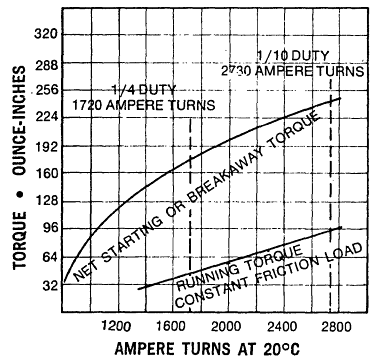
12 POSITION, 30° STEP INCREMENTS



18 POSITION, 20° STEP INCREMENTS
24 POSITION, 15° STEP INCREMENTS



36 POSITION, 10° STEP INCREMENTS



Top curve in each graph shows net starting or breakaway torque, typical when friction component of load is high in beginning — as in driving a valve. **Lower** curve applies when friction load is consistent throughout stroke. Dotted lines "A" show output at 1/4 duty, 84 watts; dotted lines "B" 1/10 duty at 210 watts.

Highlights	Unidirectional	Bidirectional
Voltage	6 to 220 VDC	6 to 220 VDC
Length	1.9″	2.5″
Width	$2\frac{1}{16}$″ (Dia.)	2.5″
Height	$2\frac{1}{8}$″ (Sq. plate)	$2\frac{13}{32}$
Weight	14 oz.	24 oz.
Price, 1-9	\$23-\$24	\$37-\$39
Price, 1000 up	\$10-\$12	\$16-\$18

Ledex Series 50 stepping motors are engineered for high torque-to-size, uniform stepping accuracy, construction simplicity and economy. Newly developed tooth clutch drive gives positive grip stepping action (no slip) and doubles as a built-in electromechanical clutch brake to eliminate the natural tendency of overdriving at the end of a step.

Catalog D-7000 lists complete details on 72 stock models, performance data and engineering considerations. We'll gladly send it to you. If you prefer, send us details of your positioning application and we'll come back with a recommended solution.

LEDEX®

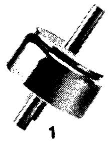
LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891

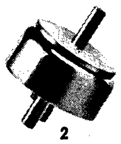
LEDEX STRAIGHT PULL DC SOLENOIDS

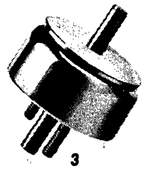
You name the job.
Short, medium or long stroke. High speed.
Tight space. Unusual load. Ledex has the
solenoid for you, usually on the shelf. Expert design
assistance for your toughest custom requirements.

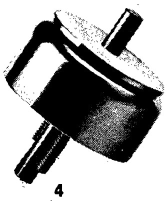
Pancake shaped Ledex push/pull solenoids are built for high force to size and fast response. Better than 10ms response. Form factor minimizes size, provides maximum pole face surface for best efficiency. Two types available. Flat face is for short stroke, rapid response. Conical face gives more mid-range punch.

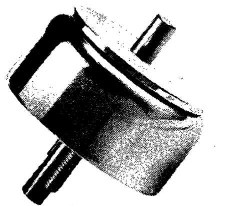
0

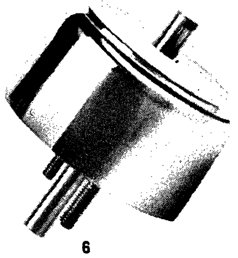

1


2


3


4


5

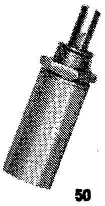

6

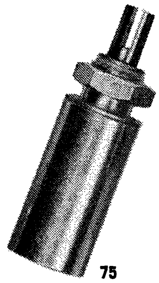
TYPICAL OUTPUT, 1/10 DUTY

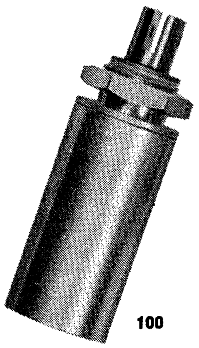
Model	0		1		2		3		4		5		6	
Size	.75″D x ½″		1″D x 17/32″		1.2″D x 27/64″		1.3″D x 11/16″		1.6″D x 55/64″		1.9″D x 1 1/64″		2.3″D x 1 21/64″	
	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face	Conical Face	Flat Face
Stroke (In.)	.020	—	.020	.010	.020	.010	.020	.010	.020	.010	.020	.010	.020	—
Force (Lbs.)	4.4	—	7.8	17	11	23	16	35	17	55	35	110	85	—
Stroke (In.)	.120	—	.120	.060	.120	.060	.120	.060	.200	.100	.250	.100	.250	—
Force (Lbs.)	1	—	2.4	3.3	3.3	4.5	8	10	6	12	16	20	52	—
Weight	1½ oz.		1½ oz.		2¼ oz.		3¾ oz.		6 oz.		10 oz.		1 lb. 5½ oz.	

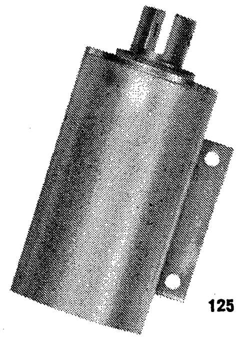
(For detail performance curves, ask for Catalog C-1100)

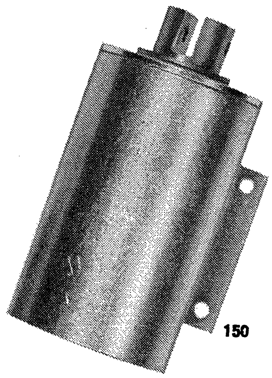
Quality engineered for efficiency and long term dependability, the Ledex long stroke solenoid has a built-in impact cushion pad to absorb energy at the end of the power stroke. For smooth travel and long wear, the solenoid plunger is electroless nickel plated. It rides in a smooth bushing track designed for positive alignment and low friction. Slotted and cross drilled plungers on all stock models simplify load attachment. Off-the-shelf models available for 12, 28 and 100 VDC operations.


50


75


100


125


150

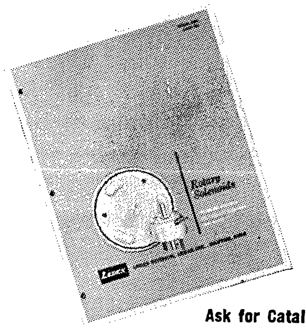
TYPICAL OUTPUT 1/10 DUTY

Model	Size 50	Size 75	Size 100	Size 125	Size 150
Size	½″ x 1″	¾″D x 1½″	1″D x 2″	1¼″D x 2¼″	1½″D x 2½″
Force, .050 Stroke	15 oz.	3 lbs.	7 lbs.	11.5 lbs.	16.5 lbs.
Force, .750 Stroke	——	.6 lbs.	2 lbs.	4 lbs.	7 lbs.
Shaft Diameter	.187	.312″	.437″	.500″	.625″
Mounting	Threaded Bushing	Thr'd Bushing	Thr'd Bushing	Saddle	Saddle
Weight	24 Grams	3 oz.	6¾ oz.	9 oz.	1 lb. ½ oz.

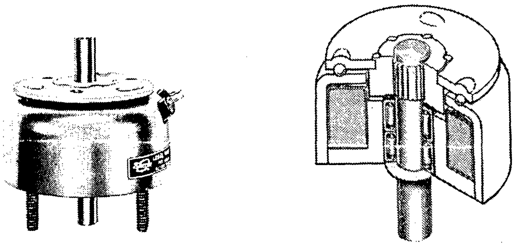
When it comes to actuating, Ledex has both the people and products to give you the quickest and best solution. There's a wide choice of stock models for a fast start on your prototype. And our expert application staff is always glad to custom engineer to your exact stroke, force, speed and size requirements. Other models (not shown) are available on made-to-order basis with force outputs in excess of 350 pounds. Ask for Catalog C-1100.

LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891

LEDEX ROTARY SOLENOIDS



Ask for Catalog C-1000



252 stock models for quick prototype starts
Fast, direct rotary action

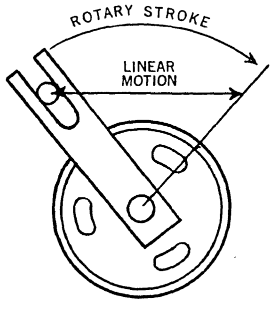
Ledex Rotary Solenoids step, turn, pull, push, index, hammer, punch or trigger — whenever there's a need for fast and dependable direct rotary action. Known for high force-to-size, ability to resist shock. Family of 8 basic sizes with right and left hand strokes from 25 to 95 degrees. Torque to 117 pound-inches. Wide choice of stock models offer economy and quick starts on prototypes. LIFE: 100,000,000 actuations with special endurance engineered models.

GROSS TORQUE IN POUND-INCHES

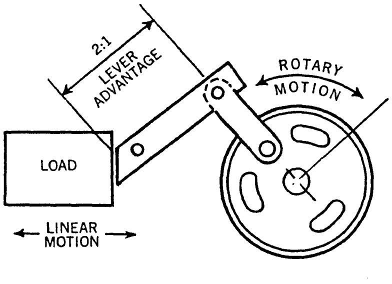
Rotary Stroke			25°		35°		45°		67½°		95°	
Duty Cycle			1/10	1/20	1/10	1/20	1/10	1/20	1/10	1/20	1/10	1/20
Size	Diam. (in.)	Ht. (in.)										
1E	1	⅝	.8	1.1			.43	.62				
2E	1⅛	21/32	1.4	1.7	1.1	1.3	.72	.89				
3B*	1 5/16	⅞	2.7	3.2	2.0	2.3	1.4	1.7	.65	.8		
3E		51/64	2.7	3.2	2.0	2.3	1.44	1.8	.70	.89		
4E	1 9/16	61/64	4.5	5.2	3.1	3.5	2.6	3.1	1.6	1.9	1.0	1.2
5B*	1⅞	1 13/64	8.3	10.0	6.9	8.3	5.0	6.0	3.3	4.0	1.6	1.9
5S		1 3/64	12.1	13.2	7.8	9.2	6.3	6.9	3.9	4.9	1.9	2.6
6S	2¼	1 27/64	27.8	30.6	18.6	20.5	11.0	12.1	8.8	9.7	5.2	5.7
7S	2¾	1 55/64	42.4	46.6	38.0	42.0	29.8	32.8	17.5	19.3	10.5	11.6
8S	3⅜	2 5/16	98.0	117	64.0	77.0	54.0	65.0	29.0	35.0	17.0	20.0

* 3B and 5B have random wound coils; all other are precision wound.

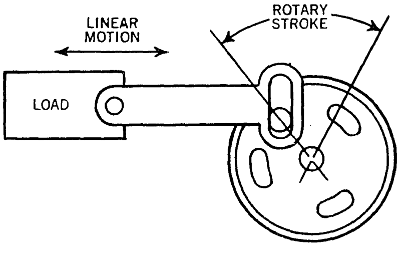
Rotary Solenoid as a Linear Actuator



SHAFT BAR LINK



ARMATURE LEVER



ARMATURE DRIVE PIN

When the stroke length is beyond the range of Ledex straight pull solenoids, a rotary solenoid may be the best solution.

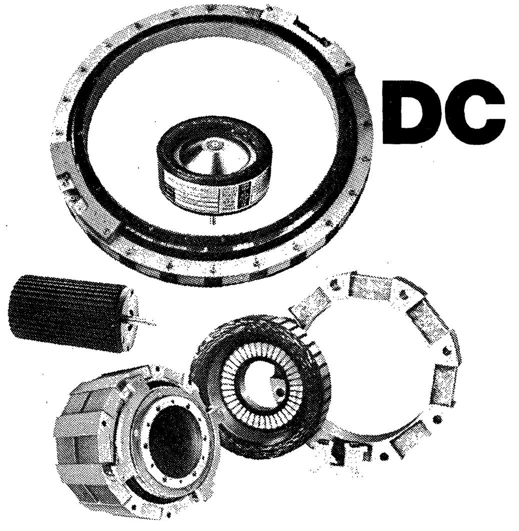
Ledex rotary solenoids have raceways coined in the armature and stator. With precision ball bearings riding on inclined raceways, the solenoid provides direct, almost friction-free rotary motion. In the beginning of the stroke, where the output of a linear solenoid is low, the raceways are steep. Toward the closed end, where the magnetic attraction reaches maximum force, the raceways taper off. The effect is to evenly distribute the force.

Ledex solenoids can help you get a lot of work done in places where you don't have much room. We make both push/pull and rotary solenoids in a wide variety of shapes and sizes to solve just about any actuating problem you have.

Call Ledex when you need a lot of power in a small space to push, pull, turn, twist, step, index, hammer, punch or trigger. For a quick start on your prototype, choose from 252 different stock model designs. Or, send details and we'll custom design a space-saving solenoid for you.

LEDEX

LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891



Magnedyne

DC TORQUE MOTORS

for accurate, high torque positioning and speed control

D.C. TORQUE MOTORS — VARNISHED

MODEL	Peak Torque (oz.-in.)	Power @ Peak Torque (watts)	No-Load Speed (rad./sec.)	Elect. Time Constant (sec.)	K_M $\frac{\text{oz.-in.}}{\sqrt{\text{watts}}}$	O.D. (in.)	I.D. (in.)	Width (in.)	Weight (oz.)	Inertia (oz.-in.-sec.^{2})	Breakaway Torque (oz.-in.)
401-06	30	80	360	.0003	3.34	2.000	.500	1.500	5.5	.0015	2.0
401-01	60	110	245	.00035	5.7	2.000	.500	1.875	9.2	.0025	2.5
401-07	90	145	215	.0004	7.45	2.000	.500	2.250	13.0	.0035	3.0
401-08	120	170	190	.0005	9.2	2.000	.500	2.625	16.5	.0045	3.5
402-06	100	92	125	.001	10.4	3.070	.427	1.750	25	.011	3.0
402-05	200	125	84	.0013	17.9	3.070	.427	2.450	45	.02	5.5
402-14	300	155	69	.0016	24.0	3.070	.427	3.150	20.0	.029	8.0
402-15	400	190	64	.0019	29.2	3.070	.427	3.850	23.5	.038	10.5
218-04	90	80	120	.0007	9.5	3.250	.625	1.500	18	.011	1.3
218-08	180	115	85	.001	16.8	3.250	.625	2.050	34	.02	2.0
	(lb.-ft.)	(watts)	(rad./sec.)	(sec.)	$\frac{\text{lb.-ft.}}{\sqrt{\text{watts}}}$	(in.)	(in.)	(in.)	(lb.)	(lb.-ft.-sec.^{2} x 10^{3})	(lb.-ft.)
235-01	1	90	63	.001	.105	3.907	.875	1.680	1.65	.218	.035
235-02	2	120	42	.0014	.182	3.907	.875	2.245	3.1	.364	.045
235-03	3	150	35	.0016	.245	3.907	.875	2.810	4.4	.51	.065
235-04	4	180	31	.0018	.298	3.907	.875	3.375	5.9	.665	.075
235-05	5	210	29	.002	.346	3.907	.875	3.940	6.9	.8	.085
235-06	6	240	28	.0022	.388	3.907	.875	4.505	8.6	.95	.095
223-01	15	330	16.2	.0027	.825	9.375	5.000	2.937	18.5	22.0	.15
223-02	30	420	10.3	.0041	1.46	9.375	5.000	3.937	30	32.0	.31
223-03	45	510	8.3	.0051	2.0	9.375	5.000	4.937	38	42.0	.46
223-04	60	600	7.35	.0061	2.45	9.375	5.000	6.375	47	54.0	.62
232-01	75	475	4.6	.0067	3.4	20.5	16.0	2.97	45.5	380.0	.65
232-02	150	610	3.0	.0095	6.1	20.5	16.0	3.97	76	640.0	1.3
232-03	225	775	2.5	.011	8.1	20.5	16.0	4.97	106	890.0	2.0
232-04	300	890	2.2	.012	10.1	20.5	16.0	5.97	137	1150.0	2.6

D.C. TORQUE MOTORS — ENCAPSULATED

MODEL	Peak Torque (oz.-in.)	Power @ Peak Torque (watts)	No-Load Speed (rad./sec.)	Elect. Time Constant (sec.)	K_M $\frac{\text{oz.-in.}}{\sqrt{\text{watts}}}$	O.D. (in.)	I.D. (in.)	Width (in.)	Weight (oz.)	Inertia (oz.-in.-sec.^{2})	Breakaway Torque (oz.-in.)
401-11	30	80	360	.0003	3.34	2.000	.625	.63	6	.0012	1.0
401-12	60	110	245	.00035	5.7	2.000	.625	1.00	10	.002	1.0
401-13	90	145	215	.0004	7.45	2.000	.625	1.38	14	.003	1.5
401-14	120	170	190	.0005	9.2	2.000	.625	1.75	16	.004	2.0
408-01	120	70	78	.0008	14.3	3.280	1.000	.920	18	.016	4.5
408-02	240	94	53	.0011	24.8	3.280	1.000	1.460	30	.026	7.0
408-03	360	120	45	.0013	32.8	3.280	1.000	1.990	42	.036	9.0
408-04	480	145	40	.0017	40.0	3.280	1.000	2.520	54	.047	11.0
	(lb.-ft.)	(watts)	(rad./sec.)	(sec.)	$\frac{\text{lb.-ft.}}{\sqrt{\text{watts}}}$	(in.)	(in.)	(in.)	(lb.)	(lb.-ft.-sec.^{2} x 10^{-3})	(lb.-ft.)
403-04	1.0	90	63	.001	.105	3.907	1.640	.920	1.6	.218	.035
403-05	2.0	120	42	.0014	.182	3.907	1.640	1.460	2.65	.364	.045
403-06	3.0	150	35	.0016	.245	3.907	1.640	1.990	3.7	.51	.065
403-07	4.0	180	31	.0017	.298	3.907	1.640	2.520	4.8	.665	.075
412-01	1.45	110	48	.0012	.153	4.500	2.240	.920	2.0	.55	.042
412-02	2.9	145	36	.0017	.232	4.500	2.240	1.460	3.3	.91	.056
412-03	4.35	185	30	.002	.264	4.500	2.240	1.990	4.5	1.27	.07
412-04	5.8	220	27	.0022	.390	4.500	2.240	2.520	5.9	1.66	.081
414-01	2.0	130	45	.0014	.175	5.125	2.900	.920	2.5	.98	.049
414-02	4.0	175	30	.002	.300	5.125	2.900	1.460	3.8	1.64	.07
414-03	6.0	220	26	.0023	.400	5.125	2.900	1.990	5.3	2.3	.093
414-04	8.0	265	23	.0026	.490	5.125	2.900	2.520	7.0	3.0	.097
416-01	2.6	150	40	.0016	.213	5.750	3.500	.920	2.9	1.76	.053
416-02	5.25	200	26	.0023	.370	5.750	3.500	1.460	4.4	2.95	.08
416-03	7.9	250	22	.0027	.500	5.750	3.500	1.990	6.2	4.14	.096
416-04	10.5	305	20	.003	.600	5.750	3.500	2.520	8.3	5.5	.106
418-01	3.35	165	34	.0018	.26	6.380	4.110	.920	3.4	3.0	.06
418-02	6.75	225	23	.0026	.45	6.380	4.110	1.460	5.0	5.0	.093
418-03	10.0	285	20	.003	.59	6.380	4.110	1.990	7.0	7.0	.10
418-04	13.5	340	18	.0034	.73	6.380	4.110	2.520	9.4	9.0	.13
420-01	4.12	185	31	.002	.30	7.000	4.730	.920	3.8	4.8	.067
420-02	8.25	250	21	.0029	.52	7.000	4.730	1.460	5.6	8.0	.09
420-03	12.4	315	18	.0033	.70	7.000	4.730	1.990	7.3	11.2	.12
420-04	16.5	380	16	.0038	.84	7.000	4.730	2.520	10.6	14.6	.17
422-01	5.1	205	28	.0022	.356	7.630	5.360	.920	4.2	7.4	.10
422-02	10.2	275	19	.0032	.615	7.630	5.360	1.460	6.2	12.4	.076
422-03	15.3	345	16	.0037	.82	7.630	5.360	1.990	8.6	17.3	.16
422-04	20.4	420	15	.0042	1.0	7.630	5.360	2.520	11.8	22.6	.20
424-01	6.0	220	26	.0025	.40	8.245	5.360	.920	4.7	10.9	.083
424-02	12.0	300	18	.0035	.695	8.245	5.360	1.460	6.8	18.2	.12
424-03	18.0	380	15	.004	.925	8.245	5.360	1.990	9.5	25.5	.18
424-04	24.0	455	13	.0046	1.13	8.245	5.360	2.520	12.9	33.2	.24
426-01	7.2	240	23	.0027	.465	8.860	6.590	.920	5.1	15.7	.095
426-02	14.3	325	16	.0038	.795	8.860	6.590	1.460	7.4	26.2	.15
426-03	21.2	410	14	.0044	1.05	8.860	6.590	1.990	10.3	36.8	.22
426-04	28.6	495	12	.005	1.28	8.860	6.590	2.520	14.0	48.0	.30
428-01	8.4	260	22	.003	.52	9.500	7.200	.920	5.5	21.8	.093
428-02	16.7	350	15	.0043	.89	9.500	7.200	1.460	8.0	36.4	.18
428-03	25.0	440	12	.005	1.19	9.500	7.200	1.990	11.1	51.0	.26
428-04	33.4	530	11	.0055	1.45	9.500	7.200	2.520	15.1	66.5	.35

2 types to choose from

Industrial Type — Low cost, varnished construction. Axially displaced commutator with cartridge-type brushes simplify installation and provide exceptionally long brush life.

Military Type — Encapsulated, wrap-around commutator construction minimizes size and weight.

Advantages

High Efficiency — High energy, permanent magnets used in a unique field structure and an efficient, multi-pole armature produce exceptionally high torque-to-power and torque-to-weight ratios.

Torque Applied Directly To Load — Wrap-around rotor construction permits the rotor to be mounted directly to, or around, shafts or hubs. In many applications this feature eliminates gear trains and their associated backlash problems and results in extremely high performance servo systems.

Housed or frameless models — Most Magnedyne torque motors are available in both a housed version or a space-saving frameless version for integration into customer-designed equipment.

Wide application

- Position and velocity servo systems
- Antenna drives
- Memory drives
- Rate-of-turn tables
- Control moment gyros
- Rocket motor thrust vectoring system
- Precision tape recorders
- Film drives
- Machine tool controls
- Throttle control actuators
- Linear and rotary servo actuators

. . . Anywhere high torque positioning or speed control is required.

Other Magnedyne products — General-purpose AC motors, hysteresis synchronous motors, motor/tachometers, solid state amplifiers for driving DC torque motors, actuators.

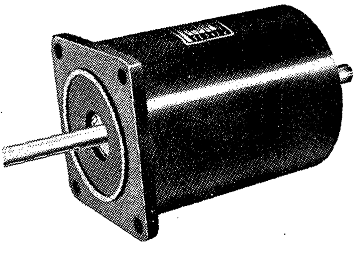
magnedyne inc.
a subsidiary of Axial Corporation
5580 El Camino Real, Carlsbad, California 92008

McLEAN COMPUTER DESIGNED PRECISION INSTRUMENT MOTORS

All motors feature: air-cooled bearings to reduce temperature and extend life; dimensionally stable aluminum alloy motor frames; rotors that exceed requirements of MIL-M-17059 to assure extra-smooth running; and other quality features.

HYSTERESIS SYNCHRONOUS MOTORS

OUTPUT PERFORMANCE ON 115 VOLTS, 60 Hz.			
FRAME	**RPM**	**PULL-OUT TORQUE**	**CAPACITOR**
47	1200	15 oz-in.	3 Mfd.
47	1800	14 oz-in.	3 Mfd.
47	3600	12 oz-in.	.5 Mfd.
59	1200	55 oz-in.	8 Mfd.
59	1800	60 oz-in.	6 Mfd.
59	1200/3600	45/25 oz-in.	9 Mfd.



REQUEST DATA SHEET

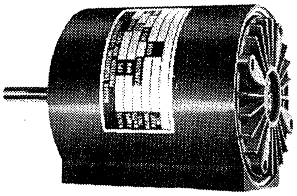
FEATURES

- The starting torque approximates the running torque. Self-starting.
- The motor runs at synchronous speed, but is not phase polarized as are the polarized synchronous motors shown elsewhere.
- The direction of rotation of the shaft is reversible externally.
- Dual voltage and/or dual speed motors available.

POLARIZED SYNCHRONOUS MOTORS

PERFORMANCE ON 115 VOLTS, 60 Hz., WITH INTERNAL FAN		
FRAME USED	**47 FRAME**	**59 FRAME**
Speed	3600 RPM	3600 RPM
Line current	1.2 amp.	1.5 amp.
Capacitor required	5 Mfd.	8 Mfd.
Stall torque	10-14 oz-in.	27 oz-in. max.
Pull-in torque	15-18 oz-in.	25 oz-in.
Pull-out torque	15 oz-in.*	14 oz-in.*
Reversible	yes	no

*Must not be exceeded for continuous duty.



REQUEST DATA SHEET

FEATURES

- Ideal where repeated phase synchronization is required between line voltage and shaft position for one or more motors.
- Single or dual voltage, but only single speed, motors available.
- Currently available for 3600 rpm only at 60 Hz. Other speeds and frequencies available when the need materializes.

INDUCTION MOTORS

PSC and 3-PHASE

McLEAN 47 FRAME MOTOR

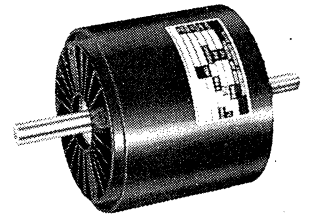
OUTPUT PERFORMANCE ON 115 VOLTS				
RPM	**WATTS**	**HERTZ**	**VENTILATION**	**PHASE**
1600	30	60	totally enclosed	single
1600	40	60	open, with circulation	single
3200	60	60	totally enclosed	single
3200	80	60	open, with circulation	single
5400	80	400	open, with circulation	single
5400	100	400	open, with circulation	three

McLEAN 59 FRAME MOTOR

OUTPUT PERFORMANCE ON 115 VOLTS					
RPM	**WATTS**	**"B"**	**HERTZ**	**VENTILATION**	**PHASE**
1600	20	2⅝	60	open, with circulation	single
3300	20	2⅝	60	open, with circulation	single
1600	100	4⅛	60	totally enclosed	single
1600	165	4⅛	60	open, with circulation	single
3200	250	5⅛	60	open, with circulation	single
3200	525	6⅞	60	open, with circulation	single
3200	100	4⅛	400	open, with circulation	single
3200	130	4⅛	400	open, with circulation	three

FEATURES

Optimum design achieved using McLean high speed electronic digital computer with our internally programmed analysis.



Starting and running torques matched to fan and blower loads, where the motors are so used.

Direction of rotation of the shaft is reversible externally.

Dual voltage and/or dual speed motors available.

Face mount is standard, but base mount is available in 47 Frame Size Motor and flange mount is available in 59 Frame Size Motor.

Available for single-phase use in 2, 4, 6, 8, and 12-pole speeds, and for three-phase use in the same speeds.

REQUEST DATA SHEET

McLEAN ENGINEERING LABORATORIES mclean®

Princeton Junction, New Jersey 08550 • Phone 609-799-0100 • TELEX: 84-3422

If you're concerned with costs...

MOTRONICS
CORPORATION
PHONE: 315 823-4050

Then you'll want to talk to us.

Our key personnel have a combined experience in excess of 85 years in the design, development and manufacture of top quality motors.

The Motronics Corporation new facility in the Riverside Industrial Park, Little Falls, N. Y. contains the most up-to-date production machinery and equipment specifically designed to manufacture the highest quality motors.

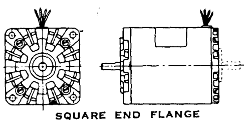
A.C. MOTORS
- Hysteresis Synchronous
- Induction
- Torque
- Reluctance Synchronous
- Split Phase
- Synchronous Split Phase
- Universal Series

D.C. MOTORS
- Shunt Wound
- Compound Wound
- Series-Split Field Series
- Torque
- Permanent Magnet

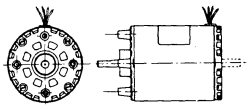
AVAILABLE IN
- Single-Two-Three or Four Speeds
- Synchronous Speeds @ 60 Hertz 3600-1800-1200-900-600 rpm
- Any Voltage to 440 Volts
- Single-Two or Three Phase
- 20 to 1000 Hertz
- Ball Bearing or Sleeve Bearing

Insulations Class A—105°C; B—130°C; F—155°C; H—180°C.

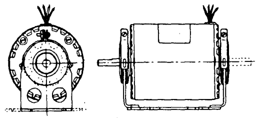
STANDARD OPTIONAL MOUNTINGS



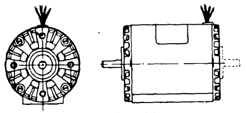
SQUARE END FLANGE



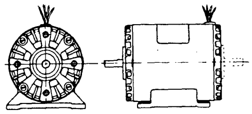
EXTENDED MOUNTING BOSSES



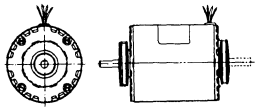
RESILIENT BASE



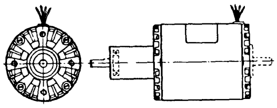
RIGID BASE



RIGID BASE

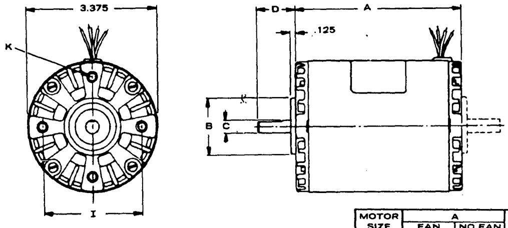


HENRITE RING



EXTENDED BEARING SUPPORT

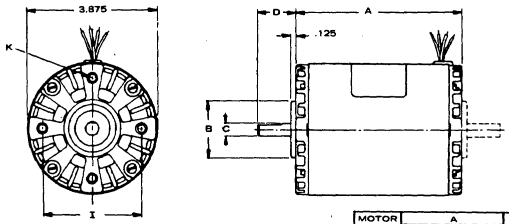
Consult factory for dimensions and detail specs



34
FRAME

H.P. RANGE 1/300—1/20 H.P.

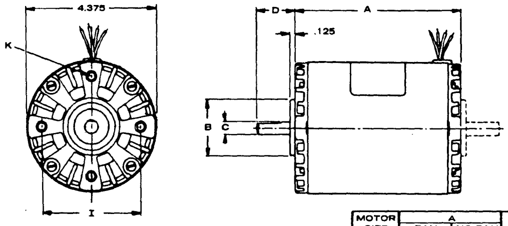
MOTOR SIZE	A		PILOT	SHAFT		MOUNTING	
	FAN	NO FAN	B	C	D	I	K
3410	3.650	3.150	*	*	*	*	*
3415	4.150	3.650	1.500	.3125		2.625	10-24
3420	4.650	4.150	2.125	.375			10-32
3425	5.150	4.650	NONE	.500			
3430	5.650	5.150					



39
FRAME

H.P. RANGE: 1/200—1/8 H.P.

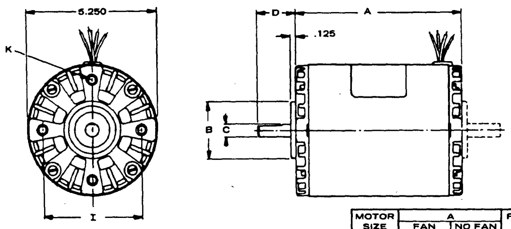
MOTOR SIZE	A		PILOT	SHAFT		MOUNTING	
	FAN	NO FAN	B	C	D	I	K
3910	3.750	3.250	*	*	*	*	*
3915	4.250	3.750	1.500	.3125		2.625	10-24
3920	4.750	4.250	2.125	.375			10-32
3925	5.250	4.750	NONE	.500			
3930	5.750	5.250					



44
FRAME

H.P. RANGE: 1/150—1/6 H.P.

MOTOR SIZE	A		PILOT	SHAFT		MOUNTING	
	FAN	NO FAN	B	C	D	I	K
4410	3.850	3.300	*	*	*	*	*
4415	4.350	3.800	2.125	.3125		3.000	10-24
4420	4.850	4.300	NONE	.375		3 500	10-32
4425	5.350	4.800		.500			¼-20
4430	5.850	5.300		.625			
4440	6.850	6.300					



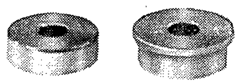
53
FRAME

H.P. RANGE: 1/8—3/4 H.P.

MOTOR SIZE	A		PILOT	SHAFT		MOUNTING	
	FAN	NO FAN	B	C	D	I	K
5310	4.000	3.400	*	*	*	*	*
5320	5.000	4.400	2.125	.375			¼-20
5330	6.000	5.400	NONE	.500			
5340	7.000	6.400		.625			
5350	8.000	7.400					
5360	9.000	8.400					

** OR / PER CUSTOMER REQUIREMENT*

RIVERSIDE INDUSTRIAL PARK • LITTLE FALLS, NEW YORK 13365

Northfield miniature precision instrument bearings- interchangeable with ball bearings -at only ⅓ the  cost!

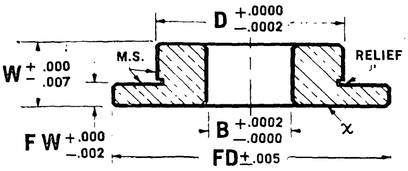
HERE'S HOW DESIGN ENGINEERS CUT BEARING COSTS WITHOUT LOSS OF ACCURACY

Here are the reasons why:

- ⅓ the cost of miniature precision ball bearings
- I.D., O.D., concentricity and facial squareness held to .0002″
- Precision made of sintered bronze (MIL-B-5687, Type I, Comp. A) with 4% Molybdenum Disulphide added at sintering
- Vacuum impregnated with instrument oil (MIL-L-6085A)
- Low coefficient of friction and excellent resistance to radial loads and impact
- Full range of sizes — flanged and sleeve types
- Immediate delivery from stock
- Used in gyro stabilizers, airborne compasses, analog and digital computers, inertial guidance systems, ground control approach instruments, infrared guidance systems, sound recording equipment, etc.

Write for latest brochure.

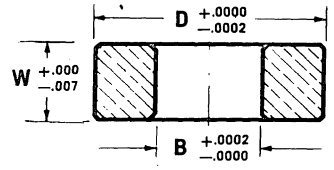
SERIES 127 FLANGED BEARINGS



RUNOUT OF BORE TO M.S. WITHIN .0002 T.I.R.

RUNOUT OF X SURFACE TO BORE WITHIN .0002

SERIES 238 SLEEVE BEARINGS



RUNOUT OF BORE & O.D. WITHIN .0002 T.I.R.

FACIAL SQUARENESS HELD WITHIN .0002

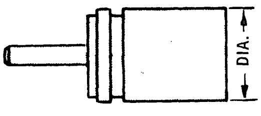
Typical Characteristics

Tensile Strength (psi)	16,000
Compressive Strength (psi)	18,000
Hardness (Rockwell No.)	H45-H54
Coeff. of Thermal Expan. per °F (x 10^{-6})	10.5
Coeff. of Friction (Break-away)	.07

IN STOCK, AVAILABLE FOR IMMEDIATE DELIVERY OF PRODUCTION QUANTITIES

Specify NORTHFIELD Miniature Precision MICROSPIN Instrument Bearings as direct replacement for miniature precision ball bearings

Miniature adjustable mechanical limit stops

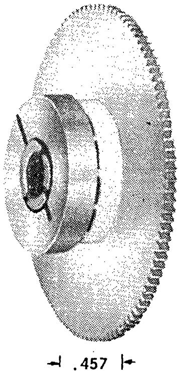


HIGH TORQUE RATINGS AND REPEATABILITY IN SMALLER DIMENSIONS

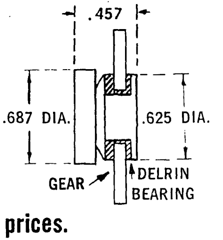
Model	Dia.	Torque Rating
BUORD Size 5	.500 max.	40 OZ. IN.
BUORD Size 8	.753 max.	80 OZ. IN.

Improved Quality Features: Outstanding repeatability • Low starting torque • Long Life—rugged construction • Hardened and ground lead screw • Precision engineered to MIL-E-5272 C. Immediate delivery from stock.

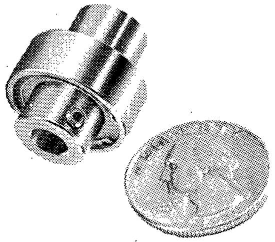
Improved gear type miniature adjustable slip clutch



TOP QUALITY FEATURES: Delrin bearing and clutch plate achieve smooth torque transmission with minimum charge from pre-set torque • Adjustable from zero to 50 inch ozs. torque • Precision engineered to MIL-E-5272 C • Stainless steel gear. Anodized aluminum hub and clamp • Low cost.



Miniature slip clutch coupling



• Simple interconnection between shafts • Teflon coated clutch faces for overload protection • Range: 0-50 oz. in. slip torque • No lubrication • Spring loaded, friction-type • Self-locking • Slip speeds to 1200 RPM.

Write or call for specifications and prices.

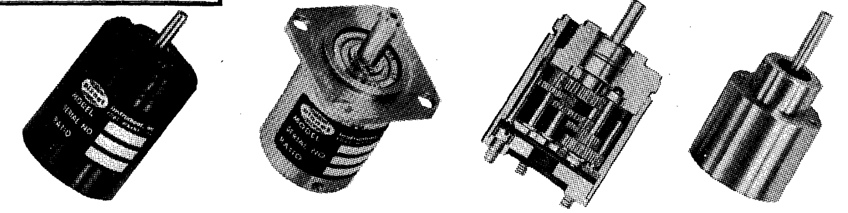
NORTHFIELD
PRECISION INSTRUMENT CORPORATION

Northfield Precision Instrument Corp.
4400 Austin Blvd., Island Park, N. Y., 11558
(516) 431-1112

planet instruments
Thomas A Edison
McGRAW EDISON
INSTRUMENT DIVISION
1520 PROGRESS ROAD, FORT WAYNE, IND. 46808
PHONE: 219-483-8194 • TWX: 810-332-1419

Precision Gearheads

and Speed Reducers



MECHANICAL SPECIFICATIONS								MOTOR PINION DATA			
Model	Size	Starting Torque (in.-oz.)	Max. Oper. Load Torque (in.-oz.)	Momentary Load Torque (in.-oz.)	Moment of Inertia at Input 1 (GM-CM²)	Shaft End Play 2 (in.)	Shaft Radial play 3 (in.)	No. of Teeth	Diametral Pitch	Pitch Diameter	Outside Diameter
A-101A	5	.005	2	10	.0010	.004	.002	13	180	.0722/.0719	.0833/.0830
A-102B	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102C	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-109B	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102E	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102F	8	.005	5	30	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102G	8	.005	3	15	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102H	8	.005	3	15	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-102K	8	.005	1	5	.0012	.004	.002	13	120	.1083/.1078	.1247/.1242
A-103A	10	.005	10	50	.003	.004	.002	13	120	.1083/.1078	.1247/.1242
A-103B	10	.005	10	50	.003	.004	.002	13	120	.1083/.1078	.1247/.1242
A-110A	10	.005	10	50	.003	.004	.002	13	120	.1083/.1078	.1247/.1242
A-356	10	.015	25	100	.01	.006	.004	13	120	.1083/.1078	.1247/.1242
A-104A	11	.005	25	100	.02	.004	.002	13	120	.1083/.1078	.1247/.1242
A-111A	11	.005	25	100	.02	.004	.002	13	120	.1083/.1078	.1247/.1242
A-105A	15	.008	35	100	.04	.004	.002	13	120	.1083/.1078	.1247/.1242
A-105B	15	.008	35	100	.04	.004	.002	15	96	.1083/.1078	.1247/.1242
A-112A	15	.008	35	100	.04	.004	.002	13	120	.1083/.1078	.1247/.1242
A-112B	15	.008	35	100	.04	.004	.002	15	96	.1083/.1078	.1247/.1242
A-106A	18	.01	60	165	.15	.004	.002	15	96	.1562./1557	.1771/.1766
A-106B	18	.01	60	165	.15	.004	.002	21	120	.1562./1557	.1771/.1766
A-113A	18	.01	60	165	.15	.004	.002	15	96	.1562./1557	.1771/.1766
A-113B	18	.01	60	165	.15	.004	.002	21	120	.1562./1557	.1771/.1766

Bold Type Indicates: Speed Reducer. 1 Measured at input shaft. 2 Max. with 1 Pound Gage Load. 3 Per Inch Length with 4 oz. Gage Load.
Temperature Range: —55°C to +125°C. Pressure angle of motor pinion should be 20 degrees
Complete dimensional specifications may be obtained thru any of the authorized Planet representatives or write direct to the factory.

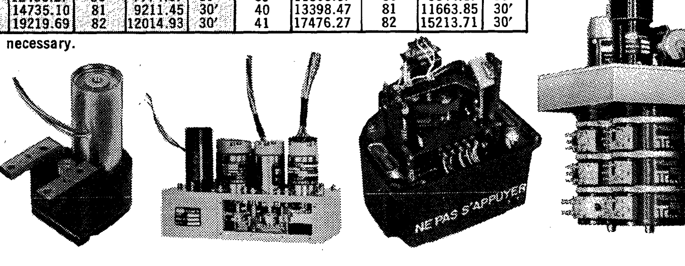
		SIZE 5		SIZE 8		SIZE 10		SIZE 11		SIZE 15					SIZE 18				
Dash No.	Rotation	Ratio	Back-lash (Max.)	Ratio	Back-lash (Max.)	Ratio	Back-lash (Max.)	Ratio	Back-lash (Max.)	A-105A, A-112A Dash No.	A-105A, A-112A Ratio	A-105B, A-112B Dash No.	A-105B, A-112B Ratio	Back-lash (Max.)	A-106A, A-113A Dash No.	A-106A, A-113A Ratio	A-106B, A-113B Dash No.	A-106B, A-113B Ratio	Back-lash (Max.)
1	Direct	9.85	75′	7.79	45′	10.23	45′	14.77	45′	1	18.77	42	11.73	45′	1	17.07	42	14.86	45′
2	Reverse	12.53	75′	10.90	45′	12.56	45′	20.25	45′	2	23.64	43	14.76	30′	2	21.49	43	18.71	30′
3	Reverse	14.77	75′	12.53	45′	14.83	45′	23.26	45′	3	27.03	44	16.90	30′	3	24.58	44	21.39	30′
4	Reverse	17.50	75′	14.46	45′	17.62	45′	26.86	45′	4	31.01	45	19.39	30′	4	28.20	45	24.55	30′
5	Reverse	20.92	75′	16.80	45′	21.10	45′	31.21	45′	5	35.75	46	22.35	30′	5	32.51	46	28.30	30′
6	Reverse	25.62	75′	19.70	45′	25.58	45′	36.58	45′	6	41.49	47	25.94	30′	6	37.73	47	32.84	30′
7	Reverse	31.18	75′	23.36	45′	30.70	45′	43.38	45′	7	48.58	48	30.37	30′	7	44.17	48	38.45	30′
8	Reverse	39.38	75′	28.15	45′	39.99	45′	56.62	45′	8	57.56	49	35.98	30′	8	52.34	49	45.56	30′
9	Direct	50.13	60′	39.41	45′	47.71	45′	80.98	30′	9	75.08	50	46.93	30′	9	68.27	50	59.43	30′
10	Direct	70.02	60′	45.29	45′	56.37	45′	93.06	30′	10	94.54	51	59.01	30′	10	85.97	51	74.84	30′
11	Direct	83.69	60′	52.28	45′	66.95	45′	107.43	30′	11	108.11	52	67.94	30′	11	98.30	52	85.58	30′
12	Direct	101.27	60′	60.75	45′	80.18	45′	124.83	30′	12	124.04	53	77.54	30′	12	112.79	53	98.19	30′
13	Direct	124.72	60′	71.21	45′	97.19	45′	146.32	30′	13	143.00	54	89.40	30′	13	130.03	54	113.20	30′
14	Direct	157.54	60′	84.46	45′	116.68	45′	173.54	30′	14	165.96	55	103.75	30′	14	150.91	55	131.37	30′
15	Reverse	200.50	60′	101.78	45′	151.95	45′	226.46	30′	15	194.32	56	121.47	30′	15	176.69	56	153.82	30′
16	Reverse	236.31	60′	142.50	30′	181.31	30′	323.94	30′	16	230.24	57	143.93	30′	16	209.35	57	182.25	30′
17	Reverse	280.07	60′	163.74	30′	214.21	30′	372.23	30′	17	300.31	58	187.73	30′	17	273.07	58	237.71	30′
18	Reverse	334.77	60′	189.03	30′	254.43	30′	429.71	30′	18	378.17	59	236.40	30′	18	343.86	59	299.34	30′
19	Reverse	405.10	60′	219.64	30′	304.70	30′	499.30	30′	19	432.44	60	270.34	30′	19	393.22	60	242.31	30′
20	Reverse	498.87	60′	257.45	30′	369.33	30′	585.27	30′	20	496.16	61	310.17	30′	20	451.15	61	392.75	30′
21	Reverse	630.15	60′	305.35	30′	443.20	30′	694.15	30′	21	572.01	62	357.59	30′	21	520.13	62	452.79	30′
22	Direct	802.01	60′	367.99	30′	577.42	30′	905.85	30′	22	663.84	63	414.99	30′	22	603.62	63	525.47	30′
23	Direct	945.23	60′	515.18	30′	688.97	30′	1295.75	30′	23	777.27	64	485.90	30′	23	706.76	64	615.26	30′
24	Direct	1120.27	60′	591.98	30′	814.00	30′	1488.91	30′	24	920.94	65	575.72	30′	24	837.40	65	728.99	30′
25	Direct	1339.08	60′	683.40	30′	966.83	30′	1718.86	30′	25	1201.23	66	750.93	30′	25	1092.27	66	950.86	30′
26	Direct	1620.40	60′	794.08	30′	1157.85	30′	1997.21	30′	26	1512.66	67	945.62	30′	26	1375.45	67	1197.38	30′
27	Direct	1995.49	60′	930.79	30′	1403.47	30′	2341.07	30′	27	1729.77	68	1081.34	30′	27	1572.86	68	1369.23	30′
28	Direct	2520.62	60′	1103.96	30′	1684.15	30′	2776.62	30′	28	1984.64	69	1240.67	30′	28	1804.61	69	1570.98	30′
29	Reverse	3208.06	60′	1330.42	30′	2194.20	30′	3623.38	30′	29	2288.06	70	1430.35	30′	29	2080.51	70	1811.16	30′
30	Reverse	3780.92	60′	1862.58	30′	2618.08	30′	5183.01	30′	30	2655.35	71	1659.96	30′	30	2414.48	71	2101.89	30′
31	Reverse	4481.09	60′	2140.23	30′	3093.22	30′	5955.64	30′	31	3109.07	72	1943.59	30′	31	2827.04	72	2461.04	30′
32	Reverse	5356.31	60′	2470.77	30′	3673.94	30′	6875.43	30′	32	3683.77	73	2302.86	30′	32	3349.62	73	2915.96	30′
33	Reverse	6481.58	60′	2870.90	30′	4399.84	30′	7988.85	30′	33	4804.92	74	3003.73	30′	33	4369.07	74	3803.43	30′
34	Reverse	7981.95	60′	3365.17	30′	5333.14	30′	9364.27	30′	34	6050.64	75	3782.48	30′	34	5501.70	75	4789.50	30′
35	Reverse	10082.46	60′	3991.25	30′	6237.63	30′	11106.46	30′	35	6919.09	76	4325.38	30′	35	6291.46	76	5476.94	30′
36				4809.96	30′	8337.98	30′	14493.54	30′	36	7938.57	77	4962.69	30′	36	7218.46	77	6283.93	30′
										37	9152.23	78	5721.40	30′	37	8322.03	78	7244.63	30′
										38	10621.41	79	6539.83	30′	38	9657.94	79	8407.58	30′
										39	12486.27	80	7774.37	30′	39	11808.17	80	9844.17	30′
										40	14735.10	81	9211.45	30′	40	13398.47	81	11663.85	30′
										41	19219.69	82	12014.93	30′	41	17476.27	82	15213.71	30′

A-356 HIGH TORQUE GEARHEAD		
Dash No.	Ratio	"L" Max.
1	8.08	1.016
2	12.48	1.235
3	17.05	1.235
4	23.30	1.235
5	31.21	1.235
6	42.63	1.235
7	58.25	1.545
8	78.02	1.545
9	106.57	1.545
10	145.62	1.545
11	195.04	1.545
12	266.43	1.545
13	364.04	1.830
15	666.07	1.830
16	910.11	1.830
17	1218.00	1.830
18	1665.16	1.830

Anti-backlash gears may be specified where lower backlash requirements are necessary.

Custom Services

Planet will translate your assembly drawings and specifications into servo systems and sub systems. Where drawings and specifications are lacking, Planet will design and build complete servo packages to your performance requirements. Matching electrical, mechanical and indicating requirements is a Planet specialty.



ROTATING COMPONENTS

Division of INSTRUMENT SYSTEMS CORPORATION
1560 FIFTH AVE., BAY SHORE, N.Y. 11706
(516) 666-8500 TWX 516-666-7047

AC & DC PRECISION MOTORS

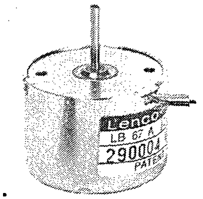
RC's EXPANDED LINE NOW INCLUDES DC MOTORS

in addition to a complete inventory of fractional AC Motors

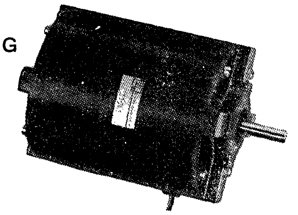
LOW COST MINIATURE AC AND DC MOTORS

- EXCLUSIVE U.S. LICENSE BY LENCO
- IMMEDIATE DELIVERY
- QUIET ● RELIABLE
- RUGGED ● LONG-LIFE
- WORLD-WIDE MARKET ACCEPTANCE
- APPLICATIONS INCLUDE:

MEASURING AND CONTROL INSTRUMENTS- FANS/BLOWERS - RECORDING EQUIPMENT- CAMERAS - TAPE AND CASSETTE PLAYERS-

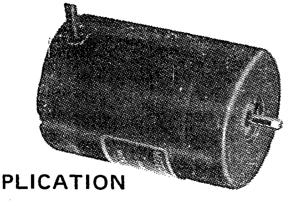


TORQUE MOTORS



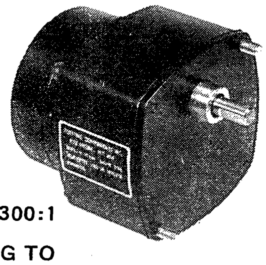
- SMOOTH RUNNING
- CONTINUOUS DUTY RATING AT STALL
- STALL TORQUES to 170 OZ. IN.
- SINGLE OR DUAL FREQUENCY/ VOLTAGE DESIGNS

INDUCTION DRIVE MOTORS



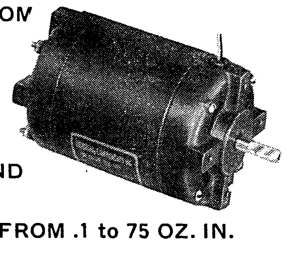
- TORQUE RATINGS FROM .1 to 150 OZ. IN.
- LIFE IN EXCESS OF 10,000 HRS. IN MANY APPLICATIONS
- QUIET
- VERSATILE IN APPLICATION
- SINGLE OR DUAL SPEED, VOLTAGE, FREQ.
- BALL OR SLEEVE BEARING

GEAR MOTORS



- COMPETITIVELY PRICED ● COMPACT SIZE
- OUTPUT SPEEDS FROM 5 to 250 RPM
- TORQUE RATINGS TO 1200 OZ. IN.
- INTERGRAL MOTOR GEARHEAD COMBINATIONS AVAILABLE
  - RATIOS FROM 6:1 to 300:1
  - SIZE 1" to 4.38" O.D.
  - LENGTHS ACCORDING TO REQUIREMENTS
- TEMP RANGE: FROM 0 to 90°C
- BACKLASH: 30' MAX.
- PRECISION ENGINEERED
- SUITABLE FOR A WIDE VARIETY OF INDUSTRIAL AND PERIPHERAL COMPUTER EQUIPMENT APPLICATIONS

HYSTERESIS AND RELUCTANCE SYNCHRONOUS MOTORS



- 60 Hz SPEEDS FROM 450 to 3600 RPM
- 400 Hz SPEEDS FROM 4000 to 24000 RPM
- PRECISION BALL OR SLEEVE BEARINGS AVAILABLE
- MINIMUM WOW AND FLUTTER
- PULL-IN TORQUE FROM .1 to 75 OZ. IN.
- MULTIPLE SPEEDS AVAILABLE
- AMBIENT TEMPERATURE RANGE: -65 to 150° C
- LONG LIFE - DESIGNED FOR MAXIMUM RELIABILITY

also: AXIAL FANS ● CENTRIFUGAL BLOWERS ● Servo Motors ● Drag Cup Motors ● AC Tachometer Generators ● PM Tachometer Generators ● AC Induction Generators

ROTATING COMPONENTS

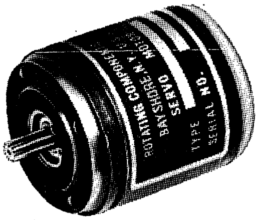
Division of INSTRUMENT SYSTEMS CORPORATION
1560 FIFTH AVE., BAY SHORE, N.Y. 11706
(516) 666-8500 TWX 516-666-7047

RC

AC PRECISION MOTORS

THE FOLLOWING SPECIFICATIONS ARE A TYPICAL SAMPLING OF RC'S "OFF THE SHELF" LINE OF AC MOTORS ... MODELS LISTED ARE SINGLE-PHASE, 115 VAC DESIGN; BUT VARIATIONS ARE AVAILABLE TO SATISFY ALMOST ANY SUB-FRACTIONAL HORSEPOWER REQUIREMENTS.

MEET OUR LIGHTWEIGHTS



DIA.	MOTOR DESIG.	REFER. TABLE
1.00	F FRAME	1
1.25	R FRAME	2
1.75	KB FRAME	3
2.00	KA FRAME	4
2.31	E FRAME	5
2.75	M FRAME	6

TABLE 1. F FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12903	1/2500	1800	.25	.37	0.025	3.5	1.7969	60
12915	1/900	1200	0.6	0.6	0.050	12.0	1.32	60
12904	1/900	8000	.15	.17	0.05	7.0	1.4219	400

TABLE 2. R FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12899	1/240	3600	.60	0.10	10	2.250	60
12898	1/400	1800	.82	0.10	10	2.250	60
12928	1/900	1200	.35	0.10	12	2.000	60
12897	1/100	24000	.77	0.36	17	2.250	400
12900	1/80	12000	.80	0.31	16	2.250	400
12925	1/125	8000	.40	0.40	13	2.250	400

TABLE 3. KB FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12886	1/500	3600	0.5	.75	0.18	16	2.7301	60
12890	1/100	12000	1.0	1.0	0.90	43	2.5781	400
12888	1/200	8000	1.0	0.8	0.30	29	1.9531	400
12887	1/250	8000	0.6	0.5	0.22	20	1.9531	400

TABLE 4. KA FRAME - HYSTERISIS SYNCHRONOUS MOTORS
(SELF-COOLED MOTOR CASE SHROUD)

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12863	1/150	3600	2.5	2.7	0.25	26	3.000	60
12878	1/275	3600	1.0	1.0	0.14	16.4	2.17	60
12862	1/300	1800	2.7	2.4	0.25	24	3.000	60
12875	1/900	600	.64	1.0	0.12		3.000	60
12870	1/55	12000	2.5	2.0	1.70	50	3.000	400
12864	1/250	12000	0.5	0.4	0.35	33	2.250	400
12866	1/125	8000	2.0	1.5	0.45	45	3.000	400

TABLE 5. E FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
12854	1/27	3600	12.0	12.0	1.4	80	3.44	60
12855	1/90	3600	3.0	3.0	1.1	30	3.44	60
12856	1/175	3600	1.8	1.8	1.0	18	2.44	60
12857	1/100	1800	5.0	5.0	2.2	30	3.44	60
12858	1/250	1800	2.2	2.2	2.0	23	2.44	60
12859	1/45	12000	2.0	2.0	1.7	40	3.44	400
12861	1/65	8000	2.1	2.1	1.0	35	3.44	400

TABLE 6. M FRAME - INDUCTION DRIVE MOTORS
(SELF-COOLED RIBBED HOUSING)

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13476	1/300	3400	1.00	.110	12.0	1.94	60
13542	1/70	3010	5.00	.310	33.5	2.44	60
13639	1/80	1510	8.00	.410	46.0	2.94	60
13644	1/100	1000	9.60	.285	32.5	3.44	60
13645	1/130	1000	7.50	.220	25.0	2.94	60
13653	1/200	1000	5.00	.210	26.0	2.44	60
13649	1/440	1000	2.30	.150	14.5	1.94	60
13634	1/25	21000	1.70	0.54	45.0	3.44	400
13633	1/40	21000	1.30	0.42	38.0	2.94	400
13631	1/70	21000	0.70	0.30	28.0	2.44	400
13635	1/10	10000	10.0	1.25	140.0	3.44	400
13636	1/20	7000	7.50	0.75	65.0	3.44	400

NOTE: ALL 60 Hz DESIGN MOTORS OPERATE SATISFACTORILY AT 50 Hz WITH A 1/6 REDUCTION IN MOTOR SPEED. 50 Hz WINDINGS AVAILABLE FOR ALL LISTED MOTORS.

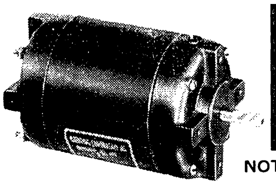
SEND FOR OUR NEW CATALOG TO MEET THE COMPLETE RC LINE OR CONTACT US DIRECTLY FOR YOUR PARTICULAR REQUIREMENTS.

SYNCHRONOUS MOTORS • TACHOMETER GENERATORS • BLOWERS • BRUSHLESS DC BLOWERS • INDUCTION GENERATORS • P.M. GENERATORS
INDUCTION MOTORS • FANS • BRUSHLESS DC MOTORS • DRAG CUP MOTORS • PRECISION GEAR MOTORS • TORQUE MOTORS • SERVO MOTORS

SPECIAL DESIGN FEATURES AVAILABLE . . .
- CHOICE OF OPERATING VOLTAGES
- POLY-PHASE DESIGN
- VARIABLE FREQUENCIES

ROTATING COMPONENTS
Division of INSTRUMENT SYSTEMS CORPORATION
1560 FIFTH AVE., BAY SHORE, N.Y. 11706
(516) 666 8500   TWX 516 666 7047

POWER PLUS



DIA.	MOTOR DESIG.	REFER. TABLE(S)
3.31	L FRAME	7, 8, 9
3.88	P FRAME	10,11,12
4.38	S FRAME	13,14,15

NOTE: For self-cooled version of all models, add .75" to case lengths listed in tables.

TABLE 7. L FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
11988	1/15	3600	20	18	1.42	115	5.05	60
12694	1/20	3600	24	14	1.1	93	4.55	60
12714	1/25	3600	12	12	0.70	77	3.61	60
12745	1/30	3600	13	11	0.95	65	3.61	60
12290	1/35	3600	8	8	0.47	43	4.18	60
12338	1/50	3600	5	7	0.38	40	3.74	60
12693	1/25	1800	27	26	1.15	85	4.55	60
12692	1/35	1800	18	18	0.80	61	4.55	60
12695	1/40	1800	13	14	0.69	55	4.55	60
12337	1/50	1800	14	12	0.63	50	3.74	60
13590	1/60	1800	16	9	0.46	48	3.74	60
12330	1/75	1800	12	9	0.48	38	3.36	60
12329	1/100	1800	7	6	0.48	38	3.36	60
10878	1/160	1800	3	4	0.24	23	3.36	60
12721	1/60	1200	14	13	0.60	65	3.61	60
12738	1/75	1200	15	14	0.43	45	3.11	60
12720	1/100	1200	8	8	0.48	52	2.93	60
12742	1/125	900	10	10	0.52	40	3.61	60
13528	1/200	900	7	6	0.30	24	4.18	60
12328	1/250	900	6	5	0.35	27	3.36	60
11544	1/320	900	5	3	0.17	16.5	3.36	60
12741	1/250	600	11	7	0.60	42	3.61	60
12736	1/300	600	9	4	0.65	45	3.11	60
12325	1/900	600	1	2	0.25	17	3.11	60
12696	1/10	12000	18	8	2.65	240	3.74	400
12724	1/20	12000	7	4	0.82	75	2.93	400
12850	1/72	4000	3	3	1.0	60	3.61	400
12697	1/125	4000	6	2	1.67	100	4.18	400

TABLE 8. L FRAME - TORQUE MOTORS

PART NO.	N.L. SPEED (RPM)	STALL TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13481	3540	16	.65	70	3.50	60
13483	3360	36	1.20	132	5.18	60
13480	3200	7	.26	29	3.94	60
13486	1725	10	.40	35	3.13	60
13489	1700	28	.61	66	3.94	60
13487	1700	13	.28	31	3.94	60
13498	1685	65	1.20	135	5.18	60
13493	1670	39	1.06	95	3.63	60
13488	1650	20	.38	42	4.32	60
13492	1585	32	.80	92	4.32	60
13502	1150	70	1.30	138	5.18	60
13501	1140	36	.70	75	4.32	60
13500	1125	16	.32	32	3.94	60
13506	880	38	.64	72	4.32	60
13507	850	70	1.20	135	5.18	60
13505	825	16	.24	29	3.94	60

TABLE 9. L FRAME - INDUCTION DRIVE MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13694	1/10	3400	31	1.65	140	4.94	60
10885	1/25	3400	12.5	.48	50	3.38	60
10873	1/35	3400	8.5	.44	42	3.12	60
10912	1/10	3350	27.5	1.00	111	3.94	60
10898	1/18	3200	18	.63	72	3.62	60
10887	1/20	3200	15	.60	65	3.50	60
13695	1/10	1650	60	1.40	140	4.94	60
13691	1/15	1650	47	.86	93	4.32	60
10855	1/25	1650	2.25	.14	14	2.62	60
10859	1/70	1650	9.0	.23	22	3.12	60
13698	1/40	1600	16.5	.39	38.5	4.94	60

TABLE 10. P FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13550	1/14	3600	28	21	2.0	150	5.19	60
11941	1/40	1200	30	21	1.0	85	4.44	60
13576	1/80	1200	14	12	0.5	55	4.44	60

TABLE 11. P FRAME - TORQUE MOTORS

PART NO.	N.L. SPEED (RPM)	STALL TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13551	1740	42.5	1.5	100	5.19	60
13776	1160	60.0	2.0	125	4.44	60
13776-2	880	64.0	2.0	150	4.44	60

TABLE 12. P FRAME - INDUCTION DRIVE MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13838	1/10	3450	30.0	1.0	170	5.19	60
13837	1/20	1700	30.0	0.75	110	5.19	60
13835	1/36	1100	25.0	1.0	120	4.44	60
13836	1/50	850	23.5	1.5	150	4.44	60

TABLE 13. S FRAME - HYSTERISIS SYNCHRONOUS MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.) ST	TORQUE (Oz. In.) P.I.	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13791	1/5	3600	64	66	3.2	290	5.50	60
13786	1/7	3600	78	46	3.0	225	5.50	60
13783	1/14	3600	35	26	2.4	190	4.50	60
13792	1/10	1800	57	61	2.5	190	5.50	60
13787	1/22	1800	31	31	1.4	100	5.50	60
13781	1/30	1800	23	24	1.0	75	4.50	60
13779	1/40	1800	19	16	0.6	60	3.50	60
13790	1/22	1200	93	45	1.8	150	5.50	60
13782	1/45	1200	24	21	0.9	80	4.50	60
13789	1/65	900	60	20	1.3	100	5.50	60
13784	1/110	600	33	17	0.7	60	4.50	60
13797	1/42	24000	18	14	6.0	360	4.50	400
13798	1/11	6000	14	18	7.8	355	5.50	400
13796	1/35	4000	11	8	1.7	120	5.50	400

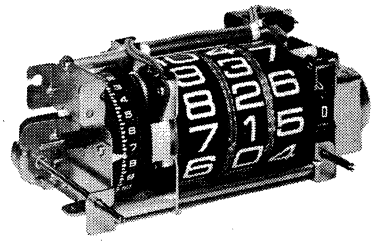
TABLE 14. S FRAME - TORQUE MOTORS

PART NO.	N.L. SPEED (RPM)	STALL TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13807	3400	14	3.3	325	3.50	60
13808	1770	45	1.0	115	4.50	60
13812	1670	140	2.3	245	5.50	60
13809	950	40	0.6	60	4.50	60
13810	830	75	1.3	120	4.50	60
13806	800	30	0.5	55	3.50	60
13813	800	140	2.0	200	5.50	60
13815	800	170	2.5	256	5.50	60
13814	750	140	1.7	175	5.50	60

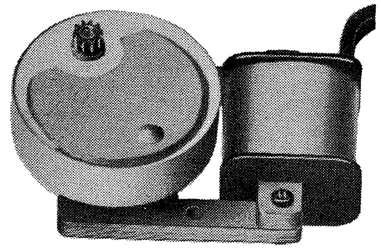
TABLE 15. S FRAME - INDUCTION DRIVE MOTORS

PART NO.	H.P.	SPEED (RPM)	TORQUE (Oz. In.)	CURRENT (AMPS)	INPUT POWER (WATTS)	CASE LENGTH	FREQ. (Hz)
13841	1/8	3450	38.0	2.00	170	5.50	60
13840	1/10	3450	30.0	1.70	150	4.50	60
13839	1/20	3400	15.0	1.10	94	3.50	60
13843	1/15	1725	38.0	1.75	140	5.50	60
13842	1/12	810	105.0	1.90	132	5.50	60

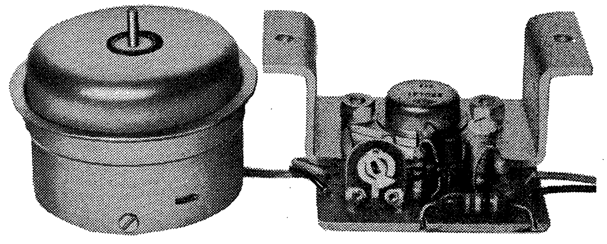
Sankyo MICRO MOTORS·TIMING MOTORS DIGITAL CLOCKS·LEVEL METERS MAGNETIC HEADS



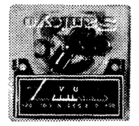
Digital Clock DT-55B



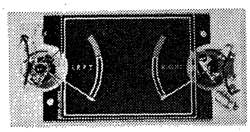
Timing Motor GMD



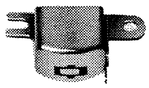
Micro Motor BF203R



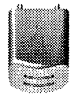
Level Meter 11



Level Meter 15



Magnetic Head 07



Magnetic Head 15

Micro Motors

	Dimensions		Rated Voltage (V)	Range of Voltage (V)	Rated Torque (gr-cm)	Rated Speed (rpm)	Load Current (mA)	Starting Torque (gr-cm)	Life (Hr)	Direction of Revolution	Speciality Use	Remarks
	M (m/m)	Length (m/m)										
SY 173L	40	32.4	6	4.5〜6	3	2000	80	35	600	L	Record player	
DMF 54R-02	38	34.8	6	4.5〜6	9	2400	140	30	600	R	Tape recorder	
RK 201R	47.9	48	13.2	10〜16	30	2400	210	100	1000	R	Car (stereo)	
BF 110R	38	30	4.5	3.5〜5.7	8	2000	160	30	1500	R	Tape recorder	Electrical Governor Motor
BF 207R	38	30	13.2	(5.5〜)9〜16	15	2200	130	30	1500	R	Car cassette	Electrical Governor Motor
ZF 900	46	50	9	6〜9	20	2200	300	45	3000	L & R	High class player, Electronic calculator	Brushless & Transistor Motor
VM 250B	25	36.5	7	6.5〜7.5	0.4	3600	45	25	500	L & R	Auto tuner	

Timing Motor GMD

Synchronous type timing motor, 100 to 240VAC, 50 or 60Hz, 2 to 3W, 3/550 to 3.6rpm, 0.2 to 3kg-cm torque.

Other models GMC, GME (Synchronous type) and GMA (Inductor type) are available.

Digital Clock DT-55B

Includes 24hr. alarm setting, sleep and drowse switch, internal lighting.

Digital Clock DT-B

Digital clock with sleep switch for radio, TV, etc.

Level Meters

	Current Sensitivity	Internal Resistance	Pointer Rest	Uses
11	OVU: 130μA ± 10% FULL: 260μA ± 20%	650Ω ± 10%	Left & Right	Level & Batt
15	OVU: 130μA ± 10% FULL: 260μA ± 20%	650Ω ± 10%	Left & Right	Level & Batt

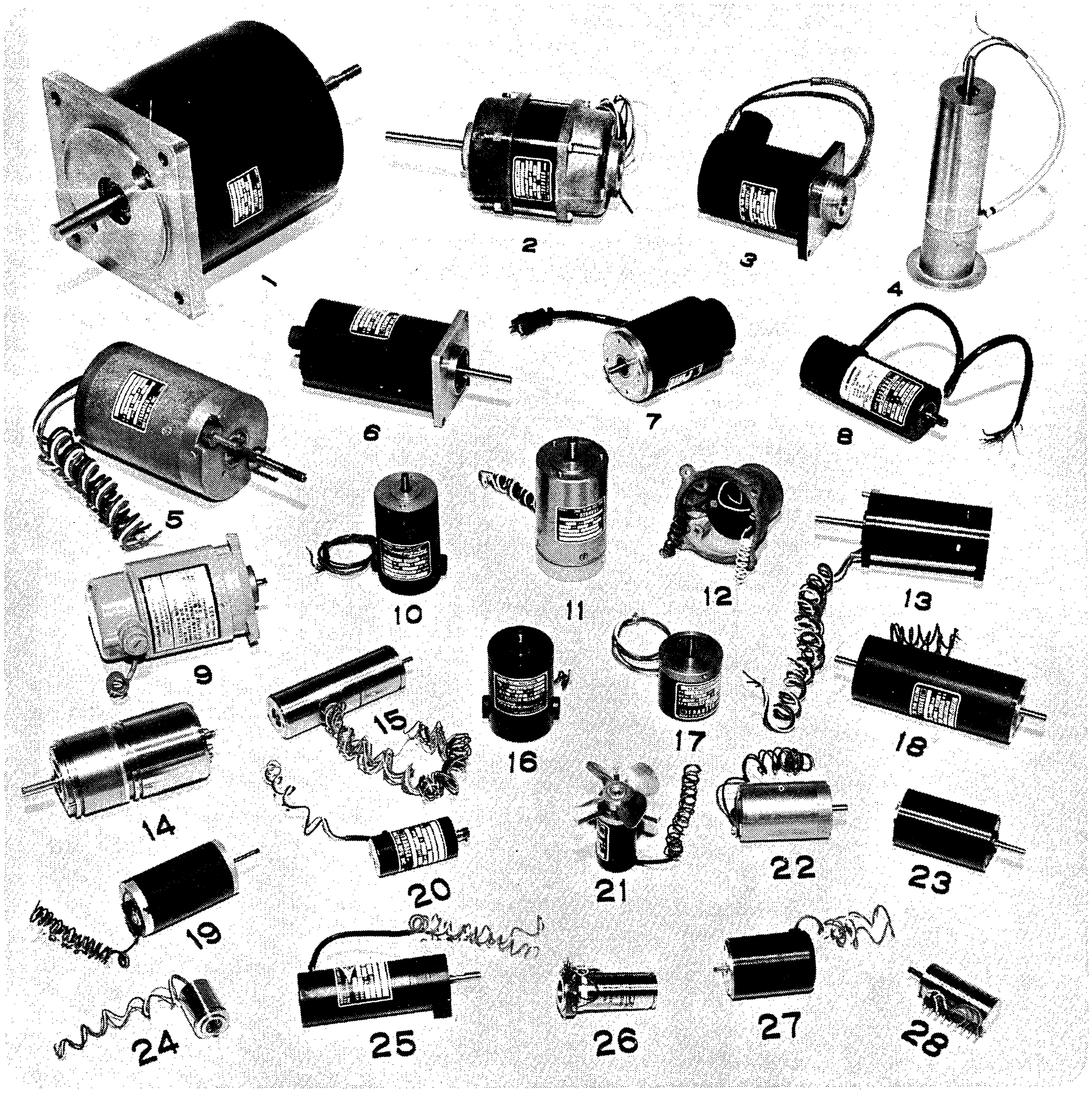
Magnetic Heads

	Classification	Resistance (Ω)	Z (1KHz)	Tape for Measurement	Tape Speed (cm/sec.)	Bias Frequency	Bias Current (μA)	Signal Current (μA)	Sensitivity of Recording/ Playback (dB)	Frequency Characteristics of Recording/Playback (dB)	Tape of Playback	Sensitivity of Playback (dB)	Frequency Characteristics of Playback (dB)	0 dB (V)
07-03	Cassette Recording/ Playback	480	1.7KΩ	Basf Reference	4.8	40KHz	500	30	−58.0 1KHz	−14.0 6.3KHz	Basf Test Tape	−64.0 333Hz	+4.0 6.3KHz	0.775
15-04	Cartridge Playback	980	2700		9.5				−63.0 500Hz		Ampex # 01-31331-01	−65.0 0.5KHz	+8.0 7.5KHz	0.775

Sankyo

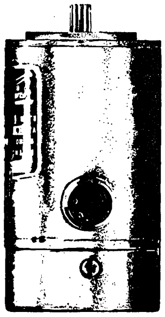
EXPORT DEPARTMENT

Sankyo Seiki Mfg. Co., Ltd. 17-2, Shinbashi 1-chome, Minato-ku, Tokyo 105, Japan. Tel: Tokyo 591-8371
American Sankyo Corp. 95 Madison Ave., New York, N.Y. 10016, U.S.A. Tel: LE-2-8020
Sankyo (Europe) Export und Import G.m.b.H. 4 Düsseldorf, Kölnerstr. 65-a, West Germany. Tel: 350281-5



(1) Tape Drive-Computer (2) Audio Recorder Tape Drive (3) Fuel Pump (4) Camera Film Drive (5) Landing Gear (6) Fuel Transfer Pump (7) Tape Drive, In-Flight Entertainment (8) Camera Film Drive (9) Water Pump (10) Coaxial Switch (11) Seat Actuator (12) Missile Switch Drive (13) Seat Actuator (14) Camera Motor (15) Servo Motor-Tachometer (16) Hot Air Valve (17) Hot Air Valve (18) Camera Film Drive (19) Laser Coolant Pump (20) Power Transfer Switch (21) Fan Motor for Clean Room Suit (22) Tachometer (23) Blower Motor (24) Servo Motor (25) Camera Film Drive (26) Servo Motor-Tachometer (27) Actuator Drive Motor (28) Servo Motor & Tachometer.

WE DESIGN AND MANUFACTURE SPECIAL PURPOSE MOTORS AC, DC, AND SERVO



Sawyer
Industries, Inc.

5445 PECK ROAD • ARCADIA, CALIFORNIA 91006 • 213/442-5981 • 213/686-1790 • TWX 910-587-3534

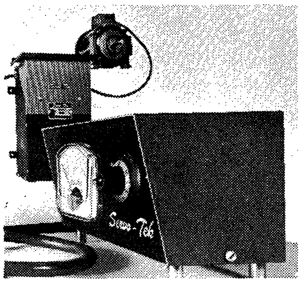
SERVO-TEK—FOREMOST IN SPEED MEASUREMENT AND CONTROL

Proven Performance, Reliability and Ease of Maintenance for the Most Demanding Industrial Applications

SOLID-STATE

"500" SERIES PRECISION ADJUSTABLE-SPEED DRIVES *

ALL MOTORS TOTALLY ENCLOSED, FAN-COOLED



SPEED RANGE Infinitely adjustable from less than 24 rpm to more than 3600 rpm (150:1) while delivering full-rated torque. Continuous duty rating at all speeds.

REGULATION Temperature-compensated tachometer feed-back provides both line and load regulation of better than ⅓ of 1% of rated speed.

MAINTENANCE Design eliminates vacuum tubes, selenium rectifiers and time delays. Utilizes silicon diodes, transistors and a magnetic amplifier for exceptionally long service life. Modular plug-in construction requires only a screwdriver for servicing.

REMOTE CONTROL A 10-turn potentiometer provides precise adjustment and can be placed in any convenient location. Meter monitors operation and continuously indicates speed.

GEARED MOTORS Motors are available with integral gear reducers.

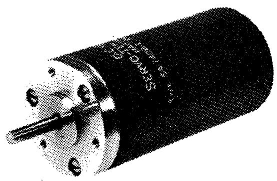
BRAKING-REVERSING Relay-controlled braking and reversing models available.

Models available from
⅛ hp to 1½ hp

D-C PERMANENT-MAGNET

TACHOMETER GENERATORS

TEMPERATURE-COMPENSATED



Applications

SERVOS—The highly linear output and wide speed range are ideal for velocity or integrating servos. Low-driving torque permits its use as a damping or rate signal in all types of servos.

TEMPERATURE-COMPENSATED — The voltage output @ +25°C. will not deviate from this amount by more than 1/100 of 1% per degree of change when operated at any temperature within the designed temperature range of −20°C. to +75°C.

SIZE — Miniature. Approx. Dia. 1⅛".

OUTPUT — Various models with outputs as high as 45v/1000 rpm.

LINEARITY — Linearity from 0 to 12,000 rpm is better than 1/10 of 1% of voltage output at 3600 rpm.

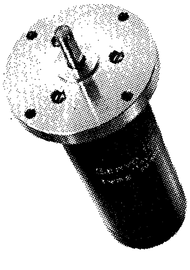
BRUSH LIFE—Better than 100,000 hours (10 years) of continuous operation at 3600 rpm.

BIDIRECTIONAL OPERATION — Output in either direction is held to a ¼ of 1% tolerance.

RIPPLE — The rms value will not exceed 3% of the d-c value at any speed in excess of 100 rpm.

CONSTRUCTION — Aluminum housings with protective treatment; stainless steel shafts; fully-shielded stainless steel ball bearings; Mylar insulation.

Our Engineering Test Report describing performance characteristics, test procedure and test results, is available at no charge, upon requst.



D-C PERMANENT-MAGNET

SERVO MOTORS

Model SU-680D-29 delivers 12.7 watts of Continuous Power Output at 8600 rpm

Applications:

Chart Recorder Pen Drives, Null-seeking Devices, Capstan Drives for Tape Transports, Proportioning Applications, Prime Mover in Servo-Mechanisms.

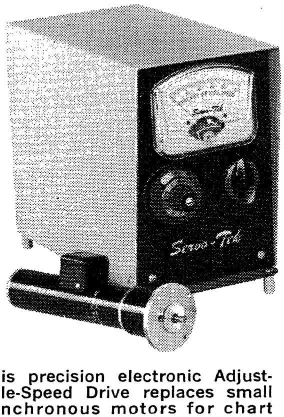
Specifications:

DYNAMIC: Maximum No-Load Speed @ 23v D-C — 10,000 ±500 rpm; Full Load Torque @ 8600 rpm—2.0 Oz.-In. (max.); Stall Torque @ 23v D-C (Theo.) — 15.0 Oz.-In. (min.); Frictional Torque — 0.25 Oz.-In. (max.); Acceleration at Stall (Torque/Inertia) — 38,000 RAD/SEC^2 (min.); Case Temperature Rise @ Full Load (Free Air Dissipation) — 55°C. (max.); Case Temperature Rise Per Watt of I^2R loss (Free Air Dissipation)—6°C.

STATIC: D-C Resistance — 4.24 Ohms (typ.); Inductance—1.85 Millihenry (typ.); Rotor Inertia — 30.0 GM-CM^2 (typ.); Total Weight — 8.25 Oz. (max.); Length—3.25 in., excluding shaft; Maximum Ambient Temp. — 40°C.

FUNCTIONAL CONSTANTS: Inertial Time Constant — 30.0 Milliseconds (max.); Electrical Time Constant—0.45 Milliseconds (typ.); Torque Constant — 2.8 Oz.-In./Amp. (min.); Voltage Constant (Back E.M.F.)—0.019v @ (1) RAD/SEC. (min.); Viscous Damping Factor—1.25 x 10^{-3} Oz.-In./rpm (min.)

Other Models Available



This precision electronic Adjustable-Speed Drive replaces small synchronous motors for chart drives, sequence switches, programmers, etc. Provides adjustable or preselected speeds from rated down to less than ½ of 1% of maximum (200:1) without loss of torque.

MINIATURE SOLID-STATE D-C

VELOCITY SERVO *

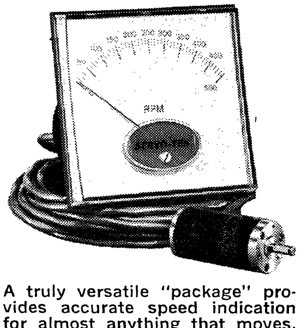
COMPLETELY NEW TOOL FOR AUTOMATION, INSTRUMENTATION

Features

Solid-state — Instant response — Tachometer feed-back — Stability better than ½ of 1% of rated speed—Line or load regulation better than ½ of 1% of rated speed —Visual speed indication—Modular plug-in construction — Input power frequency 50 to 400 cps — Two basic models provide either ¼ or 1.2 in.-oz. @ 3600 rpm — Various geared torque units with ratios as high as 7200:1 provide full speed outputs of as low as 0.5 rpm with torque to 100 in.-oz. — Components separately available for incorporation into your equipment.

ACCURATE

SPEED INDICATING SYSTEMS



A truly versatile "package" provides accurate speed indication for almost anything that moves. Nearly every industrial process or machine can benefit by the economy and safety of continuous speed indication.

SELF-POWERED—No batteries or external power required.

LOW VOLTAGE—Connecting cable can be as long as 500 ft.

PERMANENTLY LUBRICATED BALL BEARINGS.

EASILY READ 4½" INDICATOR.

TAUT BAND MOVEMENT — Withstands vibration and shock.

STANDARD RANGES — 0 to 100, 250, 500, 1000, 2000, 3000, 4000, 6000, 8000, 10,000 and 12,000 rpm. These speeds can also be provided to read "Percent of Full Speed" or "Percent of Capacity."

0 to 10 rpm available at small additional cost.

Complete System includes Generator, Indicator (specify range), Mounting Base, Coupling and 15 ft. of Connecting Cable.

PRICES quoted with a quantity discount schedule.

*An additional discount is available to resale organizations and original equipment manufacturers using these drives as an integral part of their product.

Prices subject to change without notice.

SERVO-TEK
PRODUCTS COMPANY
1086 Goffle Road, Hawthorne, N.J. 07506
(201) 427-3100

6741 Sepulveda Blvd., Van Nuys, Calif. 91401 • (213) 786-0690
CABLE ADDRESS: SERVOTEK, HAWTHORNE, N.J., U.S.A.
WESTERN UNION: FAX, HAWTHORNE, N.J.
Overseas Representative: NECO ELECTRONICS (Europe) LTD.,
North Street, Clapham Common, London S.W. 4

yasec
OUTER-ROTOR TYPE MOTORS

Highly-efficient Outer-Rotor Type Motors are now available from YASEC for economical applications in tape recorders, data-processing systems, process control systems and other highly sophisticated electrical equipment. Compared with similar size inner-rotor type motors, the new YASEC motors provide far higher torque output, with a negligible rise in temperature. The unique outer-rotor design allows precision remote-control. The rotor also may serve as a drive pulley. These overall advantages make the new YASEC motors ideal for the budget-conscious manufacturer not willing to sacrifice quality-control.

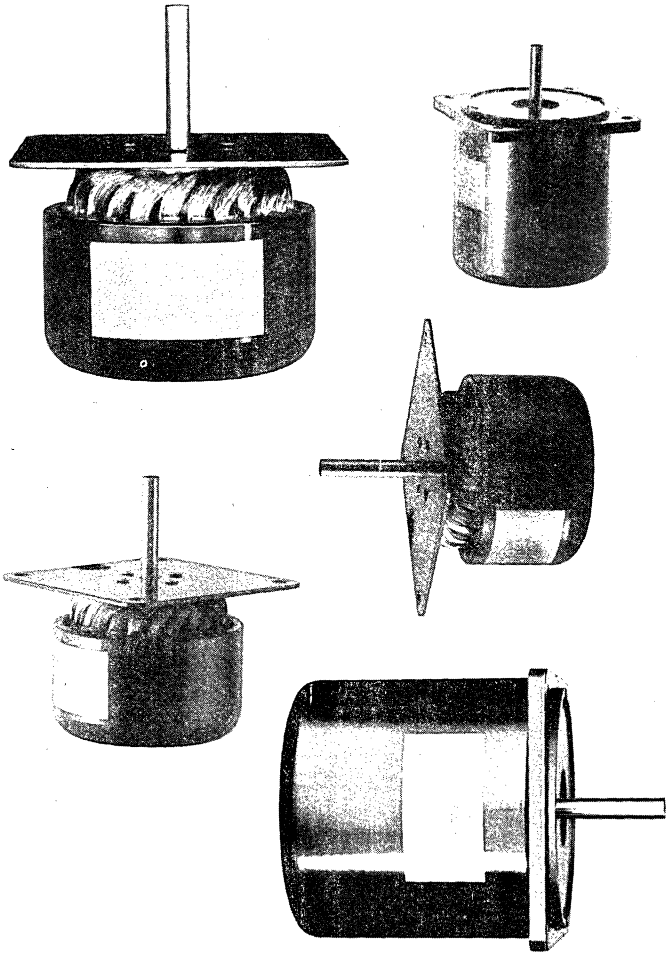
yasec motors available with many variations

YASEC motors are available in either outer-rotor or inner-rotor type for hysteresis synchronous, reaction synchronous, induction, reversible, eddy current, 2- or 3-phase, electronic servo, mult-speed, and inversion operations. The YASEC engineering staff of highly-qualified professionals at the Electronic Div. are available for designing and manufacturing small custom motors in sizes from 20 mm diam. to 200 mm diam. with output power from 1/10000 hp to 1/10 hp, according to individual requirements. Consult us about whatever small motor problem.

When you order

Let us know the following requirements and we will supply you with our estimate and drawings.

■applications ■configuration and color of housing ■diameter and length of motor shaft ■applied voltage and power frequency ■rated speed ■start torque ■rated output power (torque) ■duty ■ambient temperature range ■kind of bearings ■electrical connection ■configuration and color of condenser to be attached.



YAMASHINA SEIKI CO., LTD.

Electronic Division: 20, Kitsune Yabu-cho, Yamashina Higashino, Higashiyama-ku
Kyoto, Japan   Phone: Kyoto (075) 581-1161

Product Line of the Electronic Div.:
a full line of small motors and measuring instruments

WANTED: technical tie-up partners in line of small motors and fans; distributors throughout the world

VERNITRON CATALOG DIGEST

SERVO MOTORS

BULLETIN
*M-365-1

CUSTOM DESIGN DEPT.
Call: 516-586-5100

VERNITRON TYPE NUMBER	05M4B-AAO-AO	08M4K-AAO-AO	08M4N-ABO-AO	10M4C-AAO-AO	10M4J-AAO-AO	11M4D-ABO-AO	11M6D-AAO-AO	11M4R-AAO-AO	15M6D-AEO-AO	15M4L-ADO-AI	18M4B-AEO-HO	18M4H-ABO-CO	18M6H-ABO-CO	23M6C-ABO-BO	23M4E-AAO-AO
Frame Size	5	8	8	10	10	11	11	11	15	15	18	18	7	23	23
Weight	.6	1.1	.75	1.4	1.7	4.6	4.6	3.3	8.0	8.0	12	14	14	35	30
Stall Torque	.10	.20	.20	.30	.33	1.0	1.0	.70	2.0	1.45	2.3	5.0	8.0	18	6.0
No Load Speed	9500	9500	7000	6500	9700	6200	3450	6700	3200	6500	4800	10,000	3300	3200	10,000
Frequency	400	400	400	400	400	400	60	400	60	400	400	400	60	60	400
Rotor Inertia	.05	.40	.30	.47	.46	1.1	1.1	.65	3.3	1.0	4.0	5.0	5.0	15	10.0
Volts Input (Fixed Phase or Fixed ø)	26	26	26	115	26	115	115	115	115	115	115	115	115	115	115
Volts Input (Control Phase)	36/18	26	26	40CT	40/20	115/57.5	36CT	36CT	230/115	115/57.5	40/20	115/57.5	115/57.5	36/18	115/57.5
Stalled Impedance (F ø)	230+J200	190+J180	200+J175	2300+J3000	140+J115	634+J987	1700+J1700	1160+J1640	1300+J950	390+J670	250+J590	120+J196	325+J390	140+J190	150+J183
Stalled Impedance (Control ø)	440+J380	190+J180	200+J175	210+J270	310+J270	634+J987	221+J221	116+J164	5200+J3800	390+J670	35+J85	120+J196	325+J390	14+J19	150+J183
Power Input (Fixed ø)	1.8	1.9	1.9	2.0	3.0	6.5	4.0	3.7	6.0	8.0	9	30	16	29	36
Power Input (Control ø)	1.8	1.9	1.9	3.0	3.0	6.5	4.0	3.7	6.0	8.0	9	30	16	29	36
Acceleration @ Stall	150,000	40,000	47,500	45,000	50,000	66,000	66,000	80,000	5 3000	100,000	40,000	70,000	110,000	85,000	50,000
Figure of Merit	15,000	8,000	10,000	13,500	16,000	66,000	66,000	56,000	133,000	145,000	96,000	350,000	900,000	1,500,000	300,000
Motor Torque Constant	200	550	550	525	580	620	2000	1400	760	890	4000	3000	5700	35,000	4200
Motor Damping Factor	6.9	15	20	32	24	108	216	71	550	158	335	300	1800	4000	460
Motor Velocity Constant	29	36	27.5	16	24	5.8	9.3	20	1.4	5.6	12	10	3.0	9.0	9
Motor Corner Frequency	138	37	68	68	52	100	200	110	167	158	83	60	360	265	49
Motor Time Constant	.0072	.027	.015	.014	.019	.010	.005	.010	.006	.006	.012	.017	.028	.003	.022
Reversing Time	.011	.043	.025	.023	.030	.017	.008	.016	.010	.010	.020	.028	.004	.006	.037
		.750"L	.625"L	.625" L	1.000" L	L=1.438" w/leads Lt=1.938	L=1.438" w/leads Lt=1.938"	L=1.050" w/leads	Lt=1.800"	L=1.530"	Lt=2.015"	Lt=2.850"	Lt=2.850"	Lt=3.000"	Lt=2.100"

DAMPING DEVICES

BULLETINS
*D-365-1
*G-365-1

MOTOR GENERATOR

VERNITRON TYPE NUMBER	08G4C-AAO-AO	11G4D-AA1-AO	15G6L-AA2-CO	18G4E-AC1-BO	18G6E-AC3-BO	23G6A-AA1-AO	23G4B-AA1-BO
Frame Size	1	5	7	9	9	10	11
Weight	2	3.5	15	29	29	40	40
Frequency	400	400	60	400	60	60	400
Stall Torque	.20	.70	2.0	5.0	8.0	18	6.0
No Load Speed	6500	6500	3000	10,000	3000	3000	9500
Rotor Inertia	.33	1.0	5.3	5.0	10.0	18	18
Motor Fixed ø (volts)	26	115	115	115	115	115	115
Motor Control ø (volts)	26	36CT	36CT	115/57.5	115/57.5	115	115/57.5
Motor Fixed ø Impedance	200+J175	1160+J1640	1300+J950	120+J196	325+J390	140+J190	150+J183
Motor Control ø Impedance	200+J175	116+J164	130+J95	120+J196	325+J390	140+J190	150+J183
Motor Fixed ø Power	1.9	3.7	6.0	30	16	29	36
Motor Control ø Power	1.9	3.7	6.0	30	16	29	36
Generator Input Voltage	26	115	115	115	115	115	115
Generator Output Voltage	.45	1.0	3.0	3.1	3.0	3.2	3.2
Generator Input Power	1.5	2.5	1.5	5.4	1.5	1.5	6.0
Generator Input Impedance	570+J550	2200+J2650	3600+J4200	900+J1200	3600+J4200	3600+J4200	1000+J1100
Null Voltage	.015	.025	.050	.030	.050	.050	.025
Phase Shift	±10°	±10°	+14°	±10°	+14°	+14°	±10°
Length	1.250	1.842	3.258	4.400	4.400	4.625	3.710

INERTIALLY DAMPED

VERNITRON TYPE NUMBER	08D4B-CCO-A1	11D4A-ADO-DO	15D6B-ABO-A3	15D4C-ACO-AO	18D6B-AAO-AO
Frame Size	1	2	3	3	4
Weight	3.0	6.0	12	12	18
Frequency	400	400	60	400	60
Stall Torque	.30	.63	2.0	.7	4.0
No Load Speed	6300	6300	2700	9500	3000
Rotor Inertia	.48	1.5	6.0	6.0	6.5
Motor Fixed ø (volts)	115	115	115	115	115
Motor Control ø (volts)	40 20	40CT	40 20	36 18	40 20
Motor Fixed ø Impedance	1800+J2340	1275+J1800	1450+J1080	600+J800	750+J750
Motor Control ø Impedance	225+J292	150+J210	170+J130	60+J80	87+J86
Motor Fixed ø Power	2.8	3.5	6.0	6.5	9.0
Motor Control ø Power	2.8	3.5	6.0	6.5	9.0
Flywheel Inertia	5	10	100	100	100
Flywheel Damping	200	350	1250	1500	1000
Corner Frequency W1 (RAD/SFC)	6	4	4.2	0	4.4
W2 (RAD/SFC)	40	35	12.5	15	10
W3 (RAD/SFC)	500	300	250	250	282
Max. Kv in System (sec^{-1})	3000	2500	750	∞	670
Length (max.)	1.680	2.125	2.650	2.650	3.310

COMPUTING DEVICES

BULLETIN
*I-365-1

RATE GENERATORS

VERNITRON TYPE NUMBER	08C4A-AA1-AO	11C4A-AA1-AO	15C4A-AA1-AO
Frequency (CPS)	400	400	400
Excitation Voltage Generator (volts)	26	115	115
Power Input Generator (watts)	2.2	—	—
Voltage Gradient (volts/1000 RPM)	.63	—	—
Phase Snift (deg.)	5° Lag	5° Lag	5° Lag
Position Error (In Phase) (volts)	—	8	8
Position Error (Quadreture) (volts)	—	15	15
Axis Error In Phase (Volts)	—	4	4
Axis Error Quad. (volts)	—	5	5
RMS Null Voltage (volts)	.015	—	—
Temperature Sensitivity	.05%/C°	.05%/C°	.05%/C°
Length (L)	1.0		

INTEGRATORS

VERNITRON TYPE NUMBER	08I4A-AA1-AO	08I4A-AA1-A1	11I4B-AA1-AO	15I4A-AB2-AO	15I4E-AB1-BO	15I4A-AA3-AO	15I4B-AA1-AO
Frequency (CPS)	400	400	400	400	400	400	400
Excitation Voltage Generator (volts)	26	26	115	115	115	115	115
Power Input Generator (watts)	2.5	2.5	5.5	6	5.5	5.5	4
Voltage Gradient (volts/1000 RPM)	.5	.5	2.75	2.75	2.75	2.75	1.0
Phase Shift (deg.)	0°	0°	0°	0°	0°	0°	0°
Position Error (In Phase) (volts)	—	—	7	10	—	8	2
Position Error (Quadreture) (volts)	—	—	11	20	—	15	6
Axis Error In Phase (volts)	—	—	7	5	—	4	5
Axis Error Quad. (volts)	—	—	.10	10	—	5	5
RMS Null Voltage (volts)	.015	.015	—	—	.015	—	—
Temperature Sensitivity	±1% (−55°C to 125°C)	±.5% (−15°C to 75°C)	±.3% (0°C to 85°C)	±.3% (0°C to 85°C)	±5% (−55°C to 100°C)	±.25% (−15°C to 75°C)	±.05% (0° to 125°C)

VERNITRON CORPORATION

*** Motor Products Division**

300 Marcus Boulevard, Deer Park, New York 11729 / (516) 586-5100, TWX: 510-227-6079

Other Control Components Group Products: Control Components Division, Torrance, California - Synchros, Resolvers, Torqsyns*, Servo Assemblies; Magnetic Technology Division, Canoga Park, California - Torque Motors and Tachometer Generators. *Reg. T.M.

VERNITRON CATALOG DIGEST

HYSTERESIS SYNCHRONOUS MOTORS

BULLETIN
*HS-366-1

CUSTOM DESIGN DEPT
Call: 516-586-5100

VERNITRON TYPE NUMBER		08H6G-AA0-Y0	08H4C-AA0-Y0	08H4C-BB0-Y0	08H8E-AA0-Y0	11H6A-EE0-B4	11H4P-CC0-A0	11H4B-CC0-A0	11H4C-AA0-B0	11H10A-AA0-A0	15H4C-CC0-D0	18H6G-BB0-A0(2)	18H4G-AA0-A0	20H4A-AA0-A0	32H6A-AA0-A0
Frame Size		8	8	8	8	11	11	11	11	11	15	18	18	20	32
Frequency (Hz)		60	400	400	80	60	400	400	400	1000	400	60	400	420	60
Speed (RPM)		1800	8000	12000	1600	1800	4000	6000	12000	20000	6000	900 1800	8000	12,600	900
Poles (No.)		4	6	4	6	4	12	8	4	6	8	8 4	6	4	8
Volts		18	26	115	21	26	115	36 CT	26	26	115	115 115	115	120	115
Number of Phases		1	2	2	1	3	1	2	2	1	2	1 1	3	1	1
Power Running (watts)		2.2	3.4	2.6	3.5	1.5	5.5	3.0	4.5	4.8	7.5	12 9	14	20.0	24
TORQUE (oz-in.)	Pull In	0.10	0.22	0.14	0.05	0.20	0.18	0.09	0.28	0.03	0.80	0.40 0.40	2.25	2.3	4.1
	Pull Out	0.10	0.27	0.15	0.05	0.25	0.22	0.09	0.28	0.08	0.80	0.50 0.50	2.25	2.3	4.4
	Start	0.10	0.22	0.13	0.07	0.25	0.27	0.10	0.33	0.03	0.50	0.25 0.25	3.25	2.3	6.8
Capacity (Mfd.)		2.5	—	—	15.0	—	0.33	—	—	—	—	3.0 1.5	—	0.13	2
L (In) (3)		Spec	1.187	1.187	Spec	1.375	1.375	1.344	1.375 MAX.	1.375	L = 1.435 LT = 1.515	1.860 1.990	L = 1.860 LT = 1.990	Spec	Spec

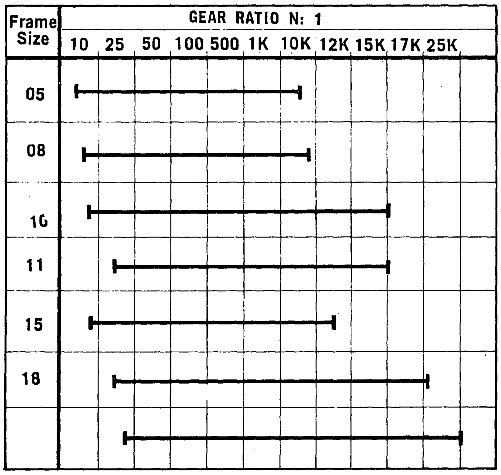
STEPPING MOTORS

BULLETIN
*S-367-1

VERNITRON TYPE NUMBER	05MPA-AA0-A0	05MRA-AA0-A0	08MPB-AA4-A0	08MPB-AB4-A0	08MPC-RE4-A0	08MRB-AG3-A0	11MPA-AB2-D0	11MPA-AH4-D0	11 MRA-AC3-D0	11 MRA-AE3-D0	11 MRA-AI3-D0	15 MPA-AD4-A0	15 MRA-AA3-A0	20 MRA-AA3-A0
Frame Size	5	5	8	8	8	8	11	11	11	11	11	15	15	20
Stepping Angle (Degree)	90	15	90	90	90	15	90	45	15	15	15	90	15	15
Max. Unloaded Stepping Rate (PPS)	100	400	240	130	110	800	225	260	1000	600	300	150	725	370
Rotor Inertia (gm-cm²)	.05	.05	.15	.15	.70	.15	1.0	1.0	1.0	1.0	1.0	3.75	1.0	10
Power Input (watts)	4.0	8.0	8.0	2.5	3.0	10.0	7.0	5.0	29.0	10.0	3.0	23.0	15.0	39
Stall Torque (oz.-in.)	0.20	0.30	0.45	0.22	0.4	.70	1.5	1.2	4.0	2.0	.50	4.0	4.5	36.0
Max. Running Torque @ 10 PPS (oz.-in.)	0.10	.12	.22	0.1	0.2	.35	0.74	0.70	2.0	.60	.25	2.0	2.4	7.0
Resistance/Phase (ohms)	200	100	100	325	260	78	120	155	30	80	250	35	50	20.6
Current/Phase (ma)	140	28	280	90	108	360	240	180	940	350	110	800	560	1400
Length (in.)	1.000	1.000	1.000	1.000	1.000	1.000	1.310	1.310	1.310	1.310	1.310	1.400	1.400	2.75

GEARHEADS

BULLETIN
*GH-368-1



GYRO MOTORS

BULLETIN
GM-369-1

SAMPLE: 16H4A-AA0-A0

		Inverter
Voltage	60 (AC, Mod. Sq. Wave)	26-30
Frequency	400 Hz	DC
Current	0.120A or 0.080A	0.200 or 0.150 @ 28 VDC
Power	6.2 or 4.8 Watts	—
RPM	12,000 or 8,000	—

Rotor Weight: 130 or 109 Grams
Rotor Inertia: 280 or 150 GM-CM²
Unit Diameter: 1.625 or 1.557 in.

CALL **(516) 586-5100** FOR FULL GYRO MOTOR LISTING

INSTANT TORQUE GUIDE

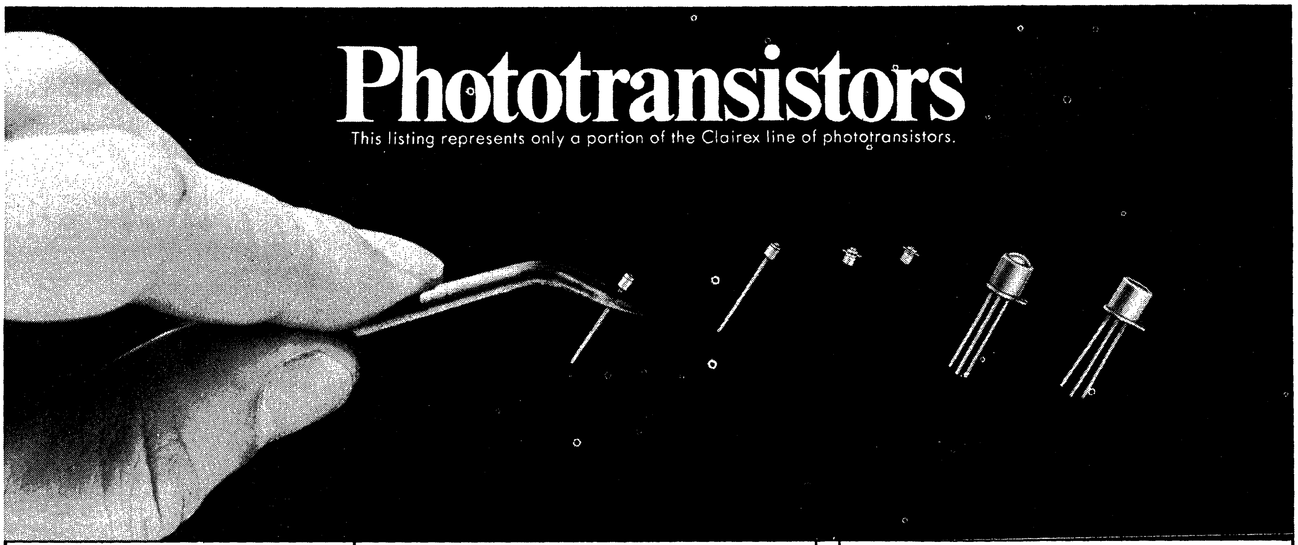
VERNITRON CORPORATION

* **Motor Products Division**
300 Marcus Boulevard, Deer Park, New York 11729 / (516) 586-5100, TWX: 510-227-6079

Other Control Components Group Products: Control Components Division, Torrance, California - Synchros, Resolvers, Torqsyns*, Servo Assemblies; Magnetic Technology Division, Canoga Park, California - Torque Motors and Tachometer Generators. *Reg. T.M.

Phototransistors

This listing represents only a portion of the Clairex line of phototransistors.



Silicon NPN Planar Epitaxial Phototransistors

Maximum Ratings
Maximum Temperatures
Storage Temperature −65°C to + 200°C
Operating Junction Temperature +150°C
Maximum Power Dissipation
Total Dissipation at 25°C, P_T = 250mWderate 2.0mW/°C
Total Dissipation at 100°C, P_T = 100mW

Maximum Ratings
Maximum Temperatures
Storage Temperature −65°C to +180°C
Operating Junction Temperature +150°C
Maximum Power Dissipation
Total Dissipation at 25°C, P_T = 50mW derate 0.5mW/°C
Total Dissipation at 100°C, P_T = 12.5mW

ELECTRICAL CHARACTERISTICS	**CLT 2010**	**CLT 2030**	**CLT 2130**	**CLT 2160**	**CLR 2050**	**CLR 2060**	**CLR 2170**	**CLR 2180**	**CLT 3020**	**CLT 3030**	**CLT 3160**	**CLT 3170**	**CLT 4020**	**CLT 4030**	**CLT 4160**	**CLT 4170**
Package or Size ("O.D.)	TO-18	TO-18	TO-18	TO-18	TO-18	TO-18	TO-18	TO-18	.060"	.060"	.060"	.060"	.060"	.060"	.060"	.060"
Window or Lens	W	W	L	L	W	W	L	L	W	W	L	L	W	W	L	L
MAX VOLTAGES (Volts)																
V_{CBO}	80	60	80	60	80	80	80	80								
V_{CEO}	50	30	50	30	40	40	40	40	50	40	50	40	50	40	50	40
V_{ECO}	5	5	5	5					5	5	5	5	5	5	5	5
V_{EBO}					10	10	10	10								
MAX CURRENT I_C ma, Note 3.	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
LIGHT CURRENT in ma , Note 1.																
I_L ($V_{CE}=5V$, $H=0.02mW/cm^2$) min.							0.2	0.4								
max.							0.5	0.8								
I_L ($V_{CE}=5V$, $H=0.2mW/cm^2$) min.					0.6	1.4	2.0	4.0								
max.					1.8	4.0										
I_L ($V_{CE}=5V$, $H=2.0mW/cm^2$) min.					6.0	14.0										
max.																
I_L ($V_{CE}=5V$, $H=5.0mW/cm^2$) min.	0.2	1.0	0.6	4.0					0.1	0.25	0.25	0.5	0.1	0.25	0.25	0.5
max.	0.6	3.0	1.8	12.0												
I_L ($V_{CE}=5V$, $H=20.0mW/cm^2$) min.									0.4	1.0	1.0	2.0	0.4	1.0	1.0	2.0
max.									1.2	3.0	3.0	5.0	1.2	3.0	3.0	5.0
DARK CURRENT																
I_D (I_{CEO} @ 25°C) in na, H=O max.	25	25	25	25	50	50	50	50	10	10	10	10	10	10	10	10
I_D (I_{CEO} @ 100°C) in μa, H=O max.	25	25	25	25												
BREAK DOWN VOLTAGES (Volts)																
BV_{CEO} I_C=100 μa min.	50	30	50	30	40	40	40	40	50	40	50	40	50	40	50	40
BV_{CBO} I_C=100 μa min.	80	60	80	60	80	80	80	80								
BV_{EBO} I_E=100μa min.					10	10	10	10								
BV_{ECO} I_{EC}=100 μa min.	5	5	5	5					5	5	5	5	5	5	5	5
t_r μsec (I_C=0.5ma, R_L=1000Ω, V_{CC}=5V) Note 2. (Typical)	3	3	3	3	100	100	100	100	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
t_f μsec	3	3	3	3	150	150	150	150	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
$V_{CE (SAT)}$ I_C=10ma, I_B=0.05ma, H=O					1.0	1.0	1.0	1.0								
$V_{CE (SAT)}$ I_C=10ma, I_B=0.5ma, H=O	0.30	0.30	0.35	0.30												
$V_{CE (SAT)}$ I_C=0.4, H=20mW/cm²									0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

Note 1: The light source is a frosted tungsten incandescent lamp at 2854°K. **Note 2:** The light source is a gallium arsenide LED pulsed with a rise and fall time of < 0.3 μsec.
Note 3: Pulsed conditions: 300 μsec., 2% duty cycle.

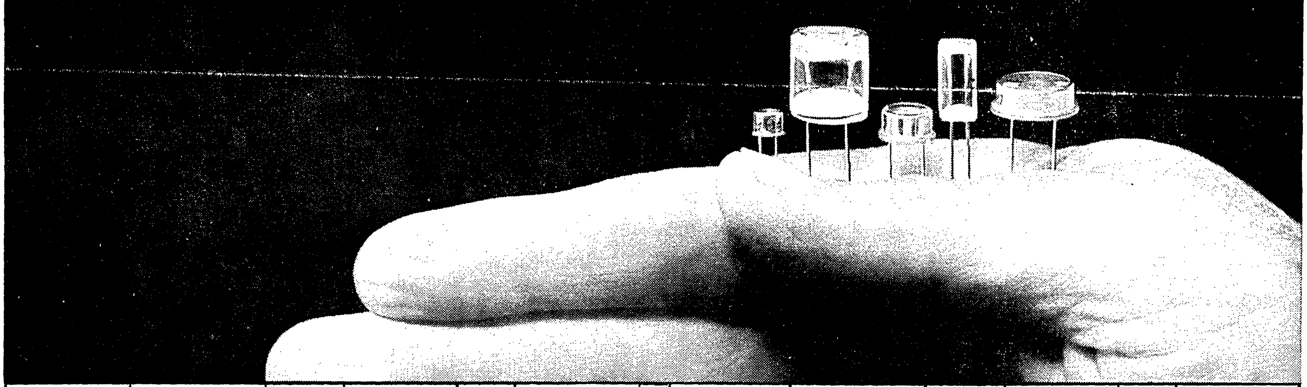
CLAIREX ELECTRONICS®

A DIVISION OF CLAIREX CORPORATION

560 SOUTH THIRD AVE., MOUNT VERNON, N.Y. 10550 • WRITE FOR NAME OF YOUR NEAREST CLAIREX REPRESENTATIVE OR DISTRIBUTOR.

Photoconductive Cells

This listing represents less than half of the Clairex standard and special photocells available. A 16-page design manual is available on request.



Photocell ordering abbreviation	Diam. X Length (inches)	Resistance @ 2 fc ± 33⅓%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL5M2	.55 X .18	55K	1:100	250	2000-500[1]
CL602	.25 X .5	1 meg.		300	75
CL702	.36 X .18	1 meg.		300	125
CL902	.21 X .15	1 meg.		250	50

Type 2 CdS (photosensitive material designated by last number in ordering abbreviation, i.e. CL5M2). Peak spectral response 5150 angstroms, bluest response photosensitive material, high stability, lowest temperature error.

CL503	.5 X .5	7.2K	1:10,000	250	500-250[1]
CL5M3	.55 X .18	7.2K		250	2000-500[1]
CL603	.25 X .5	133K		300	75
CL603A	.25 X .5	75K		300	75
CL603AL	.25 X .5	3.5K		170	75
CL703	.36 X .18	133K		300	125
CL703A	.36 X .18	67K		300	125
CL703L	.36 X .18	2.7K		100	125
CL903	.21 X .15	133K		250	50
CL903A	.21 X .15	67K		250	50
CL903L	.21 X .15	6.0K		100	50

Type 3 CdSe, peak spectral response 7350 angstroms, fast response, and very high light-to-dark resistance ratio. Can be used for high speed switching or counting. Sensitive to near infra red. For use with incandescent or neon lamps.

CL504	.5 X .5	1.5K	1:1000	250	500-250[1]
CL5M4	.55 X .18	1.5K		250	2000-500[1]
CL504L	.5 X .5	0.25K		170	500-250[1]
CL5M4L	.55 X .18	0.25K		170	2000-500[1]
CL604	.25 X .5	30K		300	75
CL604L	.25 X .5	1.5K		170	75
CL704	.36 X .18	30K		300	125
CL704L	.36 X .18	0.6K		100	125
CL904	.21 X .15	30K		250	50
CL904L	.21 X .15	2K		100	50

Type 4 CdSe, peak spectral response 6900 angstroms, lowest resistance photocells available. Can be used for "on-off" applications when low resistance is desired. For use with incandescent or neon lamps.

CL505	.5 X .5	9K	1:100	250	500-250[1]
CL5M5	.55 X .18	9K		250	2000-500[1]
CL505L	.5 X .5	1.5K		170	500-250[1]
CL5M5L	.55 X .18	1.5K		170	2000-500[1]
CL605	.25 X .5	166K		300	75
CL605L	.25 X .5	7.5K		170	75
CL705	.36 X .18	166K		300	125
CL705L	.36 X .18	3.3K		100	125
CL905	.21 X .15	166K		250	50
CL905L	.21 X .15	10K		100	50

Type 5 CdS, peak spectral response 5500 angstroms (closely matches the human eye), most stable, lowest memory photocell available. Can be used in light measuring applications and precision low speed switching. For use with incandescent, fluorescent or neon lamps.

CL705HL	.36 X .18	28K	1:1000	100	125
CL905HL	.21 X .15	100K		100	50
CL905HN	.21 X .15	700K		100	50

Type 5H CdS, peak spectral response 5500 angstroms (closely matches the human eye). Combines high speed, stability, linearity, and uniform color temperature response.

Photocell ordering abbreviation	Diam. X Length (inches)	Resistance @ 2 fc ± 33⅓%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)
CL507	.5 X .5	7.2K	1:1000	250	500-250[1]
CL5M7	.55 X .18	7.2K		250	2000-500[1]
CL607	.25 X .5	133K		300	75
CL707	.36 X .18	133K		300	125
CL707L	.36 X .18	2.7K		100	125
CL907	.21 X .15	133K		250	50
CL907N	.21 X .15	66K		100	50

Type 7 CdS, peak spectral response 6150 angstroms, moderate speed and ratio. Can be used in general beam breaking applications. For use with incandescent, neon or fluorescent lamps.

CL707H	.36 X .18	500K	1:1000	300	125
CL707HM	.36 X .18	100K		250	125
CL707HL	.36 X .18	10K		100	125
CL907H	.21 X .15	600K		250	50
CL907HN	.21 X .15	300K		100	50
CL907HL	.21 X .15	24K		100	50

Type 7H CdS Peak Spectral response 6200 angstroms. Very fast decay time coupled with low resistance and high linearity. Ideal for beam breaking applications.

Photocell ordering abbreviation	Diam. X Length (inches)	Resistance @ 2 fc ± 33⅓%	Minimum resistance ratio from 2 ftc to Dark within 5 sec.	Maximum voltage	Power Dissipation @ 25°C (mw)	Type
CL703/2	.36 X .18	50K	1:10,000	300	125	3 CdSe
CL703L/2	.36 X .18	6.5K	1:10,000	100	125	3 CdSe
CL704/2	.36 X .18	17K	1:1000	300	125	4 CdSe
CL704L/2	.36 X .18	1.5K	1:1000	100	125	4 CdSe
CL705/2	.36 X .18	166K	1:100	300	125	5 CdSe
CL705L/2	.36 X .18	7.5K	1:100	100	125	5 CdS

DUAL ELEMENT

Photocells contain two separate elements with two separate leads and one common lead.

CELL
CLAIREX
PHOTOMOD
CLM3024
LAMP

PHOTOMOD®

PHOTOCELL-LAMP ASSEMBLIES

Part No.	Rated Lamp Voltage	Resistance (Max. Ohms) @ Rated Lamp Voltage	Max. Allowable Cell Voltage @ Peak AC
CLM3006A	6	160	120V
CLM4006A	6	55	120V
CLM4012A	12	30	120V
CLM3012A	12	160	120V
CLM5H10A	10	3000	120V
CLM7H16A	16	550	170V
CLM3120A	120	1150	120V
CLM4120A	120	160	120V

FOOTNOTE: [1] With and without heat sink.

CLAIREX ELECTRONICS®

A DIVISION OF CLAIREX CORPORATION

560 SOUTH THIRD AVE., MOUNT VERNON, N.Y. 10550 • WRITE FOR NAME OF YOUR NEAREST CLAIREX REPRESENTATIVE OR DISTRIBUTOR.

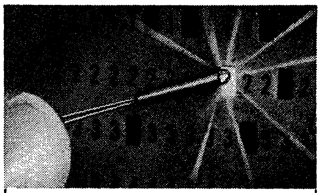
From photosensing components to
Custom Optoelectronic Assemblies and Systems...

You'll get the best in sensor technology from

SENSOR TECHNOLOGY, INC.

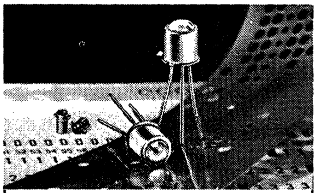
PHOTO-TRANSISTORS AND ARRAYS

For computer card/tape readout and photosensing devices.



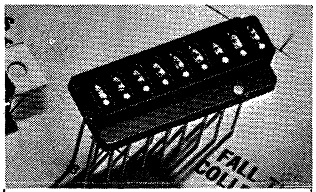
NARROW-VIEWING PHOTO TRANSISTORS

Fast switching with extremely narrow field of view for minimum cross-talk. Hermetically sealed glass package is small, ideal for close positioning.



MINIATURE AND TO-18 PHOTO-TRANSISTOR STYLES

High sensitivity and fast switching in rugged TO-18 case or miniature no-lead case for mounting directly into PC boards. All ratings.

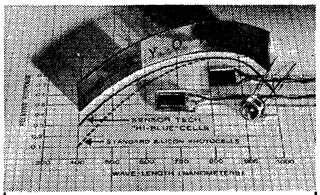


HIGH EFFICIENCY PHOTO-TRANSISTOR ARRAYS

Multi-position NPN arrays housed in standard drop-in packages. High sensitivity and fast reading. Interface with DTL, RTL or TTL logic.

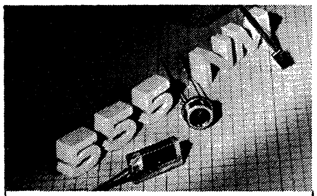
COLOR SENSING PHOTOCELLS

For colorimetry and spectrometry.



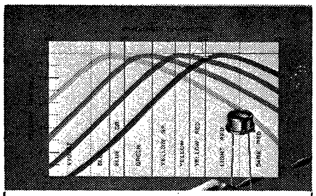
"HI-BLUE" SILICON CELLS

Sensor Tech "Hi-Blue" cells provide an output up to 300% greater than standard silicon cells sensing the blue (400 nm.) region, to simplify and reduce amplification.



SENSOR 555 "GREEN PEAK"

Ideal for color recognition systems because they have a peak response identical to that of the human eye (555 nm.) and do not require bias power for photovoltaic action.

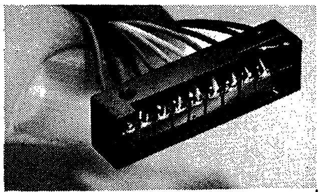


"PICK-A-PEAK" PHOTOCELLS

A new line of silicon cells that lets you "pick" the peak spectral response characteristics you want and need at any point on the spectrum... from blue to infra-red region!

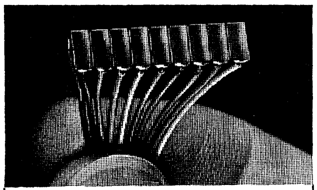
SILICON PHOTOVOLTAIC CELLS

For light actuated devices and solar energy conversion.



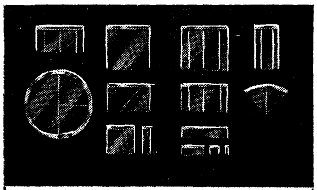
SENSOR TECH ULTRA-CELL®

Silicon photovoltaic cells for faster response speed and lower reverse leakage than standard cells. Single cells or arrays in geometries to meet any device requirement.



EDGE-CONTACT CELLS

An exclusive ST development, Edge Contacts maximize the usable active cell area, permit closer mounting to the light source. May be specified for any ST cell type.



SILICON SOLAR CELLS

Highly efficient photovoltaic cells for light actuated devices or for converting sunlight directly into DC power. Cells, arrays or panels to any size or shape requirement.

CUSTOM ASSEMBLIES AND SENSING SYSTEMS

Advanced thin-film hybrid and fiber optic technologies.

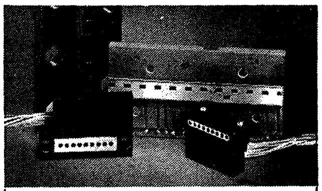
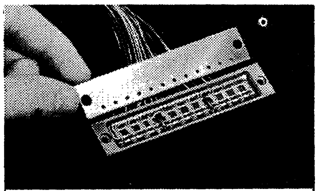


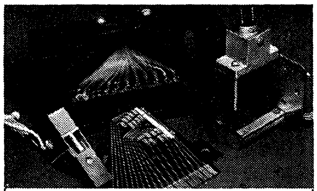
PHOTO-TRANSISTOR CARD/TAPE READERS

Dual-in-line packaged phototransistor arrays in rugged mountings designed and produced to your specifications. DTL, RTL or TTL interfacing.



THIN-FILM HYBRID READOUT ASSEMBLIES

Thin-film sensor/amplifier circuits in minimum space, in custom housings for ease of mounting. Amplifiers are DTL or TTL compatible.



COMPLETE SYSTEMS... DESIGN THRU TESTING

Photovoltaic or Photo conductive. Fiber optic interfacing, sensing, amplification, biasing and packaging in one unit, to any requirement.

WRITE FOR LITERATURE: SENSOR TECHNOLOGY, INC., 7118 GERALD AVENUE, VAN NUYS, CALIFORNIA 91406. (213) 781-2154

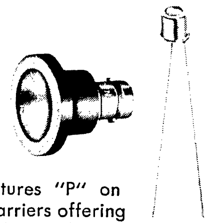
12 ways to shed some light on your silicon detector problems

It all starts with UDT
And our overwhelming selection of both diffused and Schottky Silicon PIN photodetectors.
Add to that, our complete array of digital light measuring instrumentation, and you begin to see the light . . .
to a spectral response of 2000 Å to 11,500 Å and sensitivities of D* to 10^{13}. And with response time to 4 nanoseconds and absolute calibrations traceable to NBS.
Write (on your letterhead) for our FREE design manual.
It'll shed a lot more light on your problems.

from
UNITED DETECTOR TECHNOLOGY

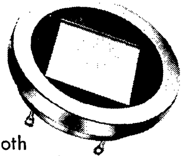
1732 21st Street
Santa Monica, California 90404
(213) 393-2781 or 393-3785

1.



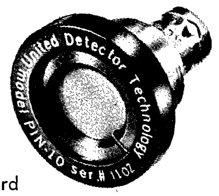
DIFFUSED STANDARD SERIES
This series features "P" on "N" diffused barriers offering long term stability and ruggedness under all levels of incident irradiation to as high as direct sunlight. These devices may be used photovoltaicly without bias or biased to 100V.

2.



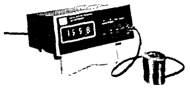
POSITION SENSING SERIES
Consisting of both long line single axis light position sensors and circular one- and two-axis sensors, this series provides heretofore unobtainable position sensitivity, resolution and off center absolute position accuracy.

3.



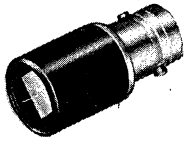
CALIBRATED SERIES
Provides a fast, convenient, and accurate standard traceable to NBS for photometric and radiometric measurements. Calibration stability is better than 2 percent over a 6 month period.

4.



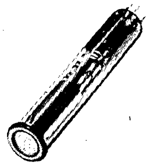
DIGITAL PHOTOMETER
4-digit readout in footcandles, footlamberts or watts/cm² (10^{-3} to 10^{4} footcandles range). Photometer comes complete with detector, mount, cosine receptor, factory calibration, photopic filter, carrying case, and BCD output. Total price $925.

5.



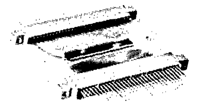
LOW CAPACITY SERIES
This series takes advantage of the low distributed detector capacities possible with the Schottky Barrier process. This process permits UDT to maintain the excellent low capacity characteristics of high resistivity "N" type silicon.

6.



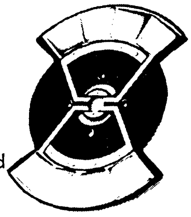
SILICON VIDICON TARGET
SV-100 silicon vidicon targets are high performance, high density arrays of photodiodes on a silicon chip. Characteristics are: 0.001" center-to-center spacing, spectral response peak at 9000Å, total target leakage current is 5 na, low blemish count, no lag or hysteresis.

7.



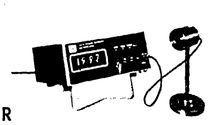
STANDARD ARRAY SERIES
Single and Dual Axis arrays with center to center spacings from 0.008" to 0.500". Multiple chip or monolithic construction to 10" in length. A wide variety of mounting schemes are available.

8.



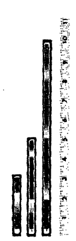
SPECIALS
The Schottky and planar diffused technologies employed by United Detector Technology are very readily adaptable to new geometries and to modified characteristics. Geometries possible include lengths to 10", widths to 1", diameters to 2".

9.



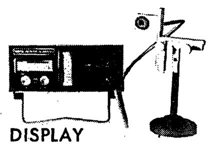
DIGITAL LASER POWER METER
4-digit, readout in microwatts — milliwatts — watts for any 3 preselected monochromatic colors or white light (10^{-9} to 10 watts). Meter comes complete with detector, bench mount, filter holder, carrying case, and BCD output. Total price $840.

10.



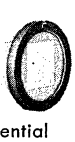
LONG LINE SERIES
Utilizing the cold formed Schottky Barrier permits this 'P" on "N" barrier to be evaporated up to 9" in length. These devices have low distributed capacity, good blue response, and low leakage current independent of a guard ring.

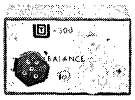
11.



X-Y LINEAR DISPLACEMENT DISPLAY
This instrument, when used with one of UDT's "SC" position detectors and collimated light source, gives a display in X and Y with a resolution better than 0.0001". Unit includes two null meters, two UDT-300 Differential Amplifiers, power supply, and null controls.

12.





AMPLIFIERS (UDT 300)
UDT-300: Differential amplifier and balance control for position sensing.

UDT-100: Low noise, single input AC voltage amplifier.
UDT-400: Transistor can (TO-5) mounted detector-amplifier combination, DC to 40OKHz.
UDT-200: 5 nsec rise time detector amplifier.

VACTEC

PHOTOCONDUCTIVE CELLS

Light dependent resistors in 5 materials and 8 styles. All ± 33⅓% tolerance for a 2 Ft.-C resistance.

HOW TO ORDER (example)

VT-102
series
material
resistance

MATERIAL	PEAK SPECTRAL RESPONSE
Type 0 CdS (Broad Spectrum)	5650 A
Type 1 CdSe (High Speed)	7350 A
Type 2 CdS (High Stability)	5150 A
Type 3 CdS (High Speed and Stability)	5500 A
Type 4 CdSe (Low Resistance)	6750 A

VT-100 Series (Plastic)

200 MW @ 25°C

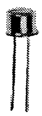
Part No.	2 Ft.-C Resis. KΩ	Max. Volt.
VT-10L	1.6	200
VT-101	3	200
VT-101H	6	200
VT-102L	9	300
VT-102	16	300
VT-103L	32	300
VT-103	66	300
VT-104	136	300
VT-111	2.3	200
VT-111H	4.6	200
VT-112L	9.2	300
VT-112	22	300
VT-113L	44	300
VT-113	60	300
VT-121	3	200
VT-121H	6	200
VT-122L	9	300
VT-122	16	300
VT-123L	32	300
VT-123	66	300
VT-124	136	300
VT-132	10	200
VT-133L	14	200
VT-133	28	200
VT-14L	.6	200
VT-141	1.2	200
VT-141H	2.4	200
VT-142L	4.8	300
VT-142	7	300
VT-143L	14	300
VT-143	28	300

VT-100
(.065" Thickness)
(Diam. .368")
Plastic

VT-200 Series (TO-18)

50 MW @ 25°C

Part No.	2 Ft.-C Resis. KΩ	Max. Volt.
VT-201	4.3	100
VT-202	8	100
VT-202H	15	100
VT-203	22	300
VT-203H	44	300
VT-204L	88	300
VT-204	110	300
VT-205	1000	300
VT-211	2.3	100
VT-211H	3.5	100
VT-212L	6	100
VT-212	7.8	100
VT-213L	16	100
VT-213	22	300
VT-213H	32	300
VT-214L	64	300
VT-214	140	300
VT-221	6.8	100
VT-222	10	100
VT-222H	20	100
VT-223	40	300
VT-223H	65	300
VT-224L	80	300
VT-224	500	300
VT-225	1000	300
VT-232	100	100
VT-233L	150	100
VT-233	350	100
VT-234	700	100
VT-235	1400	300
VT-241	2	100
VT-241H	4	100
VT-242L	8	100
VT-242	15	100
VT-242H	30	300



VT-200
TO-18
(Diam. .183)

VT-300 Series (TO-5)

125 MW @ 25°C

Part No.	2 Ft.-C Resis. KΩ	Max. Volt.
VT-30L	1.8	200
VT-301	3	200
VT-301H	6	200
VT-302L	10	300
VT-302	16	300
VT-303L	32	300
VT-303	70	300
VT-304	144	300
VT-305	1000	300
VT-311L	2.1	200
VT-311	4.2	200
VT-312L	8.4	300
VT-312	22	300
VT-312H	30	300
VT-313L	60	300
VT-314	140	300
VT-32L	1.95	200
VT-321	3.9	200
VT-321H	7.8	200
VT-322L	15.6	300
VT-322	31.2	300
VT-325	1000	300
VT-333L	14	200
VT-333	28	200
VT-34L	.6	200
VT-341	1.2	200
VT-341H	2.4	300
VT-342L	4.8	300
VT-342	7	300
VT-343L	14	300
VT-343	28	300

VT-300
TO-5
(Diam. .325)

DUAL ELEMENT CELLS VT-300 Series

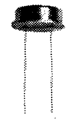
.325" diam.

Part No.	2 Ft.-C Resis. KΩ	Max. Volt.
VT-301/2	7.5	200 (ea. ½)
VT-302/2	16	200 (ea. ½)
VT-303L	32	200 (ea. ½)
VT-312/2	5	200 (ea. ½)
VT-313L/2	10	200 (ea. ½)
VT-333/2	60	200 (ea. ½)
VT-34L/2	1.5	200 (ea. ½)
VT-341/2	3	200 (ea. ½)

VT-500 Series (TO-8)

500 MW @ 25°C

Part No.	2 Ft.-C Resis. KΩ	Max. Volt.
VT-50L	1.3	200
VT-501	2.6	200
VT-501H	4	300
VT-502L	8	300
VT-502	16	300
VT-503L	32	300
VT-503	66	300
VT-51L	.7	200
VT-511L	1.4	200
VT-511	2.3	300
VT-511H	4.6	300
VT-512L	9.2	300
VT-521	2.6	200
VT-521H	5	300
VT-522L	9	300
VT-522	18	300
VT-523L	36	300
VT-533L	12.5	200
VT-533	25	200
VT-54L	.25	200
VT-541	.5	200
VT-541H	1	200
VT-542L	1.5	300
VT-542	2	300



VT-500
TO-8
(Low Profile)
(Diam. .490)

VT-700 Series (Plastic)

250 MW @ 25°C

⅜" diam.

Part No.	2 Ft.-C Resis. KΩ	Max. Volt.
VT-70L	1.6	200
VT-701	3.0	200
VT-721	2.55	300
VT-721H	4.8	300
VT-732	10	300
VT-74L	.45	100
VT-741	.90	100

VT-800 Series (Plastic)

175 MW @ 25°C

¼" diam.

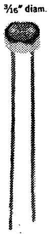
VT-801	3.0	200
VT-804	140	300
VT-82L	1.9	100
VT-833	33	300
VT-835	330	300
VT-841L	.90	100

VT-900 Series (Plastic)

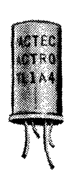
80 MW @ 25°C

³⁄₁₆" diam.

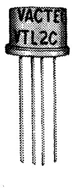
VT-901	4.3	100
VT-902	8.0	100
VT-903H	44.0	300
VT-904L	88.0	300
VT-904	110.0	300
VT-912L	6.0	100
VT-912	15.0	100
VT-913H	32.0	100
VT-914L	64.0	100
VT-914	140.0	250
VT-93L	11.0	100
VT-931	22.0	100
VT-932	100.0	100
VT-941	2.0	100



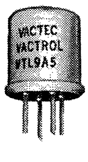
VACTROLS PHOTON ISOLATORS LED, INCANDESCENT, OR NEON ACTUATED



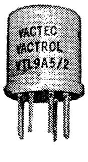
VTL1 Series
TO-5 Hermetic
.64" height



VTL2 Series
TO-5
Hermetic



VTL9 Series
.63" Diam.
.70" height



VTL9/2 Series
2 cells - 1 lamp
Same specs as
VTL9 Series

VTL1 Series

Part No.	Max. Lamp V.	Lamp Ma.	Max. On Ohms
VTL1A1	1.5	50	500
VTL1A2	6.0	40	150
VTL1A3	10	14	800
VTL1A4	12	25	250

VTL-1 Series Cont'd

Part No.	Max. Lamp V.	Lamp Ma.	Max. On Ohms
VTL1B5*	150	1.2	
VTL1B6*	90	.3	

*Neon

VTL-2 Series

LED INPUT (40 ma)

Part No.	Max. On Ohms	Min. Off Ohms	Max. Decay to
VTL2C1	10K	10^8	1 meg—3.5 ms.
VTL2C2	500	10^6	100K—500 ms.
VTL2C3	2K	10^7	100K—35 ms.
VTL2C4	100	4×10^5	100K—1.5 sec.

VTL-9 Series

VTL9/2 DUAL CELL

Part No.	Max. Lamp V.	Lamp Ma.	Max. On Ohms
VTL9A1	1.5	50	400
VTL9A2	6.0	40	60
VTL9A3	10.0	14	250
VTL9A4	10.0	22	300
VTL9A5	10.0	22	1500

VTL-9 Series Cont'd

Part No.	Max. Lamp V.	Lamp Ma.	Max. On Ohms
VTL9A9	6.0	40	200
VTL9A10	10	14	800
VTL9A11	12	25	600
NEON TYPES			
VTL9B6	125	1.5	300
VTL9B7	125	1.5	800
VTL9B8	80	.3	2000

PAM-1 PHOTOCELL AMPLIFIER MODULE

The Vactec Photocell amplifier module (PAM) consists of a matched selenium photocell and a high gain operational amplifier. All solid state unit replacement for phototube and associated amplifier or multiplier.

	Specifications
Input	± 15 VDC; + 15 ma max.
Output	0-10 VDC; 2 K min. load resistance (1)
Response Time	100 u sec.
Photometric Response (min. with 2850° K Source)	6u V/fc/ohm

(1) Load resistance is the parallel combination of feedback and external load.

SELENIUM PHOTOVOLTAIC CELLS

UNMOUNTED SIZES

Part Number	Size (Inches)	Minimum Microamp Output
RX5B	.250 diameter	14
RX10B	.375 diameter	20
RX15B	.500 diameter	44
RX80B	1.000 diameter	170
R1B	1.130 diameter	220
R5B	1.375 diameter	390
R10B	1.500 diameter	430
R75B	1.770 diameter	500
R100B	2.000 diameter	850
SX10B	.250 x .484	28
S1B	.440 x .730	88
S2B	.654 x .765	120
S3B	.622 x 1.118	180
S8B	.875 x .875	220
S13B	1.500 x 1.500	500
S17B	.281 x .875	56
S100B	.886 x 1.689	400
S150B	.250 x 6.000	330

MOUNTED SIZES

Part Number	Dimensions (Inches) Thickness	Diameter
R100MB	¾	2¼
R10M1B	13/32	1¾
R75EB	7/16	2
*RX80HB	¼	1⅛
R100KB	1 9/32	2 5/16
Metal — epoxy case octal plug		
S100MB	T(¼) x W (1 3/32) x L (1 29/32)	
Plastic case — acrylic window		
S100EB	same as S100M	
Epoxy encapsulated		

NOTE: Add "L" before B for "6" soldered leads on unmounted cells

VACTEC INC.

2423 Northline Ind. Blvd., Maryland Heights, Mo. 63043
Phone: (314) 872-8300

Write for bulletin on specific product of interest. Vactec designs and manufactures wholly within the U.S.A. Send your requirements for special sizes or characteristics.

AMGLO **INDUSTRIES, INC.** *THE NO. 1 SOURCE FOR LIGHT*

5301 WESLEY TERRACE, ROSEMONT, ILLINOIS 60018 • (312) 671-4321 • CABLE ADDRESS AMGLO

LINEAR FLASHTUBES

Amglo manufactures 36 different types of standard pyrex and quartz linear tubes. New standard tubes include designs in excess of 500 types.

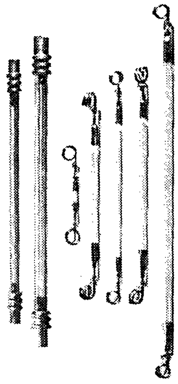
Listed below are a few of the various types:

Part No.	Arc Lgth. (inches)	OD mm	Typical Input Joules*
LSP160	1″ Pyrex	6	100
LSP360	3″ Pyrex	6	150
LSP380	3″ Pyrex	8	200
LSP680	6″ Pyrex	8	250
LSP12100	12″ Pyrex	10	350
LSP20100	20″ Pyrex	10	700
LXQ360	3″ Quartz	6	300
LXQ660	6″ Quartz	6	600
LXQ380	3″ Quartz	8	600
LXQ680	6″ Quartz	8	800
LXQ6100	6″ Quartz	10	1200
LXQ6150	6″ Quartz	15	2500

* Depending on pulse width Ratings for 1-2 MS pulse width.

Other Linear Tubes available with special electrodes.

Tube Diameter to 25mm OD and lengths to 30″.

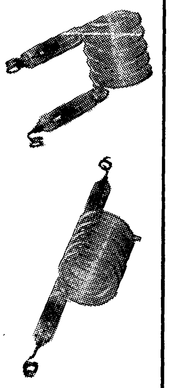


HELICAL FLASHTUBES

Amglo Helical Tubes are available in Pyrex and Quartz in ID's from ¼″ to 4″ and tubing diameter to 25mm.

Part No.	Turns	DIA.	Tubg. Dia. mm	Typical Input Joules
HSP28-½A	2	½″ Pyrex	8	200
HSP48-½A	4	½″ Pyrex	8	400
HSP58-½A	5	½″ Pyrex	8	450
HSP510-½A	5	1½″ Pyrex	10	1000
HXQ28-½A	2	½″ Quartz	8	800
HXQ48-½A	4	½″ Quartz	8	2000
HXQ510-1½A	5	1½″ Quartz	10	4000
HXQ515-1A	5	1″ Quartz	15	10000

Helical Lamps available in 6mm OD to 25mm OD Quartz and Pyrex and ID's to 4″.



H-88 SERIES SIGNAL, STROBOSCOPE AND PHOTOGRAPHIC FLASHTUBES

The H-88 series tubes were especially created for applications requiring heavy duty use under exacting conditions. The tube is constructed of 6mm O.D. Pyrex with Iron triple carbonate coated electrodes. The H-88 is ideal for aircraft strobe beacons, high intensity warning lights, photographic speedlight and high speed stroboscope applications.

H-88-0

Tube only — two turn Helix ⅜ I.D. 11/16″ Centers, 1¾″ Overall length. Flexible braid connection. Triggering may be accomplished with a fine wire wrapped around tube making contact with silver stripe.

H-88-T

Same as H-88-0 except with trigger band.

H-88-B8

T-88-T Mounted in Octal Base. Mounts in standard octal socket type 78S8 Dia. 1⅛ x 2¼″ high exclusive of pins.

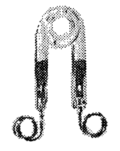
H-88-BF6

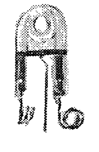
H-88-B series with frosted cover for flat diffused light.

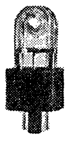
H-88-W

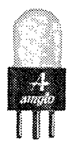
With White Reflective Base.

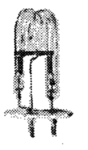
The H-88 is available in 4 pin, Octal and 3 pin wafer bases.


H-88-0


H-88-T


H-88-B8


H-88-BF6



H-88-W

GENERAL SPECIFICATIONS:

Operating voltage: 450-900. *Maximum Input:* 80 joules/flash. *Maximum recommended average power:* 10 watts. *Output:* 4500 Lumen seconds at 125 joules. At 10 joules (450 volts) the peak output is approximately 1 million lumens (250 lumen-seconds) at a flash rate of 60 per minute.

REFLECTOR ASSEMBLIES

FOR USE IN STROBOSCOPES, WHEEL AND BALANCING EQUIPMENT.

ARA400SD-H88P4	Semi Diffused Flat Field
ARA400S-H88P4	Specular Finish
ARA400S-H88TP4	with built in Trigger Coil

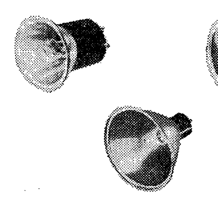
ARA400 Series is 4 7/32″ Diameter x 3⅞″ Deep, operating at 350-600 Volts. Other sizes available.

Ratings (H88 type tube)

Max. Energy: 125 Joules per flash

Repetitive Flashing: 60/minute

10 Joules/flash — 100 flashes/second — .1 joules/flash

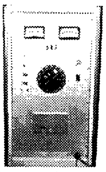


ELECTRICAL SYSTEMS AMGLO PS-4000-2B

Energy charging supply for use in Flash Photolysis. High Energy Stroboscopes, Flash Photography, Laser Excitation.

The PS 4000-2B is a versatile equipment designed for reliable continuous use. The unit features Variable Energy up to 1200 Joules/Flash at a rate of up to 6 Flashes/second. Pulse width is variable from 20 Microseconds to 1 Millisecond, depending on Flashead selected.

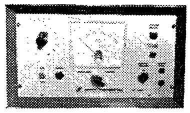
The PS 4000-2B is truly representative of the Quality and Workmanship expected of the No. 1 Source for Light.



AMGLO AC 5000-1

Energy Storage Charging Supply

The AC 5000-1 is a low cost 0-5KV supply containing a versatile trigger module. The AC 5000 will charge an External 50 MFD Capacitor to 4000 Volts in 10 seconds.



TYPE HD-2

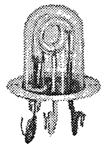
Operating voltage 350-500V. Energy input 30 to 150 Watt-seconds. For use with electrolytic condenser of 450 volt rating. Use AMGLO ST25 Trigger Transformer.

Part & Description

HD-20
Tube only

HD-2
Tube mounted in Reflective Base with Glass Cover

HD-2R
HD-2 mounted in AR 365 Reflector



TYPE HD-2A

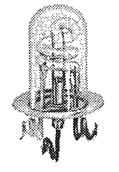
Operating voltage and energy input similar to HD-2. Employs two turn helix with central cathode housing, producing longer life characteristics than HD-2. Use with AMGLO MT55 Trigger Transformer.

Part & Description

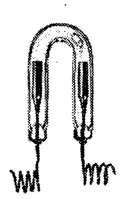
HD-2AO
Tube only

HD-2A
Tube mounted in Reflective Base with Glass Cover

HD-2AR
HD-2A mounted in AR 365 Reflector

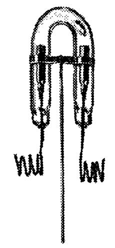


U-35-O



Glass portion of 6 MM tube 1½″ long x ¾″ wide. Mounts on ½″ Centers. Flexible Braid Electrode Connections. For noncritical applications, a fine wire may be wrapped around nose of tube to apply trigger pulse.

U-35T



Same as U-35-0 except with adjustable Trigger Band. Ideal for Stroboscopes and Amglo Flat Field Series Reflectors.

U-35-B

U-35-T Mounted with white Reflective Disc in 3 Pin Base. Plugs into standard 6 Prong Radio Tube Socket Type 78S6. Dia. 1⅛″ x 1¾″ high, exclusive of pins.

EXPERIENCE

The production of reliable and efficient flashtubes is an art understood and practiced by relatively few organizations in the world. The development of these devices involves an intimate and extensive knowledge of plasma physics, precious metal properties, vacuum technology and electronic control systems. In addition, the ability to produce these devices requires the utilization of skilled and highly specialized craftsmen. The AMGLO Corporation is a leader in this field because it has the background, craftsmen, and over 30 years of practical experience in producing flashtubes.

BULOVA LIGHT CHOPPERS/SCANNERS

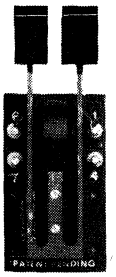
APPLICATION AREAS

- Bolometers
- Burglar Alarm Systems
- Colorimeters
- Densitometers
- Horizon Sensors
- Information Storage systems
- Intrusion Systems
- Ion Beam Choppers
- IR Detectors
- Mass Spectrometers
- Radiometers
- Spectrophotometers
- Star Trackers
- Telemetry Systems

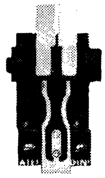
A NEW CONCEPT OF LIGHT MODULATION THAT OUTMODES MOTOR DRIVEN TYPES

Light choppers and scanners are used to chop light and similar energy beams, switch a radiation source to two or more sensors, switch two sources alternately to one sensor, scan an area with a radiation source, and for many other purposes. Based upon the balanced vibrating members of a tuning fork, optical choppers offer outstanding advantages over motor driven types. **Features:** • Power requirements as low as 500 mw • No lubrication needed • No wearing parts • Lightweight — ½ to 3 ounces maximum • Reference signal voltage available • Small size — as small as ⅝″ x ⅜″ x 1 5/32″.

LIGHT CHOPPERS



L40C
⅞″ x 3″ x ⅝″



L2C
¾″ x 1½″

OPTICAL CHOPPER
TYPE L8
CYCLES 400
SER. NO. 1000
American Time Products

L8C
1½″ x 1½″ x ⅜″

(Patented and Patent Pending)

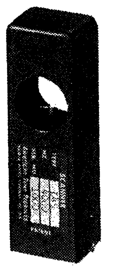
STANDARD APERTURES (inch. & mm)

Frequency Hz	L40*		L2		L8C**	
	in	mm	in	mm	in	mm
10	.4	10				
30	.4	10				
50	.4	10				
100	.4	10				
150	.4	10				
200	.32	8	.20	5.0	.16	4.0
400	.2	5	.12	3.0	.12	4.0
800	.08	2	.08	2.0	.04	1.0
1000	.05	1.2	.05	1.2	.032	.8
2000			025	.625	.02	.5
2500			015	.375		
3000			012	.300		

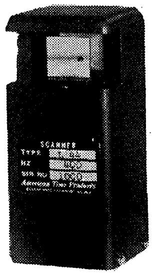
*The length of aperture is 10 mm. minimum.
**Length of aperture is a minimum of twice the width.

OPTICAL SCANNERS

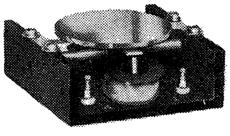
(Patented and Patent Pending)



MODEL L-45
¾″ x 1″ x 3 3/16″ High



MODEL L-44
1½″ x 1½″ x Approx. 3″ High



MODEL L50
1 7/16″ Sq. x ⅝″ High

TORSIONAL TYPE

L44 for frequencies 100 to 600 Hz
L45 for frequencies 600 Hz to 10 KHz

A fixed frequency device which can, in its simplest form, be used to cause a light, or energy beam to scan a target in a harmonic manner.

SPECIFICATIONS

Fixed Frequency Hz	Angular Amplitude Peak to Peak*	Maximum Mirror Size MM
100	20°	30 x 30
200	14°	20 x 20
400	10°	15 x 15
800	7°	10 x 10
1000	6°	10 x 10
2000	5°	7 x 7
4000	4°	7 x 7
6000	3°	5 x 5
10000	2°	2 x 3

*Angle is doubled upon reflection.

Maximum angular velocity in degrees per second is $\pi f \theta$.

ACCURACY: Normally ±2%; better on request.

REFERENCE SIGNAL: Squared wave; 5V rms min. into 50K ohms.

OPERATING TEMPERATURE: −55°C to +85°C. Other ranges available.

INPUT: Approx. 400 mw at 24 to 28V DC Driver Amplifier for 115V AC also available.

TAUT BAND TYPE L-50

A mechanically resonant device in which the restoring force is a taut ribbon. Power to start and maintain the oscillations is furnished by a solid state driver powered from d.c., optional 110V AC drivers are also available.

Freq. Range HZ	Mirror Angle Peak to Peak	Stock Mirror Size
5 to 24	30°	25 x 25 MM
25 to 40	25°	15 x 15 MM
41 to 99	20°	15 x 15 MM
100 to 149	15°	10 x 10 MM
150 to 199	10°	10 x 10 MM
200 to 400	5°	10 x 10 MM

ACCURACY: Normally ±2% from 0°C to 40°C (higher on request).

REFERENCE SIGNAL: 1V p to p min. into 50K ohms.

OPERATING TEMPERATURE: −40°C to +50°C

INPUT: To driver unit 6 to 28V DC.

SIZE: 1½ x 1½ x ¾″ high.

WEIGHT: .75 oz. approx.

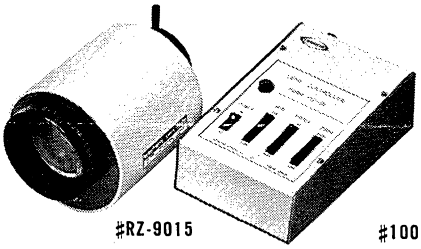
Manufacturer of the widest range of Frequency Control Components: Crystals • Crystal Oscillators • Crystal Filters • LC Filters • Tuning Forks • Fork Oscillators • Ovens • Coils • Servo Amplifiers

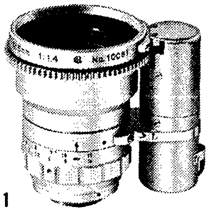
BULOVA AMERICAN TIME PRODUCTS

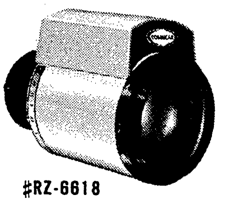
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

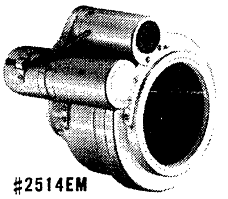
61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

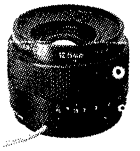
Perfect your CCTV system with COSMICAR® lenses


#RZ-9015


#100M1


#RZ-6618


#2514EM


#100EF

	Article Number	Focal Length & Aperture	Lens Element	Image Format Covered			f-stop	Focusing Range	Outside Diameter	Overall Length	Mounting Type	Net Weight	Note
				Diagonal	Horizontal	Vertical							
Lens for 1″ VIDICON CAMERAS	#Z-6618	22~66mm 1 : 1.8	11	39° 41′ ≀ 13° 43′	32° 12′ ≀ 11° 0′	24° 26′ ≀ 8° 15′	1.8~22	5′ or 1.5m to infinity	77.0mm	146.0mm	C-mount	1,100g	3× zoom lens
	#RZ-6618	Technical data of optical system are similar to #Z-6618. Motors are driven with 6V. D.C. Control box attached.							108.0mm	151.0mm	C-mount	1,680g	Motor driven 3× zoom lens
	#Z-9015	22.5~90mm 1 : 1.5	15	38° 18′ ≀ 10° 2′	31° 12′ ≀ 8° 2′	23° 19′ ≀ 6° 0′	1.5~22	5′ or 1.5m to infinity	85.0mm	170.0mm	C-mount	1,280g	4× zoom lens
	#RZ-9015	Technical data of optical system are similar to #Z-9015. Motors are driven with 30V. A.C. Control box attached.							120.0mm	170.0mm	C-mount	2,500g	Motor driven 4× zoom lens
	#Z20019	20~200mm 1 : 1.9	15	43° 18′ ≀ 4° 33′	35° 14′ ≀ 3° 38′	26° 47′ ≀ 2° 44′	1.9~16	8′ or 2.5m to infinity	115.0mm	275.0mm	C-& Pentax-mount	2,500g	10× zoom lens Fully closed diaphragm
	#Z-1025	15~145mm 1 : 2.5	14	55° 46′ ≀ 6° 16′	45° 36′ ≀ 5° 1′	35° 8′ ≀ 3° 46′	2.5~22	9′ or 2.5m to infinity	85.0mm	170.0mm	C-mount	1,280g	9.7×zoom lens
	#503	12.5mm 1 : 1.4	8	64° 50′	53° 52′	41° 43′	1.4~22	10″ or 0.3m to infinity	48.0mm	64.0mm	C-mount	210g	
	#100EF	Technical data of optical system are similar to #503. Automatic light control mechanism comprising galvanometer.							84.0mm	68.5mm	C-mount	580g	Fully closed diaphragm
	#1219	12.5mm 1 : 1.9	8	64° 50′	53° 52′	41° 43′	1.9~22	10″ or 0.3m to infinity	45.0mm	64.0mm	C-mount	200g	
	#2514	25.0mm 1 : 1.4	6	35° 14′	28° 30′	21° 34′	1.4~22	2′ or 0.6m to infinity	42.0mm	42.5mm	C-mount	105g	
	#2514EF	Technical data of optical system are similar to #2514. Automatic light control mechanism comprising galvanometer.							70.0mm	45.5mm	C-mount	300g	Fully closed diaphragm
	#2514EM	Technical data of optical system are similar to #2514. Automatic light control system by D.C. motor. Control box attached.							99.0mm	70.0mm	C-mount	500g	Fully closed diaphragm
	#2519	25mm 1 : 1.9	4	35° 14′	28° 30′	21° 34′	1.9~22	2′ or 0.6m to infinity	42.0mm	47.0mm	C-mount	100g	
	#114N3	25mm 1 : 1.8	4	35° 14′	28° 30′	21° 34′	without stop	1′ or 0.3m to infinity	40.0mm	34.0mm	C-mount	85g	Simplified lens
	#218	50mm 1 : 1.4	6	18° 2′	14° 29′	10° 53′	1.4~22	3.5′ or 1m to infinity	45.8mm	65.0mm	C-mount	260g	
	#5019	50mm 1 : 1.9	6	18° 2′	14° 29′	10° 53′	1.9~22	3.5′ or 1m to infinity	42.0mm	68.0mm	C-mount	200g	
	#504	75mm 1 : 1.4	5	12° 5′	9° 41′	7° 16′	1.4~22	4′ or 1.2m to infinity	60.0mm	100.5mm	C-mount	525g	
	#7519	75mm 1 : 1.9	5	12° 5′	9° 41′	7° 16′	1.9~22	4′ or 1.2m to infinity	50.3mm	73.5mm	C-mount	270g	
	#2514M1 (25mm 1 : 1.4), **#100M1** (12.5mm 1 : 1.4), **#153M1** (50mm 1 : 1.4) MOTOR-DRIVEN REMOTE-CONTROL DIAPRAGM LENSES							Technical data of optical systems are similar to #2514, #503 and #218. Motors are driven with 6V. D.C.					
Lens for 2/3″ VIDICON CAMERAS	#MZ-6X66	11~66mm 1 : 2.0	13	53° 8′ ≀ 9° 32′	43° 36′ ≀ 7° 38′	33° 24′ ≀ 5° 43′	2.0~16	6′ or 1.8m to infinity	60.0mm	123.0mm	C-mount	520g	6× zoom lens
	#Z-4518	15~45mm 1 : 1.8	11	40° 16′ ≀ 13° 56′	32° 42′ ≀ 11° 10′	24° 49′ ≀ 8° 23′	1.8~16	3′ or 1m to infinity	59.0mm	102.0mm	C-mount	520g	3× zoom lens
	#815	8.5mm 1 : 1.5	8	65° 46′	54° 44′	42° 26′	1.5~16	8″ or 0.2m to infinity	42.0mm	42.0mm	C-mount	150g	
	#1616	16mm 1 : 1.6	4	37° 54′	30° 45′	23° 18′	without stop	0.5m to infinity	38.0mm	27.0mm	C-mount	80g	Simplified lens
	#518	50mm 1 : 1.8	4	12° 33′	10° 3′	7° 33′	1.8~16	3.5′ or 1m to infinity	42.0mm	49.0mm	C-mount	200g	

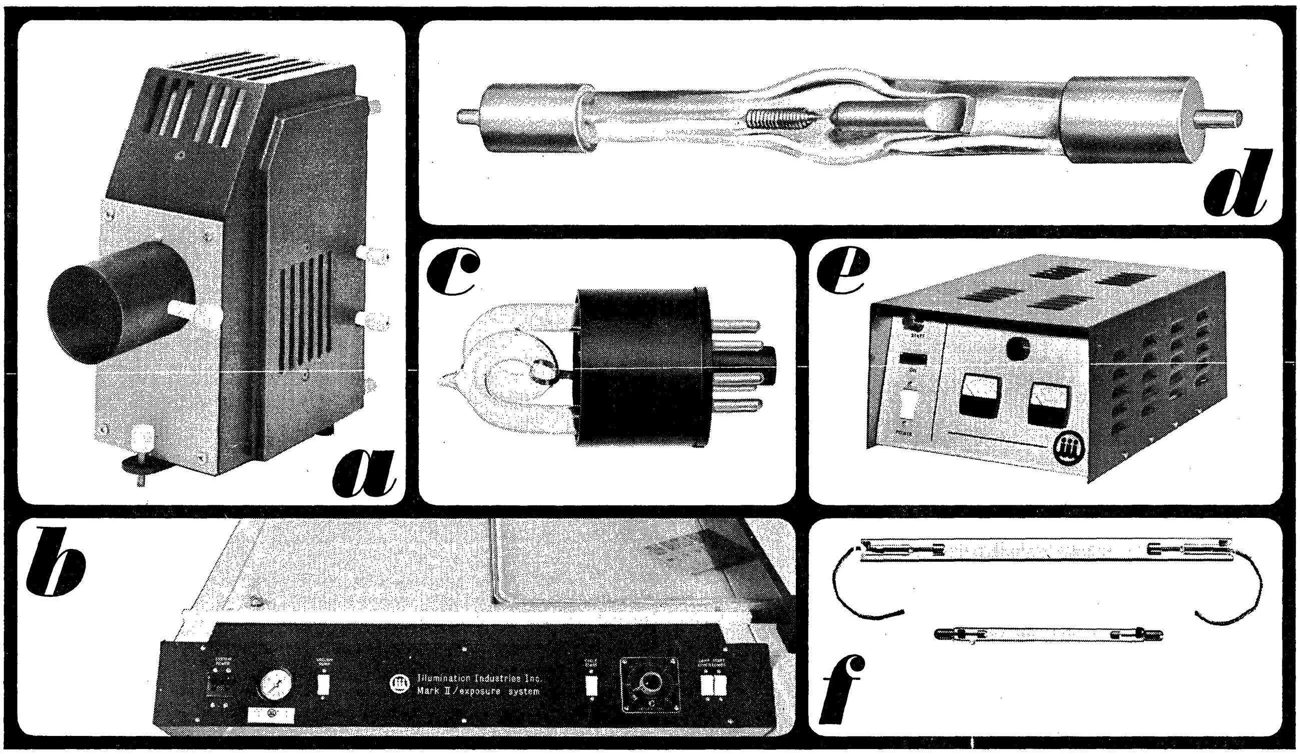
OTHER LENSES & ACCESSORIES

#15032 : 150mm 1:3.2 Element, 4. Coverage angle, 6° 4′. Wt. 650g.
#EX-2035 : 200mm 1:3.5 Element, 5. Coverage angle, 4° 33′. Wt. 700g.
#EX-300 : 300mm 1:5.5 Element, 5. Coverage angle, 3° 2′. Wt. 1100g.
#EX-4056 : 400mm 1:5.6 Element, 5. Coverage angle, 2° 12′. Wt. 2100g.
#EX-5063 : 500mm 1:6.3 Element, 4. Coverage angle, 1° 49′. Wt. 1700g.
Rear Operated (Gear Drive) Zoom Lenses
Filter: UV and infrared types
Stand for the vidicon cameras: Manually operated and intallable on the wall.

COSMICAR

COSMICAR OPTICAL CO., LTD.
424, Higashi-Oizumi, Nerima-ku, Tokyo, Japan   Cable Address: "MOVIEKINO TOKYO"

Light as a system: The power supply... the optics... the light source... and the experience to make them a winning team.



a **Lamphouses** by **iii** are designed for mercury or xenon short arc lamps. 2" or 3" optics. Maximum transmission and uniformity over exposure area. For mask alignment photo resist systems, fluorescent microscopy, spectrophotometry, image projection, as an optical bench accessory, and as a universal lab source. Back plate, available separately as a lampholder module has exceptional adjustability of lamp and optics. Lenses can also be purchased as independent components.

b **Photo resist exposure systems.** A new line of equipment for photo resist exposure in printed circuit production and chemical milling; also applicable in lithographic platemaking. First exposure systems to combine high productivity, top fidelity and uniformity with self-sealed vacuum frames that can be handled independently of the exposure unit. A variety of table top and floor models are available.

c **Mini Strobe.** Low cost source of high intensity strobe light. Average 15-watt power. Helical xenon flash lamp is complete with trigger transformer and plug. 3" high from base. For aviation-marine-highway beacons, photography, emergency and police vehicle flashers, computer output printers, advertising displays . . .

d **Short arc lamps** for applications where intense sources of UV, visible or IR illumination, or spectral matching are required. Mercury lamps from 100 to 500 watts; 2,000 to 30,000 lumens. Xenon lamps from 35 to 300 watts; 600 to 7,500 lumens. Extreme arc stability, reliability, constant lumen output throughout life of lamp.

e **Power supplies.** Standard power supply units are available for **iii**'s full range of short arc and strobe lamps, and those of other manufacturers. The **iii** engineering team is expert also in the development of power supply criteria and subsystem hardware to maximize the effectiveness and reliability of new electro-optical systems.

f **Xenon flash and strobe lamps.** This family of lamps available in wide range of powers, pulse durations and repetition rates. Noted for seal integrity, long life, reliable triggering and high conversion efficiency. 8 to 18,000 joules; output of 15 to 50 lumen-seconds per joule input. Typical uses: visual strobe units, high speed and underwater photography, laser pumping, step and repeat printing, photo typesetting, office copiers.

Custom design capability. Illumination Industries Inc. has assembled an engineering and manufacturing staff with a depth of experience unequalled in its field. We are anxious to apply this talent to the solution of your most challenging electro-optical problems.

Illumination Industries Inc.
610 Vaqueros Dept. C
Sunnyvale, California 94086
(408) 738-2744, Ext. 336

ALA INDUSTRIES INC.

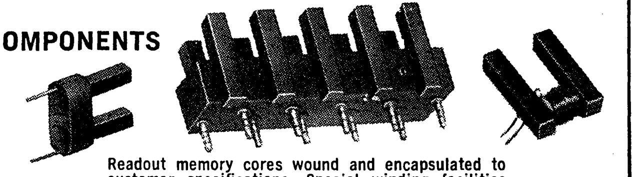
99 CALVERT STREET •
HARRISON N.Y. 10528

914-835-0400

COILS RF ANTENNA AF

PC MINIATURE • PC STANDARD ENCAPSULATED • OPEN FRAME REED RELAYS

COMPONENTS



Readout memory cores wound and encapsulated to customer specifications. Special winding facilities developed to insure accurate winding at high rates of production.

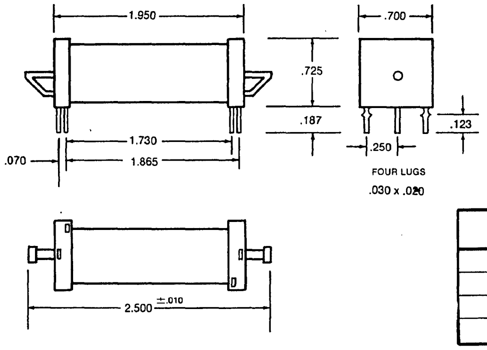
GENERAL INFORMATION

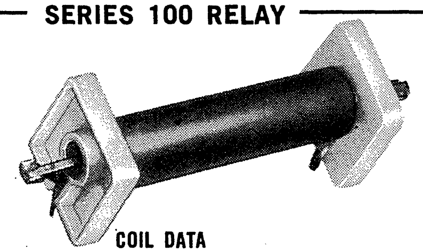
- All switches sealed in inert gas.
- Switching speeds in low millisecond time.
- Contact material Di-Met, DIFFUSED GOLD, RHODIUM and Mercury to Mercury.
- Maximum Initial Contact Resistance .05 to 0.2 ohm Dependent on Selected Contact Material.
- Relays available with magnetic and or electrostatic shielding.
- Special relay assemblies to customer specifications.

For additional specifications or special design applications, contact factory or nearest sales office.

We Manufacture Reed Relays to Customer Specifications.

SERIES 100 RELAY





COIL DATA

Drive Voltage	D.C. Coil Resistance ±10%
6	120 Ohms
12	450 Ohms
24	1600 Ohms
48	5700 Ohms

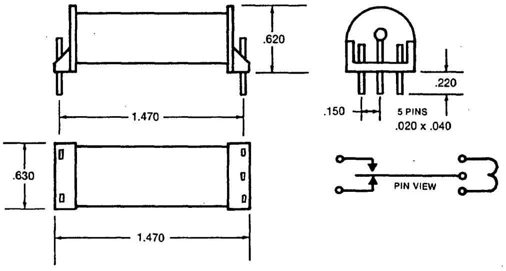
ORDERING INFORMATION:
A single pole single throw reed relay with a 24 vdc coil and 50 watt contacts would be specified as part number 100F-24.

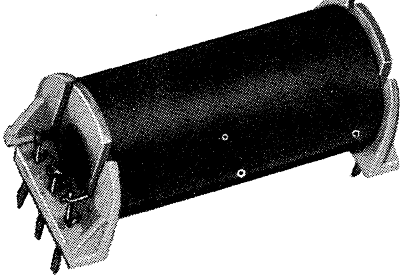
100-101 REED SWITCH SELECTOR CHART

Reed Switch Code	Reed Type	Max. Volts	Max. Current
E	15W. Form A	250	1.0A
F	50W. Form A	250	3.0A
G	100W. Form A	250	3.0A
H*	50W. Form A	500	3.0A
J	3W. Form C	100	0.5A
L	10W. Form C	150	0.5A
M	20W. Form C	200	1.0A
N	50W. Form C	250	3.0A

*Mercury Wetted

SERIES 101 RELAY





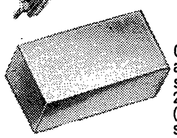
ORDERING INFORMATION:
A single pole single throw reed relay with a 24 vdc coil and 50 watt contacts would be specified as part number 101F-24.

COIL DATA

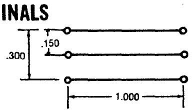
Drive Voltage	D.C. Coil Resistance ±10%
6	120 Ohms
12	450 Ohms
24	1600 Ohms
48	5700 Ohms

SERIES PCMO & PCMM

PRINTED CIRCUIT MINIATURE TERMINALS



On 0.150x1.0 centers available in one to six reeds with 6, 12, 24 and 48 VDC coils (with metal enclosure specify as Type PCMM)



PCMO, PCMM & TPE REED SWITCH SELECTION CHART

Reed Switch Code	Reed Type	Max. AC Volts	Max. Current
A	10W. Form A	250-1200	.5A
H	50W. Form A	1000	1.0A
C	4W. Form C	200	.1A

SERIES TPE

EPOXY ENCAPSULATED

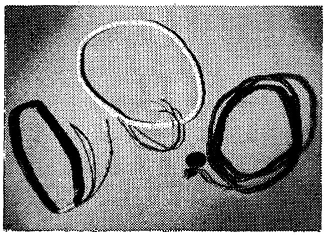
A.L.A.
INDUSTRIES

Dim. — 1″ L. x ⅜″ Dia.
Axial leads variable in length and spacing to order.
Coil Voltage — 6, 12, 24 and 48 VDC.

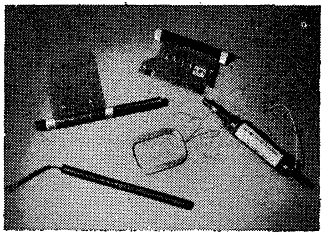
CUSTOMIZED RELAY ASSEMBLY

AF • RF • ANTENNA COILS

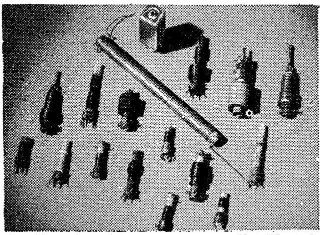
TV DEGAUSING COILS



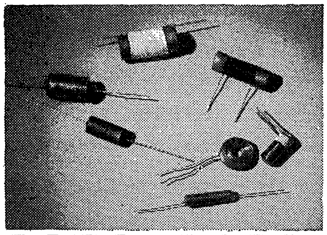
AIRLOOP & FERRITE ANTENNAS



RF COILS & INDUCTORS



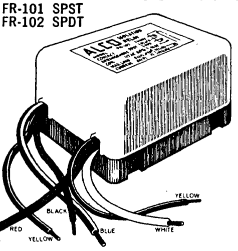
LINE FILTER CHOKES

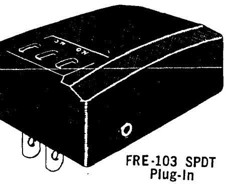


ALCOSWITCH® DIV. OF ALCO ELECTRONIC PRODUCTS, INC.

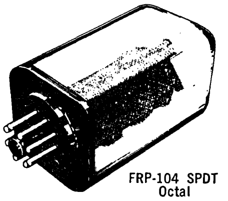
ALCOSWITCH LOW-VOLTAGE RELAY

FR-101 SPST
FR-102 SPDT

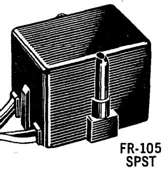




FRE-103 SPDT
Plug-In



FRP-104 SPDT
Octal



FR-105
SPST

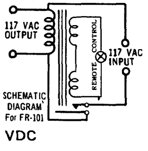
For safety's sake, control circuits should be isolated from power lines and operated at low voltages such as those obtained from a battery or from any **ALCOSWITCH RELAY** described on this page. Several case styles are available, each incorporating similar electrical characteristics and they all perform the same function, but vary in shape to fit your particular needs.

FR-101, FR-102 and FR-105 are permanently wired and occupy a minimum of space in equipment or appliance. **FRE-103** is a self-contained model that readily adapts to a standard AC outlet receptacle for experimental or for quickly assembled remote-control circuit applications. **FRP-104** is the plug-in model which makes use of a standard octal mount and is designed for electronic equipment which requires ready accessibility for ease of maintenance.

All units are capable of handling up to 7 Amps @ 117 VAC and may be operated from remote switches located up to several hundred feet away. The remote circuit carries a low voltage which is fully isolated to minimize any possibility of shock hazards.

These models illustrated represent "stock relays" available for immediate application, but they may also be supplied with modifications for your special use.

SPECIFICATIONS

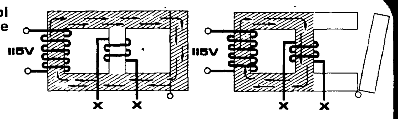


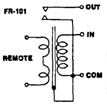
SCHEMATIC DIAGRAM For FR-101

Operating Voltage:
80-125 VAC 60 Hz
Primary Coil Current:
Below 40 mA
Secondary Voltage (open):
Below 30 volts
Contact Voltage:
95-125 volts
Insulation Resistance:
Over 30 megohms @ 500 VDC
Dielectric Strength:
One minute @ 1200 VAC
Coil Temperature Ascent:
Under 158°F.
Load — FR-101: 6 amps (pwr Factor 1)
5 amps (pwr Factor .75)
FR-102: 7 amps (pwr Factor 1)
5 amps (pwr Factor .75)
FRE-103: 7 amps (pwr Factor 1)
5 amps (pwr Factor .75)
FRP-104: 7 amps (pwr Factor 1)
5 amps (pwr Factor .75)
FRP-105: 7 amps (pwr Factor 1)
5.5 amps (pwr Factor .75)

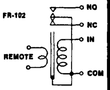
FR-101-230, FR-102-230 & FR-105-230 are 230V Types at 50% of rated power

Model	Maximum Control Circuit Resistance
FR-101	1300 ohms
FR-102	300 ohms
FRE-103	400 ohms
FRP-104	150 ohms
FRP-105	280 ohms

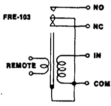




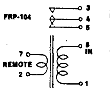
FR-101 SPST BASIC relay has a primary and secondary as a step-down transformer, and a third winding acting as a low-voltage relay. 6-inch pigtail leads extend from the inner core to beyond the polypropylene cover. The inner core measures 1¾" long x 1⅛" wide x 1" high. The basic relay is recommended for installations within the equipment housing. Available for 117 VAC or 230 VAC operation.



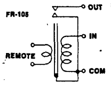
FR-102 SPDT BASIC relay has a SPDT feature and is similar in appearance to the FR-101, but slightly larger. The main difference is the core construction where the FR-102 has two coils — a primary and secondary. When the secondary is shorted, the primary and associated outer core turns into a relay. Complete with dust-proof case and 6-inch pigtail leads. The FR-102 core assembly is the basic unit for all other relays described below. Available for 117 VAC or 230 VAC operation.



FRE-103 SPDT PLUG-IN relay has a stylized plastic case holds the laminated core inside and also has a patented three-way receptacle on the top portion that allows selection of either a Normally Open or Normally Closed circuit. A side jack serves as a plug-in for a remote switch or sensor. The plug-in capability enables the user to insert the ALCOSWITCH RELAY FRE-103 directly into an AC wall outlet. No other wiring is necessary other than the addition of the remote switch and cord attached to a plug. Complete to operate with plug; less cord and remote switch.

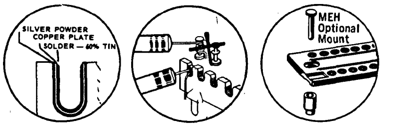


FRP-104 SPDT OCTAL base plug feature is added to the basic ALCOSWITCH RELAY for the industrial user. Wiring is not required for the FRP-104, only for the socket mounted in the panel or equipment. The FRP-104 is protected by a clear-view plastic dust cover. The neat finger-gripping size unit easily plugs into an octal socket for horizontal or vertical installations. The plug-in model makes use of a standard octal mount and is designed for electronic equipment which requires ready accessibility for ease of maintenance.



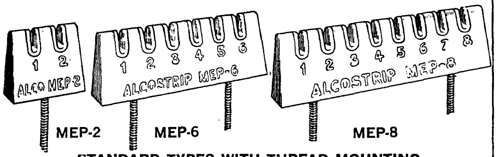
FR-105 SPST BASIC is similar to the FR-102 in specifications and application, but more compact in width and depth. The black plastic molded case is contoured to conserve space. Equipped with normal 6" leads. This particular unit is generally available from stock and could be tailored to customers' particular needs.

Model	Contacts	Description	One-99	100-499	500-999
FR-101	SPST	Basic Relay for 117 VAC	3.85	3.01	2.62
FR-101-230	SPST	Basic Relay for 230 VAC	4.25	3.32	2.89
FR-102	SPDT	Basic Relay for 117 VAC	4.45	3.47	3.03
FR-102-230	SPDT	Basic Relay for 230 VAC	4.85	3.78	3.30
FRE-103	SPDT	Plug-in	4.95	3.82	3.37
FRP-104	SPDT	Octal	5.45	4.25	3.71
FR-105	SPST	Basic Relay for 117 VAC	3.85	3.01	2.62
FR-105-230	SPST	Basic Relay for 230 VAC	4.25	3.32	2.89



CERAMIC TERMINAL STRIPS

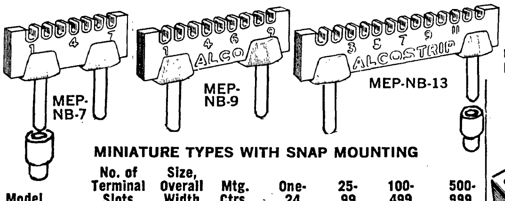
Ceramic-base terminal strips with fired silver, copperplated and tinned terminals to facilitate high-temperature soldering of components and leads. Features permanent bond between metal and ceramic. Standard 2-56 threaded studs are extra long for cutting to any required dimension. Board ht. 0.590" from base. Depth of slots, 0.197". Dielectric Strength: more than 10 seconds at 1500 VDC between terminals. Insulated Resistance: over 1000 megohms at 500 VDC megger. Dip Solder Test: no exfoliation at 250°C for 5 seconds.



STANDARD TYPES WITH THREAD MOUNTING

Model	No. of Terminal Slots	Size Overall Width	Mtg. Ctrs.	One-24	25-99	100-499	500-999
MEP-2	2	0.650	-------	.36	.24	.216	.198
MEP-4	4	1.161	0.512	.45	.30	.27	.248
MEP-6	6	1.673	1.024	.60	.40	.36	.33
MEP-8	8	2.185	1.535	.75	.50	.45	.413
MEP-10	10	2.697	2.047	.87	.58	.522	.479
MEP-12	12	3.209	2.560	.99	.66	.594	.545

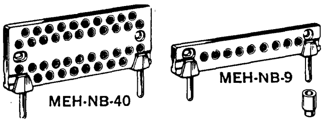
ALCOSTRIPS ARE MANUFACTURED UNDER A LICENSE GRANTED BY TEKTRONIX, INC.



USE WITH MEP-NB SERIES DESCRIBED AT LEFT!

MINIATURE TYPES WITH SNAP MOUNTING

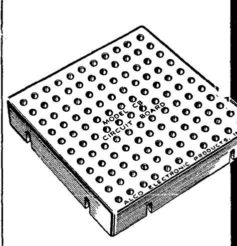
Model	No. of Terminal Slots	Size, Overall Width	Mtg. Ctrs.	One-24	25-99	100-499	500-999
MEP-NB-3	3	0.600	-- ---	.48	.32	.288	.264
MEP-NB-5	5	0.885	0.490	.66	.44	.396	.363
MEP-NB-7	7	1.165	0.490	.81	.54	.486	.446
MEP-NB-9	9	1.445	0.750	.87	.58	.522	.479
MEP-NB-13	13	2.140	1.500	1.11	.74	.666	.611
MEP-NB-16	16	2.440	1.500	1.35	.90	.81	.743
MEP-NB-20	20	3.020	2.520	1.65	1.10	.99	.908



UNIVERSAL TYPES WITH SNAP MOUNTING

ALCO's new concept allows for horizontal or vertical mounting of terminal strips. Each strip is supplied with 2 types of mounting hardware. The selected positioning of the terminals permits the use of more components in a limited space (either singly or in pairs). Silverplated copper eyelets are swedged to the ceramic base.

Model	No. of Terminal Slots	Size Overall Width	Mtg. Ctrs.	One-24	25-99	100-499	500-999
MEH-NB-9	9	3.000	2.500	.80	.53	.48	.44
MEH-NB-18	18	3.000	2.500	1.45	.96	.87	.798
MEH-NB-19	19	3.000	1.750	1.45	.96	.87	.798
MEH-NB-40	40	3.000	2.500	2.20	1.46	1.32	1.21



Simplify Circuitry With These
DESIGN BOARDS
and Plug-in Terminal Strips

Ceramic Alcostrips are ideal for breadboarding which may be quickly inserted or removed as desired to simplify circuit design. A mating circuit board measuring only 5" x 6" is provided to form a base for experimental design work. Complete ceramic kit includes 16 strips (8 sizes) and one board.

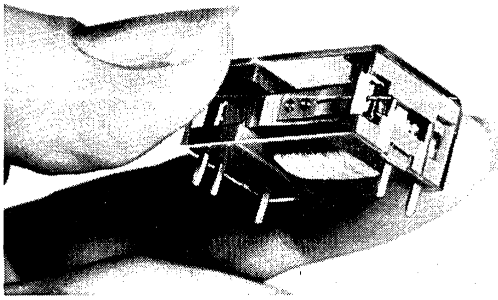
	One-24
CB-2 Kit	10.95
CB-1 Board only	.95

ALCO® ELECTRONIC PRODUCTS, INC.
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

AREA CODE 617
686-3887

American Zettler, inc.

THINPAK™ MINIATURE RELAYS SERIES AZ 530



ACTUAL SIZE

FEATURES

- 0.415″ high for 0.6″ standard pc board spacing
- Up to 5 Amp SPDT contacts
- 0.1″ Grid Terminal spacing
- Insulation resistance greater than 10^{10} ohms
- Contact resistance less than 50×10^{-3}
- No phenolic insulation used
- 2500 Vrms contact to coil

GENERAL DESCRIPTION

The AZ miniature THINPAK relay, Series 530, has been designed for applications with either demanding space limitations, such as 0.6″ center-to-center PC card mounting, or operating requirements that cannot be met by reed relays or conventional contact type relays. The high pressure SPDT 1, 2 or 5 amp contacts operating at 26 VDC enables the unit to switch capacitance or lamp loads with current spikes that would normally weld the contacts of reed relays. The high sensitivity of 125 mW pull-in, long life and insulation resistance of more than 10^{10} ohms makes it an ideal unit for galvanic separation between electronic circuits. The AZ-530 THINPAK is available in standard coil voltages from 6 to 115 VDC with an operate and release time of less than 2 ms. It has PC terminals in 0.10″ grid spacing. A black plastic dust cover with a mylar bottom plate is provided.

ELECTRICAL SPECIFICATIONS

ContactContact Rating — noninductive load
Light Duty: Fine silver goldplated
1 Amp @ 26 VDC or
0.5 Amp @ 115 VAC
Medium Duty: Silver Cadmium-Oxide
2 Amp @ 26 VDC or
1 Amp @ 115 VAC
Heavy Duty: Silver Cadmium-Oxide
5 Amp @ 26 VDC or
3 Amp @ 115 VAC or
2 Amp @ 220 VAC

Life Expectancy — Mechanical Operations: 10^7
Operations at Rated Load: 10^6

Contact Resistance — 50 milliohms max. initially

Operate Time — <5 ms at 2 times must operate voltage or current

Release Time — <2 ms at 2 times must operate voltage or current

Contact Bounce — at 10 mA contact current:
2 ms max. at operate N.O. side
3 ms max. at release N.C. side

Capacitance — typical: NC to Movable 0.6 pF
NO to Movable 0.9 pF
contact to coil 12 pF

Dielectric Strength —	AZ 530	AZ 535
Contact — Contact	500 Vrms	1000 Vrms
Contact — Coil	500 Vrms	2500 Vrms

Insulation Resistance — 10,000 Megohms min. @ 20°C.
100 VDC, 50% RH

Drop Out — 10% minimum of must operate-voltage or current.

Coil Power — Pick up typical:
Light duty type — 125 mW
Medium duty type — 250 mW
Heavy duty type — 400 mW
Max. Continuous Dissipation:
AZ 530 — 1.6 W @ 20°C (68°F) ambient
1.2 W @ 40°C (105°F) ambient
Temperature Rise: appr. 55°C per watt
AZ 535 — 2.3 W @ 20°C (68°F) ambient
1.9 W @ 40°C (105°F) ambient
Temperature Rise: appr. 35°C per watt

Coil Temperature — Max. 105°C (220°F)

Ambient Temperature —
Operating: −55°C (−72°F) to 80°C (175°F)
@ nominal operating voltage
Storage: −55°C (−72°F) to 105°C (220°F)

Vibration — 0.062 DA @ 10-55 Hz

Shock — 20 g

Enclosure — Black plastic cover with mylar bottom plate

Terminals — Printed circuit board terminals goldplated in 0.10″ standard grid space

Weight — Approx. 10 (AZ 530)
Approx. 20 gr. (AZ 535)

Standard Relays with light duty contact (1 Amp)

Nom. Coil VDC	Max. Contin. VDC	Resist. Ohm ±10%	Must Operate* mA	Must Operate* VDC	Part No.
6	9.7	66	49	3.6	AZ 530-12-1
12	21.8	330	22.5	8.3	AZ 530-08-1
24	37	950	13	13.8	AZ 530-06-1
48	68	4700	6.2	32.6	AZ 530-04-1
60	104	7600	5	42.6	AZ 530-035-1
115	145	14500	3.6	58.6	AZ 530-03-1

Standard Relays with medium duty contact (2 Amp)

Nom. Coil VDC	Max. Contin. VDC	Resist. Ohm ±10%	Must Operate* mA	Must Operate* VDC	Part No.
6	8.2	47	83	4.8	AZ 530-13-2
12	17	200	41	9.2	AZ 530-09-2
24	37	950	18.3	19.5	AZ 530-06-2
48	66	3000	11	37	AZ 530-045-2
60	82	4700	8.7	46	AZ 530-04-2
115	145	14500	5	82	AZ 530-03-2

Standard Relays with heavy duty contact (5 Amp)

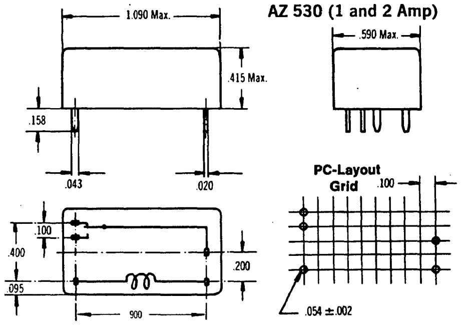
Nom. Coil VDC	Max. Contin. VDC	Resist. Ohm ±10%	Must Operate* mA	Must Operate* VDC	Part No.
6	8.7	37	110	4.5	AZ 535-15-2
12	16	125	61	8.4	AZ 535-11-2
24	30	440	33	16	AZ 535-08-2
48	63	1030	15.5	33	AZ 535-055-2
60	74	2700	13.5	40	RZ 535-05-2
115	147	10500	7.2	83	AZ 535-035-2

All values at 20°C

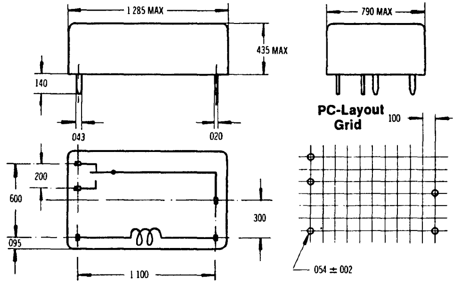
* Relay will pull in with less than "must operate" value.
There will be a change of less than 10% in must operate if several relays are mounted close together.

Note: To fasten relay on PC board do not bend contact terminals as this damages adjustment. Use coil terminals only. After soldering relay to board, do not dip the board into a cleaning solution.
Solder temperature: Max. 270°C (500°F)
Soldering time: Max. 5 sec.

AZ 530 (1 and 2 Amp)



AZ 535 (5 Amp)



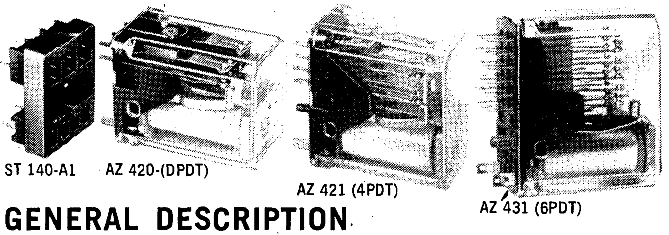
American Zettler, inc.
697 RANDOLPH AVE. ▪ COSTA MESÁ, CALIF. 92626 ▪ PHONE (714) 540-4190 ▪ TELEX: 67-8472

American Zettler, inc.

MINIATURE GENERAL-PURPOSE RELAYS

UP TO 6 PDT CONTACTS SERIES AZ 420

General purpose miniature relays in plastic dust cover — Interchangeable with other cradle type relays — Combination solder and plug-in terminals. UL-version listed under UL Component Recognition Fil 43203.



FEATURES

- International Standard type
- Combination plug in/wire or PC terminals
- Low level bifurcated, 2 amp or 5 amp contacts
- Life expectancy more than 100 million operations
- Form A, B, C and D contacts are available
- Molded cradle eliminates phenolic dust inside the relay
- Balanced, spring-held armature allows dependable operation in any position
- Round core and larger coil volume provides more pull force, eliminating expensive, sensitive version
- Slim profile mounting with right-angle socket
- Sockets are of unbreakable fiberglass-filled base and have unique knife-type connectors for dependable contact
- Available from stock.

GENERAL DESCRIPTION

The AZ miniature general-purpose, comb-actuated relay can be used in a wide variety of applications such as computer systems, control and alarm systems, business machines and data processing equipment, etc. The field-proved, long-life characteristics of the AZ relay, along with its unique plug-in design and integral dust cover, allow it to be used in transistorized systems where space requirements and operational longevity are of prime consideration. The AZ relay requires less than one cubic inch of space. When installed with the AZ right-angle socket, its overall height is only 3/4″.

AZ miniature relays are available in all contact configurations through 6PDT. The contacts are capable of carrying loads up to 5 amps, as well as low-level signals. For low-level, high reliability switching, bifurcated contacts are available.

All parts of the magnetic circuit are made from armco magnetic ingot iron and aged in the most modern hydrogen annealing equipment ;a process which assures optimal stability of operating data during the life of the relay. All AZ relays are insulated with the highest quality pre-aged phenolic obtainable.

The AZ relays described in this brochure are all of the round-core type. This design feature provides a higher number of turns at the same coil resistance, resulting in greater mechanical force with less coil power. Only one adjustment is needed for any application. Standard and sensitive versions are thereby eliminated.

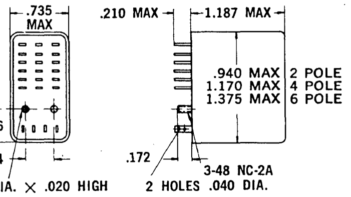
The unique armature retention spring dissipates kinetic energy of the armature resulting in minimum bounce. The molded low-friction cradle results in further reduction of bounce and eliminates the problem of phenolic dust inside of the relay.

Additional features of the AZ420 include a new base and socket design made of unbreakable fiberglass-filled polyurethane, with an insulation resistance of >10¹⁰ ohms. A unique knife-type connector provides a more secure connection and eliminates flux contamination of contact surfaces during machine soldering.

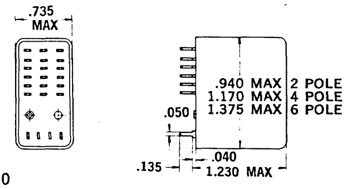
MECHANICAL SPECIFICATIONS

DIMENSIONS (inches)

PLUG IN OR SOLDER

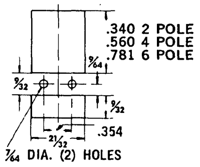


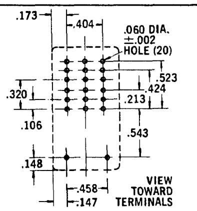
PRINTED CIRCUIT



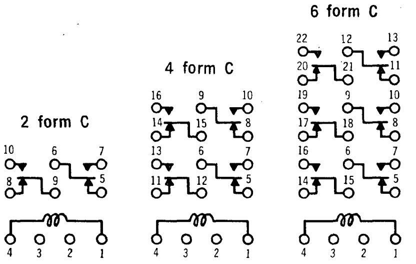
Tolerances ± .010
Standard relays have gold plated terminals.

SUGG. PANEL LAYOUT OR P/C BOARD





WIRING DIAGRAM



VIEW TOWARD TERMINALS

Terminals 2 + 3 for dual coil version, on single coil not inserted.

ELECTRICAL SPECIFICATIONS

Contact Rating — Noninductive load
Light Duty (Code L): Fine silver goldplated — low level to 2 amps @ 26 VDC or 1 amp @ 115 VAC
Heavy Duty (Code H): Silver cadmium oxide — 5 amp @ 26 VDC or 3 amp @ 115 VAC
Other contact material available

Life Expectancy — Mechanical Operations: 10^8
Operation at Rated Load: 10^6

Contact Resistance — 50 milliohms max. initially
200 milliohms at end of life

Operate Time — At two times "must operate" voltage or current: ≤ 8ms

Release Time — At two times "must operate" voltage or current: ≤ 3ms

Contact Bounce — At 10 ma contact current:
2 ms max. at operate, N.O. contacts
3 ms max. at release, N.C. contacts

Dielectric Strength — 1000 V rms; 500 V rms across contact gap

Insulation Resistance: — 10,000 megohms minimum @ 25°C, 100 VDC, 50% RH

Coil Temperature — Max. 105°C (220°F)

Ambient Temperature —
Operating: −55°C (−72°F) to 80°C (175°F) @ nominal operating voltage
Storage: −55°C (−72°F) to 105°C (220°F)

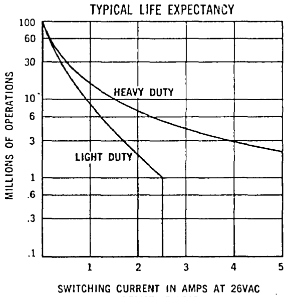
Vibration — Operating: .062 DA @ 5-55 Hz; 10g @ 55-110 Hz
Non-Operating: 10 g @ 5-500 Hz

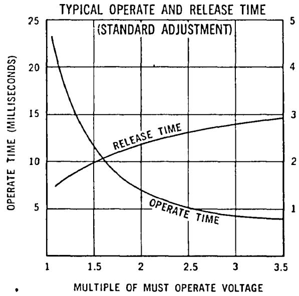
Shock — Operating: 20 g @ 11ms
Non-Operating: 30 g @ 11ms

Weight — 23 to 35 grams (approx. 1 oz.)

MINIATURE GENERAL-PURPOSE RELAYS UP TO 6 PDT CONTACTS SERIES AZ 420

ELECTRICAL SPECIFICATIONS (Continued)





Notes: 1. Coils not arc suppressed
2. Switched battery voltage source

ORDER INFORMATION

1. Select basic relay type from Table I
2. Add coil code from Table II
3. Add contact code from Table III

FOR EXAMPLE

AZ 431 — 07 — 1L

Plug-in type

1000 ohm coil resistance

6 PDT contacts single, light duty

TABLE I — BASIC TYPES

	Contact Arrangements		
Mounting	2 Form C (DPDT)	4 Form C (4PDT)	6 Form C (6PDT)
Plug-In/Solder	AZ 420	AZ 421	AZ 431
PC Terminals	AZ 428	AZ 429	AZ 439

TABLE III — CONTACT CODE

	Contact Type		
Contact Arrangement	Light Duty 2 amp 26 VDC Single Silver Gold Plated	Light Duty 2 amp 26 VDC Bifurcated Silver Gold Plated	Heavy Duty 5 amp 26 VDC Single Silver Cadmium
2 Form C	4L	40L	4H
4 or 6 Form C	1L	10L	1H

Note:

Ordering information for sockets and hardware — see next page. For free samples or assistance in specifying your relay, contact our office or your nearest engineering representative listed in the yellow section. If the type relay you want is not listed in this short-form catalog, write directly to us. Refer to AZ 420 Series and provide information as to coil resistance, operating data (voltage or current), contact configuration, contact load, and approximate life requirements. Double-coil versions and A, B, and D contacts available on request.

TABLE II — COIL CODE — COIL RESISTANCE AND OPERATING DATA FOR STANDARD RELAYS 2 AND 4-POLE

COIL DATA					MUST OPERATE (2)			
					2C Contacts		4C Contacts	
Coil Code	Nom. Oper. VDC	Max. Cont. VDC	Resist. Ohms ±10%	Induct. Henrys (1)	mA	VDC	mA	VDC
21	3	5	14	0.3	75	1.2	112	1.8
15	6	10	52	0.8	37	2.2	57	3.3
1011	12	19	185	3	20	4.1	30	6.1
80	18	30	430	5.5	14	6.6	22	10.4
08	20	35	600	9	12	8	18	11.9
70	24	38	700	9	12	9.1	18	13.8
07	26	45	1 K	15	9	10	13.5	14.9
56	48	72	2.5 K	38	5.4	14.8	8.3	22.8
40	72	110	5.8 K	65	4.2	27	6.3	40
408	90	142	10 K	120	3.1	34	4.5	50
035	115	175	15 K	200	2.4	40	3.5	58

For bifurcated and heavy duty contacts add ⅓ of the listed "Must Operate" value.

6-POLE TYPE

COIL DATA					MUST OPERATE (2)			
					Single 2 Amp Cont.		2 Amp Cont. Bifur. 5 Amp Cont. Single	
Coil Code	Nom. Oper. VDC	Max. Cont. VDC	Resist. Ohms ±10%	Induct. Henrys (1)	mA	VDC	mA	VDC
18	6	7	25	0.4	106	3.2	140	4
13	12	14	90	1.3	59	5.5	78	8
80	24	30	430	5.5	29	14	38	18
07	36	45	1000	15	17	20	24	26
06	48	61	1800	26	13.5	27	18	35
56	60	72	2500	38	11	31	15	41
04	115	138	9000	120	6.5	62	8.5	85

All values at 20°C (1) Inductance for closed armature. For open armature, divide by two.
(2) Relay will pull in with less than "must operate" value.

HARDWARE FOR CRADLE-TYPE RELAYS

GENERAL DESCRIPTION

The Series ST Sockets and Hardware described in this bulletin will accommodate most cradle-type relays available, and specifically, American Zettler's AZ 420 and AZ 430 General Purpose Relays. Unique in design, these ST sockets open new applications for cradle-type relays and the unbreakable fiberglass-filled polyurethane base provides stability under extreme environmental conditions, enhancing the reliability of the relay itself.

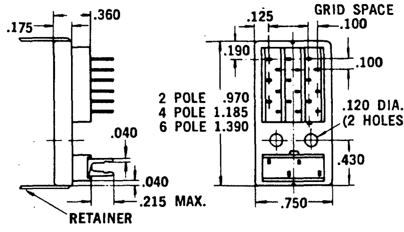
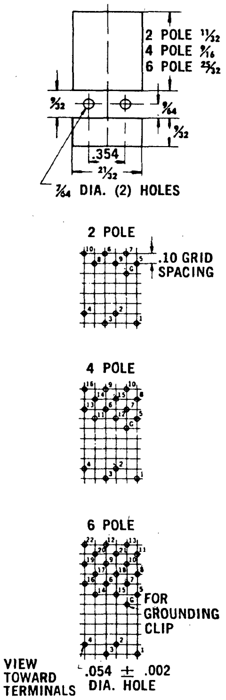
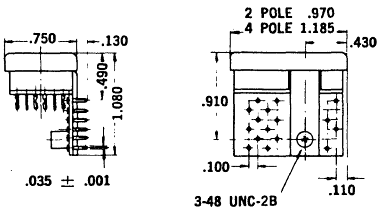
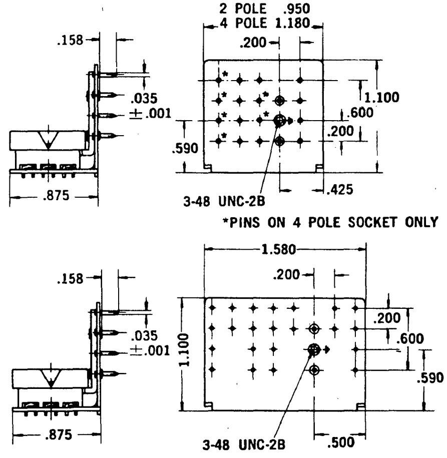
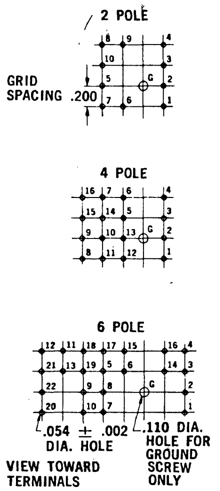
Outstanding design features offered by the new ST Series are the insulation resistance of more than 10,000 megohms, the unique knife-type connector that assures a positive contact, and the slim-profile mounting. Right-angle sockets with relays mounted extend to only ¾-inches in height above the PC board. All right angle sockets are enforced by a stable nickel plated steel bracket which also provides ground connection.

Other features include a molded riser to provide a gap between the socket base and the PC board to eliminate flux contamination during machine soldering operations; universal terminal spacing format for accommodating 0.1- and 0.2-inch grids.

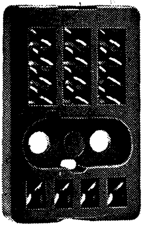
CONTINED ON FOLLOWING PAGE

American Zettler, inc.

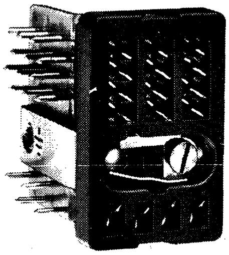
HARDWARE FOR CRADLE-TYPE RELAYS

PART NO.	NO. OF POLES	DIMENSIONS (inches)	SUGGESTED PANEL LAYOUT OR P/C BOARD
ST-140-A1 FOR AZ 420 **ST-141-A1** FOR AZ 421 **ST-345-A1** FOR AZ 431	2 4 6	**SOCKET FOR WIRING OR PC** Diagram A  .175 .360 .125 GRID SPACE .100 .190 .100 2 POLE .970 4 POLE 1.185 6 POLE 1.390 .120 DIA. (2 HOLES) .040 .430 .040 .215 MAX. .750 RETAINER	 2 POLE 11/32 4 POLE 9/16 6 POLE 25/32 5/32 5/64 1/32 .354 21/32 7/64 DIA. (2) HOLES 2 POLE .10 GRID SPACING 4 POLE 6 POLE FOR GROUNDING CLIP VIEW TOWARD TERMINALS .054 ± .002 DIA. HOLE
ST-342-A1 FOR AZ 420 **ST-350-A1** FOR AZ 421 **N.A.**	2 4 6	**RIGHT-ANGLE SOCKET FOR PC** Diagram B  .750 .130 .490 1.080 .035 ± .001 2 POLE .970 4 POLE 1.185 .430 .910 .100 .110 3-48 UNC-2B	
ST-349-A1 FOR AZ 420 **ST-343-A1** FOR AZ 421 **ST-354-A1** FOR AZ 431	2 4 6	**RIGHT-ANGLE SOCKET FOR PC** Diagram C  2 POLE .950 4 POLE 1.180 .158 .200 .035 ±.001 1.100 .600 .200 .590 .875 .425 3-48 UNC-2B *PINS ON 4 POLE SOCKET ONLY 1.580 .158 .200 .035 ±.001 .200 .600 1.100 .590 .875 3-48 UNC-2B .500	 2 POLE GRID SPACING .200 4 POLE 6 POLE .054 ± .002 DIA. HOLE .110 DIA. HOLE FOR GROUND SCREW ONLY VIEW TOWARD TERMINALS

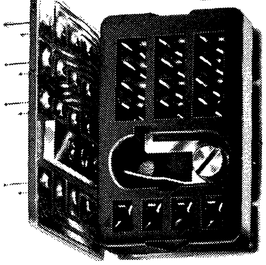
TOLERANCES: ±.010 Standard sockets have silver-plated terminals and are dipped in flux for easy machine soldering.



ST-141-A1
4 POLE



ST-350-A1
4 POLE



ST-343-A1
4 POLE

ELECTRICAL SPECIFICATIONS

Dielectric Strength — 1500 Vrms between all elements; 500 Vrms for right-angle sockets only

Insulation Resistance — 10,000 megohms minimum @ 25°C, 100 VDC, 50% RH; 1,000 megohms for right-angle sockets

Current Rating — 5 amps maximum, continuous; 2 amps for right-angle sockets

Ambient Temperature — −55°C (−72°F) to 105°C (220°F) For machine soldering maximum 240°C (460°F)

Vibration — 10 g @ 5-55 Hz (socket soldered into PC board with relay plugged-in and held in place with retainer)

Shock — 50 g any position (socket soldered onto PC board with relay plugged-in and held in place with retainer)

Terminals — Combination type facilitates hand wiring or printed circuit mounting. Right-angle sockets for printed circuit mounting only.

ORDER INFORMATION

AZ Type	Description	Diagram Identification	Contacts
ST-140-A1	Socket	A	DPDT
ST-342-A1	Right Angle for PC	B	DPDT
ST-349-A1	Right Angle for PC	C	DPDT
ST-140-1	Retainer		DPDT
ST-141-A1	Socket	A	4PDT
ST-343-A1	Right Angle for PC	C	4PDT
ST-350-A1	Right Angle for PC	B	4PDT
ST-141-1	Retainer		4PDT

AZ Type	Description	Diagram Identification	Contacts
ST-345-A1	Socket	A	6PDT
ST-354-A1	Right Angle for PC	C	6PDT
ST-345-1	Retainer		6PDT
ST-140-2	Ground Clip for all		

Order socket, retainer and grounding clip (if desired) by separate part numbers. To specify sockets with gold plated terminals, substitute -A2 for -A1.

ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

American Zettler, inc.
697 RANDOLPH AVE. ▪ COSTA MESA, CALIF. 92626 ▪ PHONE (714) 540-4190 ▪ TELEX: 67-8472

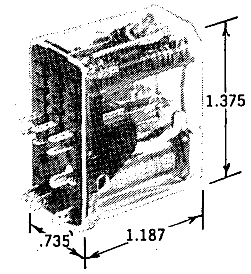
American Zettler, inc.

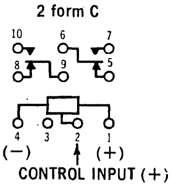
HYBRIDS
SERIES AZ 1400

GENERAL DESCRIPTION

The Hybrid Series AZ 1400 combines the advantages of mechanical contacts for the output and the most advanced electronic circuitry for the input to provide a highly reliable, yet most flexible switching device. There is complete galvanic isolation between input and output. The mechanical side consists of the proven cradle type relay AZ 420, with DPDT, 2 or 5 Amp contacts. The electronic part utilizes a unijunction transistor, a thyristor, and tantalum capacitors. The units are completely enclosed in a polycarbonate dustcover and have wire or plug-in terminals which fit standard relay sockets. The following basic types are available:

1. Voltage Sensor
2. Variable Time Delay Relay (on operate)
3. Variable Time Delay Relay (on release)
4. Variable Impulse Limiter
5. Variable Impulse Stretcher (monoflop)
6. Variable Impulse Generator (multiflop)
7. Alternate Action Impulse Relay (flip flop)





VIEW TOWARD TERMINALS

ELECTRICAL SPECIFICATIONS

Contact Rating — non inductive

Light Duty (Code L): Fine silver gold plated — low level to 2 amps at 26VDC or 1 amp at 115VAC

Heavy Duty (Code H): Silver cadmium oxide — 2 to 5 amp at 26VDC or 3 amp at 115VAC

Contact Configuration — DPDT is standard, other types on request.

Dielectric Strength — 500Vrms

Insulation Resistance — 10^9 ohms at 25°C 50% RH

Temperature Range — 0° to 40°C (Storage: −30° to +85°C)

Repeatability — ±2%

Polarity Protection — yes, (except voltage sensor)

Accuracy — Max. +10% −15% at ±5% Volt variation and at 0° to 40°C

Transient Protection — +50V 1ms

Vibration — .062 DA at 5-55Hz

Shock — 20g at 11ms

Weight — 35gr (1¼ oz)

Description	Operate Voltage or Current	Variation Range	Contact Code	Order No.
VOLTAGE SENSOR, energizes the relay section at a predetermined voltage. This voltage is adjustable with a built-in pot within the variation range. It deenergizes 30 mV below the set voltage. A Zener diode is used for the reference voltage.	70 mA Max.	9 to 15VDC	L	AZ 1435-10-4L-15
			H	AZ 1435-10-4H-15
	45 mA Max.	18 to 30VDC	L	AZ 1435-10-4L-30
			H	AZ 1435-10-4H-30
VARIABLE TIME DELAY (on operate) energizes the built-in relay after the operating voltage is applied to terminal #1 and 4, and after elapse of the predetermined time. This time is adjustable within the variation range. The recovery time is less than 150 ms. No false operation.	24VDC +10% −15% 30 mA	1 to 10 sec	L	AZ 1436-07-4L-10
			H	AZ 1436-07-4H-10
		3 to 30 sec	L	AZ 1436-07-4L-30
			H	AZ 1436-07-4H-30
VARIABLE TIME DELAY (on release) pulls in with less than 50 ms after a positive control voltage of more than 20VDC is applied to terminal #2. The release time starts when the control voltage is switched off. The operate voltage remains on terminal 1 (+) and 4 (−) as auxiliary voltage. The release time is adjustable within the variation range. No false operation.	24VDC +10% −15% 30 mA	1 to 10 sec	L	AZ 1437-07-4L-10
			H	AZ 1437-07-4H-10
		3 to 30 sec	L	AZ 1437-07-4L-30
			H	AZ 1437-07-4H-30
VARIABLE IMPULSE LIMITER activates the built-in relay immediately after the operate voltage is applied, and releases after elapse of preset time. This time is adjustable within the variation range. The recovery time is less than 150 ms.	24VDC +10% −15% 50 mA	50 to 150 ms	L	AZ 1438-08-4L-0.15
			H	AZ 1438-08-4H-0.15
		150 to 450 ms	L	AZ 1438-08-4L-0.45
			H	AZ 1438-08-4H-0.45
		450 to 1500 ms	L	AZ 1438-08-4L-1.5
			H	AZ 1438-08-4H-1.5
VARIABLE IMPULSE STRETCHER energizes the relay section for a defined time independent from the length of the incoming positive trigger impulse. The closing time of the relay is adjustable within the variation range. The trigger impulse (min 10 μsec) must be more than 5VDC, but less than 30V. The operate voltage remains on terminal #1 (+) and #4 (−) as auxiliary voltage.	24VDC +10% −15% 50 mA	50 to 150 ms	L	AZ 1439-08-4L-0.15
			H	AZ 1439-08-4H-0.15
		150 to 450 ms	L	AZ 1439-08-4L-0.45
			H	AZ 1439-08-4H-0.45
		450 to 1500 ms	L	AZ 1439-08-4L-1.5
			H	AZ 1439-08-4H-1.5
VARIABLE IMPULSE GENERATOR pulses the relay at equal on and off time regardless of the frequency. The length of the impulse can be adjusted within the variation range.	24VDC +10% −15% 30 mA	.1 to 1 sec	L	AZ 1440-07-4L-1
			H	AZ 1440-07-4H-1
		1 to 10 sec	L	AZ 1440-07-4L-10
			H	AZ 1440-07-4H-10
		3 to 30 sec	L	AZ 1440-07-4L-30
			H	AZ 1440-07-4H-30
ALTERNATE ACTION IMPULSE RELAY (bistable) can be switched in the opposite position by a positive trigger impulse applied to terminal #2, The trigger impulse (min 10 μsec) must be more than 5VDC, but less than 30VDC. The operate voltage remains on terminal #1 (+) and #4 (−) as auxiliary voltage. This is not a magnetic latching relay.	24VDC +10% −15% 30 mA		L	AZ 1441-07-4L
			H	AZ 1441-07-4H
Socket } See Hardware page for cradle type relays.				ST 345-A1
Retainer				ST 345-1

* FOR FURTHER DETAILED DIMENSIONS SEE AZ 420 SERIES 6PDT

American Zettler, inc.

GENERAL PURPOSE RELAYS SERIES AZ 480

10 AMP CONTACTS

GENERAL DESCRIPTION

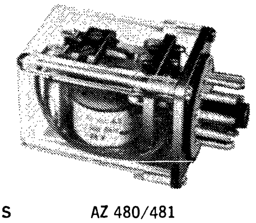
Commercial/industrial in application, these general-purpose relays feature the highest production quality at modest prices due to mass production techniques. The series AZ 480 finds broad application in the fields of motor controls, alarm systems, lighting and solenoid control, communications equipment, automated or semi-automated commercial controls, etc.

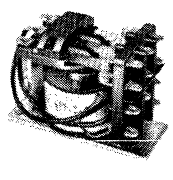
AZ 480 relays are available in either an open or plastic enclosed version. The open relay, with either solder or PC terminals, can be mounted with an attached base plate or with a 6-32 tapped hole in the core. It also can be supplied with a 6-32 mounting stud and locating tab. The relay enclosed in a plastic dust-cover is available either as a plug-in version with octal type socket (8 or 11 pins), or with PC terminals. AZ 480 relays are interchangeable with other manufacturer's types (see cross reference).

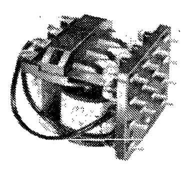
The standard AZ 480 relays have silver-cadmium-oxide 10-amp contacts in SPDT through 4PDT (5-amp contacts on request). The clean snappy action contacts operate with minimum bounce, resulting in greater reliability and longer life. A special plastic holding device prevents the armature from unseating itself during transportation or operation. The moveable contacts are securely mounted to the armature by a block of thermosetting plastic to ensure no change in adjustment during relay life. The stationary contacts are tightly stacked into a terminal block, which has barriers molded on both sides. UL-version listed under UL Component Recognition File E44211.

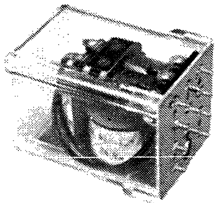
FEATURES

- American Standard Type
- AC or DC coils up to 220V
- Up to 4 PDT 10 AMP contacts
- Plug-in, wiring or PC board mounting
- Designed to meet UL requirements
- Life expectancy to 10 million operations


AZ 480/481


AZ 482/483

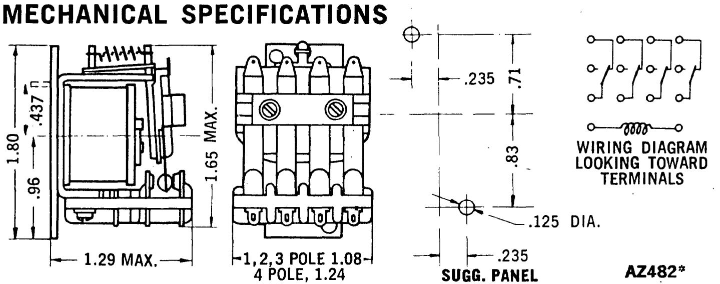

AZ 488/487


AZ 488S/487S

ELECTRICAL SPECIFICATIONS

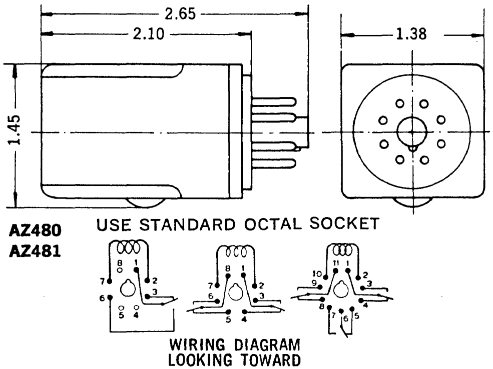
Contact Rating — 10 amp @ 115 volts AC 60 Hz non inductive
Contact Material — Silver-cadmium-oxide
Contact Arrangement — 1, 2, 3 and 4 form C (up to 4PDT)
Life Expectancy — Mechanical: 10 million operations
Rated Load: ¼ million operations
Dielectric Strength — 1500 vrms
500 vrms across contact gap
Insulation Resistance — 100 megohms minimum
Coil Voltage — to 280 volts AC
Coil Power — Nominal — DC: 1.2 watts — AC 2.5 VA
Max. Continuous Dissipation: 2.5 watts @ 35°C (95°F) ambient
Ambient Temperature — Open relay −45°C (−50°F) to 70°C (158°F) (at nominal operate voltage)
Enclosed relay −45°C (−50°F) to 50°C (125°F) (at nominal operate voltage)
Operate Time — Less than 15ms at nominal operate voltage (DC coils only)
Release Time — Less than 8ms at nominal operate voltage (DC coils only)
Weight — Open relay: 2.3 oz (65 gr) — Enclosed relay: 3 oz (85 gr)
Terminals — Open relay: pierced solder lugs
Enclosed relay: octal plug-in
Mounting — See mechanical specifications
Enclosure — Heat and shock resistant clear plastic

MECHANICAL SPECIFICATIONS

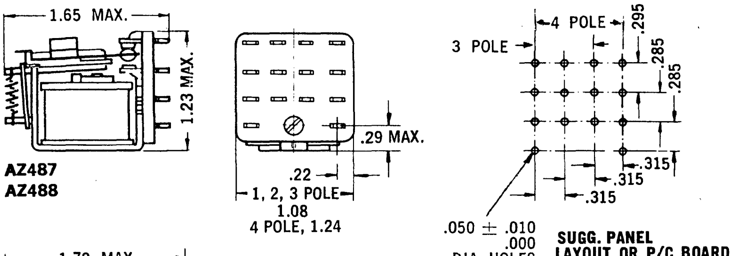

1.80
.437
.96
1.65 MAX.
1.29 MAX.
1,2,3 POLE 1.08
4 POLE, 1.24
.235
.71
.83
.125 DIA.
.235
WIRING DIAGRAM
LOOKING TOWARD
TERMINALS

SUGG. PANEL LAYOUT OR P/C BOARD

AZ482*
AZ483*

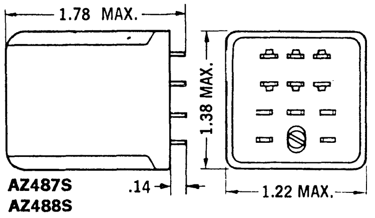

2.65
2.10
1.45
1.38
USE STANDARD OCTAL SOCKET
8 1 7 2 6 3 5 4
11 1 10 2 9 3 8 4 7 6 5
WIRING DIAGRAM
LOOKING TOWARD
TERMINALS

AZ480
AZ481

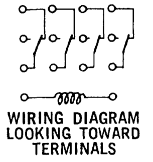

1.65 MAX.
1.23 MAX.
.29 MAX.
.22
1, 2, 3 POLE
1.08
4 POLE, 1.24
4 POLE
3 POLE
.295
.285
.285
.315
.315
.315
.050 ± .010 .000 DIA. HOLES

AZ487
AZ488

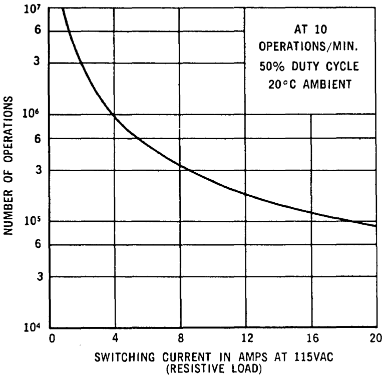
SUGG. PANEL LAYOUT OR P/C BOARD


1.78 MAX.
1.38 MAX.
.14
1.22 MAX.

AZ487S
AZ488S


WIRING DIAGRAM
LOOKING TOWARD
TERMINALS

TYPICAL LIFE EXPECTANCY



* Also available with #6-32 UNC-2A mounting stud and locating tab (add Letter "A" to part no.) or with #6-32 UNC-2B tapped core and locating tab (add Letter "B" to part no.) Tolerances ±.01

American Zettler, inc.

GENERAL PURPOSE RELAYS SERIES AZ 480

10 AMP CONTACTS

STANDARD RELAYS AC-ACTUATED — ENCLOSED

Coil Specifications					ORDER NO.	
Voltage, VAC (Volts) Nominal	Max.	Min.	Nominal Current (mA)	Contacts	Octal Plug In	PC Terminals
6 AC	9	5	410	SPDT	AZ 481-2-1	AZ 487S-2-1
12 AC	19	10	205	SPDT	AZ 481-3-1	AZ 487S-3-1
24 AC	37	21	100	SPDT	AZ 481-4-1	AZ 487S-4-1
120 AC	184	102	20	SPDT	AZ 481-7-1	AZ 487S-7-1
220 AC	280	187	11	SPDT	AZ 481-9-1	AZ 487S-9-1
6 AC	9	5	410	DPDT	AZ 481-2-2	AZ 487S-2-2
12 AC	19	10	205	DPDT	AZ 481-3-2	AZ 487S-3-2
24 AC	37	21	100	DPDT	AZ 481-4-2	AZ 487S-4-2
120 AC	184	102	20	DPDT	AZ 481-7-2	AZ 487S-7-2
220 AC	280	187	11	DPDT	AZ 481-9-2	AZ 487S-9-2
6 AC	9	5	410	3PDT	AZ 481-2-3	AZ 487S-2-3
12 AC	19	10	205	3PDT	AZ 481-3-3	AZ 487S-3-3
24 AC	37	21	100	3PDT	AZ 481-4-3	AZ 487S-4-3
120 AC	184	102	20	3PDT	AZ 481-7-3	AZ 487S-7-3
220 AC	280	187	11	3PDT	AZ 481-9-3	AZ 487S-9-3

STANDARD RELAYS DC-ACTUATED — ENCLOSED

Coil Specifications					ORDER NO.	
Voltage, VDC (Volts) Nominal	Max.	Min.	Resistance (Ohms) ±10%	Contacts	Octal Plug In	PC Terminals
6 DC	9	4.5	32	SPDT	AZ 480-2-1	AZ 488S-2-1
12 DC	19	9	130	SPDT	AZ 480-3-1	AZ 488S-3-1
24 DC	37	18	500	SPDT	AZ 480-4-1	AZ 488S-4-1
48 DC	75	36	2,100	SPDT	AZ 480-6-1	AZ 488S-6-1
110 DC	165	83	10,500	SPDT	AZ 480-9-1	AZ 488S-9-1
6 DC	9	4.5	32	DPDT	AZ 480-2-2	AZ 488S-2-2
12 DC	19	9	130	DPDT	AZ 480-3-2	AZ 488S-3-2
24 DC	37	18	500	DPDT	AZ 480-4-2	AZ 488S-4-2
48 DC	75	36	2,100	DPDT	AZ 480-6-2	AZ 488S-6-2
110 DC	165	83	10,500	DPDT	AZ 480-9-2	AZ 488S-9-2
6 DC	9	4.5	32	3PDT	AZ 480-2-3	AZ 488S-2-3
12 DC	19	9	130	3PDT	AZ 480-3-3	AZ 488S-3-3
24 DC	37	18	500	3PDT	AZ 480-4-3	AZ 488S-4-3
48 DC	75	36	2,100	3PDT	AZ 480-6-3	AZ 488S-6-3
110 DC	165	83	10,500	3PDT	AZ 480-9-3	AZ 488S-9-3

STANDARD RELAYS AC-ACTUATED — OPEN

Coil Specifications					ORDER NO.	
Voltage, VAC (Volts) Nominal	Max.	Min.	Nominal Current (mA)	Contacts	Octal Plug In	PC Terminals
6 AC	9	5	410	SPDT	AZ 483-2-1	AZ 487-2-1
12 AC	19	10	205	SPDT	AZ 483-3-1	AZ 487-3-1
24 AC	37	21	100	SPDT	AZ 483-4-1	AZ 487-4-1
120 AC	184	102	20	SPDT	AZ 483-7-1	AZ 487-7-1
220 AC	280	187	11	SPDT	AZ 483-9-1	AZ 487-9-1
6 AC	9	5	410	DPDT	AZ 483-2-2	AZ 487-2-2
12 AC	19	10	205	DPDT	AZ 483-3-2	AZ 487-3-2
24 AC	37	21	100	DPDT	AZ 483-4-2	AZ 487-4-2
120 AC	184	102	20	DPDT	AZ 483-7-2	AZ 487-7-2
220 AC	280	187	11	DPDT	AZ 483-9-2	AZ 487-9-2
6 AC	9	5	410	3PDT	AZ 483-2-3	AZ 487-2-3
12 AC	19	10	205	3PDT	AZ 483-3-3	AZ 487-3-3
24 AC	37	21	100	3PDT	AZ 483-4-3	AZ 487-4-3
120 AC	184	102	20	3PDT	AZ 483-7-3	AZ 487-7-3
220 AC	280	187	11	3PDT	AZ 483-9-3	AZ 487-9-3
6 AC	9	5	410	4PDT	AZ 483-2-8	AZ 487-2-8
12 AC	19	10	205	4PDT	AZ 483-3-8	AZ 487-3-8
24 AC	37	21	100	4PDT	AZ 483-4-8	AZ 487-4-8
120 AC	184	102	20	4PDT	AZ 483-7-8	AZ 487-7-8
220 AC	280	187	11	4PDT	AZ 487-9-8	AZ 487-9-8

STANDARD RELAYS DC-ACTUATED — OPEN

Coil Specifications					ORDER NO.	
Voltage, VDC (Volts) Nominal	Max.	Min.	Resistance (Ohms) ±10%	Contacts	Octal Plug In	PC Terminals
6 DC	9	4.5	32	SPDT	AZ 482-2-1	AZ 488-2-1
12 DC	19	9	130	SPDT	AZ 482-3-1	AZ 488-3-1
24 DC	37	18	500	SPDT	AZ 482-4-1	AZ 488-4-1
48 DC	75	36	2,100	SPDT	AZ 482-6-1	AZ 488-6-1
110 DC	165	83	10,500	SPDT	AZ 482-9-1	AZ 488-9-1
6 DC	9	4.5	32	DPDT	AZ 482-2-2	AZ 488-2-2
12 DC	19	9	130	DPDT	AZ 482-3-2	AZ 488-3-2
24 DC	37	18	500	DPDT	AZ 482-4-2	AZ 488-4-2
48 DC	75	36	2,100	DPDT	AZ 482-6-2	AZ 488-6-2
110 DC	165	83	10,500	DPDT	AZ 482-9-2	AZ 488-9-2
6 DC	9	4.5	32	3PDT	AZ 482-2-3	AZ 488-2-3
12 DC	19	9	130	3PDT	AZ 482-3-3	AZ 488-3-3
24 DC	37	18	500	3PDT	AZ 482-4-3	AZ 488-4-3
48 DC	75	36	2,100	3PDT	AZ 482-6-3	AZ 488-6-3
110 DC	165	83	10,500	3PDT	AZ 482-9-3	AZ 488-9-3
6 DC	9	4.5	32	4PDT	AZ 482-2-8	AZ 488-2-8
12 DC	19	9	130	4PDT	AZ 482-3-8	AZ 488-3-8
24 DC	37	18	500	4PDT	AZ 482-4-8	AZ 488-4-8
48 DC	75	36	2,100	4PDT	AZ 482-6-8	AZ 488-6-8
110 DC	165	83	10,500	4PDT	AZ 482-9-8	AZ 488-9-8

SENSITIVE RELAYS — AZ 484 — DC ACTUATED, ENCLOSED PLUG-IN ONLY

Contact Rating — 2 amp @ 30 VDC or 70 VAC non inductive

Coil Power — 125m Watt SPDT — 250m Watt DPDT — 375m Watt 3PDT

Operate Time — Less than 16ms at nominal power

Release Time — Less than 12ms at nominal power

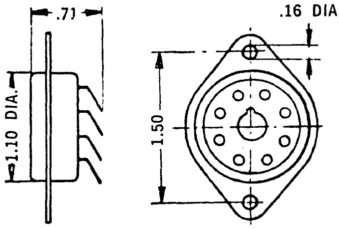
Terminals — Plug in only

All other data seet standard relays

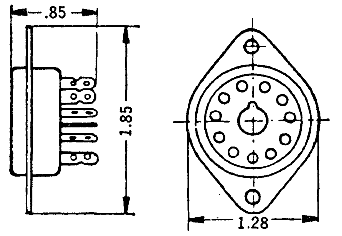
	Coil Specifications				
Order No.	Resistance (Ohms) ±5%	Voltage (Volts)	Must Operate Current (mA)	Nom. Voltage (Volts)	Contacts
Coil power: 125m Watt					
AZ 481-1-1	2500	20	7.2	27	SPDT
AZ 484-2-1	5000	27	5	36	SPDT
AZ 484-3-1	10,000	40	3.6	52	SPDT
Coil power: 250m Watt					
AZ 484-1-2	2500	27	10	36	DPDT
AZ 484-2-2	5000	40	7.2	52	DPDT
AZ 484-3-2	10,000	55	5	74	DPDT
Coil power: 375m Watt					
AZ 484-1-3	2500	34	12.3	45	3PDT
AZ 484-2-3	5000	49	8.7	65	3PDT
AZ 484-3-3	10,000	68	6.2	90	3PDT

SOCKETS AND HARDWARE

920733



920734



RETAINER
920735

If the type relay you want is not listed in this short form catalog, write directly to us. Refer to AZ 480 Series and provide information as to coil resistance, operating data (voltage or current), contact configuration, contact load, and approximate life requirements.

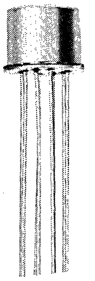
For free samples or assistance in specifying your relay, contact our office or your nearest engineering representative listed in the yellow section.

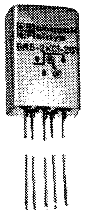
BABCOCK ELECTRONICS CORPORATION

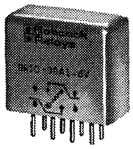
Subsidiary of Esterline Corporation
3501 No. Harbor Blvd., Costa Mesa, Calif. 92626 • Tel: (714) 540-1234 • TWX: 910-595-1517

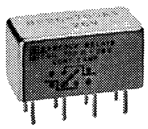
Babcock Electronics Corporation is a leading producer of high reliability and general purpose electromechanical, mercury-wetted and reed relays for aerospace and industrial control applications. All models meet or exceed applicable product standards, and are backed by the industry's first and most exacting factory test program.

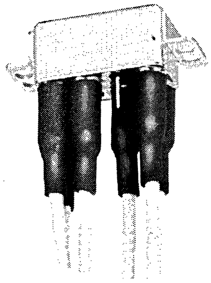
AEROSPACE & MILITARY







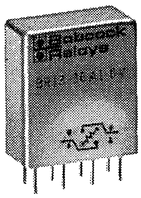


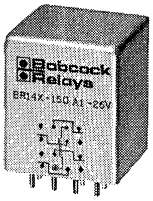


REFERENCE SPECIFICATIONS	SUBMINIATURE MODELS				1/6-SIZE CRYSTAL CAN		HALF SIZE CRYSTAL CAN			
Contact Rating	1 amp	1 amp	1 amp	1 amp	1 amp	1 amp	2 amp	2 amp	2 amp	2 amp
Relay Type	Non-Latch	Non-Latch	Non-Latch	Latch	Non-Latch	Non-Latch	Non-Latch	Latch	Non-Latch	Coaxial
Series Designation	BR5	BR40	BR41	BR39	BR10	BR44	BR16	BR17	BR26	BR25
Contact Arrangement	SPDT	DPDT	DPDT	DPDT	DPDT	DPDT	DPDT	DPDT	DPDT	DPDT (RF)
Coil Voltages (VDC)	12, 18, 26	6, 9, 12	6, 9, 12, 18, 26	6, 9, 12, 18, 26	6, 12, 18, 26	6, 12, 18, 26	6, 12, 26, 48	6, 12, 26	6, 12, 26	6, 12, 26
Coil Voltages (VAC)	—	—	—	—	—	—	—	—	—	—
Operate/Release Time (ms)	4	2	2	2	3.5	3.5	4	3	4	4
Pull-In Power (mw)	100	150	60	—	100	100	175	175	250	250
Operating Temperature Range (°C)	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125
Life (operations; min.)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Shock (operating; g's)	50	80	80	80	50	50	50	50	50	50
Vibration (sinusoidal; g's)	30	30	30	30	30	30	30	30	30	30
Terminal Styles*	B, C	A, C	A, C	A, C	A, B, C	A, B, C	A, B	A, B	A, B	D
Mounting Types**	A,C	C	C	C	A, B	A, B	A, B	A, B	A, B	A, B
Construction	Soldered	Welded	Welded	Welded	Solder/Weld	Welded	Welded	Welded	Welded	Welded
MIL-R-5757/Slash No.	—	40	70	71	19 & 30	19 & 30	9	78	9	—

*Terminal Style Code: A — plug-in; B — solder hook; C — PC leads; D — coax leads }
**Mounting Type Code: A — plain can; B — flange; C — bracket; D — studs } consult factory for non-listed styles

RELAYS (MIL-R-5757)





FULL SIZE CRYSTAL CAN													
2 amp	2 amp	2 amp	2 amp	3 amp	3 amp	5, 10 amp	5, 10 amp	5, 7.5, 10 amp	5, 7.5, 10 amp	10 amp	10 amp	10 amp	10 amp
Non-Latch	Non-Latch	Non-Latch	Non-Latch	Non-Latch	Non-Latch	Non-Latch	Non-Latch	Non-Latch	Non-Latch	Non-Latch	Latch	Latch	Latch
BR8	BR21	BR27	BR28	BR12	BR13	BR7	BR19	BR14	BR15	BR24	BR9	BR20	BR23
DPDT	4PDT	DPDT	DPDT	DPDT	DPDT	DPDT	DPDT	4PDT	4PDT	DPDT	DPDT	DPDT	4PDT
6, 12, 26, 115	6, 12, 26	6, 12, 26	6, 12, 26	6, 12, 26, 115	6, 12, 26, 115	6, 12, 26, 48, 115	6, 12, 26, 48, 115	6, 12, 26, 115	6, 12, 26, 115	6, 12, 26	6, 12, 26, 115	6, 12, 26, 48, 115	6, 12, 26, 48, 115
—	—	—	—	—	—	115	115	115	115	—	—	—	—
5/6	15/10	14	6	5/6	5/6/15	7/8.5/20	7/8.5/20	7.5/8.5/20	7.5/8.5/20	7	10	10	10
250/150	500	40	250	250/100/40	250/100/40	175/500	175/500	1(w)/400/500	1(w)/400/500	400	250/130	250/130	500/250
−65/+125	−55/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125	−65/+125
100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
50	30	50	100	50	50	50	50	50	50	50	50	50/100	50
30	10	30	20	20/30	20/30	30	30	30	30	30	30	30	30
A, B, C	B	A, B	A, B	A, B, C	A, B, C	A, B, C	A, B, C	A, B	A, B	A, B	A, B	A, B	A, B
A, B, C	D	A, B	A, B	A, B	A, B	A, B, C	A, B, C	A, B	A, B	A, B, C	A, B, C	A, B, C	A, B
Soldered	Soldered	Welded	Welded	Soldered	Welded	Soldered	Welded	Soldered	Welded	Welded	Soldered	Welded	Welded
—	—	13	10	—	10 & 77	—	28	—	—	23 & 28	—	—	—

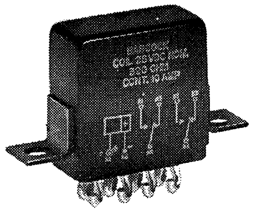
ESTERLINE

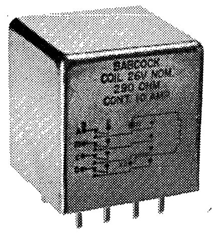
BABCOCK ELECTRONICS CORPORATION
Subsidiary of Esterline Corporation
3501 No. Harbor Blvd., Costa Mesa, Calif. 92626 • Tel: (714) 540-1234 • TWX: 910-595-1517

AEROSPACE & MILITARY RELAYS (MIL-R-6106)

Miniature Babcock relays produced to comply with the requirements of military specification MIL-R-6106 (MS27400/MS27401) are widely used in direct aircraft and prime mover installations, and are designed specifically to meet the electrical and environmental needs of those applications. The general specification has attributes not found in other relay specifications. The most significant being the increased requirements for overload and rupture.

The Models BR46 (DPDT) and BR30 (4PDT), 10/15-amp., relays are new entries into this exacting market environment.





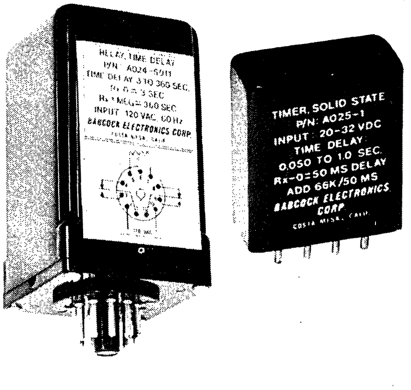
REFERENCE SPECIFICATIONS	MINIATURE MODELS	
Contact Rating	10, 15 amp	10, 15 amp
Relay Type	Non-Latch	Non-Latch
Series Designation	BR46	BR30
Contact Arrangement	DPDT	4PDT
Coil Voltages (VDC) **(VAC)**	6, 12, 28 115	6, 12, 28 115
Operate/Release Time (ms)	10	15/50
Pull-In Power (mw)	500	600
Operating Temperature Range (°C)	—70/+125	—70/+125
Life (operations; min.)	100,000	100,000
Shock (operating; g's)	200	200
Vibration (sinusoidal; g's)	30	30
Terminal Styles*	A, B	A, B
Mounting Types**	A, B	A, B
Construction	Welded	Welded
MIL Drawing	MS27401	MS27400

INDUSTRIAL/MILITARY TIMERS & SENSORS

TIME DELAY RELAYS

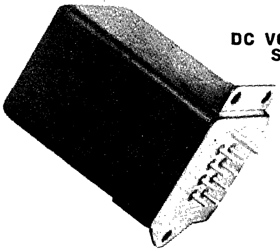
Solid-state industrial and military time delay relays; *Delay Ranges:* from 0.1 to 300 sec.; *Accuracy:* ±5%; *Recycle Time:* 100 ms. to 10 sec.; *Voltages:* 18 to 32 VDC; *Life:* to 10,000 hrs.; *Temp. Range:* −55°c to +125°c; *Shock/Vibration:* to 100/30 g's.

Lightweight A025 solid-state adjustable time delay relay; *Delay Range:* adjustable from 0.050 to 200 sec.; *Accuracy:* ±10%; *Recycle Time:* 100 ms. to 5 sec.; *Voltage:* 28 VDC; *Life:* 10,000 hrs.; *Temp. Range:* −55°c to +85°c; *Shock/Vibration:* 100/30 g's.



DC VOLTAGE SENSOR

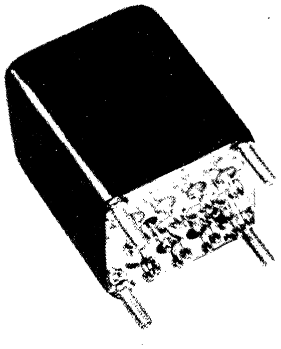
Applicable for monitoring over and undervoltage conditions & protection of voltage sensitive circuitry; *Trip Voltages:* to 220 VDC; *Accuracy:* ±1%; *Types:* SPDT & DPDT; *Ratings:* 2, 5 & 10-amp.; *Temp. Range:* −55°c to +125°c; *Life:* 100,000 operations; *Shock/Vibration:* to 50/20 g's.



DC VOLTAGE SENSOR

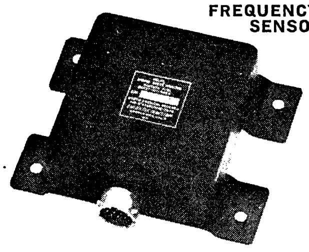
AC VOLTAGE SENSORS

Over and undervoltage units for monitoring and protection of voltage sensitive circuits; *Trip Voltages:* to 400 VAC; *Accuracy:* ±1%; *Types:* SPDT & DPDT; *Ratings:* 2, 5 & 10-amp.; *Temp. Range:* to −55°c to +125°c; *Life:* 100,000 operations; *Shock/Vibration:* to 50/20 g's.



FREQUENCY SENSORS

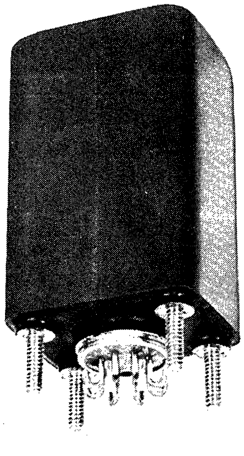
For monitoring over and underfrequency conditions and frequency sensitive equipment protection; *Input Freq.:* 60 or 400 Hz; *Voltage Range:* 90 to 260 VAC; *Types:* SPDT & DPDT; *Accuracy:* to ±1%; *Life:* to 100,000 operations; *Temp. Range:* −65°c to +125°c; *Shock/Vibration:* to 50/20 g's.



FREQUENCY SENSOR

PHASE SENSORS

Protects phase sensitive circuits by detecting incorrect phase rotation or loss of one or more phases or neutral connection; *Freq. Range:* 50 to 70 Hz & 360 to 440 Hz; *Voltage Range:* 90 to 150 VAC & 156 to 260 VAC; *Types:* SPDT & DPDT; *Ratings:* 2 to 10-amp; *Accuracy:* less than 10% sine wave distortion; *Operate/Release Time:* 100 ms. max.; *Life:* 100,000 operations; *Temp. Range:* −65°c to +125°c; *Shock/Vibration:* to 50/20 g's.



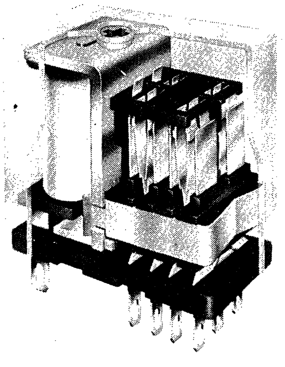
ESTERLINE

BABCOCK ELECTRONICS CORPORATION
Subsidiary of Esterline Corporation
3501 No. Harbor Blvd., Costa Mesa, Calif. 92626 • Tel: (714) 540-1234 • TWX: 910-595-1517

INDUSTRIAL/GENERAL PURPOSE RELAYS

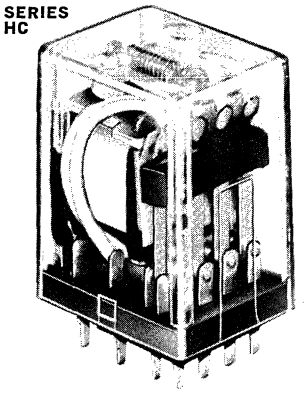
SERIES K

Unique "lift-off," card-operated units, directly interchangeable with existing cradle relays; *Types:* DPDT, 4PDT & 6PDT; *Voltages:* to 110 VDC & 220VAC; *Ratings:* 2, 3 & 5 amp.; *Life:* to 10^7 operations; *Temp. Range:* −40°c to +80°c; socket or PCB terminals available.



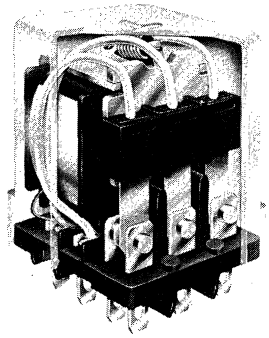
SERIES HC

Directly interchangeable with comparable relay; *Types:* SPDT, DPDT, & 4 PDT; *Voltages:* 6 to 110 VDC, 6 to 240 VAC; *Ratings:* 3, 5, 7 & 10-amp.; *Life:* to 10^6 operations; *Temp. Range:* −50°c to +50°c; socket or PCB terminals available.



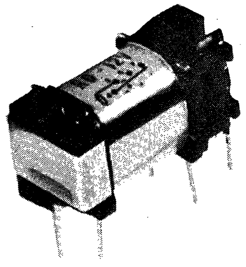
SERIES HP

Reliable power unit interchangeable with existing comparable relays; *Types:* 2, 3 & 4PDT; *Voltages:* to 110 VDC & 240 VAC; *Ratings:* 10-amp; *Life:* 500,000 operations; *Temp. Range:* −50°c to +40°c; socket or PCB terminals available.



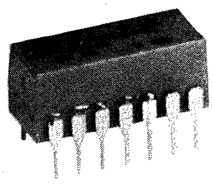
SERIES R

Miniature high-speed relay with the long life characteristics of a reed with the contact performance of an electromechanical unit, available in open and sealed (shielded) configurations, in latching and non-latching versions; *Type:* SPDT; *Voltages:* to 60 VDC; *Rating:* 1-amp.; *Life:* to 10^6 operations; *Temp. Range:* −55°c to +65°c; PCB terminals available.



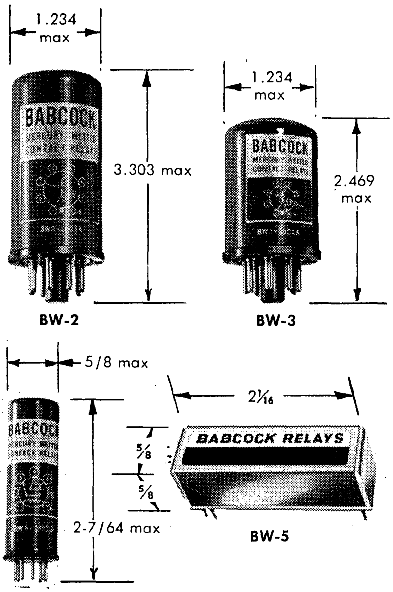
MODEL BR70

Unique DIP electromechanical, machine-insertable relay; *Type:* DPDT; *Voltages:* to 28 VDC; *Rating:* 3 watts @ 250 ma.; *Life:* to 10^6 operations; *Temp. Range:* −30°c to +71°c; 14-pin terminal.



MERCURY-WETTED RELAYS

BW SERIES



BW-2

BW-3

BW-5

BW-4

	BW-2	BW-3	BW-4	BW-5
Coil Resistance (ohms)	2 thru 25K	275 thru 14K	65 thru 24K	115 thru 1950
Maximum power dissipation @ 35°C (watts)	2.0	1.5	1.0	1.7
Contacts	1 form C; SPDT (break-before-make)	1 form C; SPDT (break-before-make)	1 form C; SPDT (break-before-make)	1 form C; SPDT (break-before-make)
Contact rating				
Amperes (max)	2.0	2.0	2.0	2.0
Volts (max)	500	500	500	500
Va (max) with contact protection	100.0	100.0	100.0	100.0
Adjustment				
Single side stable*				
Must operate power (Max. Sensitivity)	3.7 mW	6.3 mW	20 mW	20 mW
Must release power	.1 mW	.2 mW	.8 mW	.8 mW
Bi-stable**				
Must release power	±1.2 mW	±2.0 mW	±6 mW	+6 mW
Chopper adjustment	Relays are adjusted to follow 60 Hz sinusoidal AC current with approximately equal dwell on the fixed contacts. Available on models BW-2 and BW-3 only.			
Contact resistance				
Typical (milliohms)	25	25	25	25
Maximum (milliohms)	40	40	40	40
Dielectric strength	1000 volts RMS	1000 volts RMS	1000 volts RMS	1000 volts RMS
Insulation Resistance***	10,000 MΩ min.	10,000 MΩ min.	10,000 MΩ min.	10,000 MΩ min.
Coil temperature rise per watt of power dissipation	15°C	20°C	40°C	40°C

*The permanent magnets are adjusted so that the relay will release (open its front contact) when the current through its coil is reduced to less than the 'must release' value.

**The permanent magnets are adjusted to hold the armature in the position to which it was last operated until sufficient current of opposite polarity is applied.

***Special Order

BABCOCK ELECTRONICS CORPORATION

Subsidiary of Esterline Corporation
3501 No. Harbor Blvd., Costa Mesa, Calif. 92626 • Tel: (714) 540-1234 • TWX: 910-595-1517

ESTERLINE

TIME DELAY RELAYS* • VOLTAGE SENSING MODULES* • PHASE SEQUENCE DETECTORS • AC VOLTAGE SWITCHES • DC VOLTAGE SWITCHES • VOLTAGE LIMIT DETECTORS • 400 Hz LINE FREQUENCY DETECTORS • AC CURRENT SWITCHES • POWER INTERLOCK DIODE ADAPTORS • FLASHERS • AC-DC POWER SUPPLIES

*Formerly Bourns Inc., 3900-3917 Series time delay relays, now exclusively **manufactured** and **sold** by Betamite.

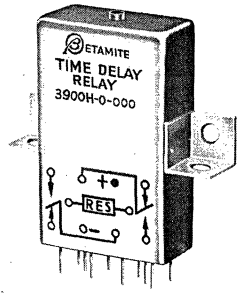
The Betamite line of off-the-shelf solid state devices offers a wide range of time delays, ratings, terminal configurations and packages to meet your particular application. All devices undergo complete quality assurance testing and, where applicable, meet or exceed life and environmental requirements of MIL-R-5757D. For devices not shown, contact the factory or your Betamite Representative.

BETAMITE ELECTRONIC DEVICES

MODEL 3900

Adjustable Time Delay Relay (Delay on Operate) 1.0 Amp. DPDT Relay Output

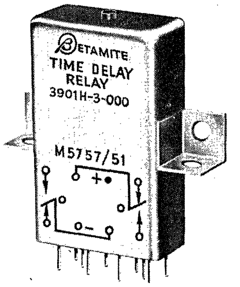
Time Delay Range from 0.1 to 200 seconds • Smallest DPDT Integrally Adjustable Time Delay Relay • Less than 0.050 amperes required for continuous operation • Meets or exceeds MIL-R-5757D/51.


BETAMITE
TIME DELAY RELAY
3900H-0-000
RES

MODEL 3901

Time Delay Relay Adjustable (Delay on Operate) 1.0 Amp. DPDT Relay Output

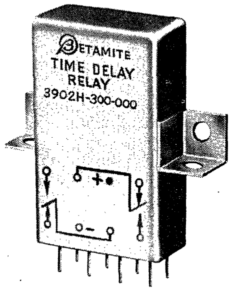
Meets or exceeds MIL-R-5757D/51 • Time delay ranges from 0.1 to 15 seconds • Smallest DPDT integrally adjustable time delay relay • Less than 0.05 ampere required for continuous operation.


BETAMITE
TIME DELAY RELAY
3901H-3-000
M5757/51

MODEL 3902

Fixed Time Delay Relay (Delay on Operate) 1.0 Amp. DPDT Relay Output

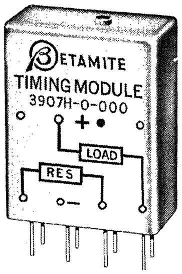
Time Delays available from 0.1 to 15 seconds • Time Delay preset at factory • Meets or exceeds MIL-R-5757D/51 • Special designs available to meet custom specifications.


BETAMITE
TIME DELAY RELAY
3902H-300-000

MODEL 3907

Time Delay Module Adjustable (Delay on Operate) SPSTNO Solid State Switch

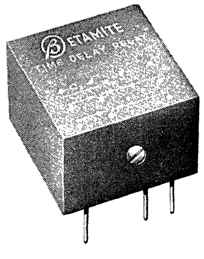
Time delay range from 0.1 to 200 seconds • Single Pole, Single Throw, Normally Open Output • Output capable of switching 6 watts • Less than 0.03 amp plus load current required for continuous operation.


BETAMITE
TIMING MODULE
3907H-0-000
LOAD
RES

MODEL 3908

Adjustable Time Delay Relay (Delay on Operate) 1.0 Amp. DPDT Relay Output

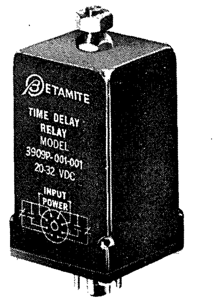
Time Delay Range from 0.1 to 200 seconds • Transient Protection up to 100% of line voltage • Less than 0.05 amp required for continuous operation.


BETAMITE
TIME DELAY RELAY

MODEL 3909

Industrial Time Delay Relay (Adjustable 1.0 to 500 seconds) 10 Amp. DPDT Relay Output

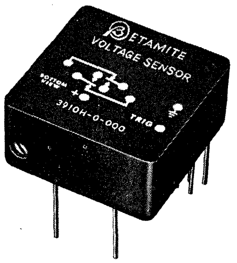
Time Delay Range from 1.0 to 500 seconds • Temperature Range: 0°C to +60°C • Repeatability: ±1% • Resolution: ±1% • Stable operation from 20 to 32 VDC or 105 to 125 VAC.


BETAMITE
TIME DELAY RELAY
MODEL
3909P-001-001
20-32 VDC
INPUT POWER

MODEL 3910

Voltage Sensing Relay DPDT Electromechanical Relay Output

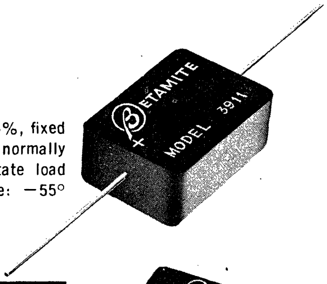
Voltage sensing range from −24 to +1000 VDC • Repeatability under all environmental conditions ±5% • Accuracy of ±1% under static conditions • Ambient temperature range −55°C to +105°C.


BETAMITE
VOLTAGE SENSOR
BOTTOM VIEW
3910H-0-000
TRIG

MODEL 3911

Fixed Time Delay Solid State

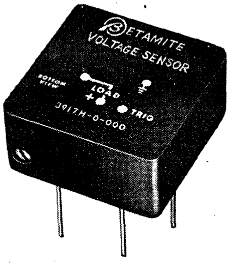
Time delay range: .05 to 50seconds ±5%, fixed • Output: Single pole, single throw, normally open. 10 mA to 2 amp DC steady state load current • Operating temperature range: −55° to +85°C.


BETAMITE
MODEL 3911
+

MODEL 3917

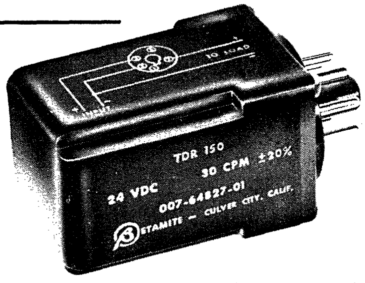
Voltage Sensing Module SPSTNO Solid State Output

Voltage sensing range from −24 to +1000 VDC • Repeatability under all environmental conditions ±5% • Accuracy of ±1% under static conditions • Ambient temperature range −55°C to +105°C.


BETAMITE
VOLTAGE SENSOR
BOTTOM VIEW
LOAD
TRIG
3917H-0-000

TDR 150 SOLID STATE FLASHER

On and off time may be specified • Operates on 12 or 24 VDC • Accuracy ±20%.


TDR 150
30 CPM ±20%
24 VDC
007-64827-01
BETAMITE – CULVER CITY, CALIF.

NOTES: (1) Individual specification sheets available for each series upon request.
(2) Other mounting and Header configurations available other than shown.

BETAMITE ELECTRONIC DEVICES

6321 WEST SLAUSON AVENUE • CULVER CITY, CALIFORNIA 90230 • TEL: (213) 390-3401 / 870-5601 • TWX: 910-343-7408

COMPUTER COMPONENTS INC.

88-06 Van Wyck Expressway, Jamaica, New York 11418 (212) 291-3500

REED RELAYS

Computer Components Inc. HP Series of dry reed and mercury wetted relays offers the design engineer miniature, low profile, plug-in devices, with magnetically shielded coils.

Fast switching speeds and low power consumption make them applicable to control and instrumentation, low level switching, counting, high speed sampling, computers and associated peripheral equipment.

In addition to the company's standard dry reed and mercury wetted designs, CCI also produces exact replacements for IBM plug-in reed relays. (See Equivalency Chart on back page of catalog for specifications and cross reference part numbers.) Write or phone for catalog.

CONTACT RATING — HP-A SERIES — SINGLE POLE, SINGLE THROW, DRY REED

Contact Dash No.	Resistive Load Max. Amps D.C.	Max. Volts D.C.	Max. Watts D.C.	V.A. A.C.	Max. Initial Contact Res. (Ohms)	Min. Break-down Voltage D.C.	Min. I.R. (Ohms)	Life @ Rated Load $\times 10^6$	Contact Material Plating	Suggested Application
1	.5	28	10	10	.100	300	10^{10}	10	Rhodium over Gold	Instrument Grade Low Thermal EMF
2	.5	200	10	12	.200	300	10^{10}	10	Rhodium or Dimet	General Purpose D.C. to 30MHz
3	.5 @ 20V .01 @ 1000V	1000	10	10	.100	1500	10^{10}	10	Rhodium	High Voltage

CONTACT RATING — HP-C SERIES — SINGLE POLE, DOUBLE THROW, DRY REED

Contact Dash No.	Resistive Load Max. Amps D.C.	Max. Volts D.C.	Max. Watts D.C.	V.A. A.C.	Max. Initial Contact Res. (Ohms)	Min. Break-down Voltage D.C.	Min. I.R. (Ohms)	Life @ Rated Load $\times 10^6$	Contact Material Plating	Suggested Application
1	.25	28	3	3	.150	250	10^9	10	Rhodium over Gold	Instrument Grade
2	.25	150	4	4	.200	200	10^9	10	Rhodium	General Purpose
3	.50	150	6	10	.150	200	10^9	10	Gold Rhodium	General Purpose

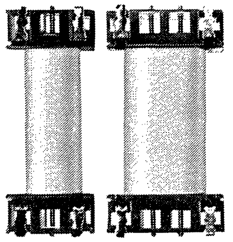
CONTACT RATING — MWHP-A SERIES — SINGLE POLE, SINGLE THROW, MERCURY WETTED REED

Contact Dash No.	Resistive Load Max. Amps D.C.	Max. Volts D.C.	Max. Watts D.C.	V.A. A.C.	Max. Initial Contact Res. (Ohms)	Min. Break-down Voltage D.C.	Min. I.R. (Ohms)	Life @ Rated Load $\times 10^6$	Contact Material Plating	Suggested Application
1	1.0	100	28	28	.100	1000	10^{10}	100	Mercury Wetted	No Bounce
2	1.0 Derate to .02 @ 500V	500	50	50	.100	1500	10^{10}	50	Mercury Wetted	No Bounce

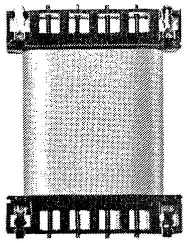
OPERATING PARAMETERS — HP-A, HP-C, MWHP-A SERIES

Contact Arrange-ment†	Nominal Coil Voltage V.D.C.*	Coil Resistance @ 25°C Ohms ±10%	Max. Pick-up Voltage @ 25°C	Min. Release Voltage @ 25°C	Operate Power @ 25°C Milliwatts	Nominal Power @ 25°C Milliwatts	Max. Pick-up Time Milliseconds Contact Form A	Max. Pick-up Time Milliseconds Contact Form B, C, MW	Max. Release Time Milliseconds** Contact Form A	Max. Release Time Milliseconds** Contact Form B, C, MW
1A	6	150	4.5	1.0	140	240	1.0	1.75	0.5	2.0
	12	600	9.0	2.0						
	24	2400	18.0	4.0						
2A	6	110	4.5	1.0	190	330	1.0	1.75	0.5	2.0
2B	12	440	9.0	2.0						
1C	24	1760	18.0	4.0						
4A	6	90	4.5	1.0	230	400	1.5	2.0	0.75	2.5
4B	12	360	9.0	2.0						
2C	24	1440	18.0	4.0						
6A	6	50	4.5	1.0	410	720	1.5	2.5	0.75	2.5
6B	12	200	9.0	2.0						
3C	24	800	18.0	4.0						

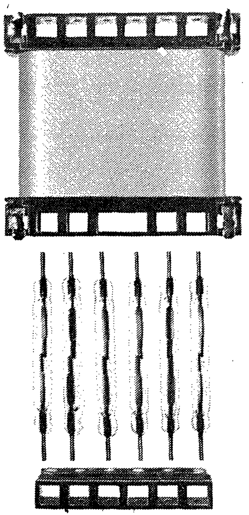
NOTES: †Available in mixed arrangements. *Available with 3, 5, 9, 18 and 48 volt coils. **With coil unsuppressed.



LOW PROFILE

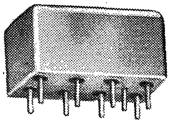


PLUG-IN

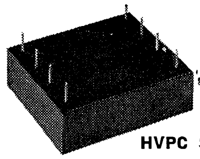


REPLACEABLE SWITCHES

STANDARD CATALOG RELAYS

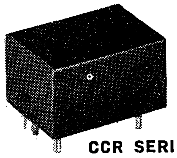


MG SERIES

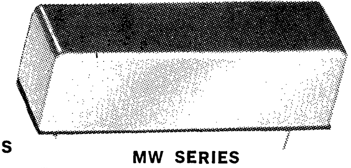


HVPC SERIES

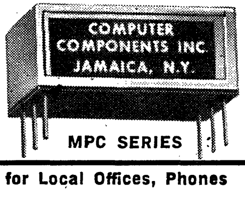
LO SERIES



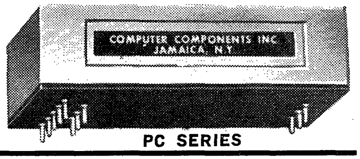
CCR SERIES



MW SERIES



MPC SERIES



PC SERIES

All Relays above are available with the following features:

- 6, 12, 24 and 48 VDC coils.
- Magnetic and/or electrostatic shielding.
- Higher insulation resistance.
- Available for +125°C operation (standard temperature −55°C to +85°C).

For detailed information write or phone for our latest catalog.

C. P. CLARE & CO.

3101 PRATT AVENUE, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-7700

MERCURY-WETTED CONTACT RELAYS

Input analog switching, output power conversion switching, solid state input and output buffering.

- Life: 22 x 10^9 operations.
- Low, constant contact resistance.
- No contact bounce.
- Switching speeds as fast as 1 millisecond.
- Versatile contact load capabilities . . . low level to 250 va.
- High power gain . . . up to 5,000 with no noise sensitivity.
- Wide range of sensitivities: 2.0 mw to 550 mw.

TYPE HG 1-FORM D CONTACT (SPDT BRIDGING) 5A, 500 V. MAX.*

Clare Part Number	Nominal Resistance (Ohms)	Base Figure (Next Page)	Must Opreate Current (ma-dc)	Must Release Current (ma-dc)	Must Operate Voltage (vdc)	Maximum Voltage (vdc)
HG-1001	2500	1	10	4.4	28	87
HG-1002	4000	1	7.5	3.3	33	110
HG-1003 Wdg. 1	700	2	32	14	25	46
HG-1003 Wdg. 2	3300	2	13	4.9	47	99
HG-1004	700	1	19	8.3	15	45
HG-1011	11000	1	5.0	2.2	61	180
HG-1012	130	4	37	16	5.4	20
HG-1017	4000	4	7.5	3.3	33	110
HG-1019	40	4	67	30	2.9	11
HG-1026	500	1	20	8.7	11	39
HG-1043	1000	1	15	6.6	17	55

TYPE HG2A 2-FORM D CONTACTS (DPDT BRIDGING) 5A., 500 V. MAX.*

HG2A-1001	5000	2A1	11	4.7	62	142
HG2A-1002	700	2A2	31	13	24	53
HGSA-1003	315	2A2	44	19	15	36
HG2A-1004	5000	2A2	11	4.7	62	142
HG2A-1013	10000	2A2	8.6	3.6	94	200
HG2A-1015	1250	2A2	22	9.3	30	71

TYPE HG3A 2-FORM D CONTACTS (3PDT BRIDGING) 5A., 500 V. MAX.*

HG3A-1003	5000	3A1	11	4.7	62	142
HG3A-1004	315	3A1	44	19	15	36
HG3A-1006	500	3A1	35	15	19	45
HG3A-1008	1250	3A1	22	9.3	30	71

TYPE HG4A 4-FORM D CONTACTS (4PDT BRIDGING) 5A., 500 V. MAX.*

HG4A-1006	10000	4A1	8.6	3.7	94	200
HG4A-1007	1400	4A1	23	9.9	35	75
HG4A-1011	390	4A1	42	18	18	40

* 250 VA max. with required contact protection All values at 25°C. Resistance values ±10%.

TYPE HGS 1-FORM D CONTACT (SPDT BRIDGING) 2A., 500 V. MAX.**
(Higher Speed, Greater Sensitivity than Type HG)

SINGLE SIDE STABLE

HGS-1005	4000	S1	1.25	0.25	5.5	90
HGS-1006	2500	S1	1.4	0.17	3.9	70
HGS-1009	600	S1	2.9	0.69	1.9	34
HGS-1014	1000	S1	2.2	0.38	2.4	44
HGS-1016	7000	S1	0.87	0.14	6.7	118
HGS-1017	11000	S1	0.72	0.12	8.7	148
HGS-1018	500	S1	2.9	0.50	1.6	31
HGS-1048	4000	S4	2.0	1.0	8.8	90
HGS-5015***	1000	S1	2.2	0.38	2.4	44
HGS-5016***	25000	S1	0.52	0.09	14.3	224

BI-STABLE DOUBLE WOUND COIL

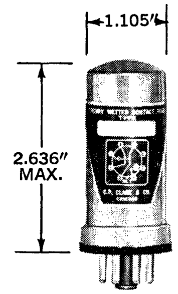
HGS-1019	1100/1100	S3	±1.8 - 1.8	—	±2.2 - 2.2	47 - 47
HGS-5002	135/135	S3	±4.5 - 4.5	—	±.67 - .67	47 - 47
HGS-5013	1100/1100	S3	±1.8 - 1.8	—	±2.2 - 2.2	47 - 47

CHOPPER

HGS-1004	600	S1	—	—	6.3 vac-rms	—

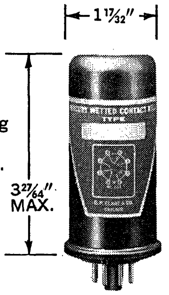
** 100 VA with required contact protect. All values at +25°C. Resistances ±10%.
*** Form C contact action.

TYPE HG



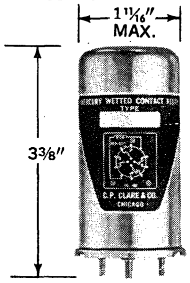
TYPE HG
Octal Plug

TYPE HG2A & HG3A



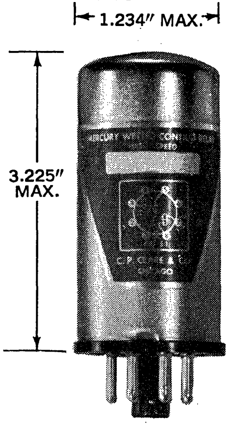
TYPE HG2A
& HG3A
HG2A Octal Plug
HG3A 11-Pin
Octal style plug.

TYPE HG4A



TYPE HG4A
14 or 20 Pin
glass-to-metal
plug.

TYPE HGS



TYPE HGS
Octal Plug.

SEE NEXT PAGE FOR PLUG WIRING

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

MERCURY-WETTED CONTACT RELAYS

PLUG WIRING (SEE PRECEDING PAGE FOR OTHER DETAILS)

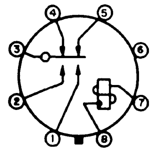


FIG. 1

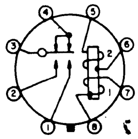


FIG. 2

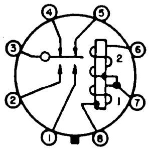


FIG. 3

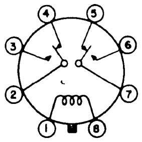


FIG. 2A1

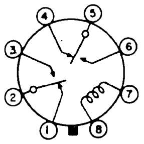


FIG. 2A2

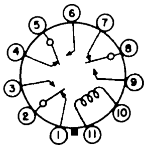


FIG. 3A1

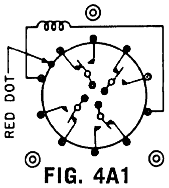


FIG. 4A1

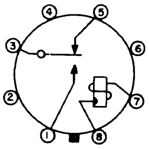


FIG. S1

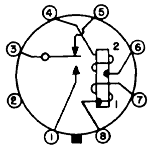


FIG. S3

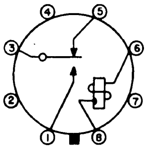
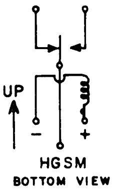


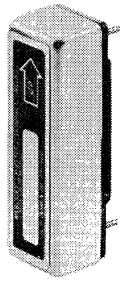
FIG. S4

Positive potential applied to the start of the winding indicated by the symbol ▲ will close the contacts shown open on the electrical schematics.

Clare Mercury-Wetted Contact Relays for PC Board

Clare Part Number	Nominal Resistance (ohms)	Schematic	Must Operate Current (ma-dc)	Must Release Current (ma-dc)	Must Operate Voltage (vdc)	Max. Voltage (vdc)
TYPE HGSM: 1-FORM D CONTACT (SPDT BRIDGING) 2A., 500 V. MAX.** IN 1000 SERIES OR 1-FORM C CONTACT (SPDT NON-BRIDGING) 2A., 500 V. MAX.** IN 5000 SERIES.						
SINGLE SIDE STABLE						
HGSM-1001	1425	Single Wound	8.3	1.4	13	53.4
HGSM-1002	940	Single Wound	10.1	1.7	10.5	43.3
HGSM-1003	2400	Single Wound	7.35	1.2	20.6	69.2
HGSM-1005	65	Single Wound	37.4	6.2	2.7	11.4
HGSM-1009	275	Single Wound	17.0	2.8	5.2	23.4
HGSM-1010	450	Single Wound	12.9	2.1	6.4	30.0
HGSM-1011	675	Single Wound	11.6	1.9	8.6	36.7
HGSM-5001	1425	Single Wound	8.3	1.4	13	53.4
HGSM-5002	1950	Single Wound	7.5	1.2	17.6	62.4
HGSM-5010	675	Single Wound	11.6	1.9	8.6	36.7
HGSM-5011	940	Single Wound	10.1	1.7	10.5	43.3
BI-STABLE						
HGSM-1016	#1 1100	Double Wound	±7.25	—	±8.77	46.9
	#2 1100		±5.7		±6.9	46.9
HGSM-5003	#1 1100	Double Wound	±7.25	—	±8.77	46.9
	#2 1100		±5.7		±6.9	46.9
HGSM-5020	#1 460	Double Wound	±7.8	—	±3.95	30.3
	#2 460		±7.8		±3.95	30.3
TWO CAPSULE SINGLE SIDE STABLE						
HGS2M-5006	500	Single Wound	18.3	1.8	10	38.7





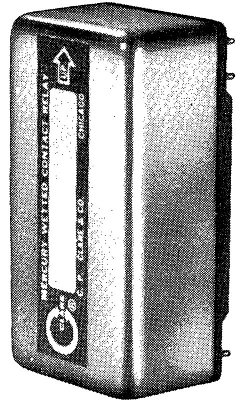
TYPE HGSM
.040″ Dia. Pins on
.10″ Grid Spacing

TYPE HGS2MT UNSHIELDED

CLARE PART NUMBER 2 FORM C	2 FORM D	NOMINAL VOLTAGE (dc)	COIL RESISTANCE (ohms ±10%)	MUST OPERATE VOLTAGE (dc)	MUST RELEASE VOLTAGE (dc)
HGS2MT5001	HGS2MT1001	6	130	3.0	0.5
HGS2MT5002	HGS2MT1002	12	520	6.0	1.0
HGS2MT5003	HGS2MT1006	24	2200	12.0	2.0
HGS2MT5004	HGS2MT1009	48	8000	24.0	4.0

TYPE HGS2MT ELECTROSTATICALLY SHIELDED

CLARE PART NUMBER 2 FORM C	2 FORM D	NOMINAL VOLTAGE (dc)	COIL RESISTANCE (ohms ±10%)	MUST OPERATE VOLTAGE (dc)	MUST RELEASE VOLTAGE (dc)
HGS2MT5044	HGS2MT1010	6	130	3.0	0.5
HGS2MT5005	HGS2MT1011	12	520	6.0	1.0
HGS2MT5006	HGS2MT1012	24	2200	12.0	2.0
HGS2MT5010	HGS2MT1013	48	8000	24.0	4.0



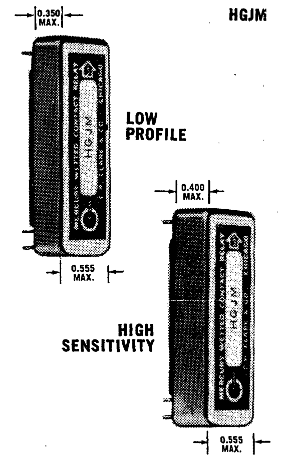
HGS2MT .040″ Dia. Pins

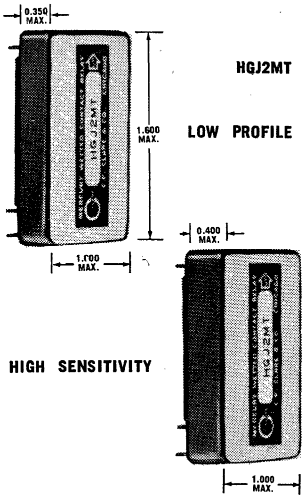
FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

C. P. CLARE & CO.

3101 PRATT AVENUE, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-7700

MERCURY-WETTED CONTACT RELAYS





HGJM

A breakthrough in mercury-wetted contact relays when compared to industry standards. Noise is a mere 15 microvolts at 4 ms after coil energization with 10kHz bandwidth, less than 5 microvolts at 5 ms. Faster response, the relay is ultra-stable to 250 Hz, and the response time approaches one millisecond. Available in low profile (.350″H) for ½″ board centers and high sensitivity (.400″H) models. SPDT contacts rated 2 amperes at 500 volts maximum (100 VA max. either AC or DC).

Part No.	Nominal Volts (dc)	Coil Resistance (ohms)	Must Operate Voltage (dc)	Must Release Voltage (dc)	PRICES 1-9	10-24	25-49	50-99	100
0.350″ Low Profile Single Side Stable									
HGJM 51131J00	5.0	68	2.7	0.57	$13.20	$9.95	$9.24	$8.58	$7.92
HGJM 51131N00	12.0	400	6.4	1.5	13.20	9.95	9.24	8.58	7.92
HGJM 51131R00	24.0	1425	12.5	2.65	13.20	9.95	9.24	8.58	7.92
HGJM 51131V00	48.0	6100	24.5	5.4	13.20	9.95	9.24	8.58	7.92
0.400″ High Sensitivity Single Side Stable									
HGJM 51111K00	5.0	125	2.81	0.61	12.60	9.60	8.82	8.19	7.56
HGJM 51111P00	12.0	685	7.25	1.88	12.60	9.60	8.82	8.19	7.56
HGJM 51111T00	24.0	2680	13.9	3.05	12.60	9.60	8.82	8.19	7.56
HGJM 51111W00	48.0	9850	27.1	6.15	12.60	9.60	8.82	8.19	7.56

† Double Wound. ‡ Single Side Stable. * Bi-Stable. †* Bi-Stable Double Wound. § Chopper.

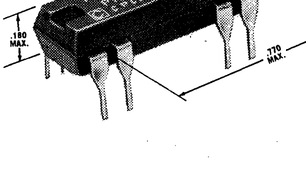
HGJ2MT

The HGJ2MT has the same outstanding characteristics as the HGJM but gives you two capsules for DPDT configurations. This compact packaging saves both space and money. Both contacts rated 2 amperes at 500 volts max. (100 VA either AC or DC).

Part No.	Nominal Volts (dc)	Coil Resistance (ohms)	Must Operate Voltage (dc)	Must Release Voltage (dc)	PRICES 1-9	10-24	25-49	50-99	100
0.350″ Low Profile Single Side Stable									
HGJ2MT 51231E00	5.0	27	2.6	.54	$25.40	$19.15	$17.78	$16.51	$15.24
HGJ2MT 51231K00	12.0	230	6.0	1.36	25.40	19.15	17.78	16.51	15.24
HGJ2MT 51231N00	24.0	800	12.0	2.4	25.40	19.15	17.78	16.51	15.24
HGJ2MT 51231R00	48.0	2850	23.0	4.65	25.40	19.15	17.78	16.51	15.24
0.400″ High Sensitivity Single Side Stable									
HGJ2MT 51211G00	5.0	55	2.60	0.55	24.35	18.35	17.05	15.83	14.61
HGJ2MT 51211L00	12.0	370	6.65	1.41	24.35	18.35	17.05	15.83	14.61
HGJ2MT 51211P00	24.0	1370	12.8	2.80	24.35	18.35	17.05	15.83	14.61
HGJ2MT 51211T00	48.0	5300	25.5	5.55	24.35	18.35	17.05	15.83	14.61

REED RELAYS

PRME DIP



DIP Picoreed® Series PRME

Clare's new TO-116 case DIP Picoreed Relay provides sealed contacts in an epoxy molded package for optimum environmental performance. The DIP Picoreed is ideal for electronic process control equipment applications and they can be operated by integrated circuits with 65 mW outputs. Available with one Form A contact.

High speed — up to 600 μs operate time, including bounce, at nominal coil power.
Contact rating — 0.5 amperes max., 100 volts max., 10 VA max.
1.5 ampere max., carry load
Life expectancy — 100 x 10^6 operations at low-level loads.
5 x 10^6 operations at 28 Vdc, 0.125 ampere.

* The 5 volts series of DIP Picoreed relays have been designed especially for compatibility with standard 5 volt DTL and TTL logic families. These relays have a must operate voltage value of 3.5 volts @ +25°C.

Part Number	Nominal Voltage	Coil Resistance	Must Operate Vdc	Max. Vdc	Must Release Vdc
PRME 1A005	5	380	3.75	15.0	0.9
PRME 1A006	6	380	4.5	15.0	0.9
PRME 1A012	12	530	9.0	18.0	2.0
PRME 1A024	24	2000	18.0	32.0	4.0

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

CLARE PICOREED RELAYS

Picoreed Series PRB

The Clare **Picoreed** relays represent a start-of-the-art advancement in sealed contact reed relays; they are the fastest and smallest reed-contact relays made. Their response time, physical size, sensitivity, and reliability characteristics combine to give the **Picoreed** complete electrical and packaging compatibility with IC solid-state devices. These characteristics provide an answer for economical and reliable solid-state input-output isolation buffering.

High speed — up to 500μs operate time, including bounce, at nominal coil power.

Contact rating — 0.5 amperes max., 100 volts max., 10 VA max.
2.0 ampere max., carry load.

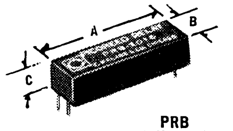
Life expectancy — 100 x 10^6 operations at low-level loads.
5 x 10^6 operations at 28 Vdc, 0.125 ampere.

*The 5 volts series of **Picoreed** relays have been designed especially for compatibility with standard 5 volt DTL and TTL logic families. These relays have a must operate voltage values of 3.75 volts @ +25°C.

PRB Series has straight pin. High sensitive relays allow P.C.B. spacing of .500 inch centers. H in part number denotes more sensitive unit. Low profile units allow .375 spacing. Molded **PRB 1 Form A** has P.C.B. leads.

Clare Part No. Printed Circuit	Nominal Operating Voltage DC	Must Operate Voltage at +25°C	Coil Resistance Ohms ±10% at +25°C	Contact Action	Maximum Voltage at +25°C	Must Release Voltage DC at +25°C
LOW PROFILE						
PRB-2010	6	4.50	387	1 Form A	19	.80
PR2B-2007	6	4.50	136	2 Form A	19	.80
PR3B-2006	6	4.50	117	3 Form A	19	.80
PR4B-2005	6	4.50	88	4 Form A	19	.80
PR5B-2005	6	4.50	105	5 Form A	19	.80
PRB-2013	12	9.00	1200	1 Form A	34	2.00
PR2B-2011	12	9.00	740	2 Form A	34	2.00
PR3B-2009	12	9.00	483	3 Form A	34	2.00
PR4B-2008	12	9.00	351	4 Form A	34	2.00
PR5B-2008	12	9.00	419	5 Form A	34	2.00
PRB-2016	24	18.00	5380	1 Form A	73	4.00
PR2B-2014	24	18.00	3042	2 Form A	73	4.00
PR3B-2013	24	18.00	2254	3 Form A	73	4.00
PR4B-2012	24	18.00	1856	4 Form A	73	4.00
PR5B-2011	24	18.00	1424	5 Form A	73	4.00
HIGH SENSITIVITY						
PRB-2009H	6	4.50	535	1 Form A	19	1.00
PR2B-2007H	6	4.50	295	2 Form A	19	1.00
PR3B-2006H	6	4.50	230	3 Form A	19	1.00
PR4B-2005H	6	4.50	155	4 Form A	19	1.00
PR5B-2005H	6	4.50	180	5 Form A	19	1.00
PRB-2013H	12	9.00	2870	1 Form A	34	2.50
PR2B-2010H	12	9.00	1180	2 Form A	34	2.50
PR3B-2009H	12	9.00	877	3 Form A	34	2.50
PR4B-2008H	12	9.00	663	4 Form A	34	2.50
PR5B-2008H	12	9.00	771	5 Form A	34	2.50
PRB-2016H	24	18.00	11900	1 Form A	73	4.50
PR2B-2013H	24	18.00	3780	2 Form A	73	4.50
PR3B-2013H	24	18.00	4700	3 Form A	73	4.50
PR4B-2012H	24	18.00	3620	4 Form A	73	4.50
PR5B-2011H	24	18.00	3150	5 Form A	73	4.50
LOW PROFILE						
PRB-3010	5*	3.75	387	1 Form A	19	.80
PR2B-3007	5*	3.75	136	2 Form A	19	.80
PR3B-3006	5*	3.75	117	3 Form A	19	.80
PR4B-3005	5*	3.75	88	4 Form A	19	.80
PR5B-3005	5*	3.75	105	5 Form A	19	.80
HIGH SENSITIVITY						
PRB-3009H	5*	3.75	535	1 Form A	19	1.00
PR2B-3007H	5*	3.75	295	2 Form A	19	1.00
PR3B-3006H	5*	3.75	230	3 Form A	19	1.00
PR4B-3005H	5*	3.75	155	4 Form A	19	1.00
PR5B-3005H	5*	3.75	180	5 Form A	19	1.00

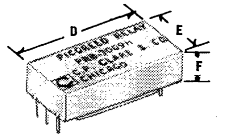
*Sensitive relay (available at slight price increase for other voltages).



PRB
1 Form A

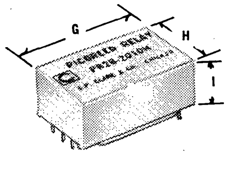
MOLDED 1 FORM A
LOW PROFILE

A	B	C
.781″	.187″	.250″



LOW PROFILE

Form	D	E	F
2A	.80	.38	.225
3A	.80	.48	.225
4A	.80	.58	.225
5A	.80	.68	.225
6A	.80	.78	.225



HIGH SENSITIVITY

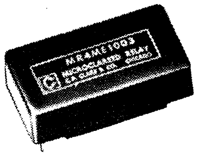
Form	G	H	I
1A	.80	.38	.350
2A	.80	.48	.350
3A	.80	.58	.350
4A	.80	.68	.350
5A	.80	.78	.350

C. P. CLARE & CO.

3101 PRATT AVENUE, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-7700

CLARE MINIATURE SEALED-CONTACT REED RELAYS

MICROCLAREED® RELAYS



MRME
Molded Epoxy

Sizes	MRME Relays
L	1 19/64"
H	.385"
W	See W in Table Below

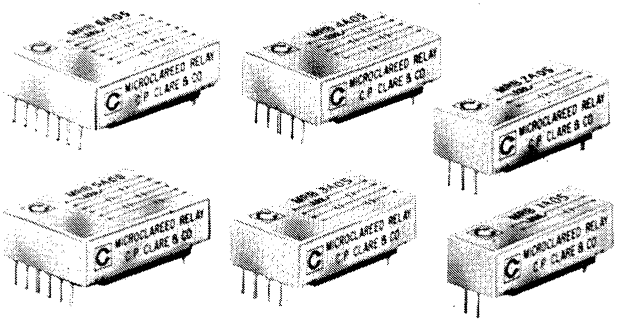
All the advantages of Clareed Relays in one-fifth the size. Switching speeds as low as 500 microseconds — fully compatible with other process-control equipment. Immune to false operation by transients — insensitive to overload transients which would damage solid-state devices. Load capability: low level to 10 va.

Epoxy Molded	Nominal Operating Voltage DC	Must Operate Voltage DC at +25°C	Coil Resistance Ohms ±10% at +25°C	Contact Action	Max. Voltage at +25°C	Must Release Voltage DC at +25°C	"W"
MRME-1041	6	4.0	218	1 Form A	14	.29	11/32"
MR2ME-1041	6	4.0	168	2 Form A	14	.36	29/64"
MR3ME-1041	6	4.0	125	3 Form A	14	.37	35/64"
MR4ME-1041	6	4.0	95	4 Form A	13	.35	21/32"
MR5ME-1041	6	4.0	70	5 Form A	12	.49	3/4"
MRME-1042	12	8.0	790	1 Form A	28	.57	11/32"
MR2ME-1042	12	8.0	635	2 Form A	28	.57	29/64"
MR3ME-1042	12	8.0	510	3 Form A	28	.92	35/64"
MR4ME-1042	12	8.0	410	4 Form A	28	.78	21/32"
MR5ME-1042	12	8.0	285	5 Form A	25	1.0	3/4"
MRME-1043	24	16.0	3060	1 Form A	55	1.1	11/32"
MR2ME-1043	24	16.0	2580	2 Form A	56	1.4	29/64"
MR4ME-1043	24	16.0	1950	3 Form A	55	1.6	35/64"
MR4ME-1043	24	16.0	1500	4 Form A	54	1.9	21/32"
MR5ME-1043	24	16.0	1070	5 Form A	49	2.0	3/4"
MRME-1044	48	32.0	12,200	1 Form A	110	2.2	11/32"
MR2ME-1044	48	32.0	9450	2 Form A	106	3.4	29/64"
MR3ME-1044	48	32.0	7450	3 Form A	102	3.3	35/64"
MR4ME-1044	48	32.0	5750	4 Form A	104	3.1	21/32"
MR5ME-1044	48	32.0	4350	5 Form A	98	4.0	3/4"
MRME-1045	6	4.0	280	1 Form B	8.7	.38	29/64"
MR2ME-1045	6	4.0	125	2 Form B	9.4	.40	35/64"
MR3ME-1045	6	4.0	46	3 Form B	8.8	.36	3/4"
MR4ME-1045	6	4.0	46	2A2B	8.8	.36	3/4"
MRME-1046	12	8.0	1030	1 Form B	18	.92	29/64"
MR2ME-1046	12	8.0	510	2 Form B	18	1.5	35/64"
MR3ME-1046	12	8.0	170	3 Form B	17	.76	3/4"
MR4ME-1046	12	8.0	170	2A2B	17	.77	3/4"
MRME-1047	24	16.0	3930	1 Form B	35	1.7	29/64"
MR2ME-1047	24	16.0	1950	2 Form B	38	2.3	35/64"
MR3ME-1047	24	16.0	700	3 Form B	34	1.5	3/4"
MR4ME-1047	24	16.0	700	2A2B	35	1.5	3/4"
MRME-1048	48	32.0	15,800	1 Form B	67	2.9	29/64"
MR2ME-1048	48	32.0	7450	2 Form B	70	4.5	35/64"
MR3ME-1048	48	32.0	2670	3 Form B	68	3.1	3/4"
MR4ME-1048	48	32.0	2670	2A2B	70	2.9	3/4"
MR2ME-1049	6	4.0	51	1A1B	9.0	.45	35/64"
MR3ME-1049	6	4.0	40	2A1B	9.5	.39	21/32"
MR2ME-1050	12	8.0	210	1A1B	18	.76	35/64"
MR3ME-1050	12	8.0	148	2A1B	17	.66	21/32"
MR2ME-1051	24	16.0	780	1A1B	35	1.4	35/64"
MR3ME-1051	24	16.0	600	2A1B	35	1.3	21/32"
MR2ME-1052	48	32.0	3170	1A1B	70	2.8	35/64"
MR3ME-1052	48	32.0	2310	2A1B	69	2.7	21/32"

"W" dimension of MRME are 1/16" greater than listed.

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

CLARE MICROCLAREED® SEALED-CONTACT REED RELAYS



This latest Microclareed relay features the popular 0.100" x 1.000" grid pin spacing for printed circuit board applications. The MRB construction consists of a rugged, molded epoxy base with a metal cover. Low level to 10VA contact ratings and an operate time under 650 microseconds are standard in this line. The relays are fully compatible with process control and automatic test equipment applications. The totally sealed packages provide years of maintenance free operations.

Length: 1.135" max.
Height: .350" max.
Width: See "W" in table below.

Part Number	Contact Form	Nominal Voltage (Vdc)	Must Operate (Vdc)	Must Release (Vdc)	Maximum Voltage (Vdc)	Coil Resist. (Ohms, ±% @ 25°C)	"W" Inches
MRB 1A05	1A	5	3.75	0.15	15	225	.360
MRB 1A06	1A	6	4.5	0.15	18	340	.360
MRB 1A12	1A	12	9.0	0.70	36	1400	.360
MRB 1A24	1A	24	18.0	2.5	60	4340	.360
MRB 2A05	2A	5	3.75	0.15	11	105	.460
MRB 2A06	2A	6	4.5	0.15	14	180	.460
MRB 2A12	2A	12	9.0	0.70	26	730	.460
MRB 2A24	2A	24	18.0	2.5	48	2500	.460
MRB 3A05	3A	5	3.75	0.15	10	82	.560
MRB 3A06	3A	6	4.5	0.15	12	130	.560
MRB 3A12	3A	12	9.0	0.70	24	570	.560
MRB 3A24	3A	24	18.0	2.5	44	1540	.560
MRB 4A05	4A	5	3.75	0.15	9	60	.660
MRB 4A06	4A	6	4.5	0.15	11	100	.660
MRB 4A12	4A	12	9.0	0.70	18	275	.660
MRB 4A24	4A	24	18.0	2.5	36	1090	.660
MRB 5A05	5A	5	3.75	0.15	8	45	.760
MRB 5A06	5A	6	4.5	0.15	10	70	.760
MRB 5A12	5A	12	9.0	0.70	20	320	.760
MRB 5A24	5A	24	18.0	2.5	34	790	.760
MRB 6A05	6A	5	3.75	0.15	7	32	.860
MRB 6A06	6A	6	4.5	0.15	9	50	.860
MRB 6A12	6A	12	9.0	0.70	18	210	.860
MRB 6A24	6A	24	18.0	2.5	36	900	.860
MRB 1B05	1B	5	3.75	0.40	7.5	300	.460
MRB 1B06	1B	6	4.5	0.50	9	450	.460
MRB 1B12	1B	12	9.0	1.00	18	1240	.460
MRB 1B24	1B	24	18.0	2.00	36	5800	.460
MRB 2B05	2B	5	3.75	0.40	7.5	82	.560
MRB 2B06	2B	6	4.5	0.50	9	132	.560
MRB 2B12	2B	12	9.0	1.00	18	570	.560
MRB 2B24	2B	24	18.0	2.00	36	2330	.560

Part Number	Contact Form	Nominal Voltage (Vdc)	Must Operate (Vdc)	Must Release (Vdc)	Maximum Voltage (Vdc)	Coil Resist. (Ohms, ±% @ 25°C)	"W" Inches
MRB 1N05	1A1B	5	3.75	0.40	7.5	50	.560
MRB 1N06	1A1B	6	4.5	0.50	9	82	.560
MRB 1N12	1A1B	12	9.0	1.00	18	230	.560
MRB 1N24	1A1B	24	18.0	2.00	36	900	.560
MRB 2N05	2A2B	5	3.75	0.40	7.5	28	.760
MRB 2N06	2A2B	6	4.5	0.50	9	45	.760
MRB 2N12	2A2B	12	9.0	1.00	18	185	.760
MRB 2N24	2A2B	24	18.0	2.00	36	800	.760
MRB AL05	1AL	5	± 3.75	—	−7.5	1900	.460
MRB AL06	1AL	6	± 4.5	—	−9.0	2500	.460
MRB AL12	1AL	12	± 9.0	—	—	2500*	.460
MRB AL24	1AL	24	±18.0	—	—	2500**	.460
MRB 1C05	1C	5	3.75	0.40	10	77	.460
MRB 1C06	1C	6	4.5	0.50	12	135	.460
MRB 1C12	1C	12	9.0	1.00	24	535	.460
MRB 1C24	1C	24	18.0	2.00	40	1810	.460
MRB 2C05	2C	5	3.75	0.40	7.5	46	.560
MRB 2C06	2C	6	4.5	0.50	10	75	.560
MRB 2C12	2C	12	9.0	1.00	20	350	.560
MRB 2C24	2C	24	18.0	2.00	33	840	.560
MRB 3C05	3C	5	3.75	0.40	6.5	26	.760
MRB 3C06	3C	6	4.5	0.50	8.0	41	.760
MRB 3C12	3C	12	9.0	1.00	16	166	.760
MRB 3C24	3C	24	18.0	2.00	32	715	.760
MRB 4C05	4C	5	3.75	0.40	6.5	18	.860
MRB 4C06	4C	6	4.5	0.50	8.0	29	.860
MRB 4C12	4C	12	9.0	1.00	15	117	.860
MRB 4C24	4C	24	18.0	2.00	30	536	.860

NOTES:

1. * Use externally, ¼ W 2.5K ohm resistor in series with coil.
   ** Use externally, ¼ W 7.5K ohm resistor in series with coil.
2. Maximum voltage ratings must be observed on magnetically biased relays to prevent false operation.

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

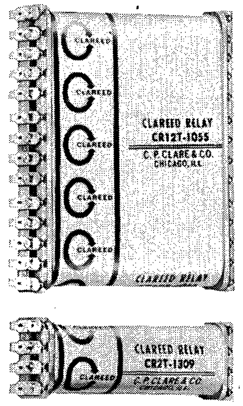
C. P. CLARE & CO.
3101 PRATT AVENUE, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-7700

CLAREED® SEALED-CONTACT REED RELAYS

Industrial control, data logging and instrumentation, communication switching, ground control and check-out systems.

- Inherent reliability with no maintenance (contacts sealed in glass).
- Switching speeds in low millisecond range.
- Immunity to transient electrical noise.
- Contact load versatility... low level to 50 va.
- Life: 20 x 10^6 or 100 x 10^6 at full rated load depending on choice of switches.
- One to twelve contacts.
- Packaging for pcb or wired chassis... or as functional pcb assemblies.

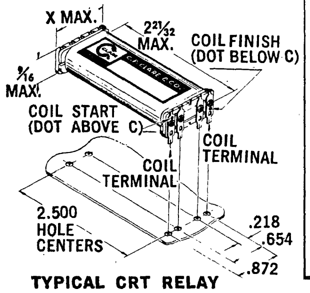
CLARE TYPE CRT



CONTACT RATING:
1 amp. max., 250 volts max., 15 va max.

PACKAGING:
Coils and contacts have fixed terminals for printed circuit board mounting.

Clare Part No.	Nominal Operating Voltage dc	Must Operate Voltage dc at +25°C	Coil Resistance	Contact Action	Maximum Voltage at +25°	Must Release Voltage at +25°	X Dimension (inches)
CRT-1007	6	4.4	160	1 Form A	20	0.60	$\frac{5}{8}$
CR2T-1004	6	4.5	88	2 Form A	18	0.54	$\frac{27}{32}$
CR3T-1005	6	4.6	70	3 Form A	17	0.54	$1\frac{1}{16}$
CR5T-1004	6	4.4	40	5 Form A	16	0.48	$1\frac{1}{2}$
CR6T-1003	6	4.3	31	6 Form A	15	0.47	$1\frac{49}{64}$
CR8T-1002	6	4.2	25	8 Form A	15	0.46	$2\frac{13}{64}$
CR12T-1001	6	3.8	14	12 Form A	13	0.40	$3\frac{7}{64}$
CRT-1010	12	8.7	600	1 Form A	38	1.20	$\frac{5}{8}$
CR2T-1006	12	7.3	235	2 Form A	28	0.88	$\frac{27}{32}$
CR3T-1007	12	7.4	180	3 Form A	28	0.86	$1\frac{1}{16}$
CR5T-1007	12	8.7	155	5 Form A	32	0.95	$1\frac{1}{2}$
CR6T-1006	12	8.4	120	6 Form A	29	0.92	$1\frac{49}{64}$
CR8T-1005	12	8.4	96	8 Form A	29	0.91	$2\frac{13}{64}$
CR12T-1004	12	7.5	53	12 Form A	25	0.79	$3\frac{7}{64}$
CRT-1013	24	18.0	2500	1 Form A	78	2.5	$\frac{5}{8}$
CR2T-1010	24	18.0	1400	2 Form A	68	2.2	$\frac{27}{32}$
CR3T-1011	24	18.0	1070	3 Form A	67	2.1	$1\frac{1}{16}$
CR5T-1010	24	19.0	650	5 Form A	63	2.0	$1\frac{1}{2}$
CR6T-1009	24	18.0	510	6 Form A	60	1.9	$1\frac{49}{64}$
CR8T-1008	24	17.0	380	8 Form A	58	1.8	$2\frac{13}{64}$
CR12T-1007	24	16.0	210	12 Form A	50	1.6	$3\frac{7}{64}$
CRT-1016	48	35.0	9450	1 Form A	150	4.8	$\frac{5}{8}$
CR2T-1013	48	36.0	5400	2 Form A	133	4.4	$\frac{27}{64}$
CR3T-1014	48	38.0	4450	3 Form A	137	4.4	$1\frac{1}{16}$
CR5T-1013	48	37.0	2550	5 Form A	124	3.9	$1\frac{1}{2}$
CR6T-1012	48	34.0	1900	6 Form A	117	3.8	$1\frac{49}{64}$
CR8T-1011	48	32.0	1450	8 Form A	114	3.5	$2\frac{13}{64}$
CR12T-1010	48	32.0	900	12 Form A	107	3.3	$3\frac{7}{64}$
CRT-1026	24	18.0	1400	1 Form B	55	2.2	$\frac{27}{32}$
CR2T-1025	24	17.0	690	2 Form B	37	1.2	$1\frac{1}{16}$
CR2T-1041	24	17.0	455	1 Form C	33	1.8	$1\frac{1}{16}$
CR4T-1009	24	20.0	410	2 Form C	34	1.0	$1\frac{1}{2}$
CR6T-1025	24	17.0	235	3 Form C	32	1.1	$2\frac{13}{64}$
CR8T-1025	24	19.0	210	4 Form C	31	0.97	$3\frac{7}{64}$
CR2T-1058	24	17.0	455	1A and 1B	33	1.8	$1\frac{1}{16}$
CR4T-1027	24	20.0	410	2A and 2B	34	1.0	$1\frac{1}{2}$
CR6T-1056	24	17.0	235	3A and 3B	32	1.1	$2\frac{13}{64}$
CR8T-1040	24	19.0	210	4A and 4B	31	0.97	$3\frac{7}{64}$



TYPICAL CRT RELAY

BI-STABLE (LATCHING)

CRT-1065	24	17.0/17.0	6400/6400	1 Form A	58	—	$\frac{27}{32}$
CR2T-1079	24	16.7/16.7	3200/3200	2 Form A	52	—	$1\frac{1}{16}$

For detail characteristics see Data Sheet 951.

* Max. voltage based on 2.4 watt.

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

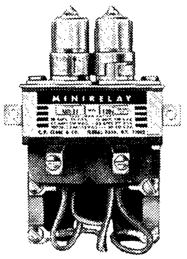
CLARE MERCURY DISPLACEMENT RELAYS

TYPICAL STOCK RELAYS

MINIATURE POWER RELAYS — 20 AMPS — 120 VAC (CSA LISTED)

Compact units capable of handling loads nearly twice that of ordinary armature type units of equal size. Hermetically sealed, mercury-to-mercury contacts. No contacts to pit, stick or corrode. Full rating with inductive or resistive loads. Coil current, .042 amp. single pole; .080 amp, 2-pole. MR-1, 3 x 1⅞ x 1½"; MR-2, 4 x 1⅞ x 1½"; MR-11, 4½ x 3 x 1⅞". Coils — 120 VAC, 60 Hz. 1¼ lbs.

Type	Description
MR-1	Normally Open, SPST
MR-2	Normally Closed, SPST
MR-11	2-Pole, Both N.O.
MR-111	3-Pole, All N.O.

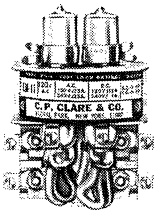


Type MR-11

STANDARD DUTY — 35 AMPS — 120 VAC (UL AND CSA LISTED)

Rated 35 amps (per pole) at 120 VAC. Coil operating current: EM-1, .050 amp; EM-2, .050 amp; EM-11, .120 amp; EM-111, .220 amp. EM-1, 4¾ x 2⅝ x 2½"; EM-2, 5⅜ x 3⅜ x 2½"; EM-11, 6¼ x 4 x 3⅜". Coils — 120 VAC, 60 Hz. 2 lbs.

Type	Description
EM-1	Single Pole, N.O.
EM-2	Single Pole, N.C.
EM-11	2-Pole, Both N.O.
EM-111	3-Pole, All N.O.

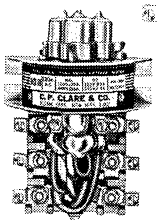


Type EM-11

HEAVY-DUTY — 60 AMPS — 120 VAC (UL AND CSA LISTED)

Type HD-1 rated 60 amps for 120 V and 35 amps for 230 V, 60 Hz AC. Type HD-2 2-pole relay; each pole, 60 amps at 115 V, and 35 amps at 230 V. Type HD-11 3-pole relay; each pole, 60 amps at 120 V, and 35 amps at 230 V. Coils — 120 VAC, 60 Hz. * 2⅜ x 5¼ x3¾"; +2⅜ x 5¾ x 3¾"; § 3⅜ x 6⅝ x 4". 3 lbs.

Type	Description
HD-1	Single Pole, N.O.*
HD-2	Single Pole, N.C.+
HD-11	2-Pole, Both N.O.§
HD-111	3-Pole, All N.O.

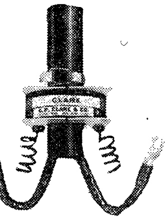


Type HD-111

"100" RELAY — 100 AMPS — 120 VAC (CSA LISTED)

Front-mounted load and coil terminals. Rated 100 amps at 120 V, AC or 12 kW resistive load capacity. Coil operating current, .260 amps. 7 x 3½ x 3⅜". Coils, 120 VAC, 60 Hz. 4 lbs.

Type	Description
100	Single Pole, N.O.

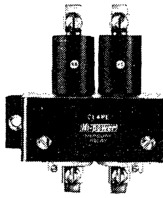


Type "100"

"HI-POWER" ENCAPSULATED RELAYS

High performance relays have hermetically sealed steel shells with ceramic lined electrode chamber, epoxy insulation. Similar to above relays, but with higher current capacity, maximum reliability. Impervious to physical or thermal shock, moisture and dirt. Types S and T completely encapsulated. Rated to switch loads up to 550 volts AC. Coils — 120 VAC, 60 Hz.

Type	Description
A-1	Single Pole, N.O.
A-2	Single Pole, N.C.
A-11	2-Pole, Both N.O.
A-111	3-Pole, All N.O.

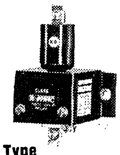


Type A-11

TYPE A — MINIATURE POWER

25 Amps/120 VAC 25 Amps/240 VAC

Sizes: A-1, 4¼ x 3 x 2¼"; A-11, 4¼ x 4¼ x 2½". 2 lbs.



Type A-1

TYPE B — STANDARD DUTY

50 Amps/120 VAC 35 Amps/240 VAC

Sizes: B-1, 4¾ x 3 x 2¼"; B-11, 4¾ x 4¼ x 2½"; B-111, 4¾ x 4¼ x 3½". 3 lbs.

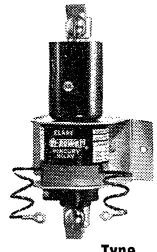
Type	Description
B-1	Single Pole, N.O.
B-11	2-Pole, Both N.O.
B-111	3-Pole, All N.O.

TYPE H — HEAVY DUTY

100 Amps/120 VAC 90 Amps/240 VAC

Sizes: H-1, 7½ x 4 x 3½"; H-11, 7½ x 6½ x 4". 6 lbs.

Type	Description
H-1	Single Pole, N.O.
H-11	2-Pole, Both N.O.
H-111	3-Pole, All N.O.



Type H-1

COMPLETELY ENCAPSULATED

Type S 25 Amp/120 VAC Type T 50 Amp/120 VAC

Epoxy case, sealed; molded terminals. Sizes: S-1, 3½ x 1¾ x 1⅝"; T-1, 3⅞ x 2 x 1⅞". 1 lb.

Type	Description
S-1	Single Pole, N.O.
T-1	Single Pole, N.O.

Type S-1

TD HIGH-POWER TIME DELAY RELAYS

Single-pole, N.O. mercury-to-mercury contacts. Delay circuit resets upon completion of delay. Load contacts are totally isolated from delay circuit and are capable of switching loads to 550 VAC. Range, −10° to +65°C. Repeatability, ±2%. Hermetically sealed. Sizes: TD-A, 4³⁄₁₆ x 3 x 2¼"; TD-B, 4¾ x 3 x 2¼"; TD-H, 6¾ x 4 x 3⅝". Delay operates from 120 VAC. *Time range in seconds. Av. shpg. wt. 2 lbs.

25 AMPS AT 120 VAC 15 AMPS AT 550 VAC

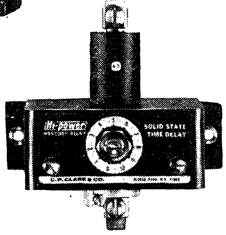
Type
TD-A-1-.5-60S-120 VAC

50 AMPS AT 120 VAC 25 AMPS AT 550 VAC

Type
TD-B-1-.5-60S-120 VAC

100 AMPS AT 120 VAC 70 AMPS AT 550 VAC

Type
TD-H-1-.5-60S-120 VAC



Type TD

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

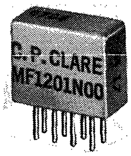
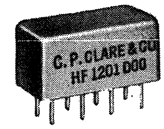
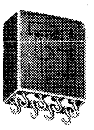
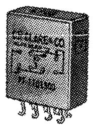
C. P. CLARE & CO.

3101 PRATT AVENUE, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-7700

CLARE MILITARY-TYPE (CRYSTAL CAN) RELAYS

Aerospace and ground support equipment, communications, instrumentation, data processing, industrial process control

- Long electrical and mechanical life, under extreme conditions of temperature, shock, vibration, linear acceleration.
- Sensitivities from 40 mw.
- Wide variety of mounting styles.
- Wide range of relay types in addition to those listed.
- Versatile contact capabilities — low level to 10 amp. Gold-plated contact areas, high contact pressures, positive wiping action.

 **Type MF** L — .500″ W — .230″ H — .400″ Data Sheet 756	 **Type HF** L — .810″ W — .410″ H — .410″ Manual 701	 **Type F** L — .800″ W — .400″ H — .900″ (Standard crystal can size) Manual 701	 **Type PF** L — 1.075″ W — .515″ H — 1.300″ Data Sheet 757

TYPICAL STOCK RELAYS

Relay Type	Part Number	Enclosure	Vibration Resistance	Relay Type	Part Number	Enclosure	Vibration Resistance
MF	MF1201N00	Plain Case	20g	F	RP7641G2	Plain Case	30g
	MF1202N00	Ear Brackets	20g		RP7641G8	Plain Case	30g
	MF1105N00	Side Brackets	20g		RP9809G1	Ear Brackets	20g
HF	HF1201D00	Plain Case	30g		RP9817G1	Ear Brackets	20g
F	RP7630G2	Plain Case	30g		RP9895G3	Side Plate	20g
	RP7631G12	Side Plate	20g		RP9896G9	Side Plate	20g
	RP7632G1	Ear Brackets	20g	PF	PF1101L00	Plain Case	20g
	RP7633G4	Stud — top	15g		PF1102L00	Ear Brackets	20g
	RP7640G1	Stud — side	20g		PF1203L00	Ear Brackets	20g

Electrical Characteristics	MF	HF	F	PF
Contact Arrangement	2 Form C (dpdt)			
Contact Rating — High Level	0.5 amp. res. @ 30 vdc, +125°C 150,000 miss-free operations.	2.0 amp. res. @ 28 vdc 1.0 amp. res. @ 115 vdc 100,000 miss-free operations, monitored at every operation for a maximum drop of 1.0% of source voltage.		10.0 amp. res. @ 28 vdc — 100,000 miss-free operations.
Contact Rating — Low Level	Note 1	Note 2	Note 2	
Contact Resistance Before Life	50 milliohms max. @ 6v, 100 ma			10 milliohms max. (measured per MIL-R-5757)
Contact Resistance After Life	100 milliohms max @ 6v, 100 ma			20 milliohms max.
Coil Resistance (ohms) Relays Shown Available	1500 30-5500	1250 40-3500	675 35-10,000	300 16-4800
Must Operate Sensitivity, Nominal (mw) Relays Shown Available	125 125	160 160	250 40	550 550
Must operate Voltage dc at 25°C Relays Shown Available	13.0 5.25-45	14.0 5.0-48	13.5 3.2-51	12.5 3.0-54

Note 1: 10 μa @ 10mv; 150,000 miss-free operations monitored at every operation for a maximum drop of 0.5mv.

Note 2: 10 μa @ 10mv; 100,000 miss-free operations monitored at every operation for a maximum drop of 0.5mv.

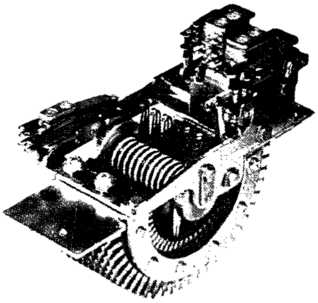
FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

STEPPING SWITCHES

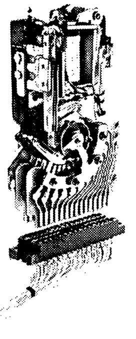
Mass sequential switching — counting, totalizing, scanning, sequence control, circuit monitoring.

- Low cost scanning and counting.
- Maximum switching density.
- Special purpose shorting switches . . . "All But One," "Progressive," "Alternate" operations.
- Long service life and low maintenance.
- Special high voltages are availale.
- Special modifications and functional assemblies for handling complex sequential switching operations.

For detail characteristics see Manual 601.



CONTACT RATINGS:
Bank and Wiper — Switch 100 ma, 30 vdc resistive . . . Carry 3 amps . . . Interrupter and Off-Normal — 2 amps, 150 watts.



QUICK-MOUNT MODELS AVAILABLE
Fast unit-for-unit replacement — no resoldering — minimum downtime. See Data Sheet 651-3A

	Clare Part No.	Nominal Operating Voltage dc	Coil Resistance	No. of Levels	Interrupter Contacts	Off-Normal Contacts
TYPE 20	20-2404	24	35	4 of 20 pt.	1C	1C
	20-2408	24	35	8 of 20 pt.	1C	1C
	20-2412	24	20	12 of 20 pt.	1C	1C
	20-2416	24	20	16 of 20 pt.	1C	1C
	20-2428	24	35	8 of 40 pt.	1C	1C
	20-4808	48	100	8 of 20 pt.	1C	1C
TYPE 26	26-2404	24	35	4 of 26 pt.	1C	1C
	26-2408	24	35	8 of 26 pt.	1C	1C
	26-2416	24	20	16 of 26 pt.	1C	1C
	26-2428	24	35	8 of 52 pt.	1C	1C
	26-4812	48	70	12 of 26 pt.	1C	1C
	26-11004	110	600	4 of 26 pt.	1C	1C
	26-11008	110	600	8 of 26 pt.	1C	1C
	26-11012	110	400	12 of 26 pt.	1C	1C
	26-11024	110	600	4 of 52 pt.	1C	1C
TYPE 210	210-2403	24	24	3 of 10 pt.	1C	1C
	210-2406	24	24	6 of 10 pt.	1C	1C
	210-2409	24	20	9 of 10 pt.	1C	1C
	210-2412	24	20	12 of 10 pt.	1C	1C
	210-11003	110	600	3 of 10 pt.	1C	1C
	210-11006	110	600	6 of 10 pt.	1C	1C
	210-11012	110	400	12 of 10 pt.	1C	1C
TYPE 211	211-2403	24	24	3 of 11 pt.	1C	1C
	211-2406	24	24	6 of 11 pt.	1C	1C
	211-2412	24	20	12 of 11 pt.	1C	1C
	211-11003	110	600	3 of 11 pt.	1C	1C
	211-11006	24	24	6 of 11 pt.	1C	1C
	211-11009	110	400	9 of 11 pt.	1C	1C

ACCESSORIES

Clare Part No.	Description
RP-2702	Short Bracket used with Rubber Mounts
RP-2703	Long Bracket Type 20 and 26
RP-2902	Long Bracket for Type 20 and 26
RP-2903	Short Bracket for Type 20 and 26
RP-3335	Switch Rubber Mounts, Type 26
RP-3336	Switch Rubber Mounts, Type 20
RP-9565	Mounting Stud for Type 11 Switch
RP-11049	Switch Rubber Mounts, Type 210 & 211
RP-11062	Shelf Mtg. Bracket, Type 200

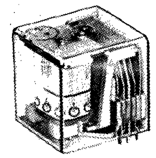
Clare Part No.	Description
RP-11068	Base Mounting Bracket, Type 200
RP-11723-G6	24 VDC Varistors
RP-11723-G14	110 VDC Varistors
RP-8047	Stepping Switch Rectifier Unit for 115 VDC
RP-9466	Lubrication Kit — Standard
RP-9467	Lubrication Kit — Low Temperature
RP-11375	Switch Tool Kits

FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

C. P. CLARE & CO.
3101 PRATT AVENUE, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-7700

TELEPHONE-TYPE RELAYS

CLARE TYPE LB/LA



LB (shown):
Direct PCB Mounting, 6 Form C, with Clear Plastic Cover.
For detail characteristics see Data Sheet 552B.
LA:
Similar to above but 4 Form C — Data Sheet 556.

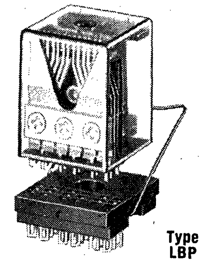
LB Part No.	LA Part No.	Nominal Operating Voltage	Must Operate Voltage	Max. Coil Voltage
LB-0060B00	LA-0040B00	12	6.9	17.7
LB-0060D00	LA-0040D00	24	14.4	37.6
LB-0060H00	LA-0040H00	14	8.4	21.9
LB-0060J00	LA-0040J00	34	19.0	52.6
LB-0060K00	LA-0040K00	30	17.5	46.9

CLARE TYPE LBP

Plug-in for use with sockets.

LBP Part No.	Nominal Operating Voltage	Must Operate Voltage	Max. Coil Voltage
LBP-0060D00	24	14.4	37.6
LBP-0060K00	30	17.5	46.9

For detail characteristics see Data Sheet 552B (LB) or 556 (LA).

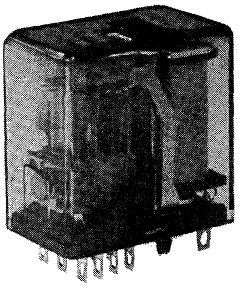


Type LBP

ACCESSORIES

LB/LBP Part No.	Description
RP-15450-G5	Socket for Wired Assemblies
RP-15450-G6	Socket for PCB Mounting
RP-15423	14 Relay Mounting Strip—19″
RP-15613	13 Relay Mounting Strip—19″

CLARE VARLEY



Direct Plug-in Relay with Clear Plastic Dust Cover.

Note 1: 1 amp max., 100 volts max., 30 watts.
Note 2: 5 amps max., 220 volts max., 100 watts.

Clare Part No.	Nominal Operating Voltage dc	Coil Resistance in Ohms ±10%	Contact Action	Contact Rating
VP2CAB12	12	185	2C	Note 1
VP2CAB26	26	700	2C	Note 1
VP2CAB47	47	2500	2C	Note 1
VP2CAB120	120	15000	2C	Note 1
VP2CBB12	12	185	2C	Note 1
VP2CBB26	26	700	2C	Note 1
VP2CBB47	47	2500	2C	Note 1
VP2/HDCAB12	12	185	2C	Note 2
VP2/HDCAB26	26	700	2C	Note 2
VP2/HDCAB120	120	15000	2C	Note 2
VP4CAB12	12	185	4C	Note 1
VP4CAB26	26	700	4C	Note 1
VP4CAB47	47	2500	4C	Note 1
VP4CAB120	120	15000	4C	Note 1
VP4CBB26	26	700	4C	Note 1
VP4CBB47	47	2500	4C	Note 1
VP4CBB120	120	15000	4C	Note 1
VP6MAB12	12	185	6A	Note 1
VP6MAB26	26	700	6A	Note 1
VP6MAB120	120	15000	6A	Note 1
VP6MBB26	26	700	6A	Note 1

CLARE MISCELLANEOUS ITEMS

Clare Part No.	Description
RP-15223-5	SOCKET—Printed Circuit TERMINALS—for VP2C Relay
RP-15223	SOCKET—Printed Circuit TERMINALS—for VP4C, VP6M, VP2/HD Relays
RP-15223-1	SOCKET—Solder tab TERMINALS—for VP2C Relay
RP-15223-2	SOCKET—Solder tab TERMINALS—for VP4C, VP6M, VP2/HD Relays

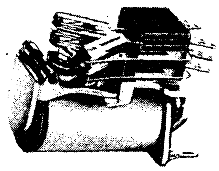
FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

CLARE TELEPHONE-TYPE RELAYS

Industrial, commercial and military ground systems where cost and life are important considerations.

- Long Life: up to 50 x 10^6 operations.
- Variety of enclosures and contact materials.
- Variety of terminals...pcb, direct plug-in, solder, taper tab.
- Highly reliable contacts, with independent twin contact surfaces.
- Stable, adjustment-free operation.
- Consistently reliable performance at low cost.

TYPE J



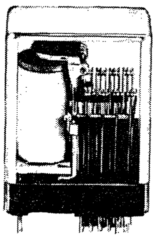
TERMINALS:
Solder tabs — slotted.

MOUNTING:
Two #6-32 NC tapped holes in relay heelpiece; mounting hardware included in relay price.

For detail characteristics see Manual 501.

Clare Part No.	Nominal Operating Voltage dc	Coil Resistance in Ohms ±10%	Contact Action	Contact and Rating
J242C24	24	500	2C	Note 1
J244C24	24	500	4C	Note 1
J246C24	24	300	6C	Note 1
J482C24	48	1300	2C	Note 1
J486C24	48	1000	6C	Note 1
J1102C24	110	6500	2C	Note 1
J1104C24	110	6500	4C	Note 1
J1106C24	110	5000	6C	Note 1

TYPE JDP



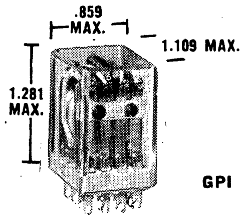
Direct Plug-in Relay Clear Plastic Dust Cover, Socket and Mounting Screws included in Relay Price.

For detail characteristics see Data Sheet 551.

Clare Part No.	Nominal Operating Voltage dc	Coil Resistance in Ohms ±10%	Contact Action	Contact and Rating
JDP242C24	24	500	2C	Note 1
JDP244C24	24	500	4C	Note 1
JDP246C24	24	300	6C	Note 1
JDP484C24	48	1300	4C	Note 1
JDP486C24	48	1000	6C	Note 1
JDP1104C24	110	6500	4C	Note 1
JDP1106C24	110	5000	6C	Note 1

Note 1 — Twin Palladium. 4 Amps, 150 Watts, A.C., N.I.

GENERAL PURPOSE RELAYS



GP1 Series — General Purpose

GP1 Relays are miniature 4PDT relays available for AC or DC operation with dust cover enclosure built to meet UL Component recognition. Contacts are fine silver-gold flashed, rated 3 amps at 30 VDC or 120 VAC resistive. Life expectancy in excess of 100 million operations AC. Solder terminals are standard. Sockets come in both solder terminals and printed circuit.

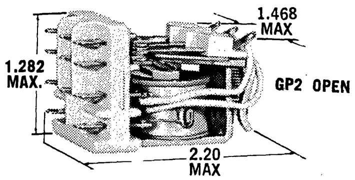
Part Numbers		Coil Resistance (ohms)	Average Current (ma)	Voltage (vdc)	Part Numbers		Coil Resistance (ohms)	Average Current (ma)	Voltage (vac)
Gold Flashed Silver Button Contacts	Silver Cadmium Oxide Button Contacts				Gold Flashed Silver Button Contacts	Silver Cadmium Oxide Button Contacts			
GP1R11D0000	GP1R21D0000	40	150	6	GP1R11A0000	GP1R21A0000	11	200	6
GP1R11D1000	GP1R21D1000	160	75	12	GP1R11A1000	GP1R21A1000	43	100	12
GP1R11D2000	GP1R21D2000	650	37	24	GP1R11A2000	GP1R11A2000	160	52	24
GP1R11D3000	GP1R21D3000	2,600	18	48	GP1R11A3000	GP1R21A3000	668	25	48
GP1R11D4000	GP1R21D4000	9,000	10	90	GP1R11A6000	GP1R21A6000	3900	11	120
GP1R11D5000	GP1R21D5000	11,000	10	110					

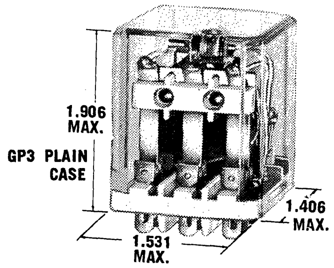
Relays listed above are stock items with same polarity rating and solder lug/plug in terminals. Stock relays with 0000000 polarity rating may be ordered by changing "R" to "Q". 3/16" pcb terminals may be ordered by changing the 00000 0000 after the letter "R" from "1" to "2". For taper tabs, change this digit to "3".

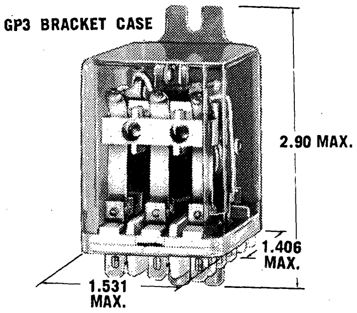
FOR MORE DETAILED INFORMATION CONSULT YOUR CLARE SALES OFFICE OR NEAREST DISTRIBUTOR.

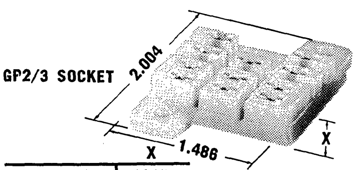
C. P. CLARE & CO.
3101 PRATT AVENUE, CHICAGO, ILLINOIS 60645 ■ PHONE: (312) 262-7700

CLARE GENERAL PURPOSE RELAYS









GPS 3003	.294″
GPS 3001	.542″

GP2 and GP3 Relays

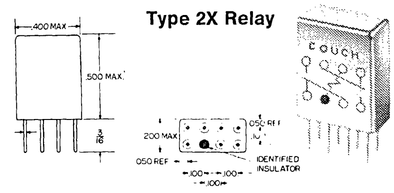
The GP2 (open) and GP3 (Lexan® dust cover) Relays are designed to meet UL bulletin 508 requirements. The rugged AC or DC relays are available in SPDT, DPDT & 3PDT configurations with Gold flashed Silver Cadmium Oxide contacts rated at either 10 amperes at 28 Vdc resistive or 120/300 Vac, .8 power factor. The GP2 and GP3 plain case models are available with matching molded nylon sockets for plug-in applications. The GP3 bracket case model is available for direct chassis mounting only. Mechanical life expectancy is 100 million operations, electrical life 100,000 operations minimum at rated load. .187″ quick connect terminals standard.

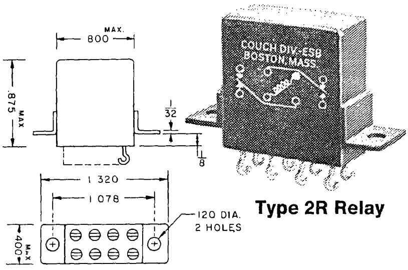
GP2 Open Relay	GP3 Plain Case	GP3 Bracket Case	Voltage	Action	Coil Resistance (Ohms)	Average Current (mA)
GP2R211AA0000	GP3R211AA0000	GP3R211NA0000	6V ac	SPDT	6.0	335
GP2R211AA1000	GP3R211AA1000	GP3R211NA1000	12V ac	SPDT	21	168
GP2R211AA2000	GP3R211AA2000	GP3R211NA2000	24V ac	SPDT	75	84
GP2R211AA6000	GP3R211AA6000	GP3R211NA6000	120V ac	SPDT	2250	17.5
GP2R211AA7000	GP3R211AA7000	GP3R211NA7000	240V ac	SPDT	9110	8.75
GP2R211AD0000	GP3R211AD0000	GP3R211ND0000	6V dc	SPDT	32.0	188
GP2R211AD1000	GP3R211AD1000	GP3R211ND1000	12V dc	SPDT	120	100
GP2R211AD2000	GP3R211AD2000	GP3R211ND2000	24V dc	SPDT	470	51
GP2R211AD5000	GP3R211AD5000	GP3R211ND5000	110V dc	SPDT	10000	11
GP2R221AA0000	GP3R221AA0000	GP3R221NA0000	6V ac	DPDT	6.0	335
GP2R221AA1000	GP3R221AA1000	GP3R221NA1000	12V ac	DPDT	21	168
GP2R221AA2000	GP3R221AA2000	GP3R221NA2000	24V ac	DPDT	75	84
GP2R221AA6000	GP3R221AA6000	GP3R221NA6000	120V ac	DPDT	2250	17.5
GP2R221AA7000	GP3R221AA7000	GP3R221NA7000	240V ac	DPDT	9110	8.75
GP2R221AD0000	GP3R221AD0000	GP3R221ND0000	6V dc	DPDT	32.0	188
GP2R221AD1000	GP3R221AD1000	GP3R221ND1000	12V dc	DPDT	120	100
GP2R221AD2000	GP3R221AD2000	GP3R221ND2000	24V dc	DPDT	470	51
GP2R221AD5000	GP3R221AD5000	GP3R221ND5000	110V dc	DPDT	10000	11
GP2R231AA0000	GP3R231AA0000	GP3R231NA0000	6V ac	3PDT	4.2	460
GP2R231AA1000	GP3R231AA1000	GP3R231NA1000	12V ac	3PDT	18	230
GP2R231AA2000	GP3R231AA2000	GP3R231NA2000	24V ac	3PDT	72	115
GP2R231AA6000	GP3R231AA6000	GP3R231NA6000	120V ac	3PDT	1700	24
GP2R231AA7000	GP3R231AA7000	GP3R231NA7000	240V ac	3PDT	7200	12
GP2R231AD0000	GP3R231AD0000	GP3R231ND0000	6V dc	3PDT	32.0	188
GP2R231AD1000	GP3R231AD1000	GP3R231ND1000	12V dc	3PDT	120	100
GP2R231AD2000	GP3R231AD2000	GP3R231ND2000	24V dc	3PDT	470	51
GP2R231AD5000	GP3R231AD5000	GP3R231ND5000	110V dc	3PDT	10000	11
	GPS3001 GPS3003	Solder Terminal Socket Printed Circuit Terminal Socket				

ROTARY RELAYS and MULTIPOLE ROTARY SWITCHES

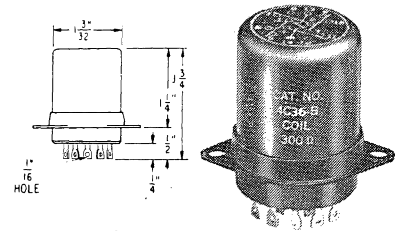
For Industrial and Military Applications

Type 2X Relay

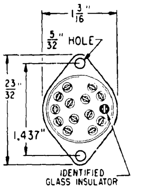




Type 2R Relay



Type 4C36B



One of six standard mounting styles

1/7th SIZE CRYSTAL CAN RELAYS*

Catalog Number	Coil Resistance	Max. Pull-In Current	Min. Drop-Out Current	Max. Pull-In Voltage	Nom. Oper. Voltage
2X10B430-A	100 ohms	32 MA	2.7 MA	3.6 volts	6.6 volts
2X10B460-A	400	16	1.3	7.1	13.2
2X10B490-A	1500	8.0	0.67	13.0	26.5
1X07B435-A	125	24	2.0	3.3	6.6
1X07B465-A	500	12	1.0	6.5	13.2
1X07B495-A	2000	6.0	0.50	13	26.5

Temperature: —65°C to +125°C
Vibration: 30G to 3000 Hz
Shock: 100G for 11 ms
Contact Rating: 1.0 amp, 30 VDC, resistive load
Pull-In Sensitivity: 2X, 100 mw; 1X, 70 mw
Dielectric Strength: 500 VRMS

FULL-SIZE CRYSTAL CAN RELAYS*

One Size – Four Different Sensitivities

2R25A420-B	625	19	1.9	13.0	24-30
2R10A440-B	1500	8.2	.82	13.6	24-47
2R04A460-B	4000	3.2	.32	14.1	24-76
2R02A470-B	6250	2.0	.20	13.8	24-94

Temperature: —65°C to +125°C
Vibration*: 15G-30G to 2000 Hz
Shock*: 50G-100G for 11 ms
Contact Rating*: 1.0-3.0 amps; 30 VDC resistive load
Pull-in Sensitivity: 25 to 250 mw
Dielectric Strength*: 500-1000 VRMS

*Value depends upon pull-in sensitivity.

SUB-MINIATURE ROTARY RELAYS*

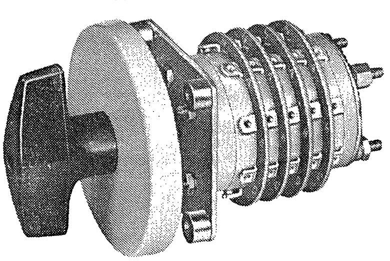
4C36-B	300	41	5.1	13.0	26.5
2B36-B	300	41	5.1	13.0	26.5

Temperature: —65°C to +125°C
Vibration: 30G to 3000 Hz
Shock: 100G for 11 ms
Contact Rating: 4C, 5 amp; 2B, 10 amp
Pull-In Sensitivity: 500 mw
Dielectric Strength: 1000 VAC

***ALL RELAYS AVAILABLE IN A WIDE VARIETY OF TERMINALS, COILS AND MOUNTINGS**

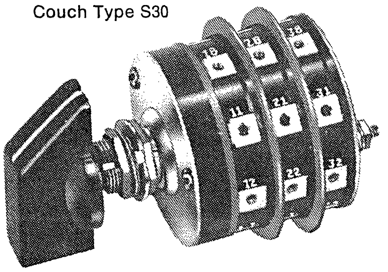
MULTIPOLE ROTARY SWITCHES

STYLE SJR SWITCH
Couch Type S10

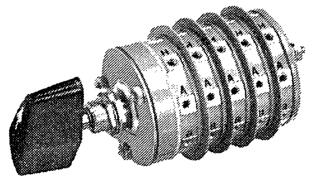


SJR and SJL switches are built in accordance with U.S. Navy drawings and are listed in the Qualified Products List of MIL-S-21604. These switches are extremely reliable under severe environmental conditions. Detailed data sheets give specifications for the many variations available. Write for them.

STYLE SJL SWITCH
Couch Type S30



COUCH TYPE S32 SWITCH



Type S32 is a 15 amp multipole rotary switch offered in a wide variety of circuit sequences for instrument, selector and control applications. A typical application is in voltmeter-ammeter switching circuits for which it can be supplied prewired. It has double-wipe, self-cleaning silver plated contacts enclosed within phenolic sections for high reliability and long life.

Type S32 Specifications

Ratings: 15A – 600V carry
10A – 125 VAC, 60 – 400 Hz
Make and break
Positions: Positive action, 8 positions
Sections: 1 to 12
Poles: 1 to 24
Dielectric: Strength: 2200 VRMS min.
Action: Break-before-make (non-shorting)
and Make-before-break (shorting)

S. H. COUCH DIVISION
ESB INCORPORATED

36 RIVER STREET, BOSTON, MASSACHUSETTS 02126
TELEPHONE (617) 298-4147

Preprinted from eem — Electronic Engineers Master — 1971-72 Edition

PRINTED IN U.S.A.

Ingraham COMAR
a division of McGraw-Edison Company

RELAYS

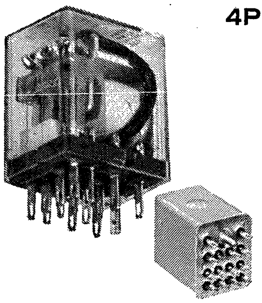
ALPHABETICAL INDEX

SERIES	PAGE	SERIES	PAGE	SERIES	PAGE	SERIES	PAGE
A	3	M-D	3	TS	5	Y-O	2
CR	1	M-O	3	U	4	Z	2
CS	1	R	5	W	4	Z1	2
D	3	TMB	5	W2	4	Z2	2
KK	4	TQC	5	Y-D	2	Solenoids	6

Prices and Specifications are subject to change without notice.

CR RELAY SERIES

4PDT • AC & DC • AVAILABLE HERMETICALLY SEALED



The CR series is an extremely compact relay recognized under U/L components program for switching loads of the same polarity (1800 Series) or opposite polarity (1900 Series).

The 1900 series features a special barrier (patented) which prevents breakdown when switching loads at opposite polarity and the subsequent destruction of the relay and/or equipment.

Components recognized by Underwriters Laboratories as an across the line starter for use in industrial applications and similar devices. Test in accordance with the requirements of U/L 114 and U/L 508.

Nylon dust cover and solder terminals are standard. Hermetically sealed relays are not U/L approved.

Contacts: Silver, gold flashed

Rated: 4 Amps @ 120 VAC., 4 Amps @ 30 VDC., ½ Amp @ 240 VAC. $^1/_{10}$ HP @ 120 VAC

Coil power: AC; operate .560 VA min., nominal 1.4 VA min. to 1.95 VA max. DC; operate 0.5 Watts min., nominal 0.9 Watts min. to 1.9 Watts max.

Mounting: #3-48 studs (furnished) or plugged directly into sockets

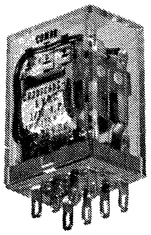
Size: $1\frac{17}{64}$" x $1\frac{7}{64}$" x $\frac{55}{64}$" (1800 & 1900 Series)
$1\frac{1}{4}$" x $1\frac{1}{8}$" x $\frac{7}{8}$" (1600 Series)

Shipping weight: 2 ounces

Part No.	Contact Arrangement	Coil Volts	Coil Res. (Ohms)	Price
"CR" 1800 SERIES				
CRN-1802A-1	4PDT	6V DC	40	5.05
CRN-1803A-1	4PDT	12V DC	160	5.05
CRN-1804A-1	4PDT	24V DC	650	5.05
CRN-1805A-1	4PDT	48V DC	2600	5.25
CRN-1806A-1	4PDT	110V DC	11000	5.90
CRN-1808A-1	4PDT	6V AC	9	5.55
CRN-1809A-1	4PDT	12V AC	36	5.55
CRN-1810A-1	4PDT	24V AC	140	5.55
CRN-1811A-1	4PDT	48V AC	580	5.65
CRN-1812A-1	4PDT	120V AC	3600	6.05
"CR" 1900 SERIES				
CRN-1902A-1	4PDT	6V DC	40	5.15
CRN-1903A-1	4PDT	12V DC	160	5.15
CRN-1904A-1	4PDT	24V DC	650	5.15
CRN-1905A-1	4PDT	48V DC	2600	5.35
CRN-1906A-1	4PDT	110V DC	11000	6.00
CRN-1908A-1	4PDT	6V AC	9	5.65
CRN-1909A-1	4PDT	12V AC	36	5.65
CRN-1910A-1	4PDT	24V AC	140	5.65
CRN-1911A-1	4PDT	48V AC	580	5.75
CRN-1912A-1	4PDT	120V AC	3600	6.15
"CRH" 1600 SERIES				
CRH-1602A-1	4PDT	6V DC	40	8.65
CRH-1603A-1	4PDT	12V DC	160	8.65
CRH-1604A-1	4PDT	24V DC	650	8.65
CRH-1605A-1	4PDT	48V DC	2600	8.80
CRH-1606A-1	4PDT	110V DC	11000	9.50
CRH-1608A-1	4PDT	6V AC	9	9.65
CRH-1609A-1	4PDT	12V AC	36	9.65
CRH-1610A-1	4PDT	24V AC	140	9.65
CRH-1611A-1	4PDT	120V AC	3600	10.00

CR2 MINIATURE RELAY SERIES

1, 2 OR 3PDT • AC & DC • U/L RECOGNIZED (FILE #29163)



The CR2 Series (with lexan dust cover) for Industrial Controls, Business Machines, Automatic Merchandising Equipment, etc.

The CR2 Series relay allows the designer the option of buying only the number of poles required with the resulting savings of price and space.

Contacts: Silver, gold flashed

Rated: $^1/_{10}$ HP 4 Amps @ 120 VAC
$^1/_{10}$ HP 3 Amps @ 240 VAC
and 4 Amps @ 28 VDC

Coil Power: DC @ 25° 1.3 Watts Max.: AC @ 25°C 1.6 Watts Max.

Mounting: Solder terminals fit sockets

Size: $1\frac{13}{64}$" x $\frac{59}{64}$" x $\frac{5}{8}$"

Shipping weight: ¾ ounces (ave)

Part No.	Contact Arrangement	Coil Volts	Coil Res. (Ohms)	Price
CR2-D-1C-6D-S1	SPDT	6V DC	40	3.12
CR2-D-1C-12D-S1	SPDT	12V DC	160	3.12
CR2-D-1C-24D-S1	SPDT	24V DC	650	3.12
CR2-D-1C-48D-S1	SPDT	48V DC	2600	3.45
CR2-D-1C-110D-S1	SPDT	110V DC	11000	4.62
CR2-D-2C-6D-S1	DPDT	6V DC	40	3.40
CR2-D-2C-12D-S1	DPDT	12V DC	160	3.40
CR2-D-2C-24D-S1	DPDT	24V DC	650	3.40
CR2-D-2C-48D-S1	DPDT	48V DC	2600	3.72
CR2-D-2C-110D-S1	DPDT	110V DC	11000	4.88
CR2-D-3C-6D-S1	3PDT	6V DC	40	3.80
CR2-D-3C-12D-S1	3PDT	12V DC	160	3.80
CR2-D-3C-24D-S1	3PDT	24V DC	650	3.80
CR2-D-3C-48D-S1	3PDT	48V DC	2600	4.20
CR2-D-3C-110D-S1	3PDT	110V DC	11000	5.30
CR2-D-1C-6A-S1	SPDT	6V AC	11	3.36
CR2-D-1C-12A-S1	SPDT	12V AC	47	3.36
CR2-D-1C-24A-S1	SPDT	24V AC	180	3.36
CR2-D-1C-120A-S1	SPDT	120V AC	4700	3.80
CR2-D-2C-6A-S1	DPDT	6V AC	11	3.70
CR2-D-2C-12A-S1	DPDT	12V AC	47	3.70
CR2-D-2C-24A-S1	DPDT	24V AC	180	3.70
CR2-D-2C-120A-S1	DPDT	120V AC	4700	4.16
CR2-D-3C-6A-S1	3PDT	6V AC	11	4.00
CR2-D-3C-12A-S1	3PDT	12V AC	47	4.00
CR2-D-3C-24A-S1	3PDT	24V AC	180	4.00
CR2-D-3C-120A-S1	3PDT	120V AC	4700	4.10

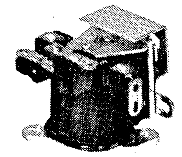
SOCKETS

Part No.	Description	
FOR CR SERIES		
Z-1993-2C	Solder Terminals (General purpose Phenolic)	
Z-1993-2A	Printed Circuit Terminals (General purpose Phenolic)	
Z-1993-2B	Solder Terminals (Mica filled Phenolic)	
Z-1993-2D	Printed Circuit Terminals (Mica filled Phenolic)	
FOR CR2 SERIES		
Z-1437-2-1A	Solder Terminals	.65 ea
Z-1437-2-1B	Printed Circuit Terminals	.65 ea

Ingraham COMAR
a division of McGraw-Edison Company

RELAYS

Z RELAY SERIES DC VOLTAGE ONLY • SPDT SWITCH



This relay can be used for applications where sensitivity, small space, simplified mounting and cost considerations are essential.

Available with either solder or printed circuit terminals.

Coil Power: 200 MW @ nominal voltage

Maximum switch combination: SPDT — Silver cadmium oxide, gold flashed

Rated: 3 Amps @ 120 VAC and 240 VAC
1/10 HP @ 120 VAC, 3 Amps @ 28 VDC resistive

Mounting centers: .625" x .735"
(use (2) 4-40 screws for solder lug type)

Printed circuit centers: 1$\frac{3}{16}$" x $\frac{25}{32}$" x ⅜" x .658"

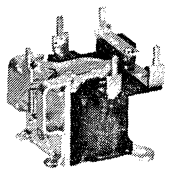
Size: 1$\frac{5}{32}$" H x 1¼" W x 1½" L

Average shipping weight: 1 ounce

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
Z-1C-6D-S-2	SPDT	6V DC	180	3.00
Z-1C-6D-P-2	SPDT	6V DC	180	3.00
Z-1C-12D-S-2	SPDT	12V DC	720	3.20
Z-1C-12D-P-2	SPDT	12V DC	720	3.20
Z-1C-24D-S-2	SPDT	24V DC	2880	3.35
Z-1C-24D-P-2	SPDT	24V DC	2880	3.35
Z-1C-48D-S-2	SPDT	48V DC	11520	3.55
Z-1C-48D-P-2	SPDT	48V DC	11520	3.55

Z1 AND Z2 RELAY SERIES

U/L RECOGNIZED



Component recognized by Underwriters Laboratories as an across the line starter for use in office appliances, business machines or similar equipment. Tested in accordance with the requirements of U/L 508 and U/L 114.

The Comar Z1 is a low cost sensitive relay, open construction, tapped holes in frame, armature common to mounting bracket. It also features a tension spring as opposed to the conventional combination blade spring.

Z1 Mounting centers: .625 x .735, use (2) 4-40 screws

Z2 Printed circuit centers: 1" x .437" x .620"

Size: 1$\frac{5}{32}$" H x 1$\frac{1}{16}$" W x 1$\frac{15}{64}$" L

Shipping weight: 1 ounce

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	

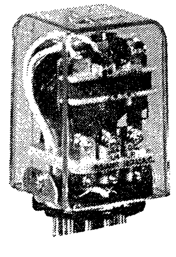
Z1 SERIES (SCREW MOUNT)

Z-1-C-6-2	SPDT	6V DC	180	3.20
Z-1-C-12-2	SPDT	12V DC	720	3.30
Z-1-C-24-2	SPDT	24V DC	2880	3.35
Z-1-C-48-2	SPDT	48V DC	11520	3.70

Z2 SERIES (PC MOUNT)

Z-2-C-6-2	SPDT	6V DC	180	3.20
Z-2-C-12-2	SPDT	12V DC	720	3.30
Z-2-C-24-2	SPDT	24V DC	2880	3.35
Z-2-C-48-2	SPDT	48V DC	11520	3.70

Y-O AND Y-D RELAY SERIES



The Y 3PDT relay incorporates outstanding construction features not available in other relays of this type.

All terminals are molded in place using diallyl phthalate; which assures precision long lasting contact alignment, and a decrease in carbon tracking. Armature is precisely fitted and has molded blade separators, again assuring contact alignment with optimum wiping action. The Comar Y relay is available in either open (Y-O) or enclosed (Y-D) models.

1, 2, and 3 pole open and 1 and 2 pole enclosed component recognized by Underwriters Laboratories as an across the line starter for use in Industrial and Office Equipment applications and similar devices.

3 pole enclosed component recognized as an across the line starter for use in coin operated vending machines of the refrigerated and non-refrigerated types or office equipment.

Tested in accordance with the requirements of U/L 508 and U/L 114. U/L components recognized program file #E-29163.

Contact rating: ¼ HP, 7.5 amps @ 120 VAC
⅙ HP, 4 amps @ 240 VAC
5 amps @ 28 VDC

Contacts: Silver cadmium oxide, gold flashed

Mounting: Y-O 6-32 tapped hole and locating stud. Y-D SPDT and DPDT, 8 pin plugs; 3PDT, 11 pin plugs

Size: Y-O 1$\frac{23}{32}$" L x 1¼" H x 1⅛" W, 3PDT 1$\frac{17}{32}$" W, across coil lugs
Y-D 2⅛" L x 1⅜" square

Shipping weight: 2½ ounces (open type)
3½ ounces (enclosed type)

Y-O SERIES (OPEN)

Part No.	Contact Arrange.	Coil			Price
		Volts	Res. (Ohms)	Curr. (MA)	
Y-O-C-6A-S2	SPDT	6V AC	3.1	509	4.70
Y-O-C-12A-S2	SPDT	12V AC	12.5	240	4.70
Y-O-C-24A-S2	SPDT	24V AC	51	117	4.70
Y-O-C-120A-S2	SPDT	120V AC	1175	23	4.70
Y-O-C-240A-S2	SPDT	240V AC	5000	11.6	5.35
Y-O-C-6D-S2	SPDT	6V DC	32	188	4.55
Y-O-C-12D-S2	SPDT	12V DC	120	100	4.55
Y-O-C-24D-S2	SPDT	24V DC	472	51	4.55
Y-O-C-110D-S2	SPDT	110V DC	10,000	11.5	5.45
Y-O-CC-6A-S2	DPDT	6V AC	3.1	509	5.80
Y-O-CC-12A-S2	DPDT	12V AC	12.5	240	5.80
Y-O-CC-24A-S2	DPDT	24V AC	51	117	5.80
Y-O-CC-120A-S2	DPDT	120V AC	1175	23	5.80
Y-O-CC-240A-S2	DPDT	240V AC	5000	11.5	6.30
Y-O-CC-6D-S2	DPDT	6V DC	32	188	5.20
Y-O-CC-12D-S2	DPDT	12V DC	120	100	5.20
Y-O-CC-24D-S2	DPDT	24V DC	472	51	5.20
Y-O-CC-110D-S2	DPDT	110V DC	10,000	11.5	6.10
Y-O-CCC-6A-S2	3PDT	6V AC	3.1	509	6.45
Y-O-CCC-12A-S2	3PDT	12V AC	12.5	240	6.45
Y-O-CCC-24A-S2	3PDT	24V AC	51	117	6.45
Y-O-CCC-120A-S2	3PDT	120V AC	1175	23	6.45
Y-O-CCC-240A-S2	3PDT	240V AC	5000	11.6	7.15
Y-O-CCC-6D-S2	3PDT	6V DC	32	188	5.85
Y-O-CCC-12D-S2	3PDT	12V DC	120	100	5.85
Y-O-CCC-24D-S2	3PDT	24V DC	472	51	5.85
Y-O-CCC-110D-S2	3PDT	110V DC	10,000	11.5	6.75

Y-D SERIES (ENCLOSED)

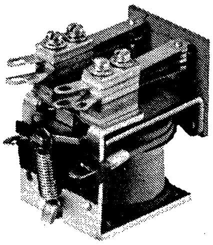
Y-D-C-24A-S2	SPDT	24V AC	51	117	8.05
Y-D-C-120A-S2	SPDT	120V AC	1175	23	8.05
Y-D-C-24D-S2	SPDT	24V DC	472	51	7.95
Y-D-C-110D-S2	SPDT	110V DC	10,000	11.5	8.80
Y-D-CC-6A-S2	DPDT	6V AC	3.1	509	8.95
Y-D-CC-24A-S2	DPDT	24V AC	51	117	8.95
Y-D-CC-120A-S2	DPDT	120V AC	1175	23	8.95
Y-D-CC-24D-S2	DPDT	24V DC	472	51	8.90
Y-D-CC-110D-S2	DPDT	110V DC	10,000	11.5	9.80
Y-D-CCC-24A-S2	3PDT	24V AC	51	117	11.10
Y-D-CCC-120A-S2	3PDT	120V AC	1175	23	11.10
Y-D-CCC-24D-S2	3PDT	24V DC	472	51	11.05
Y-D-CCC-110D-S2	3PDT	110V DC	10,000	11.5	11.95

3349 Addison Street / Chicago, Illinois 60618 / Phone (312) 588-2410 / TWX 910-221-5198

Ingraham COMAR
a division of McGraw-Edison Company

RELAYS

D RELAY SERIES



A low cost, small in size general purpose relay that can be used in almost any application.

Coil power: AC, 7½ VA 60HZ.
DC, 3 watts

Contacts: Fine silver, gold flashed

Rated: 5 amps @ 120VAC
Solder terminals

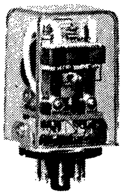
Mounting: Two #6-32 screws

Size: 1 1/16″ W x 1 23/32″ H x 1¾″ L (2PDT)
1 1/16″ W x 1⅞″ H x 1¾″ L (4PDT)

Shipping weight: 3½ ounces max.

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
D-0-2C-6A-S1	2PDT	6V AC	2	3.50
D-0-2C-12A-S1	2PDT	12V AC	8	3.50
D-0-2C-24A-S1	2PDT	24V AC	29.5	3.50
D-0-2C-120A-S1	2PDT	120V AC	750	3.75
D-0-2C-240A-S1	2PDT	240V AC	3000	3.75
D-0-2C-6D-S1	2PDT	6V DC	12	3.40
D-0-2C-12D-S1	2PDT	12V DC	50	3.40
D-0-2C-24D-S1	2PDT	24V DC	200	3.40
D-0-2C-48D-S1	2PDT	48V DC	768	3.40
D-0-2C-110D-S1	2PDT	110V DC	5000	3.80
D-0-4C-6A-S1	4PDT	6V AC	2	4.30
D-0-4C-12A-S1	4PDT	12V AC	8	4.30
D-0-4C-24A-S1	4PDT	24V AC	29.5	4.30
D-0-4C-120A-S1	4PDT	120V AC	750	4.50
D-0-4C-240A-S1	4PDT	240V AC	3000	4.50
D-0-4C-6D-S1	4PDT	6V DC	12	4.20
D-0-4C-12D-S1	4PDT	12V DC	50	4.20
D-0-4C-24D-S1	4PDT	24V DC	200	4.20
D-0-4C-48D-S1	4PDT	48V DC	768	4.20
D-0-4C-110D-S1	4PDT	110V DC	5000	4.40

M-O RELAY SERIES



Similar in construction to the Y series but does not carry Underwriters approval. This relay is more economical yet is capable of switching 10 amps with maximum reliability.

The "MD" series has a clear lexan enclosure.

Contacts: Fine silver, gold flashed

Rated: 10 amps @ 120VAC resistive
3 amps @ 28VDC

Mounting: MO 6-32 tapped hole and locating stud
MD, SPDT and DPDT types, 8 pin plugs; 3PDT, 11 pin plugs

Size: "MO" type: 1 25/32″ L x 1 7/32″ H x 15/16″ W
"MD" type: 2⅛″ L x 1⅜″ square

Shipping weight: 2 ounces (open)
3 ounces (enclosed)

M-O SERIES (OPEN)

Part No.	Contact Arrange.	Coil			Price
		Volts	Res. (Ohms)	Curr. (MA)	
M-0-1C-6A-S1	SPDT	6V AC	2.8	680	3.10
M-0-1C-12A-S1	SPDT	12V AC	11	315	3.10
M-0-1C-24A-S1	SPDT	24V AC	46	165	3.10
M-0-1C-120A-S1	SPDT	120V AC	1140	35	3.40
M-0-1C-240A-S1	SPDT	240V AC	4850	18	3.40
M-0-1C-6D-S1	SPDT	6V DC	32	188	3.00
M-0-1C-12D-S1	SPDT	12V DC	120	100	3.00
M-0-1C-24D-S1	SPDT	24V DC	475	51	3.00
M-0-1C-110D-S1	SPDT	110V DC	10,000	11.5	3.30

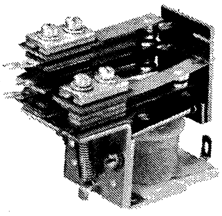
M-O SERIES (OPEN) Contd.

Part No.	Contact Arrange.	Coil			Price
		Volts	Res. (Ohms)	Curr. (MA)	
M-0-2C-6A-S1	DPDT	6V AC	2.8	680	3.30
M-0-2C-12A-S1	DPDT	12V AC	11	315	3.30
M-0-2C-24A-S1	DPDT	24V AC	46	165	3.30
M-0-2C-120A-S1	DPDT	120V AC	1140	35	3.70
M-0-2C-240A-S1	DPDT	240V AC	4850	18	3.70
M-0-2C-6D-S1	DPDT	6V DC	32	188	3.20
M-0-2C-12D-S1	DPDT	12V DC	120	100	3.20
M-0-2C-24D-S1	DPDT	24V DC	472	51	3.20
M-0-2C-110D-S1	DPDT	110V DC	10,000	11.5	3.60
M-0-3C-6A-S1	3PDT	6V AC	2.8	680	4.10
M-0-3C-12A-S1	3PDT	12V AC	11	315	4.10
M-0-3C-24A-S1	3PDT	24V AC	46	165	4.10
M-0-3C-120A-S1	3PDT	120V AC	1140	35	4.50
M-0-3C-240A-S1	3PDT	240V AC	4850	18	4.50
M-0-3C-6D-S1	3PDT	6V DC	32	188	4.00
M-0-3C-12D-S1	3PDT	12V DC	120	100	4.00
M-0-3C-24D-S1	3PDT	24V DC	472	51	4.00
M-0-3C-110D-S1	3PDT	110V DC	10,000	11.5	4.40

M-D SERIES (ENCLOSED)

M-D-1C-24A-S1	SPDT	24V AC	46	165	4.30
M-D-1C-120A-S1	SPDT	120V AC	1140	35	4.70
M-D-1C-24D-S1	SPDT	24V DC	472	51	4.20
M-D-1C-110D-S1	SPDT	110V DC	10,000	11.5	4.60
M-D-2C-6A-S1	DPDT	6V AC	2.8	680	5.00
M-D-2C-24A-S1	DPDT	24V AC	46	165	5.00
M-D-2C-120A-S1	DPDT	120V AC	1140	35	5.40
M-D-2C-24D-S1	DPDT	24V DC	472	51	4.90
M-D-2C-110D-S1	DPDT	110V DC	10, 000	11.5	5.30
M-D-3C-24A-S1	3PDT	24V AC	46	165	7.10
M-D-3C-120A-S1	3PDT	120V AC	1140	35	7.50
M-D-3C-24D-S1	3PDT	24V DC	472	51	7.00
M-D-3C-110D-S1	3PDT	110V DC	10,000	11.5	7.40

A RELAY SERIES



A multiple pole relay. Available in both AC and DC. Low cost, reliable, this relay can be used in most applications.

Contacts: Fine silver gold flashed

Rated: 10 amps, 115 VAC, resistive

Coil power: AC, 6 VA 60 Hz. DC, 1.5 Watts
3 Watts Max.

Mounting: Single screw center mounting #8-32 tap

Size: 2⅝″ x 2 9/32″ x 1 1/16″

Shipping weight: 4½ ounces

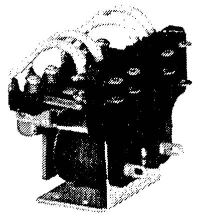
Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
A-0-2C-6A-S1	DPDT	6V AC	2	5.20
A-0-2C-12A-S1	DPDT	12V AC	8	5.20
A-0-2C-24A-S1	DPDT	24V AC	29.5	5.20
A-0-2C-120A-S1	DPDT	120V AC	750	5.60
A-0-4C-6A-S1	4PDT	6V AC	2	7.60
A-0-4C-12A-S1	4PDT	12V AC	8	7.60
A-0-4C-24A-S1	4PDT	24V AC	29.5	7.60
A-0-4C-120A-S1	4PDT	120V AC	750	7.60
A-0-4C-240A-S1	4PDT	240V AC	3000	8.05
A-0-2C-6D-S1	DPDT	6V DC	12	5.30
A-0-2D-12D-S1	DPDT	12V DC	50	5.30
A-0-2C-24D-S1	DPDT	24V DC	200	5.30
A-0-2C-110D-S1	DPDT	110V DC	5000	5.70
A-0-4C-6D-S1	4PDT	6V DC	12	7.60
A-0-4C-12D-S1	4PDT	12V DC	50	7.60
A-0-4C-24D-S1	4PDT	24V DC	200	7.60
A-0-4C-110D-S1	4PDT	110V DC	5000	8.15

3349 Addison Street / Chicago, Illinois 60618 / Phone (312) 588-2410 / TWX 910-221-5198

Ingraham COMAR
a division of McGraw-Edison Company

RELAYS

U RELAY SERIES



This series is designed with solder lugs all located in the front for easy accessability. Movable contact blades are spring loaded and mounted on molded phenolic insulating bars providing for good contact wiping action.

Contacts: Silver cadmium oxide, gold flashed

Rated: 20 amps @ 120 VAC resistive

Coil power: AC, 10 VA 60 Hz. DC, 2 Watts DC (3PDT) 4 Watts DC (5PDT)

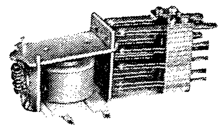
Mounting: Four #6-32 screws should be used

Size: 3PDT 1¾" wide x 2 5/16" high x 2⅛" long
5PDT 2⅝" wide x 2 5/16" high x 2⅛" long

Shipping weight: 5½ ounces (3PDT), 6 ounces (5PDT)

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
U-3C-6A-2	3PDT	6V AC	.8	8.00
U-3C-12A-2	3PDT	12V AC	2.7	8.00
U-3C-24A-2	3PDT	24V AC	12	8.00
U-3C-120A-2	3PDT	120V AC	300	8.40
U-3C-240A-2	3PDT	240V AC	1160	8.40
U-3C-6D-2	3PDT	6V DC	18	7.90
U-3C-12D-2	3PDT	12V DC	72	7.90
U-3C-24D-2	3PDT	24V DC	288	7.90
U-3C-110D-2	3PDT	110V DC	6612	8.30
U-5C-6A-2	5PDT	6V AC	.8	10.40
U-5C-12A-2	5PDT	12V AC	2.7	10.40
U-5C-24A-2	5PDT	24V AC	12	10.40
U-5C-120A-2	5PDT	120V AC	300	11.00
U-5C-240A-2	5PDT	240V AC	1160	11.00
U-5C-6D-2	5PDT	6V DC	9	10.00
U-5C-12D-2	5PDT	12V DC	36	10.00
U-5C-24D-2	5PDT	24V DC	144	10.00
U-5C-110D-2	5PDT	110V DC	3306	10.60

KK RELAY SERIES



The functional simplicity of the KK design gives the design engineer the widest possible selection of switch combinations without increased cost. The KK is easily serviced in the field; the entire coil assembly may be removed by loosening one nut.

Switch stacks may be removed, disassembled and reassembled into other forms by removing two switch stack screws.

Contacts: Fine silver, gold flashed

Rated: 5 amps 120 VAC resistive
3 amps 28 VDC resistive

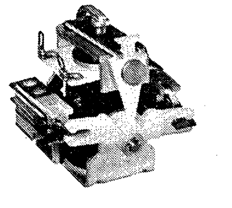
Size: 3 15/32" L x 1 15/16" H x 1 15/16" W

Side mounting: Use (2) 8-32 screws

Shipping weight: 4 ounces

Part No.	Contact Arrange.	Coil			Price
		Volts	Res. (Ohms)	Curr. (MA)	
KK-0-2C-24A-S1	DPDT	24V AC	30	270	2.60
KK-0-2C-120A-S1	DPDT	120V AC	750	56	3.00
KK-0-2C-12D-S1	DPDT	12V DC	50	240	2.50
KK-0-2C-24D-S1	DPDT	24V DC	200	120	2.50
KK-0-2C-110D-S1	DPDT	110V DC	5000	23	3.00
KK-0-4C-6A-S1	4PDT	6V AC	2	1000	3.20
KK-0-4C-12A-S1	4PDT	12V AC	7.5	540	3.20
KK-0-4C-24A-S1	4PDT	24V AC	30	270	3.20
KK-0-4C-120A-S1	4PDT	120V AC	750	56	3.60
KK-0-4C-6D-S1	4PDT	6V DC	14	461	3.10
KK-0-4C-12D-S1	4PDT	12V DC	50	240	3.10
KK-0-4C-24D-S1	4PDT	24V DC	200	120	3.10
KK-0-4C-48D-S1	4PDT	48V DC	1000	48	3.10
KK-0-4C-110D-S1	4PDT	110V DC	5000	23	3.50
KK-0-6C-6A-S1	6PDT	6V AC	2	1000	3.80
KK-0-6C-12A-S1	6PDT	12V AC	7.5	540	3.80
KK-0-6C-24A-S1	6PDT	24V AC	30	270	3.80
KK-0-6C-120A-S1	6PDT	120V AC	750	56	4.20
KK-0-6C-240A-S1	6PDT	240V AC	3000	28	4.20
KK-0-6C-6D-S1	6PDT	6V DC	14	461	3.70
KK-0-6C-12D-S1	6PDT	12V DC	50	240	3.70
KK-0-6C-24D-S1	6PDT	24V DC	200	120	3.70
KK-0-6C-48D-S1	6PDT	48V DC	1000	48	3.70
KK-0-6C-110D-S1	6PDT	110V DC	5000	23	4.10

W RELAY SERIES



The W impulse latching relay features an insulated rocker arm activated by a single coil, instead of the two coils usually used. In this one coil design, the contacts are set up in one position when the coil is energized or pulsed and return to the first position on the next pulse. Each time the coil is energized, the switch changes to the opposite position. You get two-coil efficiency with the advantages of one-coil economy and compactness. Can be supplied for either AC or DC operation, to be operated intermittently only. The switch is U/L Recognized. File #23302A & B.

Contacts: Silver cadmium oxide, gold flashed

Rated: 115 VAC Resistive, ¼ HP, 115/220 VAC.

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
W-0-1C-24A-S2	SPDT	24V AC	5.4	4.90
W-0-1C-120A-S2	SPDT	120V AC	140	5.40
W-0-1C-24D-S2	SPDT	24V DC	216	4.80
W-0-1C-115D-S2	SPDT	115V DC	5400	5.30
W-0-2C-24A-S2	DPDT	24V AC	2.4	7.10
W-0-2C-120A-S2	DPDT	120V AC	83	7.50
W-0-2C-24D-S2	DPDT	24V DC	83	7.00
W-0-4C-24A-S2	4PDT	24V AC	1.5	9.00
W-0-4C-120A-S2	4PDT	120V AC	35	9.50

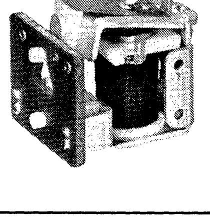
Mounting: Single hole using #8-32 brass screw

Size: 2" W x 1 29/32" L x 2 3/16" H

Shipping weight: 4 ounces

W2 LATCHING RELAY

D.C. COILS ONLY



This is a low cost, small in size, single coil impulse latching relay, with a maximum switch combination of SPDT. Printed circuit board type. Switch rated at 1 Amp maximum @ 120 VAC resistive (solder connection).

Size: 1 7/32" H x 1 3/16" W x 1 21/32" L

Shipping weight: 1½ ounces

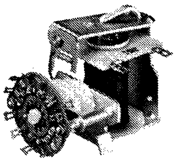
Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
W2-0-1C-6D-S	SPDT	6V DC	10	3.80
W2-0-1C-12D-S	SPDT	12V DC	40	3.80
W2-0-1C-24D-S	SPDT	24V DC	160	3.80
W2-0-1C-48D-S	SPDT	48V DC	640	3.80
W2-0-1C-110D-S	SPDT	110V DC	3673	4.20

3349 Addison Street / Chicago, Illinois 60618 / Phone (312) 588-2410 / TWX 910-221-5198

Ingraham COMAR
a division of McGraw-Edison Company

RELAYS

CS STEPPER RELAY



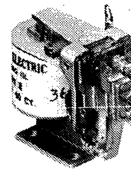
This stepper relay is low in cost but reliable, using a wafer type switch, continuous rotation, 12 position single pole non-shorting contacts, rated at 1 Amp maximum @ 120 VAC resistive.

Coil duty cycle: Intermittent

Mounting: #8-32 brass screw, also has locating tab
Size: 1¾" W x 2 5/32" H x 2⅝" L
Shipping weight: 5 ounces

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
CS-1-2-NS-6A	12 Pos.	6V AC	.2	9.40
CS-1-2-NS-12A	12 Pos.	12V AC	1.2	9.40
CS-1-2-NS-24A	12 Pos.	24V AC	4.8	9.40
CS-1-2-NS-120A	12 Pos.	120V AC	114	10.00
CS-1-2-NS-240A	12 Pos.	240V AC	380	10.00
CS-1-2-NS-6D	12 Pos.	6V DC	3	9.10
CS-1-2-NS-12D	12 Pos.	12V DC	12	9.10
CS-1-2-NS-24D	12 Pos.	24V DC	48	9.10
CS-1-2-NS-110D	12 Pos.	110V DC	1100	9.90

R RELAY SERIES



This relay is a general purpose type capable of operating with 60 Hz. coil voltages. The laminated silicon steel frame assembly results in extremely cool coil temperatures for continuous operation.

Contacts: ⅛" silver cadmium oxide, gold flashed

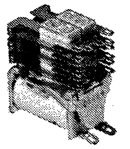
Rated: 3 amps @ 28 VDC or 115 VAC 60 Hz

Mounting: Two #8-32 tapped holes on 27/32" centers

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
R-0-2C-12-S-2-0	DPDT	12V AC	5.4	5.35
R-0-2C-24-S-2-0	DPDT	24V AC	24.0	5.35
R-0-2C-115-S-2-0	DPDT	115V AC	600.0	5.75
R-0-2C-230-S-2-0	DPDT	230V AC	3100	5.75
R-0-4C-12-S-2-0	4PDT	12V AC	5.4	6.80
R-0-4C-24-S-2-0	4PDT	24V AC	24.0	6.80
R-0-4C-115-S-2-0	4PDT	115V AC	600.0	7.20
R-0-4C-230-S-2-0	4PDT	230V AC	3100	7.20

Size: 2 17/64" L x 1⅛" W x 1¾" H
Shipping weight: 4.5 ounces

TS RELAY SERIES



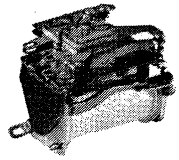
This series is of the short coil telephone type.
Contacts: ⅛" dia. silver cadmium oxide,
Rated: 3 amps 28 VDC or 115 VAC 60 Hz
Operating power: 200 MW per pole at pull in voltage
Mounting: 4, #3-48 holes on ⅜" x ⅜" centers
Size: 1.3" L x 1.250" H x .750 " W
Shipping weight: 1.5 ounces

The TSH series is hermetically sealed version of the TS with the same electrical specifications.
Mounting: Three #4-40 studs x 5/16" L on ½" x 1" centers
.800 Dia. hermetic seal with hook terminals

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
TS-01-2C-12-S-2-0	DPDT	12V DC	100	4.40
TS-01-2C-24-S-2-0	DPDT	24V DC	400	4.40
TS-01-2C-115-S-2-0	DPDT	115V DC	8000	5.00
TS-H-2C-24-H-2-0	DPDT	24V DC	400	10.40
TS-H-2C-115-H-2-0	DPDT	115V DC	8000	11.00
TS-01-4C-12-S-2-0	4PDT	12V DC	100	5.90
TS-01-4C-24-S-2-0	4PDT	24V DC	400	5.90
TS-01-4C-115-S-2-0	4PDT	115V DC	8000	6.50
TS-H-4C-24-H-2-0	4PDT	24V DC	400	13.90
TS-H-4C-115-H-2-0	4PDT	115V DC	8000	14.50

Size: 1.350" L x .984" W x 1.610" H
Shipping weight: 2.5 ounces

TMB RELAY SERIES



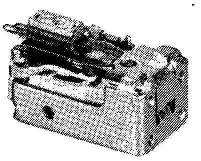
This series is of the telephone type having a moderately long coil.
Contacts: 5/32" dia. silver cadmium oxide, gold flashed
Rated: 5 Amps 28 VDC or 115 VAC 60 Hz
Operating power: 200 MW per pole at pull-in voltage
Mounting: 4 #4-40 Holes on ⅜" x 7/16" centers
Size: 1.5" L x 1.062" W x 1.5" H
Shipping weight: 2.5 ounces

The TMBH series is a hermetically sealed version of the TMB with the same electrical specifications.
Size: 1.437" L x 1.640" W x 2.062" H

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
TMB-01-2C-12-S-2-1	DPDT	12V DC	100	5.00
TMB-01-2C-24-S-2-1	DPDT	24V DC	400	5.00
TMB-01-2C-115-S-2-1	DPDT	115V DC	8000	5.60
TMB-H-2C-24-H-2-1	DPDT	24V DC	400	11.30
TMB-H-2C-115-H-2-1	DPDT	115V DC	8000	11.90
TMB-01-4C-12-S-2-1	4PDT	12V DC	100	6.80
TMB-01-4C-24-S-2-1	4PDT	24V DC	400	6.80
TMB-01-4C-115-S-2-1	4PDT	115V DC	8000	7.40
TMB-H-4C-24-H-2-1	4PDT	24V DC	400	15.40
TMB-H-4C-115-H-2-1	4PDT	115V DC	8000	16.00

Mounting: Three #6-32 studs x 5/16" L on 15/16" x 1 3/16" centers
.900 Dia. hermetic seal with hook terminations
Shipping weight: 5.5 ounces

TQC RELAY SERIES



This telephone type relay has a nominal operating power at pull-in of just 50 MW per pole.
Contacts: ⅛" silver cadmium oxide, gold flashed
Rated: 3 Amps 28 VDC or 115 VAC 60 Hz
Mounting: 4 #3-48 Holes on ½" x ⅜" centers
Size: 61/64" L x 11/16" W x 1½" H
Shipping weight: 2 ounces

The TQCH series is a hermetically sealed version of the TQC with the same electrical specifications.
Size: .980" L x .980" W x 1.750" H
Mounting: Octal type plug used with standard 8 pin socket
Shipping weight: 3 ounces

Part No.	Contact Arrangement	Coil		Price
		Volts	Res. (Ohms)	
TQC-0-1C-0.5-S-2-0	SPDT	10.0 MA	500	5.40
TQC-0-1C-1.0-S-2-0	SPDT	7.1 MA	1000	5.40
TQC-0-1C-2.5-S-2-0	SPDT	4.4 MA	2500	5.40
TQC-0-1C-5.0-S-2-0	SPDT	3.2 MA	5000	6.00
TQC-0-1C-8.0-S-2-0	SPDT	2.5 MA	8000	6.00
TQC-0-2C-0.5-S-2-0	DPDT	20.0 MA	500	6.70
TQC-0-2C-1.0-S-2-0	DPDT	10.0 MA	1000	6.70
TQC-0-2C-2.5-S-2-0	DPDT	6.3 MA	2500	6.70
TQC-0-2C-5.0-S-2-0	DPDT	4.5 MA	5000	7.30
TQC-0-2C-8.0-S-2-0	DPDT	3.5 MA	8000	7.30
TQC-H2-1C-0.5-P-2-0	SPDT	10.0 MA	500	13.00
TQC-H2-1C-1.0-P-2-0	SPDT	7.1 MA	1000	13.00
TQC-H2-1C-2.5-P-2-0	SPDT	4.4 MA	2500	13.00
TQC-H2-1C-5.0-P-2-0	SPDT	3.2 MA	5000	13.70
TQC-H2-1C-8.0-P-2-0	SPDT	2.5 MA	8000	13.70
TQC-H2-2C-0.5-P-2-0	DPDT	20.0 MA	500	13.80
TQC-H2-2C-1.0-P-2-0	DPDT	10.0 MA	1000	13.80
TQC-H2-2C-2.5-P-2-0	DPDT	6.3 MA	2500	13.80
TQC-H2-2C-5.0-P-2-0	DPDT	4.5 MA	5000	14.20
TQC-H2-2C-8.0-P-2-0	DPDT	3.5 MA	8000	14.20

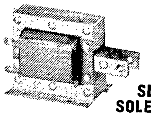
3349 Addison Street / Chicago, Illinois 60618 / Phone (312) 588-2410 / TWX 910-221-5198

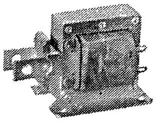
Ingraham COMAR
a division of McGraw-Edison Company

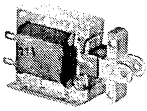
SOLENOIDS

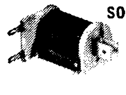
Comar has a variety of solenoids that can be used for AC or DC; Continuous or intermittent applications. The continuous duty types will not have a temperature rise of more than 85°C rise at rated voltage and ambient.

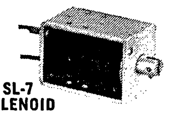
The intermittent types should not be permitted to rise more than 85°C above 25°C ambient without time for cooling between cycles.

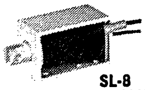

SL-1 SOLENOID

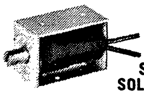

SL-2 SOLENOID

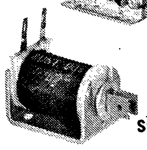

SL-3 SOLENOID


SL-4 SOLENOID

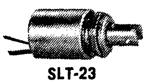

SL-7 SOLENOID


SL-8 SOLENOID


SL-9 SOLENOID


SL-10 SOLENOID

SLT-21 SOLENOID


SLT-23 SOLENOID

AC TYPE SOLENOIDS

Comar Type	Coil			Lift & Stroke @ Inches		Size (Inches)			Shipping Wt. (Oz.)	Price
	Duty*	Volts	Ohms	Oz. Max.	Oz. Min.	Height	Width	Length		
SL-1	C	115	150	25 @ 1/16	10 @ ⅝	1 7/16	1 3/16	1⅝	4	4.50
SL-1	I	115	45	55 @ 1/16	32 @ ⅝	1 7/16	1 3/16	1⅝	4	4.50
SL-2	C	115	36	65 @ 1/16	30 @ ¾	2 1/16	1 53/64	2½	17	5.00
SL-2	I	115	9.6	225 @ 1/16	100 @ ¾	2 1/16	1 53/64	2½	17	5.00
SL-2D	C	115	25	130 @ 1/16	40 @ ¾	2 1/16	2 13/64	2½	21	5.50
SL-2D	I	115	6	370 @ 1/16	160 @ ¾	2 1/16	2 13/64	2½	21	5.50
SL-3	C	115	78	55 @ 1/16	15 @ ¾	1 15/32	1 3/16	1⅝	7	3.70
SL-3	I	115	20	150 @ 1/16	55 @ ¾	1 15/32	1 3/16	1⅝	7	3.70
SL-3D	C	115	60	70 @ 1/16	24 @ ¾	1 15/32	1½	1⅝	10	4.20
SL-3D	I	115	27	164 @ 1/16	64 @ ¾	1 15/32	1½	1⅝	10	4.20
SL-4	C	115	875	8 @ 1/16	2 @ ¼	13/16	¾	1⅛	1½	2.30
SL-4	I	115	218	24 @ 1/16	7 @ ⅜	13/16	¾	1⅛	1½	2.30
SL-7	I	115	21	100 @ 1/16	5 @ ⅞	1 13/16	1 9/16	2⅝	19½	4.20
SL-8	I	115	235	24 @ 1/16	3 @ ¾	1 3/16	1	1 31/32	6	3.40
SL-8-1	I	115	280	30 @ 1/16	7 @ ⅜	1 3/16	1	1¼	4½	3.40
SL-9	C	115	330	10 @ 1/16	4 @ ⅜	1 3/16	15/16	1 29/32	4	3.20
SL-9	I	115	110	24 @ 1/16	13 @ ⅝	1 3/16	15/16	1 29/32	4	3.20
SL-10	C	115	800	10 @ 1/16	3 @ ¼	13/16	¾	1⅛	1½	3.10
SL-10	I	115	200	25 @ 1/16	7 @ ⅜	13/16	¾	1⅛	1½	3.10

DC TYPE SOLENOIDS

Comar Type	Coil			Lift & Stroke @ Inches		Size (Inches)			Shipping Wt. (Oz.)	Price
	Duty*	Volts	Ohms	Oz. Max.	Oz. Min.	Height	Width	Length		
SL-4	C	24	144	4.5 @ 1/16	.5 @ 5/16	13/16	¾	1⅛	1½	2.30
SL-4	I	24	36	15 @ 1/16	1.5 @ 5/16	13/16	¾	1⅛	1½	2.30
SL-4	C	12	36	4.5 @ 1/16	.5 @ 5/16	13/16	¾	1⅛	1½	2.30
SL-4	I	12	9	15 @ 1/16	1.5 @ 5/16	13/16	¾	1⅛	1½	2.30
SL-4	C	6	9	4.5 @ 1/16	.5 @ 5/16	13/16	¾	1⅛	1½	2.30
SL-4	I	6	2.3	15 @ 1/16	1.5 @ 5/16	13/16	¾	1⅛	1½	2.30
SL-7	C	115	1017	70 @ 1/16	7 @ 7/16	1 13/16	1 9/16	2⅝	19½	4.20
SL-7	I	115	400	100 @ 1/16	6 @ ⅞	1 13/16	1 9/16	2⅝	19½	4.20
SL-7	C	24	44.4	70 @ 1/16	7 @ 7/16	1 13/16	1 9/16	2⅝	19½	4.20
SL-7	I	24	17.4	100 @ 1/16	6 @ ⅞	1 13/16	1 9/16	2⅝	19½	4.20
SL-7-1	C	24	48	64 @ 1/16	.5 @ 7/16	1 13/16	1 9/16	2⅛	14½	4.00
SL-7-1	I	24	14.7	128 @ 1/16	16 @ ⅝	1 13/16	1 9/16	2⅛	14½	4.00
SL-7-2	C	24	57.6	80 @ 1/16	2 @ ½	1 13/16	1 9/16	1⅝	11½	4.00
SL-7-2	I	24	17.5	100 @ ⅝	8 @ ⅝	1 13/16	1 9/16	1⅝	11½	4.00
SL-8	C	24	115	20 @ 1/16	2 @ 7/16	1 3/16	1	1 31/32	6	3.40
SL-8	I	24	32	55 @ 1/16	4 @ ⅝	1 3/16	1	1 31/32	6	3.40
SL-8-1	C	24	192	6 @ 1/16	1 @ ¼	1 3/16	1	1¼	4½	3.30
SL-8-1	I	24	48	30 @ 1/16	4 @ ½	1 3/16	1	1¼	4½	3.30
SL-9	C	115	1653	20 @ 1/16	1 @ ⅝	1 3/16	15/16	1 29/32	4	3.80
SL-9	I	115	472	44 @ 1/16	1 @ ⅞	1 3/16	15/16	1 29/32	4	3.80
SL-9	C	24	72	20 @ 1/16	1 @ ⅝	1 3/16	15/16	1 29/32	4	3.20
SL-9	I	24	20.5	44 @ 1/16	1 @ ⅞	1 3/16	15/16	1 29/32	4	3.20

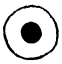
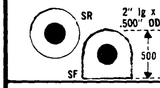
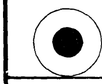
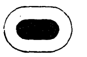
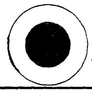
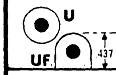
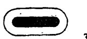
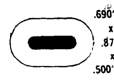
TUBULAR SOLENOIDS

Comar Type	Coil			Lift & Stroke @ Inches		Size (Inches)		Shipping Wt. (Oz.)	Price
	Duty*	Volts	Ohms	Oz. Max.	Oz. Min.	Diameter	Length		
SLT-21-1	C	24	240	4 @ 1/32	.25 @ 5/32	½	⅞	1	4.35
SLT-21-1	I	24	82	12 @ 1/32	.5 @ ¼	½	⅞	1	4.25
SLT-21-2	C	24	220	6 @ 1/32	.25 @ 5/16	½	1½	1½	4.65
SLT-21-2	I	24	48	15 1/32	.5 @ ⅝	½	1½	1½	4.55
SLT-21-3	C	24	145	10 @ 1/32	.5 @ ⅞	½	2	2	4.95
SLT-21-3	I	24	29	17 @ 1/32	.5 @ 13/16	½	2	2	4.85
SLT-23-1	C	24	130	15 @ 1/16	1 @ ⅜	1	1⅛	3½	5.25
SLT-23-1	I	24	30	50 @ 1/16	1 @ 9/16	1	1⅛	3½	5.20
SLT-23-2	C	24	95	40 @ 1/16	2 @ 11/16	1	2	5½	5.55
SLT-23-2	I	24	15	80 @ 1/16	2 @ 1¼	1	2	5½	5.45

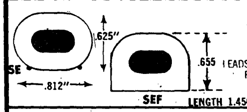
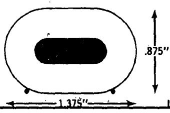
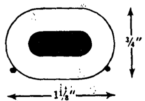
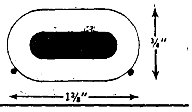
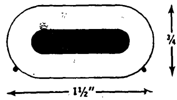
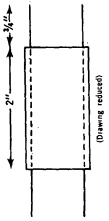
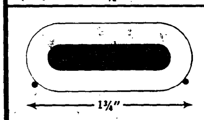
* Duty — "C" - Continuous or "I" - Intermittent.

3349 Addison Street / Chicago, Illinois 60618 / Phone (312) 588-2410 / TWX 910-221-5198

BASIC REED RELAYS

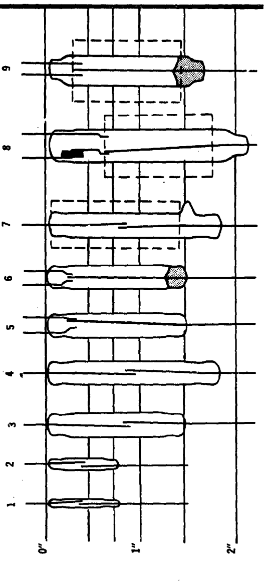
REED COILS								REEDS (See Chart At Right)			PRICES COILS ONLY			
SIZE (End drawings actual size)	CAT. NO. TYPE	VOLTS	TURNS	WIRE SIZE	RESISTANCE OHMS (Nominal)	AMP./TURNS (Nominal)	MILLIWATTS (Nominal)	NUMBER REEDS	REED FIG.	CONTACT FORMS	1-9	10-24	25-99	100-249
 2" lg x .562" OD	S	6 12 24 32 48	4000 7700 13500 15000 24000	34 37 40 41 43	105 360 1400 1930 5150	250	400	1 1 1	3 or 4 5 6	1 A 1 C 1 C or 1 D	$1.50 1.65 1.80 2.40 3.00	$1.27 1.40 1.53 2.04 2.55	$1.12 1.27 1.35 1.80 2.25	$ .97 1.07 1.17 1.56 1.95
 SR SF 2" lg x .500" OD 500	SR SF	6 12 24 32 48	4200 7400 15000 18000 24000	34 38 40 42 44	113 450 1650 2840 5890	200	330	1 1 1	3 or 4 5 6	1 A 1 C 1 C or 1 D	1.50 1.65 1.80 2.40 3.00	1.27 1.40 1.53 2.04 2.55	1.12 1.27 1.35 1.80 2.25	.97 1.07 1.17 1.56 1.95
1.450" lg x .470" OD	SP	6 12 24 32 48	3800 7300 15000 18750 30000	36 39 42 43 45	150 600 2400 4000 9200	150	250	1 1	3 or 7 5 or 6	1 A 1 C	1.30 1.50 1.75 2.00 2.65	1.20 1.35 1.60 1.80 2.40	1.05 1.20 1.45 1.65 2.20	.95 1.10 1.25 1.45 1.95
 1.187" lg x .700" OD	SA	6 12 24 32 48	2300 4500 8500 12000 17000	33 36 39 40 42	65 255 965 1810 3660	200	575	1 1	8 9	1 C 1 C or 1 D	1.50 1.65 1.80 2.40 3.00	1.27 1.40 1.53 2.04 2.55	1.12 1.27 1.35 1.80 2.25	.97 1.07 1.17 1.56 1.95
 2" lg x .500" x .720" OS	SD	6 12 24 32 48	3000 5700 11000 14000 24000	33 36 39 40 42	90 335 1290 2165 5700	200	430	2 2 2	3 or 4 3 & 5 6	2 A 1 A & 1 C 2 C or 2 D	1.70 1.90 2.10 2.55 3.20	1.45 1.60 1.80 2.20 2.75	1.28 1.45 1.60 1.95 2.40	1.10 1.25 1.40 1.70 2.10
 2" lg x .843" OD	M	6 12 24 32 48	2100 4000 9000 12400 17000	31 34 37 38 40	50 175 820 1400 3120	250	700	3 3 3 3 3 3	3 or 4 5 6 3 & 5 3 & 5 7	3 A 3 C 3 C or 3 D 2 A & 1 C 1 A & 2 C 3 A	1.60 1.70 2.00 2.65 3.00	1.36 1.45 1.70 2.25 2.55	1.20 1.27 1.50 2.00 2.25	1.04 1.10 1.30 1.70 1.95
 U UF .800" lg x .375" OD .437	U UF	6 12 24 32 48	3200 5700 12600 17000 25000	38 42 44 45 47	150 625 2500 4000 8600	125	240	1 1	1 or 2 2	1 A 1 C	1.20 1.30 1.70 2.10 4.00	1.02 1.10 1.45 1.78 3.40	.90 .97 1.27 1.57 3.00	.78 .85 1.10 1.36 2.60
.800" lg x .500" x .375" OS	UD	6 12 24 32 48	2100 4250 8100 10500 17500	36 39 42 43 45	86 350 1320 2250 5500	125	400	2 3 2 2 2 2	2 1 1 1 1 2	2 A 3 A 2 B ★ 1 A & 1 B ★ 1 C ★ 2 C	1.35 1.45 1.80 2.05 2.85	1.15 1.25 1.60 1.75 2.40	1.05 1.10 1.35 1.52 2.15	.90 .95 1.20 1.30 1.85
 .772" lg x .710" x .340" OS	UT	6 12 24 32 48	1500 3000 6000 8500 12000	36 39 42 43 45	85 340 1300 2550 5300	105	420	5 5 5 4 4	1 1 1 1 1	5 A 4 A & 1 B ★ 3 A & 2 B ★ 4 B ★ 2 C ★	1.28 1.30 1.70 2.00 2.80	1.10 1.12 1.45 1.60 2.38	.97 1.00 1.28 1.42 2.10	.83 .86 1.12 1.22 1.82
 .690" lg x .875" x .500" OS	T	6 12 24 32 48	2200 4200 8000 11000 14800	35 38 41 42 44	100 400 1600 2800 5800	125	350	4 3 3 3 3 6 5 4 4 4 3 5 5 4	2 2 2 2 2 1 1 1 1 1 1 1 1 2	4 A 1 A & 2 B ★ 1 B & 1 C ★ 2 A & 1 B ★ 1 A & 1 C ★ 6 A 5 A 3 A & 1 B ★ 2 A & 1 C ★ 2 A & 2 B or 2 C ★ 3 B ★ 4 A & 1 B ★ 1 A & 2 C ★ 4 C	1.05 1.15 1.30 1.45 1.85	.89 .98 1.10 1.23 1.57	.79 .86 .97 1.09 1.39	.68 .75 .85 .94 1.20

★ Bias Magnet Required

REED COILS								REEDS			PRICES COILS ONLY			
SIZE (End drawings actual size)	CAT. NO TYPE	VOLTS	TURNS	WIRE SIZE	RES. OHMS Nominal	AMP TURNS Nominal	mW Nominal	NO. REEDS	REED FIG.	CONTACT FORMS	1 - 9	10 - 24	25 - 99	100 - 249
 SE SEF .625" .655 .812" LENGTH 1.450" Similar to "SD" for 2 short reeds Fig. 3 LEADS 3" flexible standard. P C pins optional.	SE SEF	6	3200	34	117	160	350	2	3 5 6 7	A or C	1.70	1.45	1.28	1.10
		12	6000	37	433						1.90	1.60	1.45	1.25
		24	11000	40	1610						2.10	1.80	1.60	1.40
		32	14500	41	2740						2.55	2.20	1.95	1.70
		48	23500	43	7200						3.20	2.75	2.40	2.10
 .875" 1.375" LENGTH .718" Takes miniature reeds 12 Fig 2 up to 23 Fig. 1 LEADS 3/4" =20 T C	UH	12	3300	34	180	200	800	12 or combinations to 23	2 1	A or C* A	1.70	1.45	1.27	1.10
		24	6000	37	720			*Form C is new. Size same as Fig 2			2.00	1.70	1.50	1.30
		32	8300	38	1400						2.65	2.25	2.00	1.70
		48	10600	40	2640						3.00	2.55	2.25	1.95
 3/4" 1 1/8" COIL CONNECTIONS BOTH ENDS LEADS =20 T C All dimensions are nominal	SG 3	12	4000	34	205	240	700	3	3 4 5 6	A or C	2.60	2.10	1.80	1.60
		24	9000	37	850						3.00	2.40	2.10	1.80
		32	11290	38	1430						3.40	2.70	2.40	2.10
		48	18000	40	3800						3.50	2.80	2.50	2.20
		110	32000	43	13000						6.10	5.00	4.30	3.70
 3/4" 1 3/8"	SH 4	12	3600	33	160	260	900	4	3 4 5 6	A or C	2.70	2.20	1.90	1.70
		24	7300	36	650						3.00	2.40	2.10	1.80
		32	9190	37	1090						3.20	2.60	2.30	1.95
		48	14000	39	2500						3.70	3.00	2.60	2.20
		110	30675	42	12300						6.50	5.20	4.60	3.90
 3/4" 1 1/2"  3/4" 2" (Drawing reduced)	SJ 5	12	3100	32	130	280	1150	5	3 4 5 6	A or C	2.80	2.30	2.00	1.80
		24	6000	35	520						3.10	2.50	2.20	1.95
		32	7500	36	830						3.20	2.60	2.30	2.00
		48	10950	38	1950						3.60	2.90	2.50	2.15
		110	25176	41	8900						5.20	4.20	3.70	3.20
 3/4" 1 3/4"	SK 6	12	2600	31	100	310	1450	6	3 4 5 6	A or C	2.90	2.40	2.10	1.90
		24	5000	34	400						3.20	2.70	2.30	2.00
		32	6890	35	680						3.50	2.90	2.50	2.10
		48	10185	37	1575						3.90	3.20	2.80	2.30
		110	21000	40	7150						5.50	4.40	3.90	3.30

PRICES

REED SWITCHES



REED SWITCHES

	MINIATURE		STANDARD					JUMBO	
REED FIG.	1	2	3	4	5	6	7	8	9
DIAMETER	.095"	.125"	.220"					.320"	
CONTACT FORM	A	A or C	A	A	C	C, D	A	C	C, D
CONTACT FORM with Bias Magnet	B	B	B	B	—	Bistable	B	—	—
MOUNTING POSIT.	Any (Dry)	Any (Dry)	Any (Dry)	Any (Dry)	Any (Dry)	Vert. to 30° (Hg Wet)	Any (Dry)	Any (Dry)	Vert. to 30° (Hg Wet)

PRICES COILS ONLY

Prices for larger quantities upon request

PRICES are for coils with 3" lead. Add $3.00/C for P/C Pin Termination.

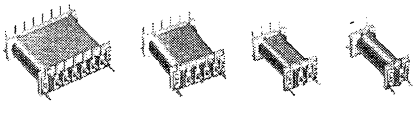
TO ORDER: Specify coil type by LETTER plus VOLTAGE desired for flexible leads (example SF-12, UV-32). For printed circuit pins add suffix P (example: SD-12-P, T-6-P).

NOTE: We do not catalog complete relays, due to the extensive variety of switches and coils available. Write for relay prices.

COTO-COIL CO., INC.

57 PAVILION AVE., PROVIDENCE, R. I. 02905
Telephone (401) 941-3355
Export Dept.: 13 E. 40th St., N. Y., N. Y. 10016

COTO-COIL MINIATURE REED RELAYS



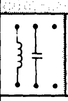
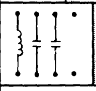
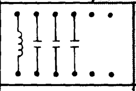
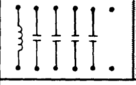
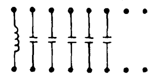
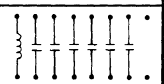
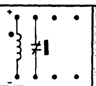
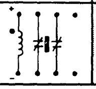
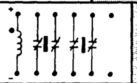
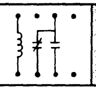
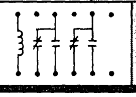
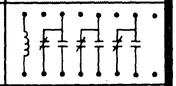
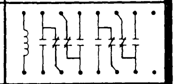
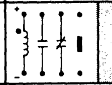
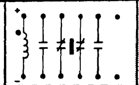
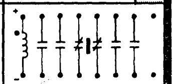
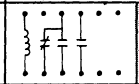
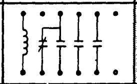
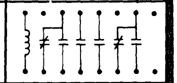
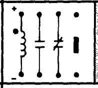
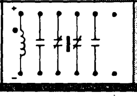
Series 1000

Dry and Mercury-Wetted

Contact ratings are maximum for resistive loads only and no single parameter should be exceeded.

TYPE REED	CONTACT (CLOSED)		CONTACT (OPEN)	
	RATING	RES. (OHMS)	INS. RES. (OHMS)	CAP. (pF)
A-B (DRY)	10W DC/12 VA AC (200V or 500mA)	.10	10^{12} MIN.	.2 NOM.
C (DRY)	3W DC/4 VA AC (50V or 250mA)	.15	10^{9} MIN.	.8 NOM.
A-B (Hg)	28W DC/30VA AC (125V or 1 AMP)	.05	10^{8} MIN.	.3 NOM.

DRY REED TYPES

Contact Form	Nominal		Res. Ohms	PART NO.	DWG.	Pin Diagram Bottom View
	Volts	mW				
1A	6	210	170	CR-1001-6	A	
	12		680	-12		
	24		2730	-24		
	32		4800	-32		
	48		10400	-48		
2A	6	340	105	CR-1002-6	B	
	12		420	-12		
	24		1680	-24		
	32		2950	-32		
	48		6720	-48		
3A	6	575	63	CR-1003-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
4A	6	575	63	CR-1004-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
5A	6	1000	36	CR-1005-6	D	
	12		144	-12		
	24		576	-24		
	32		1030	-32		
	48		2300	-48		
6A	6	1000	36	CR-1006-6	D	
	12		144	-12		
	24		576	-24		
	32		1030	-32		
	48		2300	-48		
1B *	6	340	105	CR-1021-6	B	
	12		420	-12		
	24		1680	-24		
	32		2950	-32		
	48		6720	-48		
2B *	6	340	105	CR-1022-6	B	
	12		420	-12		
	24		1680	-24		
	32		2950	-32		
	48		6720	-48		
4B *	6	575	63	CR-1024-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
1C **	6	220	160	CR-1041-6	B	
	12		640	-12		
	24		2560	-24		
	32		4500	-32		
	48		10240	-48		
2C **	6	360	100	CR-1042-6	C	
	12		400	-12		
	24		1600	-24		
	32		2800	-32		
	48		6400	-48		
3C **	6	650	55	CR-1043-6	D	
	12		220	-12		
	24		880	-24		
	32		1550	-32		
	48		3520	-48		
4C **	6	650	55	CR-1044-6	D	
	12		220	-12		
	24		880	-24		
	32		1550	-32		
	48		3520	-48		
1A-1B *‡	6	340	105	CR-1060-6	B	
	12		420	-12		
	24		1680	-24		
	32		2950	-32		
	48		6720	-48		
2A-2B *‡	6	575	63	CR-1061-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
4A-2B *‡	6	1000	36	CR-1062-6	D	
	12		144	-12		
	24		576	-24		
	32		1030	-32		
	48		2300	-48		
1A-1C **	6	360	100	CR-1070-6	C	
	12		400	-12		
	24		1600	-24		
	32		2800	-32		
	48		6400	-48		
2A-1C **	6	575	63	CR-1071-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
2A-2C **	6	650	55	CR-1072-6	D	
	12		220	-12		
	24		880	-24		
	32		1550	-32		
	48		3520	-48		
Hybrid 1C (1A-1B) *†	6	340	105	CR-1080-6	B	
	12		420	-12		
	24		1680	-24		
	32		2950	-32		
	48		6720	-48		
Hybrid 2C (2A-2B) *†	6	575	63	CR-1081-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		

*These relays contain bias magnets and correct input polarity must be observed. Red terminal indicates (+) coil input.

**These relays carry true Form C switches.

†Positive break before make for Form C switching when joined as pairs.

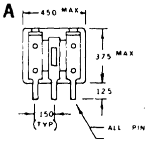
‡Break before make not guaranteed.

The Coto Series 1000 Miniature PCB Reed Relays offer the most comprehensive choice of switching parameters with pin terminations on the popular grid pattern of 1″ x .015″. Included are 21 contact combinations of Form A, B and C dry reeds and 11 combinations of Form A and B in mercury wetted types. The latter offer greatly expanded switching capability, and eliminate all contact bounce. Up to 6 poles per relay and 5 standard coil voltages are optional. In addition, special purpose reed switches, windings and terminal pin options, electrostatic and magnetic shielding may be specified.

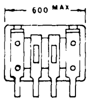
Drive coil windings have been carefully optomized to assure fast contact transfer. This is particularly important in relays carrying several reeds, since the first to close shunts out a disproportionate percent of flux unless adequate overdrive is available. Typical pull-in and drop-out is 1 mil/sec. and .5 mil/sec. respectively, including bounce and coil rise and fall time. Hg wetted reeds are somewhat slower, averaging 2 mil/sec. and 1 mil/sec. Operate times are exclusive of any delay introduced by contact protection devices. Reactive or high inrush loads will require contact protection, as with any type relay if maximum reliability and life are to be realized.

For information on contact protection request Technical Bulletin No. CS-1. For engineering assistance address Sales Engineering Dept. and include full details.

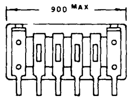
A



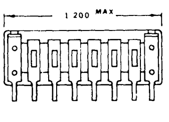
B



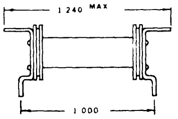
C



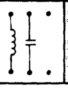
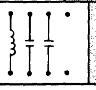
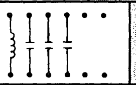
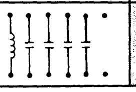
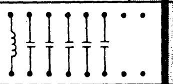
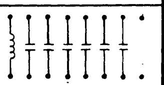
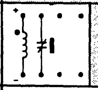
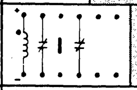
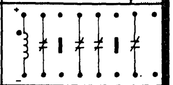
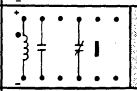
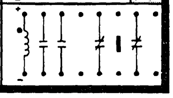
D



ALL



MERCURY-WETTED TYPES (Must be mounted within 35° of vertical)

Contact Form	Nominal		Res. Ohms	PART NO.	DWG.	Pin Diagram Bottom View
	Volts	mW				
1A	6	210	170	CR-1101-6	A	
	12		680	-12		
	24		2730	-24		
	32		4800	-32		
	48		10400	-48		
2A	6	340	105	CR-1102-6	B	
	12		420	-12		
	24		1680	-24		
	32		2950	-32		
	48		6720	-48		
3A	6	575	63	CR-1103-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
4A	6	575	63	CR-1104-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
5A	6	1000	36	CR-1105-6	D	
	12		144	-12		
	24		576	-24		
	32		1030	-32		
	48		2300	-48		
6A	6	1000	36	CR-1106-6	D	
	12		144	-12		
	24		576	-24		
	32		1030	-32		
	48		2300	-48		
1B *	6	340	105	CR-1121-6	B	
	12		420	-12		
	24		1680	-24		
	32		2950	-32		
	48		6720	-48		
2B *	6	575	63	CR-1122-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
4B *	6	1000	36	CR-1124-6	D	
	12		144	-12		
	24		576	-24		
	32		1030	-32		
	48		2300	-48		
1A-1B *‡	6	575	63	CR-1160-6	C	
	12		250	-12		
	24		1000	-24		
	32		1760	-32		
	48		4000	-48		
2A-2B *‡	6	1000	36	CR-1161-6	D	
	12		144	-12		
	24		576	-24		
	32		1030	-32		
	48		2300	-48		

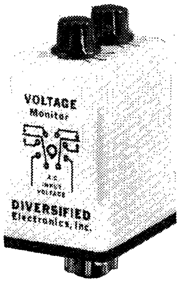
*These relays contain bias magnets and correct input polarity must be observed. Red terminal indicates (+) coil input.

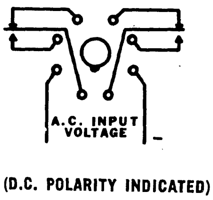
‡Break before make not guaranteed.

COTO-COIL CO., INC.

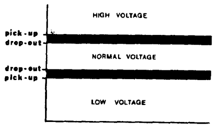
57 PAVILION AVE., PROVIDENCE, R. I. 02905
Telephone (401) 941-3355
Export Dept.: 13 E. 40th St., New York, N. Y. 10016

VB SERIES VOLTAGE BAND MONITOR/RELAY





(D.C. POLARITY INDICATED)



The VB Series offers protection to equipment which is required to operate between two voltage limits. The solid state monitor determines preselected under or over voltage conditions, and de-energizes an internal 10A DPDT control relay if these limits are exceeded. The monitor is equipped with time delay to accommodate start-up transients.

SPECIFICATIONS

RESPONSE TIME: Pickup: 30m. sec. Drop-out: 0.5 sec.
TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: DPDT Relay
10A @ 24VDC or 120VAC — 5A @ 240VAC Resistive
POWER REQUIRED: 3 Watts (Approx.)
ENCLOSURE: See Ordering Information. Drop-out time to 2.5 sec in "A" enclosure, to 5.0 sec in "F" enclosure available on request.

AC KNOB ADJUSTABLE:

Catalog No.	Nominal Voltage	No-Limit Pick-up	Hi-Limit Pick-up	Hyst. Voltage
VBA- 24-AKA	24VAC	19-24	24-29	2
VBA-120-AKA	120VAC	90-120	120-150	5
VBA-208-AKA	208VAC	185-208	208-240	8
VBA-240-AKA	240VAC	200-240	240-270	10

DC KNOB ADJUSTABLE:

VBA- 12-DKA	12VDC	10-12	12-15	1
VBA- 24-VDC	24VDC	19-24	24-29	1
VBA- 28-DKA	28VDC	22-28	28-34	1
VBA- 48-DKA	48VDC	38-48	48-58	2
VBA-110-DKA	110VDC	85-110	110-135	5
VBA-240-DKF	240VDC	200-240	240-270	10
VBA-305-DKF	305VDC	250-305	305-360	10

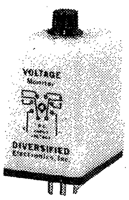
Inquire about special voltages, limit voltages, hysteresis, drop-out times, hook-ups and enclosures.

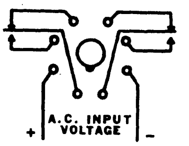
ORDERING INFORMATION

VBA - XXX - XXX

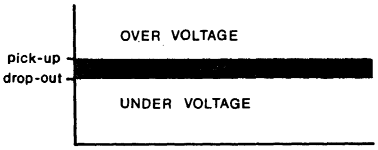
Voltage Band Monitor
Series
Nominal Voltage
Type of Voltage
A - AC — D - DC
Type of Operation — F - Fixed
K - Knob Adjustable — R - Resistor Adjustable
Enclosure Style — A - Dust Cover Plug-In
B - Sealed Plug-in — C - Sealed Hook Solder
D - Sealed Bracket Mount — F - Surface Mount

UO SERIES — OVER VOLT - UNDER VOLT MONITOR/RELAY





(D.C. POLARITY INDICATED)



The UO Series consists of a solid state voltage detector that senses a voltage greater than a preset "pick-up voltage" and causes an internal DPDT relay to operate. When the voltage drops to a preset "drop-out" voltage the output relay will de-energize. A hysteresis is set into each standard monitor to allow a differential between pickup and dropout. For specifications, see VB Series.

UO Series close differential relays with adjustable pick-up and drop out limits.

AC KNOB ADJUSTABLE:

Catalog No.	Drop-out Voltage	Pull-in Voltage	Hyst. Voltage
UOA- 24-AKA	19- 27VAC	21- 29VAC	2
UOA-120-AKA	97-130VAC	102-135VAC	5
UOA-208-AKA	177-222VAC	185-230VAC	8
UOA-240-AKA	205-250VAC	215-260VAC	10
UOA-440-AKF	370-462VAC	388-480VAC	18

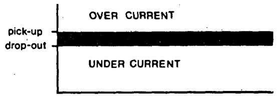
DC KNOB ADJUSTABLE:

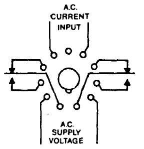
UOA- 12-DKA	9- 14VDC	10- 15VDC	1
UOA- 24-DKA	19- 27VDC	21- 29VDC	2
UOA- 48-DKA	38- 53VDC	40- 55VDC	2
UOA-110-DKA	92-125VDC	97-130VDC	5
UOA-240-DKF	205-250VDC	215-260VDC	10
UOA-305-DKF	260-335VDC	272-347VDC	12

FOR ORDERING INFORMATION SEE DIAGRAM ABOVE ON VB SERIES.

CM SERIES CURRENT MONITOR/RELAY • CT SERIES CURRENT TRANSFORMER

CURRENT
Monitor
DIVERSIFIED
Electronics, Inc.





The CM Series consists of a Solid State, magnetic, current detector which senses a current level. When the monitored current exceeds the trip point setting for a period greater than the response time, an internal 10 amp. DPDT relay will operate. A current decrease of at least 5% of trip point is required for relay to de-energize. The monitors are equipped with appropriate time delays to accommodate start-up transients and short-time line variations.

AC KNOB ADJUSTABLE — CM SERIES:

Catalog No.	Supply Voltage	Trip Point (Amps.)
CMA-120-AKA- 1	120VAC	0.2 - 1.0
CMA-120-AKA- 5	120VAC	1.0 - 5.0
CMA-120-AKA-10	120VAC	5.0 - 10.0

Also available for 240AC supply voltage.

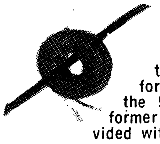
CT SERIES — CURRENT TRANSFORMER

Catalog No.	Current Ratio	Accuracy	Capacity	Max. Dia. of Primary
CT 50/5	50/5	6.0%	2V.A.	1"
CT 100/5	100/5	3.0%	2V.A.	1"

Also available in 25, 500, 1000 and 2500 amps.

SPECIFICATIONS

RESPONSE TIME: Operate: 1 sec. Release: 30m. sec.
CURRENT DIFFERENTIAL: 5% of Trip Point
TRIP POINT (FIXED): ±10% of setting
TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: DPDT Relay — Resistive
10A @ 28VDC or 120VAC — 5A @ 240VAC
SUPPLY POWER (AUXILIARY): 3 Watts (Approx.)



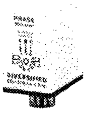
The CT Series designed to be used with the CM Series monitors, when AC currents above 10 amps. are to be detected. This torroidal transformer is used to extend the range of the 5 amp. current monitor. The transformer slips over a conductor and is provided with a secondary lead length of 24 in.

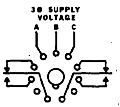
ORDERING INFORMATION

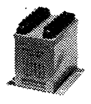
CMA - XXX - XXX - XX

Current Monitor
Series
Supply Voltage
Type of Current — A - AC
Type of Operation — F - Fixed
K - Knob Adjustable — R - Resistor Adjustable
Enclosure Style — A - Dust Cover
B - Sealed Plug-in — C - Sealed Hook Solder
D - Sealed Bracket Mount
F - Surface Mount (Screw Terminals)
Trip Point

SL SERIES PHASE SEQUENCE & LOSS MONITOR/RELAY







The SL Series is designed for use in applications where motor rotation or connection to the power line is critical, or where loss of one or more phases may cause damage to electrical equipment. If the phase sequence is correct and full-line voltage is present on all three phases, the internal relay will be energized. If one or more phase is lost or if the phase sequence is reversed, the control relay will de-energize.

SPECIFICATIONS

RESPONSE TIME: Pickup: 30m sec. Drop-out: 0.5 sec.
TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: DPDT Relay
10A @ 24VDC or 120VAC—5A @ 240VAC Resistive
POWER REQUIRED: 3 Watts (Approx.)
ENCLOSURE: See ordering information. Drop-out time to 2.5 sec in "A" enclosure, to 5.0 sec in "F" enclosure.

ORDERING INFORMATION

SLA - XXX - XXX - X

Phase Sequence and Loss Monitor
Series
Nominal Voltage
Type of Voltage — A - AC
Type of Operator — F - Fixed — K - Knob Adjustable
Enclosure Style — A - Dust Cover Plug-in
F - Surface Mount
Phase Sequence — A - ABC

AC FIXED:

Catalog No.	3ϕ Supply Voltage	Drop-Out % of Nominal Voltage One Phase Low	All Phases Low
SLA-208-AFA-A	208	83%	90%
SLA-220-AFA-A	220	83%	90%
SLA-240-AFA-A	240	83%	90%
SLA-440-AFF-A	440	83%	90%
SLA-480-AFF-A	480	83%	90%

AC KNOB ADJUSTABLE:

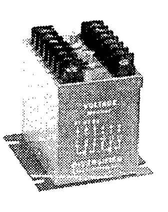
SLA-230-AKA-A	208-240	160-240
SLA-230-AKF-A	208-240	160-240
SLA-440-AKF-A	430-480	355-480

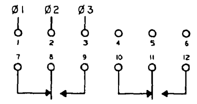
Available in 50, 60 and 400 Hz. Specify frequency when ordering.

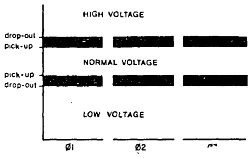
DIVERSIFIED Electronics, Inc.

BOX 6231, EVANSVILLE, INDIANA 47712
PHONE: AREA CODE 812 - 424-2288 424-5596

PB SERIES 3 PHASE VOLTAGE BAND MONITOR/RELAY



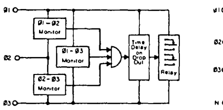


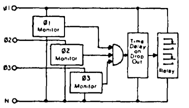


SPECIFICATIONS

RESPONSE TIME: Pickup: 30m. sec. Drop-out: 0.5 sec.
TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C
RATED OUTPUT: DPDT Relay
10A @ 24VDC or 120VAC — 5A @ 240VAC Resistive
POWER REQUIRED: 3 Watts (Approx.)
Drop-out time to 5.0 sec available on request.

The PB Series offers protection to three phase equipment which is required to operate between two voltage limits. The three phases are monitored for a preselected under or over limit. An internal control relay is de-energized when the voltage goes outside of these limits. This device provides both under and over voltage monitoring of each phase of a Delta or Y system in one package. The monitors are equipped with a drop out time delay to accommodate start-up transients. With normal operating voltages on all phases, an internal relay will be energized. If the voltage on any phase goes above or below the drop-out limit, the signal to the time delay will be removed. If this out-of-limit condition exists on any phase, for a period longer than the release time of the time delay, the output relay will de-energize.





AC KNOB ADJUSTABLE:

Catalog No.	Low-Limit	Hi-Limit	Hyst. Voltage
PBA-120-AKF-D	90 - 120	120 - 150	5
PBA-208-AKF-D	185 - 208	208 - 240	8
PBA-240-AKF-D	200 - 240	240 - 270	8
PBA-208-AKF-Y	185 - 208	208 - 240	8

All voltages — phase to phase.

UPA SERIES: 3-PHASE UNDER VOLTAGE MONITOR for under voltage operation. Each phase is monitored for a pre-selected under voltage condition. When the monitored voltage drops below the drop-out voltage set point the internal DPDT 10 amp relay drops out. When it rises above the pick-up voltage set point the relay picks-up. Available in Delta or Wye in fixed or knob adjustable voltages.

AC KNOB ADJUSTABLE

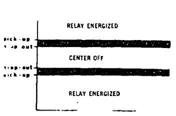
Catalog No.	Low-Limit	HYST Voltage
UPA-120-AKF-D	90-120	5
UPA-208-AKF-D	185-208	8
UPA-240-AKF-D	200-240	8
UPA-208-AKF-Y	185-208	8

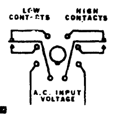
UP series close differential relays available with adjustable pick-up and drop-out limits.

ORDERING INFORMATION PBA - XXX - XXX - X

Series
Voltage Band Monitor
Nominal Voltage
Type of Voltage — A - AC
Type of Operation
F - Fixed — K - Knob Adjustable
Enclosure Style
F - Surface Mount "Screw Terminals"
Connection — D - Delta — Y - Wye

VBC SERIES VOLTAGE BAND CONTROL RELAY





Solid state voltage sensors determine preselected low or high voltage condition and control a center-off or neutral relay. Under normal voltage, the relay remains de-energized in a center-off or neutral position. The control relay energizes and the relay contacts transfer to one side or the other when a high or low voltage limit is exceeded.

The Voltage Band Control Relay is designed for applications where it is required that the voltage be maintained between two specified voltage limits. It is used in applications of differential control, voltage unbalance sensing, servomechanism control, process control, and where voltage regulation is required.
The Voltage Band Control Relay is available in two models: fixed and knob adpustable. The fixed unit has the limits set at the factory. The knob adjustable unit allows the limits to be set according to requirements.

Catalog No.	Nom. Voltage	Low-Limit Drop-out	High-Limit Drop-out	Hyst. Voltage
VBC-120-AKA	120VAC	105 - 120	120 - 135	1VAC
VBC-208-AKA	208VAC	188 - 208	208 - 228	2VAC
VBC-220-AKA	220VAC	200 - 220	220 - 240	2VAC
VBC-240-AKA	240VAC	220 - 240	240 - 260	2VAC

DC KNOB ADJUSTABLE

Catalog No.	Nominal Voltage	No-Limit Pick-up	Hi-Limit Pick-up	Hyst. Voltage
VBC- 12-DKA	12VDC	10-12	12-14	0.5
VBC- 24-DKA	24VDC	20-24	24-28	1
VBC- 48-DKA	48VDC	40-48	48-56	1
VBC-110-DKF	110VDC	95-110	110-125	2
VBC-240-DKF	240VDC	220-240	240-260	2
VBC-305-DKF	305VDC	280-305	305-330	3

SPECIFICATIONS

RESPONSE TIME: 25m. sec. (typical)

TEMPERATURE: Operating: 0°C — +55°C
Storage: −45°C — +85°C

RATED OUTPUT: Relay*
5 Amp @ 120VAC Resistive
2 Amp @ 240VAC Resistive

POWER REQUIREMENT: 3 Watts (Approx.)

* An internal lockout circuit prevents the low voltage relay or the high voltage relay from being energized at the same time.

Special voltage limits and fixed control available from factory. Specify nominal voltage, limits and hysteresis.

TD SERIES SOLID STATE TIME DELAY RELAYS

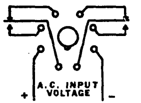


Fig. 1.

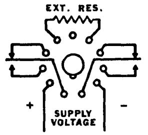


Fig. 2.

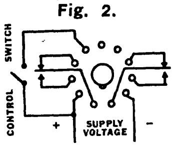


Fig. 3.

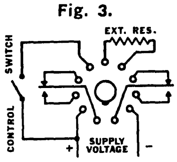


Fig. 4.

D.C. POLARITY INDICATED

TDA SERIES — DELAY ON OPERATE

(If voltage is removed before time out, relay contacts may momentarily pick up and drop out)

EXT. RES. ADJUSTABLE — Fig. 2

Catalog No.	Input Voltage	Delay Time (Sec)	Ext.Res. Max. Time
TDA- 24-DRA-010	24VDC	.1 to 10	200K
TDA- 24-ARA-010	24VAC	.1 to 10	200K
TDA-120-ARA-010	120VAC	.1 to 10	200K
TDA-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 1

Catalog No.	Input Voltage	Delay Time(Sec)
TDA- 24-DKA-010	24VDC	.1 to 10
TDA- 24-AKA-010	24VAC	.1 to 10
TDA-120-AKA-010	120VAC	.1 to 10
TDA-120-AKA-200	120VAC	2 to 200

FIXED — Fig 1

TDA- 24-DFA-010	24VDC	10
TDA- 24-AFA-010	24VDC	10
TDA-120-AFA-010	120VAC	10

TDB SERIES — INTERVAL ON OPERATE

(If voltage is removed before time out, timer will reset)

EXT. RES. ADJUSTABLE — Fig. 2

Catalog No.	Input Voltage	Delay Time (Sec)	Ext.Res. Max. Time
TDB- 24-DRA-010	24VDC	.1 to 10	1 Meg
TDB- 24-ARA-010	24VAC	.1 to 10	1 Meg
TDB-120-ARA-010	120VAC	.1 to 10	1 Meg
TDB-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 1

Catalog No.	Input Voltage	Delay Time(Sec)
TDB- 24-DKA-010	24VDC	.1 to 10
TDB- 24-AKA-010	24VAC	.1 to 10
TDB-120-AKA-010	120VAC	.1 to 10
TDB-120-AKA-200	120VAC	2 to 200

FIXED — Fig 1

TDB- 24-DFA-010	24VDC	10
TDB- 24-AFA-010	24VDC	10
TDB-120-AFA-010	120VAC	10

TDC SERIES — DELAY ON OPERATE

(If voltage is removed before time out, timer will reset and relay contacts will not pick up.)

EXT. RES. ADJUSTABLE — Fig. 2

Catalog No.	Input Voltage	Delay Time (Sec)	Ext.Res. Max. Time
TDC- 24-DRA-010	24VDC	.1 to 10	1 Meg
TDC- 24-ARA-010	24VAC	.1 to 10	1 Meg
TDC-120-ARA-010	120VAC	.1 to 10	1 Meg
TDC-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 1

Catalog No.	Input Voltage	Delay Time(Sec)
TDC- 24-DKA-010	24VDC	.1 to 10
TDC- 24-AKA-010	24VAC	.1 to 10
TDC-120-AKA-010	120VAC	.1 to 10
TDC-120-AKA-200	120VAC	2 to 200

FIXED — Fig 1

TDC- 24-DFA-010	24VDC	10
TDC- 24-AFA-010	24VDC	10
TDC-120-AFA-010	120VAC	10

TDD SERIES — DELAY ON RELEASE

(If control switch is re-closed before time out, timer will reset)

EXT. RES. ADJUSTABLE — Fig. 4

Catalog No.	Input Voltage	Delay Time (Sec)	Ext.Res. Max. Time
TDD- 24-DRA-010	24VDC	.1 to 10	1 Meg
TDD- 24-ARA-010	24VAC	.1 to 10	1 Meg
TDD-120-ARA-010	120VAC	.1 to 10	1 Meg
TDD-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 3

Catalog No.	Input Voltage	Delay Time(Sec)
TDD- 24-DKA-010	24VDC	.1 to 10
TDD- 24-AKA-010	24VAC	.1 to 10
TDD-120-AKA-010	120VAC	.1 to 10
TDD-120-AKA-200	120VAC	2 to 200

FIXED — Fig 3

TDD- 24-DFA-010	24VDC	10
TDD- 24-AFA-010	24VDC	10
TDD-120-AFA-010	120VAC	10

TDE SERIES — SINGLE SHOT

(Timer resets automatically at end of delay period)

EXT. RES. ADJUSTABLE — Fig. 4

Catalog No.	Input Voltage	Delay Time (Sec)	Ext.Res. Max. Time
TDE- 24-DRA-010	24VDC	.1 to 10	1 Meg
TDE- 24-ARA-010	24VAC	.1 to 10	1 Meg
TDE-120-ARA-010	120VAC	.1 to 10	1 Meg
TDE-120-ARA-200	120VAC	2 to 200	2 Meg

KNOB ADJUSTABLE — Fig. 3

Catalog No.	Input Voltage	Delay Time(Sec)
TDE- 24-DKA-010	24VDC	.1 to 10
TDE- 24-AKA-010	24VAC	.1 to 10
TDE-120-AKA-010	120VAC	.1 to 10
TDE-120-AKA-200	120VAC	2 to 200

FIXED — Fig 3

TDE- 24-DFA-010	24VDC	10
TDE- 24-AFA-010	24VDC	10
TDE-120-AFA-010	120VAC	10

ORDERING INFORMATION

Time Delay TDX - XXX - XXX - XXX
Series
Nominal Voltage
Type of Voltage — A - AC — D - DC
Type of Operation — F - Fixed
K - Knob Adjustable — R - Resistor Adjustable
Enclosure Style — A - Dust Cover — B - Sealed Plug-In
C - Sealed Hooked Solder — D - Sealed Bracket Mount
E - Panel Mount — F - Surface Mount
Time Delay (in seconds) — 001 = 1 sec 010 = 10 sec 100 = 100 sec etc.

CONTACT FACTORY FOR YOUR SPECIAL REQUIREMENTS OR MODIFICATIONS TO STANDARD UNITS.

INQUIRE about other products:
Frequency Sensitive Relays • Paralleling Relays
Inverse Curent Relays • Crank Cycle Timers

For more detailed information send for Industrial Catalog #100.

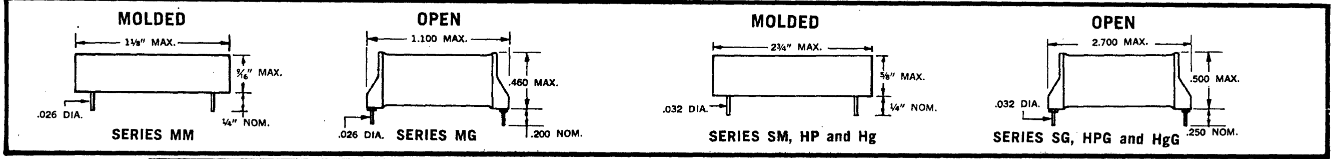
DIVERSIFIED Electronics, Inc.

BOX 6231, EVANSVILLE, INDIANA 47712
PHONE: AREA CODE 812 - 424-2288 424-5596

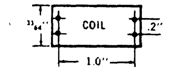
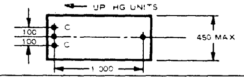
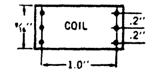
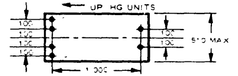
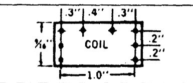
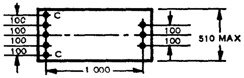
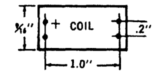
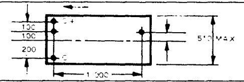
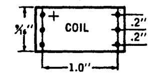
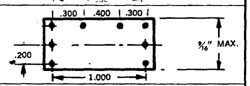
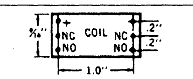
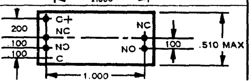
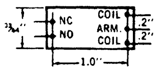
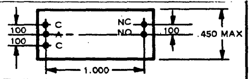
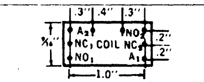
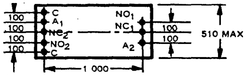
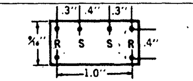
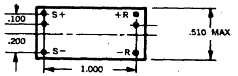
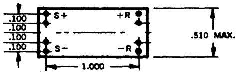
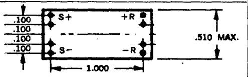
Douglas Randall

DIVISION OF WALTER KIDDE & COMPANY, INC. • 6 PAWCATUCK AVE., PAWCATUCK, CONN. 02891 • (203) 599-1750

Kidde



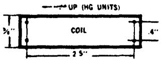
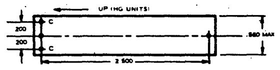
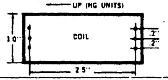
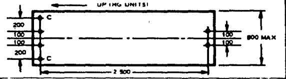
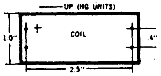
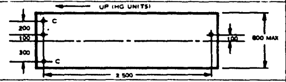
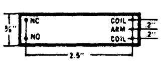
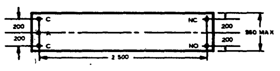
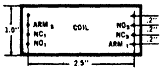
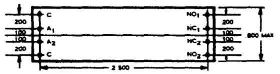
MINIATURE REED RELAYS

Contact Form	Nominal VDC	Part Number	D.C.R. Ω ±10% @ 25°C	Terminal Layout (Bottom View)	Part Number	D.C.R. Ω ±10% @ 25°C	Terminal Layout (Bottom View)
1A*	6 12 24	6MM1A 12MM1A 24MM1A	250 1000 4000		6MG1A 12MG1A 24MG1A	250 1000 4000	
2A*	6 12 24	6MM2A 12MM2A 24MM2A	170 675 2700		6MG2A 12MG2A 24MG2A	170 675 2700	
3A	6 12 24	6MM3A 12MM3A 24MM3A	110 450 1800		6MG3A 12MG3A 24MG3A	110 450 1800	
1B*	6 12 24	6MM1B 12MM1B 24MM1B	170 675 2700		6MG1B 12MG1B 24MG1B	170 675 2700	
2B	6 12 24	6MM2B 12MM2B 24MM2B	110 450 1800		6MG2B 12MG2B 24MG2B	110 450 1800	
1A1B*	6 12 24	6MM1A1B 12MM1A1B 24MM1A1B	110 450 1800		6MG1A1B 12MG1A1B 24MG1A1B	110 450 1800	
1C	6 12 24	6MM1C 12MM1C 24MM1C	250 1000 4000		6MG1C 12MG1C 24MG1C	250 1000 4000	
2C	6 12 24	6MM2C 12MM2C 24MM2C	170 675 2700		6MG2C 12MG2C 24MG2C	170 675 2700	
1A (Latching)	6 12 24	6MML1A 12MML1A 24MML1A	85/85 340/340 1350/1350		6MGL1A 12MGL1A 24MGL1A	85/85 340/340 1350/1350	
2A (Latching)	6 12 24	6MML2A 12MML2A 24MML2A	55/55 225/225 900/900		6MGL2A 12MGL2A 24MGL2A	55/55 225/225 900/900	

CONTACT RATING: SERIES MM & MG
FORM A & B UNITS: 10W or 12VA (500ma or 250V max.).
FORM C UNITS: 3W (250ma or 28V max.).
CONTACT RESISTANCE: .150 ohms max initial.

* Mercury Wetted Contacts are available in these forms.
CONTACT RATING: 1A or 28VDC max.
CONTACT RESISTANCE: 50 milliohms max.

STANDARD REED RELAYS

Contact Form	Nominal VDC	Part Number	D.C.R. Ω ±10% @ 25°C	Terminal Layout (Bottom View)	Part Number	D.C.R. Ω ±10% @ 25°C	Terminal Layout (Bottom View)
1A*	6 12 24	6SM1A 12SM1A 24SM1A	180 725 2900		6SG1A 12SG1A 24SG1A	180 720 2880	
2A*	6 12 24	6SM2A 12SM2A 24SM2A	175 700 2750		6SG2A 12SG2A 24SG2A	110 440 1760	
1B*	6 12 24	6SM1B 12SM1B 24SM1B	175 700 2750		6SG1B 12SG1B 24SG1B	110 440 1760	
1C	6 12 24	6SM1C 12SM1C 24SM1C	180 725 2900		6SG1C 12SG1C 24SG1C	180 720 2880	
2C	6 12 24	6SM2C 12SM2C 24SM2C	175 700 2750		6SG2C 12SG2C 24SG2C	110 440 1760	

SERIES SM AND SG
CONTACT RATING:
FORM A & B UNITS: 15W or 15VA (1 amp. or .250V max.).
FORM C UNITS: 3W (500 ma or 250V max.).
CONTACT RESISTANCE:
FORM A & B UNITS: .075 ohms max. initial.
FORM C UNITS: .100 ohms max. initial.

SERIES HP (MOLDED) AND HPG (OPEN)
Available in the above arrangements:
CONTACT RATING:
FORM A & B UNITS: 50W or 50VA (3 amp. or 1000V max.).
FORM C UNITS: 20W (1 amp. or 300V max.).
CONTACT RESISTANCE:
FORM A & B UNITS: .200 ohms max. initial.
FORM C UNITS: .250 ohms max initial.

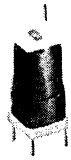
***SERIES Hg and SERIES HgG**
Standard size mercury wetted contact relay available with following rating:
CONTACT RATING: 3 amp. or 250VDC max.
CONTACT RESISTANCE: 35 milliohms max.

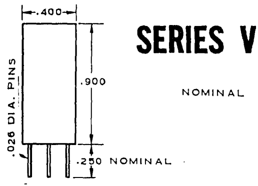
Douglas Randall

DIVISION OF WALTER KIDDE & COMPANY, INC. • 6 PAWCATUCK AVE., PAWCATUCK, CONN. 02891 • (203) 599-1750

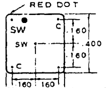
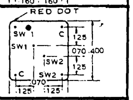
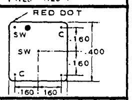
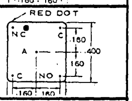
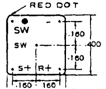
VERTI REED RELAYS — SERIES VR

Mount in 0.4″ square



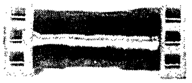

.400
.026 DIA. PINS
.900
NOMINAL
.250 NOMINAL

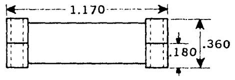
COIL DATA

Contact Arrangement	Nominal Voltage	Part Number	DCR Ohms ±10%	Terminal Layout (Bottom View)
1A	6 12 24	6 VR1A 12 VR1A 24 VR1A	225 900 3600	 RED DOT SW C .160 .400 .160
2A	6 12 24	6 VR2A 12 VR2A 24 VR2A	145 575 2300	 RED DOT SW1 SW2 C .125 .070 .400
1B	6 12 24	6 VR1B 12 VR1B 24 VR1B	225 900 3600	 RED DOT SW C .160 .400
1C	6 12 24	6 VR1C 12 VR1C 24 VR1C	225 900 3600	 RED DOT NC A NO C .160 .400
1A Latching	6 12 24	6 VRL1A 12 VRL1A 24 VRL1A	105/105 425/425 1700/1700	 RED DOT SW S+ R+ .160 .400

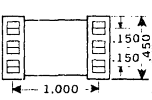
SNAP IN RELAYS — SERIES SI

For use with BERG-PAC 45590 terminals



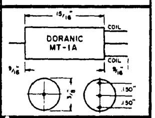
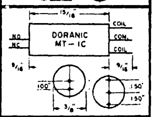

1.170
.180
.360

COIL DATA

Contact Arrangement	Nominal Voltage	Part Number	DCR Ohms ±10%	Dimensions and Terminal Locations
1A	6 12 24	6 SI1A 12 SI1A 24 SI1A	250 1000 4000	 .150 .150 .450 1.000

TUBULAR RELAYS — SERIES MT

COIL DATA

Contact Arrangement	Nominal Voltage	Part Number	DCR Ohms ±10%	Dimensions and Terminal Layout
1A	6 12 24	6 MT1A 12 MT1A 24 MT1A	185 750 3000	 DORANIC MT-1A COIL .150" .150"
1C	6 12 24	6 MT1C 12 MT1C 24 MT1C	185 750 3000	 DORANIC MT – IC NO NC COM. COIL 9/16" .100" .150" 3/8"

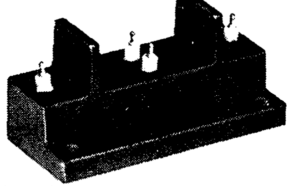
CONTACT DATA — SERIES VR, SI & MT

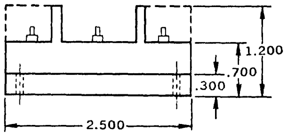
Contact Form	Maximum Resistive Load				Initial Resistance
A or B	10W	12VA	.5A	250VDC	.150 Ohms
C	3W	3VA	.250A	100VDC	.200 Ohms

ENVIRONMENTAL DATA

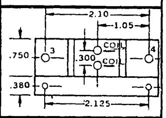
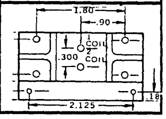
Temperature	Vibration	Shock
−20°C to +65°C	2000 cps to 20g	30g

HIGH VOLTAGE RELAYS — SERIES HV




1.200
.700
.300
2.500

COIL DATA

Contact Arrangement	Nominal Voltage	Part Number	DCR Ohms ±10%	Terminal Layout (Top View)
1A	6 12 24	6 HV1A 12 HV1A 24 HV1A	25 100 400	 2.10 1.05 .750 .300 .380 COIL 2.125
2A	6 12 24	6 HV2A 12 HV2A 24 HV2A	20 80 320	 1.80 .90 .300 COIL .18 2.125

CONTACT DATA

Series	Maximum Resistive Rating			Breakdown Voltage (min.)	Initial Resistance
35	3,5000VDC	3.0A	50W	5,000VDC	.100 Ohms
75	7,500VDC	3.0A	50W	10,000VDC	.100 Ohms
100	10,000VDC	3.0A	50W	12,500VDC	.100 Ohms

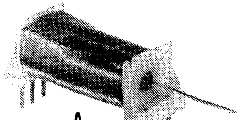
OPTION:

Relays also available in Form B up to 7500 VDC.

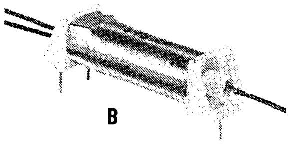
NOTE:
To order, specify as follows: 6 HV1A 35 is a 6 HV1A relay with 3,500 VDC switch.

SPECIAL DESIGNS

HIGH INSULATION RESISTANCE RELAYS



A



B

Two typical designs are shown above:

A — A miniature reed relay with a floating lead to maintain high IR.

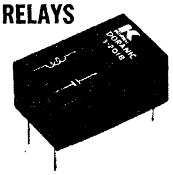
B — This is a relay using Form A and Form B switches timed to provide a Form C (break before make) function with flying leads to maintain 10^{13} ohms.

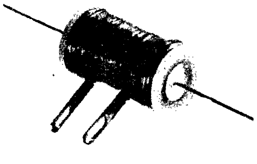
HIGH TEMPERATURE RELAYS

Use of Class H insulation throughout and design of the coil to provide good contact pressure over a wide temperature range make this relay suitable for 180°C operation.

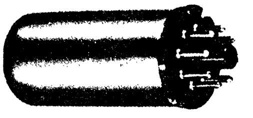
HIGH SENSITIVITY RELAYS

The relays shown will operate at 10MW coil power.





PLUG-IN RELAYS

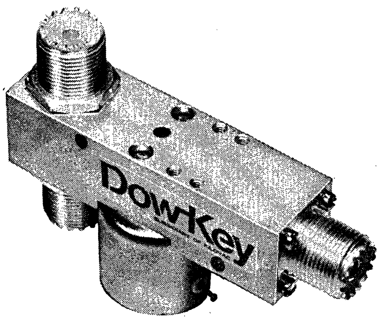


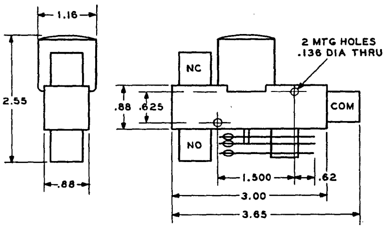
Reed relays are easily adapted to standard style headers for socket mounting.

DowKey
DIVISION OF KILOVAC CORPORATION

P. O. BOX 4422 • SANTA BARBARA, CALIFORNIA 93103
TELEPHONE (805) 684-4560 • TWX 910/336-1141

SERIES 60 SPDT
Remote Coaxial Relay





FEATURES – The Series 60 are remote operation, ruggedly constructed, SPDT coaxial relays designed for operation from low-level to 1 KW. They are offered with or without 2 Form C auxiliary contacts. For transmitter-receive applications they are available with a special high isolation "G" connector at the NC or receive position. This "G" connector increases the isolation to greater than −100 db at frequencies up to 500 MHz, although it reduces the power rating through this connector to 20 watts. "G" connectors will increase the listed VSWR above 400 MHz.

Typical electrical characteristics are shown below when used in a 50 ohm transmission line. UHF connectors and solder terminals are not recommended above 400 MHz.

SPECIFICATIONS

Operating Time . . . . 25 ms
Auxiliary Contact Rating . . . . 5 amps 115 Vac

MECHANICAL DATA

Life expectancy . . . . 1,000,000 cycles
Weight . . . . 12 oz. approx.
Finish
RF Contacts . . . . Gold Plate
Auxiliary Contacts . . . . Gold Plate

ENVIRONMENTAL DATA

(Per MIL-S-3928B)
Temperature . . . . −55°C to +85°C

MODIFICATIONS

Available on special order:

1. Moisture sealing of all entrances to RF portions. (Call for a special number)
2. Microswitch type auxiliary contacts.

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *60-260442 is the SPDT relay with UHF connectors for 115V AC operation with 2C auxiliary contacts.*

CONNECTORS AND PART NUMBERS

Connector Type	Std. SPDT	With 2C Aux. Contacts	With NC "G" Conn.	With 2C Aux. & NC "G"
UHF	60-XX04	60-XX0442	60-XX28	60-XX2842
50 ohm N	60-XX01	60-XX0142	60-XX25	60-XX2542
75 ohm N	60-XX14	60-XX1442	60-XX30	60-XX3042
BNC	60-XX02	60-XX0242	60-XX26	60-XX2642
TNC	60-XX03	60-XX0342	60-XX27	60-XX2742
C	60-XX05	60-XX0542	60-XX29	60-XX2942
Solder Terminals	60-XX19	60-XX1942	60-XX35	60-XX3542

ELECTRICAL CHARACTERISTICS

Freq. Mhz	VSWR	Isolation Loss —db.	Insertion Loss —db.	RF Power Rating
0-50	1.05	45	.05	1 KW
100	1.06	40	.05	1 KW
400	1.12	30	.1	750 W
1000	1.3	25	.15	500 W

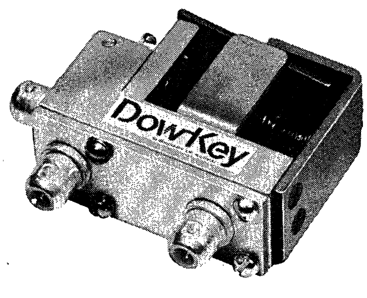
COIL CHARACTERISTICS

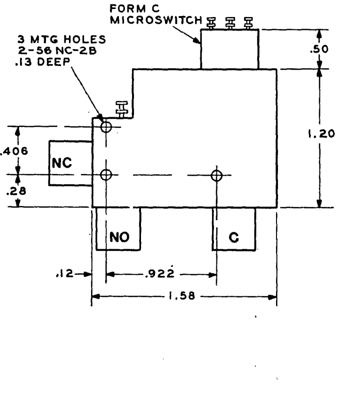
(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volts	Voltage Range	Resistance Ohms
21	6 DC	5-7	12
22	12 DC	9.5-14	48
23	26 DC	19-31	245
24	48 DC	40-54	770
25	110 DC	90-125	4000
26	115 AC	100-125	245 *
27	220 AC	200-240	770 *
28	6 AC	5-7	.8 *
29	24 AC	20-28	12 *
60	115 AC	100-125	Diode Rect.**

*Intermittent duty **Continuous duty

SERIES 61 SPDT
Remote Coaxial Relay





FEATURES – The series 61 are small SPDT switches for military and severe environmental applications and designed to withstand the applicable requirements of specification MIL-S-3928B. The balanced armature actuator prevents contact chatter under high frequency vibration and severe shock. They are offered with many types of connectors and 1 or 2 Form C microswitch auxiliary contacts. Gold finished contacts provide reliable operation at low levels.

SPECIFICATIONS

Operating Time . . . . 15 ms. max.
Auxiliary Contact Rating . . . . . 5 amps. 115 Vac

MECHANICAL DATA

Life Expectancy . . . . 10^6 cycles
Weight . . . . 3½ – 4½ oz.

Finish
RF Surfaces . . . . Silver Plate
Magnetic Parts . . . . Nickel

ENVIRONMENTAL DATA

(Per MIL-S-3928B)

Temperature . . . . -55°C + 125°C
Salt Spray . . . . 48 Hrs
Humidity . . . . 10 days
Vibration (Test condition A) . . . . 10 g's to 2000 Hz
Shock . . . . 15 g's

MODIFICATIONS

Available on special order:

Combinations of connectors.
Mounting holes on opposite side of block.
add suffix R to part number for this modification.
Attached small cables.

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *61-240312 is SPDT switch with TNC connectors, 48 DC Coil and 1 Form C microswitch.*

CONNECTORS AND PART NUMBERS

Connector Type	SPDT	With 1C Microswitch	With 2C Microswitch
BNC	61-XX02	61-XX0212	61-XX0222
TNC	61-XX03	61-XX0312	61-XX0322
TM	61-XX07	61-XX0712	61-XX0722
MIN. S50 SCREW TYPE	61-XX12	61-XX1212	61-XX1222
MIN. S70 SCREW TYPE	61-XX17	61-XX1712	61-XX1722
MIL-C-22557 50 ohm	61-XX10	61-XX1012	61-XX1022
MIL-C-22557 75 ohm	61-XX15	61-XX1512	61-XX1522
SOLDER TERMINALS	61-XX19	61-XX1912	61-XX1922
OSM	61-XX08	61-XX0812	61-XX0822

ELECTRICAL CHARACTERISTICS

Typical high frequency measurements in a 50 ohm transmission line. (75 ohm line for 75 ohm units.)

Freq. MHz	VSWR	Isolation Loss —db.	Insertion Loss —db.	RF Power Rating
50	1.03	60	.03	150 W
100	1.05	52	.05	125 W
400	1.12	40	.1	100 W
1000	1.18	30	.15	75 W

COIL CHARACTERISTICS

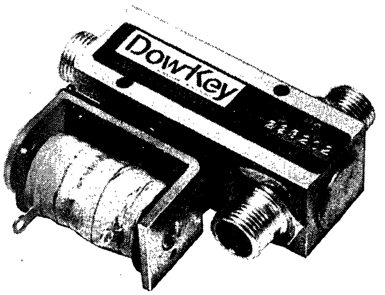
(Part No. Digits to replace XX on Connector Part No.)

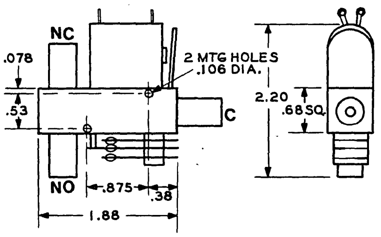
Part No. Digits	Nominal Volts	Voltage Range	Resistance Ohms ±10 %
21	6 DC	4.5-7	12
22	12 DC	9-14	60
23	26 DC	19-31	275
24	48 DC	38-54	1030
25	110 DC	90-125	5000

DowKey
DIVISION OF KILOVAC CORPORATION

P. O. BOX 4422 • SANTA BARBARA, CALIFORNIA 93103
TELEPHONE (805) 684-4560 • TWX 910/336-1141

SERIES 77 SPDT
Remote Coaxial Relay





FEATURES – The Series 77 are medium size, light weight, low priced coaxial relays for industrial and less critical military applications. The "T" shaped connector configuration has the common connector at one end and the NO and NC connectors 180° apart at the other end. They are available with or without 1 Form C auxiliary contacts.

SPECIFICATIONS

Operating Time . . . . 15 ms. max.

MECHANICAL DATA

Weight . . . . 3 oz.
Life expectancy . . . . 10^6 min. cycles

Finish
Connectors . . . . Silver Plate
Block . . . . Irridite
Magnetic Parts . . . . Nickel
RF Contacts . . . . Gold Plate

ENVIRONMENTAL DATA

(Per MIL-S-3928 B)
Shock . . . . 15 g's –11 ms
Vibration . . . . 10 g's to 55 Hz
Temperature . . . . –55°C to +85°C
Salt Spray . . . . 48 Hrs.
Humidity . . . . 10 days

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *77-230932 is SPDT Relay with phono conns, 1 C aux. contacts and 26 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Standard SPDT	With 1C Aux. Contacts
BNC	77-XX02	77-XX0232
TNC	77-XX03	77-XX0332
Phono	77-XX09	77-XX0932
*"F"	77-XX32	77-XX3232
**RG-58/U Cables	77-XX22	77-XX2232

*Especially suitable for CATV use
**Standard with 2 ft. cable length

ELECTRICAL CHARACTERISTICS

Typical high frequency measurements in a 50 ohm transmission line (75 ohm for type F).

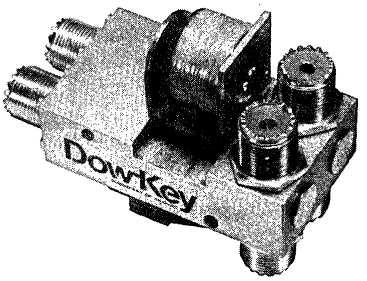
Freq. MHz	VSWR	Isolation Loss —db	Insertion Loss—db.	RF Power Rating
50	1.03	55	.03	150 W
100	1.05	51	.04	125 W
200	1.07	45	.05	100 W
400	1.1	40	.1	100 W
800	1.2	36	.15	80 W
1200	1.35	31	.2	60 W

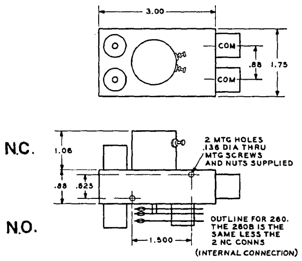
COIL CHARACTERISTICS

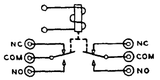
(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resistance Ohms ±10%
21	6 VDC	4.5-7	20
22	12 VDC	9-14	70
23	26 VDC	19-31	290
24	48 VDC	38-54	1000
25	110 VDC	90-125	5000
26	115 VAC	90-130	Diode Rect.

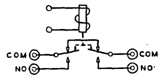
SERIES 260/260B DPDT
Remote Coaxial Relay




3.00
COM
COM
.88
1.75
N.C.
1.06
.88
.825
N.O.
1.500
2 MTG HOLES .136 DIA THRU MTG SCREWS AND NUTS SUPPLIED
OUTLINE FOR 260. THE 260B IS THE SAME LESS THE 2 NC CONNS (INTERNAL CONNECTION)



260 SCHEMATIC



260B SCHEMATIC

FEATURES – These are remote operation, ruggedly constructed, coaxial relays designed for operation from low level to 1 KW. There are two basic types: The 260 is a standard DPDT switch with 6 connectors. The 260B is a similar item, except there is an internal connection between the NC contacts, leaving only 4 connectors. The latter type is widely used for inserting a circuit element, such as a power amplifier, between two normally connected elements, such as an exciter and antenna.

Both types are offered with a wide variety of connectors and coil voltages and with or without auxiliary contacts.

SPECIFICATIONS

Operating Time . . . . 25 ms
Auxiliary Contact Rating . . . . 5 amps 115 Vac

MECHANICAL DATA

Life expectancy . . . . 1,000,000 cycles
Weight . . . . 12 oz. approx.

Finish
RF Contacts . . . . Gold Plate
Auxiliary Contacts . . . . Gold Plate

ENVIRONMENTAL DATA

(Per MIL-S-3928B)
Temperature . . . . –55°C to +85°C

MODIFICATIONS

Available on special order:

1. "G" type high isolation connectors on NO or NC.
2. NC connectors on the 260B in place of the standard NO.
3. Microswitch type auxiliary contacts.

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *260B-260442 is the 260B with UHF connectors, 115 AC Coil and 2 Form C auxiliary contacts.*

CONNECTORS AND PART NUMBERS

Connector Type	Series 260 Standard	Series 260 With 2C Aux. Contacts	Series 260B Standard	Series 260B With 2C Aux. Contacts
UHF	260-XX04	260-XX0442	260B-XX04	260B-XX0442
50 ohm N	260-XX01	260-XX0142	260B-XX01	260B-XX0142
75 ohm N	260-XX14	260-XX1442	260B-XX14	260B-XX1442
BNC	260-XX02	260-XX0242	260B-XX02	260B-XX0242
TNC	260-XX03	260-XX0342	260B-XX03	260B-XX0342
C	260-XX05	260-XX0542	260B-XX05	260B-XX0542

ELECTRICAL CHARACTERISTICS

Typical high frequency measurements are shown below with the switch in a 50 ohm transmission line (75 ohm line for 75 ohm unit) UHF connectors are not recommended above 400 Mhz

Freq Mhz	VSWR	Isolation Loss —db	Insertion Loss —db	RF Power Rating
0-50	1.05	45	.04	1 KW
100	1.06	40	.05	1 KW
400	1.12	30	.1	750 W
1000	1.3	25	.15	500 W

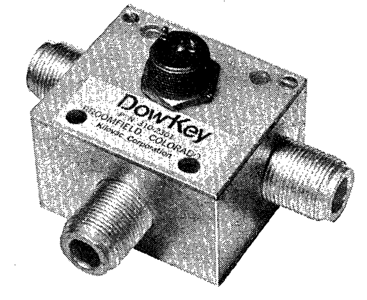
COIL CHARACTERISTICS

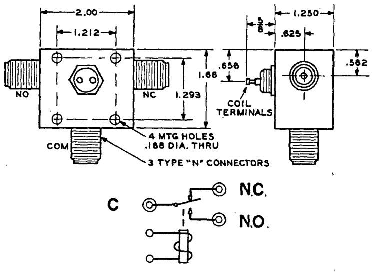
(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volts	Voltage Range	Resistance Ohms ±10
21	6 DC	5-7	12
22	12 DC	9.5-14	48
23	26 DC	19-31	245
24	48 DC	40-54	770
25	110 DC	90-125	4000
26	115 AC	100-125	Diode Rect.
27	220 AC	190-240	Diode Rect.
28	6 AC	5-7	Diode Rect.
29	24 AC	20-28	Diode Rect.

DowKey
DIVISION OF KILOVAC CORPORATION

P. O. BOX 4422 • SANTA BARBARA, CALIFORNIA 93103
TELEPHONE (805) 684-4560 • TWX 910/336-1141





SERIES 310 SPDT

Vacuum Coaxial Relay

FEATURES – Series 310 Relays have high power handling capability in a small package, with continuous power rating of 3000 watts at frequencies up to 30 MHz. At 400 MHz, the relay will carry 1000 watts. Reliable vacuum-enclosed contacts minimize losses and noise.

SPECIFICATIONS

Operating Time	6 ms max.

ELECTRICAL DATA

Peak Voltage	
At 30 MHz	1500 V
At 400 MHz	1000 V
Peak Current –1 μ Sec Pulse	
At 30 MHz	40 amps
At 400 MHz	10 amps

MECHANICAL DATA

Weight	8 oz
Life expectancy	10^6 cycles
Finish	
Connectors	Silver plate
Block	Silver plate

ENVIRONMENTAL DATA

(Per MIL-S-3928)

Shock	50 g's -11 ms
Vibration (Test condition A)	10 g's to 2000 Hz
Temperature	-55°C to +85°C
Salt Spray	48 Hrs
Humidity	10 days

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *310-2302 is SPDT Relay with BNC connectors and 26 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Part Number
N	310 -XX01
BNC*	310 -XX02
TNC*	310 -XX03
C	310 -XX05
SC	310 -XX53
HN	310 -XX51

*Reduced power limits when using these connectors.

ELECTRICAL CHARACTERISTICS

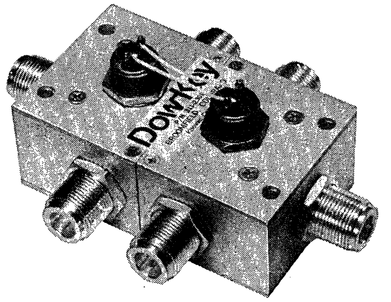
Freq. MHz	VSWR	Isolation Loss	Insertion Loss	RF Power Rating
30	1.05	35 db min.	.1 db typ.	3 KW
400	1.10	20 db typ.	.1 db typ.	1 KW

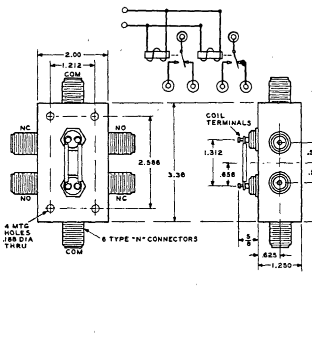
COIL CHARACTERISTICS

(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resistance Ohms ± 10 %
21	6 VDC	4.5-7	15
22	12 VDC	9-14	120
23	26 VDC	19-31	338
24	48 VDC	38-54	1000
25	110 VDC	90-125	6000
26	115 VAC	90-130	6000*

**Divide resistance by 2 on parallel coil units.*
***Requires external diode bridge.*





SERIES 311 DPDT

High Power Vacuum Coaxial Relay

FEATURES – Series 311 Vacuum Coaxial Relays are capable of handling 3 KW of RF power at 30 MHz and 1 KW at 400 MHz. The use of vacuum-enclosed contacts provides reliable, low contact resistance operation. Typical applications of the Series 311 Relays include switching RF power and radar pulse-forming networks.

SPECIFICATIONS

Operating Time	6 ms. max.

ELECTRICAL DATA

Peak Voltage	
At 30 MHz	1500 V
At 400 MHz	1000 V
Peak Current 1 μ Sec Pulse	
At 30 MHz	40 amps
At 400 MHz	10 amps

MECHANICAL DATA

Weight	12 oz.
Life expectancy	10^6 cycles
Finish	
Connectors	Silver plate
Block	Silver plate

ENVIRONMENTAL DATA

(Per MIL-S-3928)

Shock	50 g's -11 ms.
Vibration (Test condition A)	10 g's -5 to 2000 Hz
Temperature	-55°C to +85°C
Salt Spray	48 Hrs.
Humidity	10 days

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *311-2302 is DPDT Coaxial Vacuum Relay with BNC connectors and 26 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Part Number
N	311 -XX01
BNC*	311 -XX02
TNC*	311 -XX03
C	311 -XX05
SC	311 -XX53
HN	311 -XX51

*Reduced power limits when using these connectors.

ELECTRICAL CHARACTERISTICS

Freq. MHz	VSWR	Isolation Loss	Insertion Loss	PF Power Rating
30	1.05	35 db min.	.1 db typ.	3 KW
400	1.10	20 db typ.	.1 db typ.	1 KW

COIL CHARACTERISTICS

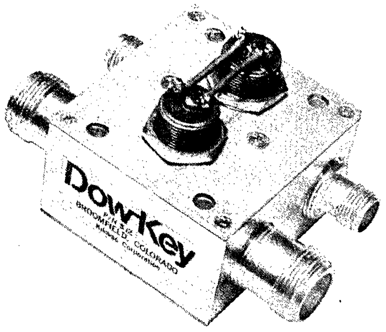
(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resistance * Ohms ± 10 %
21	6 VDC	4.5-7	15
22	12 VDC	9-14	120
23	26 VDC	19-31	338
24	48 VDC	38-54	1000
25	110 VDC	90-125	6000
26	115 VAC	90-130	6000**

**Divide resistance by 2 on parallel coil units.*
***Requires external diode bridge.*

DowKey
DIVISION OF KILOVAC CORPORATION

P. O. BOX 4422 • SANTA BARBARA, CALIFORNIA 93103
TELEPHONE (805) 684-4560 • TWX 910/336-1141



SERIES 312

Vacuum Coaxial By-Pass Relay

FEATURES — Series 312 Vacuum Coaxial Relays are intended for use in circuits where it is desired to by-pass an RF power amplifier and connect the driving source directly to the amplifier's load. The use of vacuum-enclosed contacts provides reliability and repeatable low contact resistance. Mixture of connectors available on special order.

SPECIFICATIONS

Operating Time . . . . 6 ms max.

ELECTRICAL DATA

Peak Voltage
At 30 MHz . . . . 1500 V
At 400 MHz . . . . 1000 V
Peak Current- 1 μ Sec Pulse
At 30 MHz . . . . 40 amps
At 400 MHz . . . . 10 amps

MECHANICAL DATA

Weight . . . . 12 oz.
Life expectancy . . . . 10^6 min. cycles
Finish
Connectors . . . . Silver Plate
Block . . . . Silver Plate

ENVIRONMENTAL DATA

(Per MIL-S-3298)
Shock . . . . 50 g's -11 ms
Vibration (Test condition A) . . . . 10 g's to 2000 Hz
Temperature . . . . -55°C to +85°C
Salt Spray . . . . 48 Hrs.
Humidity . . . . 10 days

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *312-2201 is DPDT Relay with type N connectors and 12 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Part Number
N	312-XX01
BNC*	312-XX02
TNC*	312-XX03
C	312-XX05
SC	312-XX53
HN	312-XX51

*Reduced power limits when using these connectors.

ELECTRICAL CHARACTERISTICS

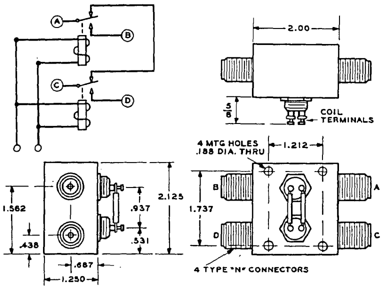
Freq. MHz	VSWR	Isolation Loss	Insertion Loss	RF Power Rating
30	1.05	35 db min.	.1 db typ.	3 KW
400	1.10	20 db typ.	.1 db typ.	1 KW

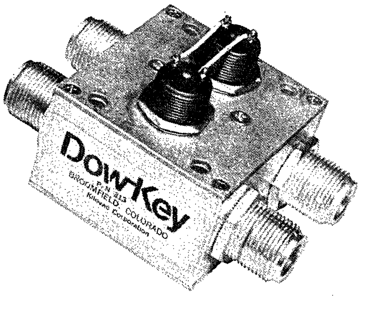
COIL CHARACTERISTICS

(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resistance * Ohms ±10%
21	6 VDC	4.5-7	15
22	12 VDC	9-14	120
23	26 VDC	19-31	338
24	48 VDC	38-54	1000
25	110 VDC	90-125	6000
26	115 VAC	90-130	6000**

**Divide resistance by 2 on parallel coil units.*
***Requires external diode bridge.*





SERIES 313 DPDT

Transfer/Crossover Coaxial Vacuum Relay

FEATURES – The Series 313 are remote operation ruggedly constructed Transfer Relays designed for high power–high voltage operation. The Series 313 also features Kilovac vacuum-enclosed contacts for high reliability, low contact resistance and long life. It is intended for interchanging two transmitters between an antenna and a dummy load, reversing feed phase for directional antennas, and similar applications. It is capable of handling 3 KW at 30 MHz.

SPECIFICATIONS

Operating Time . . . . 6 ms. max.

ELECTRICAL DATA

Impedance . . . . 50 ohms
VSWR (at 30 MHz) . . . . 1.1 max.
Insertion Loss . . . . .2 db max.
Isolation Loss (at 30 MHz) . . . . . . 35 db min.
RF Power Rating . . . . 3 KW
Peak Voltage . . . . 1500 V
Peak Current 1 μ Sec Pulse . . . . 40 amp

MECHANICAL DATA

Weight . . . . 12 oz.
Life expectancy . . . . 10^6 cycles
Finish
Connectors . . . . Silver Plate
Block . . . . Silver Plate

ENVIRONMENTAL DATA

(Per MIL-S-3928)
Shock . . . . 50 g's 11 ms.
Vibration (Test condition A) . . . 10 g's to 2000 cycles
Temperature . . . . -55°C to +85°C
Salt Spray . . . . 48 Hrs.
Humidity . . . . 10 days

ORDERING INFORMATION

After selecting connector type from the Connector & P/N Table, replace XX shown in the Part Number column with the two digits of the selected coil voltage, shown in the Part No. Digits column of the Coil Characteristics Table.

EXAMPLE: *313-2302 is a Transfer/Crossover Coaxial Relay with BNC connectors and 26 VDC Coil.*

CONNECTORS AND PART NUMBERS

Connector Type	Part Number
N	313-XX01
BNC*	313-XX02
TNC*	313-XX03
C	313-XX05
SC	313-XX53
HN	313-XX51

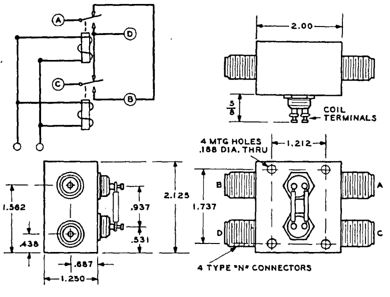
*Reduced power limits when using these connectors.

COIL CHARACTERISTICS

(Part No. Digits to replace XX on Connector Part No.)

Part No. Digits	Nominal Volt	Voltage Range	Resistance * Ohms ±10 %
21	6 VDC	4.5-7	15
22	12 VDC	9-14	120
23	26 VDC	19-31	338
24	48 VDC	38-54	1000
25	110 VDC	90-125	6000
26	115 VAC	90-130	6000**

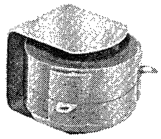
**Divide resistance by 2 on parallel coil units.*
***Requires external diode bridge.*



RELAYS·SOLENOIDS·TIMERS

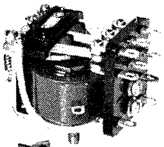
Manufactured by DELTROL CONTROLS

RELAYS



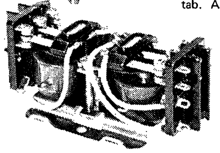
BZ BUZZER

Continuous or intermittent duty buzzer which buzzes when coil is energized. Operates on 50/60 cycle AC voltage. Mounting: No. 6-32 tapped core. UL listed (File No. S1101).



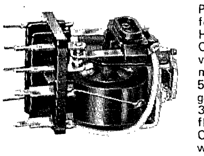
SERIES 100

Low cost, general purpose relay designed for light power loads and continuous duty operation. Armature stop maintains adjusted characteristics throughout life of relay. 5 amp contacts: 1/8" silver, gold flashed. 10 amp contacts: 3/16" silver cadmium oxide, gold flashed. Mounting: 6-32 mounting stud and locator tab. Available to 3PDT.



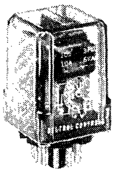
SERIES 100ML

Low cost, multi-pole (up to 6PDT) general purpose magnetic latching relay with long life (minimum of 10,000,000 mechanical operations). Positive snap-action, one-piece armature eliminates interconnections. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Standard solder or 3/16" quick-connect terminals. Dust cover available. Recognized under the Components Program of Underwriters Laboratories, Inc.



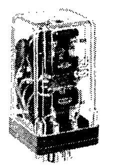
100UP/101UP

Printed circuit, mounted relay for light power load applications. Has phenolic insulating barriers. Continuous duty operation. Provided with armature stop to maintain adjusted characteristics. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" silver cadmium oxide, gold flashed. Recognized under the Components Program of Underwriters Laboratories, Inc. Available to 3PDT.



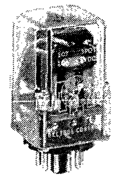
SERIES 105

General purpose plug-in relay for light power loads. Continuous duty operation. Blue transparent butyrate dust cover. Standard 8-pin octal-type plug for SPDT and DPDT units, 11-pin for 3PDT units. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Available with B3 hold-down spring. Available to 3PDT.



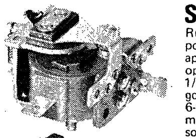
SERIES 105ML

General purpose magnetic latching plug-in relay. Positive snap-action, one-piece armature eliminates interconnections. Minimum mechanical life: 10,000,000 operations. Up to 5PDT. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Standard 8-pin octal-type plug for SPDT, 11-pin for DPDT. 20-pin for 3PDT, 4PDT & 5PDT.



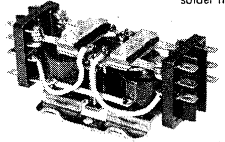
SERIES 106/107

Enclosed, plug-in version of 100 Series general purpose relay. Use for light power loads and continuous duty operation. Armature stop maintains adjusted characteristics. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Dust cover: clear, high-impact plastic. Recognized under the Components Program of Underwriters Laboratories, Inc.



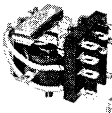
SERIES 120

Rugged, small-size, medium duty power relay for industrial controls applications. Continuous duty operation. 15/20 amp contacts: 1/4" dia. silver cadminum oxide, gold flashed. Mounting: No. 6-32 stud and locating tab. Terminals: .250 quick-connect with solder hole.



SERIES 140ML

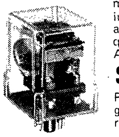
15 amp general purpose magnetic latching relay. Positive snap-action, one-piece armature eliminates interconnections. 15 amp contacts: silver cadmium oxide, gold flashed. Continuous or intermittent duty. Up to 6PDT. Terminals: .187 quick-connect with solder holes. Dust cover available.



New!

SERIES 140

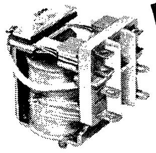
General purpose medium duty relay. Continuous duty operation. Armature stop. 15 amp contacts: 1/4" dia. silver cadmium oxide, gold flashed. Mounting: No. 6-32 mounting stud and locator tab. Terminals: .187 quick connect with solder holes. Available to 3PDT.



New!

SERIES 145

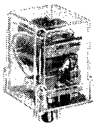
Plug-in version of 140 Series general purpose medium duty relay. Molded Lexan dust cover.



New!

SERIES 150

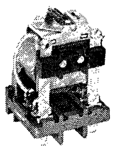
1200W tungsten lamp DPDT relay especially suited for high inrush loads. Booster springs on movable contact arms. Continuous duty operation. 20 amp contacts: 5/16" dia. silver cadmium oxide, gold flashed. Mounting: No. 6-32 stud and locator tab. Terminals: solder and .187 quick-connect with solder holes.



New!

SERIES 155

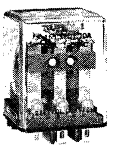
Plug-in version of 150 Series 1200W tungsten lamp relay. Standard 8-pin octal plug. Molded Lexan dust cover.



New!

SERIES 160

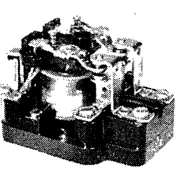
Low cost, reliable general purpose relay for industrial control. Available to 3PDT. Molded nylon coil. Blade-type terminals for higher current-carrying capacity. Continuous duty operation. 5 amp contacts: 1/8" dia. silver, gold flashed. 10 amp contacts: 3/16" dia. silver cadmium oxide, gold flashed. Mounting: No. 6-32 stud and locator tab. Terminals: .187 quick-connect with solder holes. **10 amp tab-type mounting socket available.**



New!

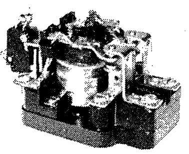
SERIES 165

Plug-in version of 160 Series relay. Molded Lexan dust cover reduces dust and contact contaminants. 10 amp nylon mounting socket available with .187 quick-connect, solder, or printed circuit terminals.



SERIES 900

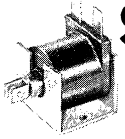
Heavy duty power relay for fast-acting industrial control applications. Particularly suited for motor controls, heater loads, and other power switching applications. Long life, rugged construction. 25 amp contacts: 5/16" dia. silver cadmium oxide, gold flashed. Heavy duty screw-type terminals. Mounting: two 3/16" holes on 1-7/8" centers. Recognized under the Components Program of Underwriters Laboratories, Inc.



SERIES 900-1C

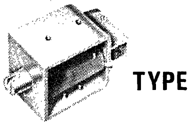
900 Series heavy duty power relay with snap-action, 10 amp, 1/3 hp, SPDT auxiliary switch. Recognized under the Components Program of Underwriters Laboratories, Inc.

SOLENOIDS



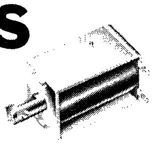
TYPE C-8

Low cost, low and medium power solenoids designed especially for volume applications where low cost is essential.



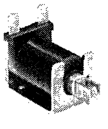
TYPE PS-65

This high power solenoid has coils having two windings: a high-surge current pull-in winding that starts the solenoid plunger in motion, and a low-drain winding for holding the plunger in a seated position. The windings are switched automatically by the motion of the plunger.



TYPE D-17

Designed for low and medium power applications. Constructed to provide maximum useful life and efficiency.

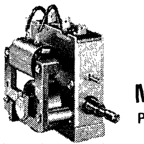


New!

TYPE C6

Low cost, low power solenoid for applications such as appliances, vending machines, and automobiles. Molded nylon coil for fungus and moisture resistance. Terminals molded into the coil for extra strength, virtually eliminating open coils.

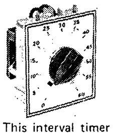
TIMERS



MODEL 110

PUSHBUTTON

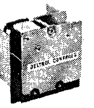
This pushbutton timer starts by manually depressing push button. Pushing button closes timer switch contacts 1-3, energizing timer load and timer motor. Upon completion of fixed time interval, contacts 1-3 open, shutting off timer load and timer motor.



MODEL 116-D1

INTERVAL TIMER

This interval timer switches contacts 1-4 OFF and contacts 1-3 ON at the beginning of each preset timer interval. At the end of the preset timed interval, contacts 1-4 switch to ON and contacts 1-3 switch to OFF.

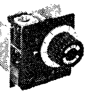


New!

400 SERIES

Automatic Reset Timer with Fixed Time Cycle

Clutch control is independent of timer motor--and may be operated on either AC or DC voltage while timer motor is operated on AC. –Can remain in timed-out position without external relay or by stalling the timer motor. At end of cycle, motor is turned off while clutch holds switch position –Time cycles up to 6 hours.



New!

600 SERIES

Automatic Reset Timer with Adjustable Time Cycle

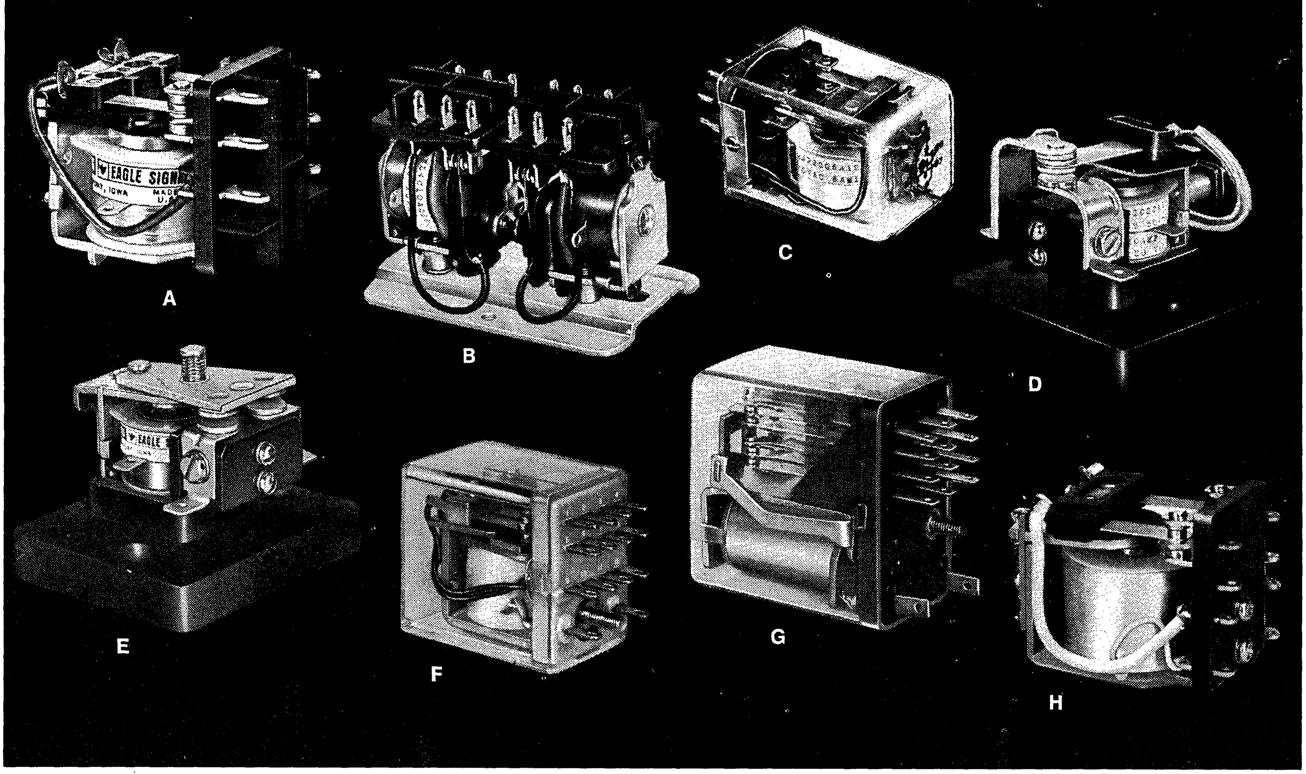
Clutch control is independent of timer motor--anc may be operated on either AC or DC voltage while timer motor is operated on AC. –Can remain in timed-out position without external relay or by stalling the timer motor. At end of cycle, motor is turned off while clutch holds switch position. –Time cycles up to 6 hours.

Write for descriptive literature.

DELTROL CONTROLS

2745 South 19th Street, Milwaukee, Wisconsin 53215, Phone (414) 671-6800, Telex 2-6871

EAGLE PRECISION CONTROL RELAYS



	Type and Description	Contact Arrangements	Contact Rating	Size	Pull-in Speed	Drop-out Speed	Terminal Type
A	General Purpose Open Type for ACDC and Plate Circuit	SPDT DPDT 3PDT	5A and 10A @ 120 VAC	1 7/8" x 1 9/32" x 1 1/32"	12 MS Max.	10 MS Max.	Solder Quick Connect Printed Cir.
B	General Purpose Latching for AC and DC	SPDT 4PDT DPDT 5PDT 3PDT 6PDT	5A and 10A @ 120 VAC	2 7/8" x 2 1/8" x 1 3/4"	12 MS Max.	10 MS Max.	Solder
C	General Purpose Octal Base for ACDC Plate Circuit	SPDT DPDT 3PDT	5A and 10A @ 120 VAC	1 1/2" x 1 3/8" x 2 1/8"	12 MS Max.	10 MS Max.	Plug-in
D & E	General Purpose Heavy Duty Power Type for AC and DC	SPST No. DB SPDT	25A @ 120 VAC 20A @ 120 VAC	2 1/2" x 2 5/16" x 2 1/8"	20 MS Max.	15 MS Max.	Tab
F	Miniature Type for AC and DC	4PDT	3A @ 120 VAC	1 1/4" x 1 19/32" x 3/4"	12 MS Max.	10 MS Max.	Plug-in
G	Miniature Type for DC only	2 Form C or 4 Form	3A @ 120 VAC	1.142" x 1.468" x .978"	10 MS Max.	8 MS Max.	Telephone Type—Plug-in
H	Miniature Open Type for AC and DC	to 3 Form C Max.	.005A to 10A	1 3/64" x 15/16" x 1 23/64"	14 MS Max.	10 MS Max.	Solder
C	Miniature Octal Base Type for AC and DC	to 3 Form C Max.	.005A to 10A	1 3/8" x 2 11/16" x 1 3/8"	14 MS Max.	10 MS Max.	Plug-in

Write for complete catalog

G+W **Eagle Signal**
a systems division of
GULF + WESTERN INDUSTRIES, INC.

EAGLE SIGNAL
50
YEARS

PLANTS | 736 Federal Street, Davenport, Iowa • 925 Lake Street, Baraboo, Wisconsin • 348 Guelph Street, Georgetown, Ontario, Canada
Orchard Road, Royston, Herts, England • 12-14 Grosvenor Street, Abbotsford, Victoria, Australia

Electronic Applications Co.

2213 EDWARDS AVE • SO. EL MONTE, CALIF. 91733 • (213) 442-3212

MINIATURE REED RELAYS

- PRINTED CIRCUIT TYPES
- ENCAPSULATED
- HIGH RELIABILITY
- HIGH SENSITIVITY
- COMPETITIVELY PRICED
- FAST DELIVERY
- LARGE STOCK

Contact Ratings	Form A	Form B	Form C
Voltage (Max. Switching)	250 VDC	250 VDC	150 VDC
Voltage (Min. Breakdown)	500 VDC	500 VDC	500 VDC
Current (Max. Switching)	750 ma	750 ma	250 ma
Current (Max. Gating or Carry)	2 Amps	2 Amps	1.5 Amps
Power (Resistive Load)	10 Watts	10 Watts	4 Watts
Capacitance (Typical)	0.2 PF	0.2 PF	0.8 PF
Contact Resistance (Typical)	.100 Ohms	.100 Ohms	.150 Ohms
Operate Time (Typical)	½ ms	½ ms	½ ms
Life (Low Load) Operations	100 x 10⁶ Min.	100 x 10⁶ Min.	20 x 10⁶ Min.
Life (Half Load) Operations	50 x 10⁶ Min.	50 x 10⁶ Min.	10 x 10⁶ Min.
Life (Full Load) Operations	20 x 10⁶ Min.	20 x 10⁶ Min.	5 x 10⁶ Min.

General Specifications

Must Operate Voltage.... — 80% of Rated Voltage (Max.)
Must Release Voltage.... — 10% of Rated Voltage (Min.)
Over Voltage.................. —200% of Rated Voltage (Min.)

Operating Parameters

Temperature.. −55°C to +125°C
Shock... 200G @ 11ms Duration
Vibration.. 50G @ 0-2000 HZ
Insulation Resistance.............................. 10⁹ Ohms Min.

DC Coil Voltage	Contact Form	Coil Resistance 25°C	Standard Package & Schematic
5V	1A (SPST) N.O.	400	X1, Y1, Z1, X2, Y2, A1, B1, C1
	2A (2PST) N.O.	300	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	200	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	150	X5, Y5, Z4
	5A (5PST) N.O.	125	X6, Y6, Z5
	6A (6PST) N.O.	100	X7, Y7, Z6
	1C (SPDT)	200	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	100	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	400	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	300	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	400	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	200	X13, Y13, A8, B8
6V	1A (SPST) N.O.	250	X1, Y1, Z1, X2, Y2, A1, B1, C1
	2A (2PST) N.O.	180	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	125	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	90	X5, Y5, Z4
	5A (5PST) N.O.	75	X6, Y6, Z5
	6A (6PST) N.O.	60	X7, Y7, Z6
	1C (SPDT)	250	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	180	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	250	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	180	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	250	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	125	X13, Y13, A8, B8
12V	1A (SPST) N.O.	1000	X1, Y1, Z1, X2, Y2, A1, B1, C1
	2A (2PST) N.O.	750	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	500	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	375	X5, Y5, Z4
	5A (5PST) N.O.	300	X6, Y6, Z5
	6A (6PST) N.O.	250	X7, Y7, Z6
	1C (SPDT)	1000	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	750	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	1000	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	750	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	1000	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	500	X13, Y13, A8, B8

DC Coil Voltage	Contact Form	Coil Resistance 25°C	Standard Package & Schematic
24V	1A (SPST) N.O.	2000	X2, Y2, A1, B1, C1
	2A (2PST) N.O.	1500	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	1000	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	750	X5, Y5, Z4
	5A (5PST) N.O.	600	X6, Y6, Z5
	6A (6PST) N.O.	500	X7, Y7, Z6
	1C (SPDT)	2000	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	1500	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	2000	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	1500	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	2000	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	1000	X13, Y13, A8, B8
48V	1A (SPST) N.O.	6000	X2, Y2, A1, B1, C1
	2A (2PST) N.O.	4500	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	3000	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	2250	X5, Y5, Z4
	5A (5PST) N.O.	1800	X6, Y6, Z5
	6A (6PST) N.O.	1500	X7, Y7, Z6
	1C (SPDT)	6000	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	4500	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	6000	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	4500	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	6000	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	3000	X13, Y13, A8, B8
115V	1A (SPST) N.O.	20000	X2, Y2, A1, B1, C1
	2A (2PST) N.O.	15000	X3, Y3, Z2, A2, B2, C2
	3A (3PST) N.O.	10000	X4, Y4, Z3, A3, B3, C3
	4A (4PST) N.O.	7500	X5, Y5, Z4
	5A (5PST) N.O.	6000	X6, Y6, Z5
	6A (6PST) N.O.	5000	X7, Y7, Z6
	1C (SPDT)	20000	X8, Y8, Z8, A4, B4, C4
	2C (2PDT)	15000	X9, Y9, Z9, X10, A5, B5, C5
	1B (SPST) N.C.	20000	X11, Y11, Z11, A6, B6, C6
	2B (2PST) N.C.	15000	X12, Y12, Z12, A7, B7, C7
	1AL Latching Single Coil	20000	X11, Y11, Z11, A6, B6, C6
	1AL Latching Dual Coil	10000	X13, Y13, A8, B8

OEM PRICE LIST — 1 THRU 12 VOLT RELAYS

Contact Arrangement	Package	Price
1A	X1, Y1, Z1	$3.60
1A	ALL OTHER	3.20
2A	ALL	4.60
3A	ALL	6.00
4A	ALL	7.00
5A	ALL	8.10
6A	ALL	9.50
1C	ALL	6.40
2C	ALL	9.40
1B	ALL	4.50
2B	ALL	6.00
1A Single Coil Latching	ALL	4.70
1A Dual Coil Latching	ALL	5.70

24 VOLT RELAYS.................. ADD 5%
48 VOLT RELAYS........................ADD 10%
115 VOLT RELAYS......................ADD 25%
MAGNETIC SHIELDING ....ADD 25¢
ELECTROSTATIC SHIELDING.........ADD 50¢
SILICONE TREATMENT................ ADD 25¢
FLAT PACK .275″ HIGH CONSULT FACTORY
AXIAL LEADS................CONSULT FACTORY

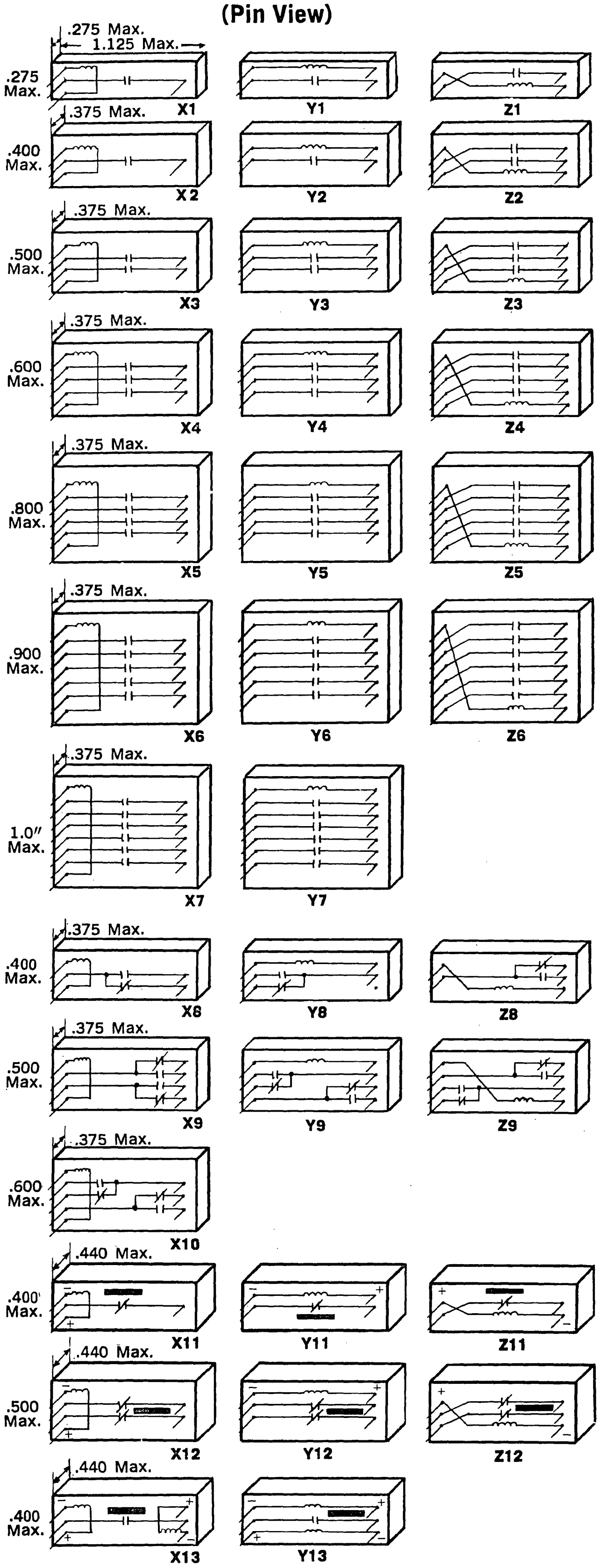
QUANTITY DISCOUNTS

1-24	List
25-49	Less 10%
50-99	Less 20%
100-499	Less 30%
500-999	Less 40%
1000 up	Consult Factory

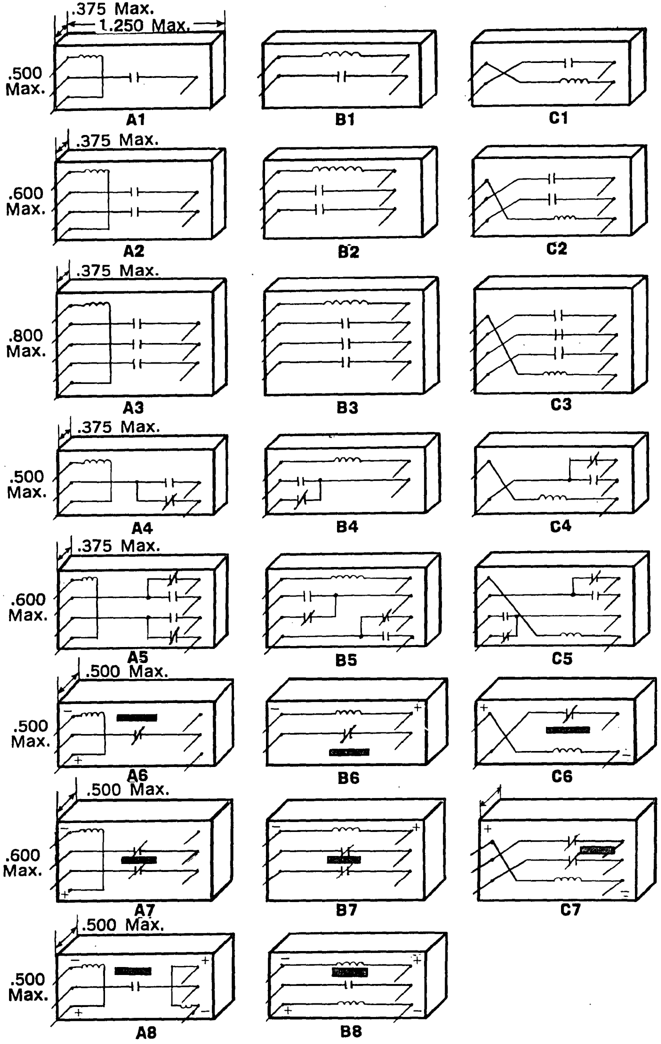
TERMS: 1% — 10, NET 30 DAYS

F.O.B. SO. EL. MONTE, CALIFORNIA

.100 SPACING ON 1″ CENTERS
(Pin View)


.275 Max.
1.125 Max.
.275 Max.
X1
Y1
Z1
.375 Max.
.400 Max.
X2
Y2
Z2
.375 Max.
.500 Max.
X3
Y3
Z3
.375 Max.
.600 Max.
X4
Y4
Z4
.375 Max.
.800 Max.
X5
Y5
Z5
.375 Max.
.900 Max.
X6
Y6
Z6
.375 Max.
1.0″ Max.
X7
Y7
.375 Max.
.400 Max.
X8
Y8
Z8
.375 Max.
.500 Max.
X9
Y9
Z9
.375 Max.
.600 Max.
X10
.440 Max.
.400 Max.
X11
Y11
Z11
.440 Max.
.500 Max.
X12
Y12
Z12
.440 Max.
.400 Max.
X13
Y13

.150 SPACING ON 1″ CENTERS
(Pin View)


.375 Max.
1.250 Max.
.500 Max.
A1
B1
C1
.375 Max.
.600 Max.
A2
B2
C2
.375 Max.
.800 Max.
A3
B3
C3
.375 Max.
.500 Max.
A4
B4
C4
.375 Max.
.600 Max.
A5
B5
C5
.500 Max.
.500 Max.
A6
B6
C6
.500 Max.
.600 Max.
A7
B7
C7
.500 Max.
.500 Max.
A8
B8

SPECIAL ADDITIONS

Symbol	Description
M	**MAGNETIC SHIELDING** (Encapsulated Inside Package) Recommended in high density packaging to reduce relay inter action or in high magnetic field environments.
E	**ELECTROSTATIC SHIELDING** Recommended in high impedance, low level application where low level noise pick-up is undesirable.
S	**SILICONE TREATMENT** Used to improve insulation resistance under severe environment conditions.

ORDERING INFORMATION

Part Number (Example)	12	3A	X4	ME
	Voltage	Contacts	Package	Special Additions (when required)

SPECIALS

Electronic Applications Company has complete facilities to manufacture special requirements or replacement of existing reed relays at competitive prices — **Consult Factory.**

— ALSO AVAILABLE —

- Mini-Micro
- Compact
- Mercury Contacts
- High Voltage Contacts
- Flat Pack
- Standard
- Axial Leads
- High Current Contacts

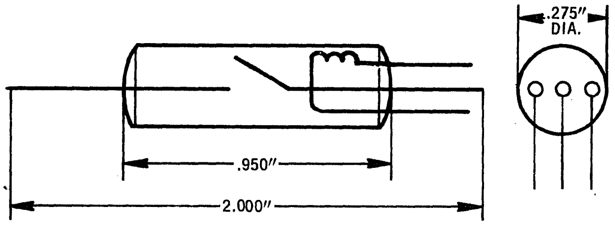
High Reliability (tested thru 1,000,000 operation run-in) also available. Consult factory for prices.

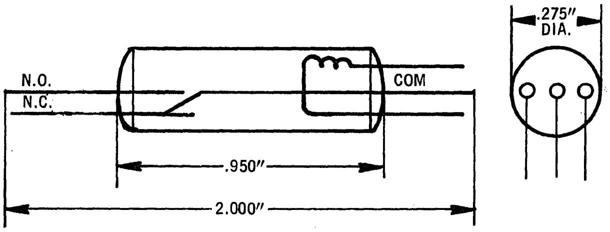
Electronic Applications Co.

2213 EDWARDS AVE • SO. EL MONTE, CALIF. 91733 • (213) 442-3212

Electronic Applications Co.

LOW COST COMMERCIAL REED RELAYS





CONTACT RATINGS — FORM A (SPST)	
Voltage (Max. Switching)	250 VDC
Current (Max. Switching)	1 Amp
Power (Max. Switching)	20 Watts
Current (Max. Gating)	2 Amps
Capacitance (Typical)	.2 PF
Contact Resistance (Typical)	.100 Ohms
Operate Time (Typical)	½ ms
Release Time (Typical)	¼ ms
Life (Low Load)	100 Million
Life (¼ Load)	50 Million
Life (½ Load)	25 Million
Life (¾ Load)	10 Million
Life (Full Load)	1 Million

CONTACT RATINGS — FORM C (SPDT)	
Voltage (Max. Switching)	200 VDC
Current (Max. Switching)	500 ma
Power (Max. Switching)	10 Watts
Current (Max. Switching)	1 Amp
Capacitance (Typical)	.8 PF
Contact Resistance (Typical)	.100 Ohms
Operate Time (Typical)	½ ms
Release Time (Typical)	¼ ms
Life (Low Load)	50 Million
Life (¼ Load)	25 Million
Life (½ Load)	10 Million
Life (¾ Load)	4 Million
Life (Full Load)	1 Million

COIL RATINGS — FORM A (SPST)

COIL VOLTAGE	PULL-IN VOLTAGE	P/N	COIL RES.
1	.75 Max.	1A1A	3 Ohms
3	2.25	1A3A	30
3	2.25	*1A3AH	100
5	3.75	1A5A	100
5	3.75	*1A5AH	400
6	4.50	1A6A	125
6	4.50	*1A6AH	400
10	7.50	1A10A	400
10	7.50	*1A10AH	1000
12	9.00	1A12A	500
12	9.00	*1A12AH	1000
24	18.00	1A24A	1000
24	18.00	*1A24AH	2000

COIL RATINGS — FORM C (SPDT)

COIL VOLTAGE	PULL-IN VOLTAGE	P/N	COIL RES.
1	.75 Max.	1C1A	3 Ohms
3	2.25	1C3A	30
3	2.25	*1C3AH	100
5	3.75	1C5A	100
5	3.75	*1C5AH	200
6	4.50	1C6A	125
6	4.50	*1C6AH	250
10	7.50	1C10A	500
10	7.50	*1C10AH	1000
12	9.00	1C12A	500
12	9.00	*1C12AH	1000
24	18.00	1C24A	1000
24	18.00	*1C24AH	2000

O.E.M. PRICE LIST (ALL VOLTAGES) FORM A

QUANTITY	SPST	QUANTITY	SPST
1-24	1.60	2500-4999	.72
25-49	1.44	5000-9999	.64
50-99	1.28	10000-24999	.56
100-499	1.12	25000-49999	.48
500-999	.96	50000-99999	.45
1000-2499	.80	100000 UP	.39

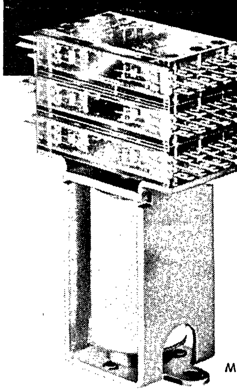
O.E.M. PRICE LIST (ALL VOLTAGES) FORM C

QUANTITY	SPDT	QUANTITY	SPDT
1-24	3.96	2500-4999	1.95
25-49	3.56	5000-9999	1.91
50-99	3.17	10000-24999	1.88
100-499	2.77	25000-49999	1.85
500-999	2.38	50000-99999	1.82
1000-2499	1.98	100000 UP	1.79

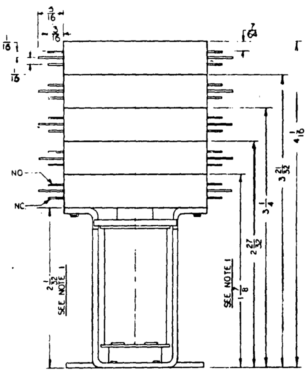
NOTE: *Add 10% to above prices for High Sensitivity Coils.
TERMS: 1% - 10/N - 30 days, FOB So. El Monte, Calif.

Electronic Applications Co.
2213 EDWARDS AVENUE • SO. EL MONTE, CALIF. • (213) 442-3212

T-BAR® Switch/Relays



T-BARS are for switching more circuits in less space ...up to 60 circuits simultaneously!



SERIES 801 T-BAR RELAY COIL CHARACTERISTICS*

	12 POLES 1 WAFER RELAY Wt: 4.5 oz.			24 POLES 2 WAFER RELAYS Wt: 6.75 oz.			36 POLES 3 WAFER RELAYS Wt: 7.25 oz.			48 POLES*** 4 WAFER RELAYS Wt: 8.5 oz.			60 POLES 5 WAFER RELAYS Wt: 9 oz.		
Voltage	Resistance Ohms	Current Amps	Power Watts	Resistance Ohms	Current Amps	Power Watts	Resistance Ohms	Current Amps	Power Watts	Resistance Ohms	Current Amps	Power Watts	Resistance Ohms	Current Amps	Power Watts
6 VDC	11.9	0.504	3.01	11.09	0.541	3.24	7	0.857	5.06	5.5	1.09	6.54	5.5	1.09	6.54
12 VDC	49.1	0.244	2.96	45	0.267	3.19	28	0.429	5.16	22	.545	6.54	22	.545	6.54
24 VDC	193	0.124	2.98	174	0.138	3.32	111	0.216	5.15	94	.255	6.12	94	.255	6.12
28 VDC	258	0.109	3.03	227	0.123	3.44	150	0.187	5.23	120	.233	6.52	120	.233	6.52
48 VDC	778	0.062	2.98	674	0.071	3.41	438	0.110	5.26	350	.137	6.58	350	.137	6.58
110 VDC	3963	0.028	3.05	3450	0.032	3.54	2355	0.047	5.18	1930	.057	6.27	1930	.057	6.27
115 VAC**	3963	0.024	2.80	3450	0.027	3.10	2355	0.041	4.72	1930	.049	5.62	1930	.049	5.62

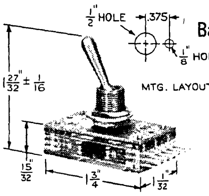
*All characteristics are nominal and subject to normal manufacturing tolerances, other voltages available on special order.

**115 VAC units are made with a full wave bridge rectifier and use the same coils as listed under 110 VDC units.

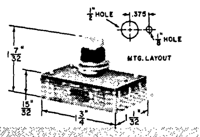
***Four-wafer relays with all "A" form contacts use three-wafer relay coils.

NOTE 1: ONE WAFER RELAYS USE A SHORTER ACTUATOR ASS'Y. — INSTEAD OF 2-1/32 AS SHOWN. THE ACTUATOR IS 1-15/32 HIGH.

SERIES 802
Bat Handle T-Bar Switches



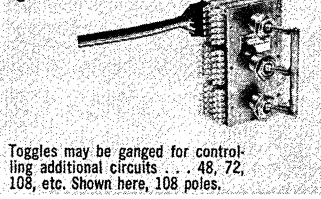
SERIES 803
Push Button Switch



Series 802 & 803

No. of Poles	Weights Oz. Approx.
12	2.0
24	2.5
36	3.0

Ganged T-Bar Switches

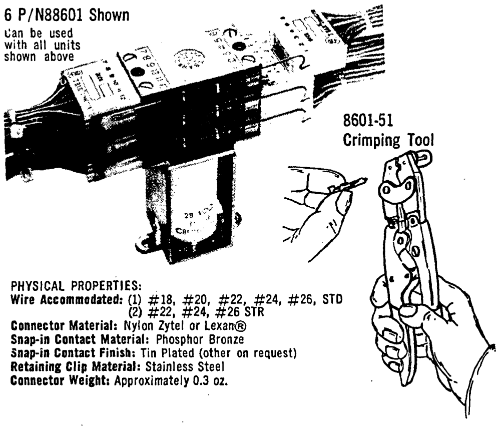


Toggles may be ganged for controlling additional circuits . . . 48, 72, 108, etc. Shown here, 108 poles.

MANUFACTURED BY:

T-Bar
INCORPORATED
SWITCHING TECHNOLOGY

T-BAR Connectors save time and reduce installation costs using individual snap-in crimp terminals crimped to pre-stripped wire and then snapped into a contact block, which forms the connector. The connector is pushed onto the wafer terminals, eliminating soldering. Because we offer a connector, rather than a receptacle, harness work can be completed outside the chassis and therefore no fancy chassis work is required to accept a receptacle. It not only makes the metal work simpler, but it also saves layout engineering and drafting time. Since T-Bar Switch/Relays are so easily mounted, they are often found on the back of meter panels or on their own brackets.



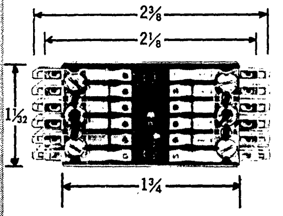
6 P/N88601 Shown
Can be used with all units shown above

8601-51 Crimping Tool

PHYSICAL PROPERTIES:
Wire Accommodated: (1) #18, #20, #22, #24, #26, STD
(2) #22, #24, #26 STR
Connector Material: Nylon Zytel or Lexan®
Snap-in Contact Material: Phosphor Bronze
Snap-in Contact Finish: Tin Plated (other on request)
Retaining Clip Material: Stainless Steel
Connector Weight: Approximately 0.3 oz.

Manufactured under 1 or more of the following patents: 3,206,990, 3,226,508

® "T-Bar" — Reg. T.M.



GENERAL FEATURES:

The series 801 T-Bar Relays are solenoid actuated multi-pole relays with a unique design permitting stack-up of enclosed contact "wafers." Each wafer has a maximum of 12 pole double throw contacts thereby allowing ECI to supply the 801 relay with any combination from 4 to 60 poles.

CONTACT RATING:
3 amp, resistive load 150 watt maximum make or break;
5 amp, 500 watt maximum carry.

CONTACT MATERIAL:
Gold bonded, fine silver, standard. Others available on special order.

CONTACT FORMS:
"A" single throw N.O.
"B" single throw N.C.
"C" double throw, break before make
"D" double throw, make before break

NUMBER OF POLES (RELAYS):

One Wafer	— 12 poles
Two Wafers	— 24 poles
Three Wafers	— 36 poles
Four Wafers	— 48 poles
Five Wafers	— 60 poles ("A" form only)

OPERATE VOLTAGE:
Min. voltage: 80% of nominal at 25°C

RELEASE VOLTAGE:
Max. voltage: 20% of nominal at 25°C

OPERATE TIME:

One Wafer Relay	— 15 ms. max.
Two Wafer Relay	— 25 ms. max.
Three Wafer Relay	— 30 ms. max.
Four Wafer Relay	— 35 ms. max.
Five Wafer Relay	— 40 ms. max.

RELEASE TIME:
5 ms. max. (36 pole) — 10 ms. max. (12 pole)

TERMINALS:
Solder tab that also mates with T-Bar connector P/N 88601 (two required per wafer)

ENCLOSURE:
Contacts enclosed in dust tight plastic enclosure that is separated from the actuator assembly. Withstands Mil. Std. — 202 method 106B moisture resistance test.

LIFE:
Mechanical — 20,000,000 operations minimum for relay
Electrical — 20,000,000 operations minimum at 100 milliamps to 100,000 minimum at 5 amps, 150 watts resistive load.

DIELECTRIC:
1000 vrms terminals to case at sea level and 25°C
1000 vrms terminal to terminal at sea level and 25°C
1000 vrms coil to case at sea level and 25°C

TEMPERATURE RANGE:
—55°C to +85°C

INSULATION RESISTANCE:
5,000 megohms @ 25°C minimum

ORDERING INFORMATION:
Specify Series No. — number of poles plus contact form letter-coil voltage. For example a 36 pole double throw relay with a 24 VDC coil is: 801-36C-24

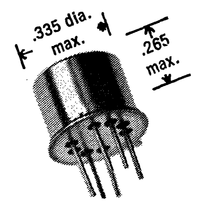
Danbury Road, Wilton, Conn. 06897 • (203) 762-8351

ELECTRONIC SPECIALTY DIVISION

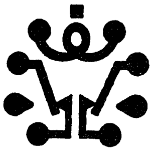
DATRON SYSTEMS INC. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97220 / (Area Code 503) 665-0121 / TWX 910-469-8782

10 — 10 SERIES, TRANSISTOR CASE TYPE

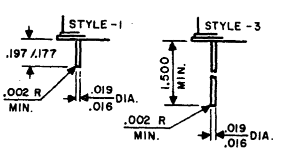
2PDT / 125 MW PICK-UP / DRY-CIRCUIT TO 1 AMP LOADS / WELDED SEAL

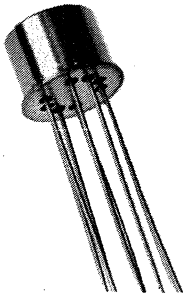


Series	Nominal Voltage	Coil Resist.	Max. Pick-Up Voltages −65°C- +125°C	Min. Drop-Out Voltages −65°C - +125°C	Adjust- ment Schedule	Prices 1-24	25-49
10	5.0	50	3.3	0.14	A 125 mw	20.00	15.20
	6.0	98	4.5	0.20			
	9.0	220	6.8	0.30			
	12.0	390	9.0	0.40			
	18.0	880	13.5	0.60			
	26.5	1560	18.0	0.80			



HEADER STYLES





SPECIFICATIONS

Ambient Temperature ....−65°C to +125°C
Contact Life ....100,000 operations
Vibration ....30 G's
Shock ....75 G's
Contact Rating ....1.0 Ampere at 28 VDC
Operate Time ....2.0 Milliseconds maximum
Release Time ....1.5 Milliseconds maximum

These TO-5 transistor case, hermetically sealed relays are especially designed for applications requiring minimum volume, fast operation and dry-circuit to 1 ampere switching capability. The 10 series is designed to meet and exceed the requirements of MIL-R-5757E (MIL-R-5757/40).

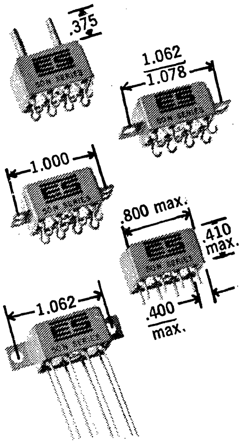
HOW TO ORDER

10G B 0 - 3 - A - 1.56K

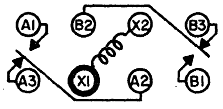
COIL RESISTANCE
ADJUSTMENT SCHEDULE
TERMINAL STYLE
CASE AND OTHER VARIATIONS
0 - Plain Shell, Plain Coil Circuit
2300 - Plain Shell, Suppression Diode
6700 - Plain Shell, Suppression and Blocking Diodes
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES (2PDT General Purpose)

50N — 50N SERIES, HALF SIZE TYPE

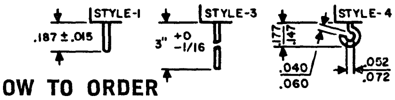
2PDT / 250 MW PICK-UP / DRY-CIRCUIT TO 2 AMP LOADS / WELDED SEAL



Series	Nominal Voltage	Coil Resist- ance	Max. Pick-Up Voltage +125°C	+25°C	Adjust- ment Schedule	Prices 1-24	25-49
50N	6.0	40	4.2	3.0	A 250 mw	12.25	10.50
	12.0	150	8.3	6.0			
	26.5	700	18.0	13.0			
	48.0	2500	33.9	24.5			
	110.0	10000	69.3	50.0			



HEADER STYLES



SPECIFICATIONS

Ambient Temperature ....−65°C to +125°C
Shock ....100 G's
Contact Life ....100,000 operations
Vibration ....20 G's maximum
Contact Rating ....2.0 Amperes at 28 VDC
Operate Time ....4.0 Milliseconds maximum
Release Time ....4.0 Milliseconds maximum

These balanced-armature, half-size crystal-can hermetically-sealed relays are especially designed for applications demanding fast operating relays with dry-circuit to 2 ampere switching capability. The 50N series is designed to meet and exceed the requirements of MIL-R-5757E, (MIL-R-5757/9).

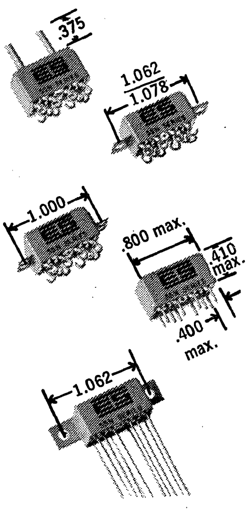
HOW TO ORDER

50G B 0 N - 1 - A 700

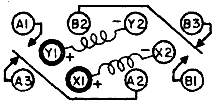
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction.
MOUNTING ARRANGEMENTS
0—Plain Shell 1—2 Top Studs ⅜"
2—Flange—4 Hole—Up ⅛"
3—Side Bracket
5—Flange—2 Hole—Up ⅛"
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT General Purpose)

55N — 55N SERIES, HALF SIZE SENSITIVE LATCHING TYPE

2PDT / 90 MW TRANSFER / DRY-CIRCUIT TO 2 AMP LOADS / WELDED SEAL

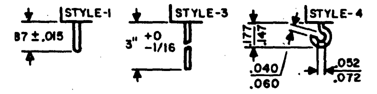


Series	Nominal Voltage	Coil Resist- ance	Max. Transfer Voltage +125°C	+25°C	Adjust- ment Schedule	Prices 1-24	25-49
55N	3.0	25	2.1	1.5	A 90 mw	30.00	26.50
	6.0	100	4.2	3.0			
	9.0	300	6.9	5.0			
	12.0	500	9.3	6.7			
	26.5	1800	17.6	12.7			



Y1 & Y2 LAST ENERGIZED

HEADER STYLES



SPECIFICATIONS

Ambient Temperature ....−65°C to +125°C
Shock ....100 G's
Contact Life ....100,000 operations
Vibration ....20 G's maximum
Contact Ratings ....2.0 Amperes
Operate and Reset Time ....5.0 MSEC maximum

These separate-coil, balanced armature, half-size crystal-can sensitive, hermetically-sealed relays are especially designed for applications demanding fast latching relays with dry-circuit to 2 ampere switching capability. The 55N series is designed to meet and exceed the requirements of MIL-R-5757E, and the part numbers of M5757/76A.

The 55N series incorporates a symmetrically designed magnetic circuit that enables the relay to be placed in a prewired socket in either of two positions, 180° apart, without any change in the transfer characteristics and still maintain the proper contact position, regardless of the presence or lack of coil power.

HOW TO ORDER

55G B 0 N - 1 - A - 1.8K

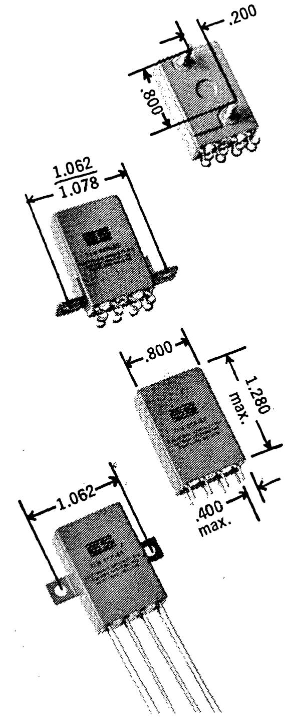
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction.
MOUNTING ARRANGEMENTS:
0—Plain Shell 1—2 Top Studs ⅜"
2—Flange—4 Hole—Up ⅛"
3—Side Bracket
5—Flange—2 Hole—Up ⅛"
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT Latching)

ELECTRONIC SPECIALTY DIVISION

DATRON SYSTEMS INC. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97220 / (Area Code 503) 665-0121 / TWX 910-469-8782

71N 71N SERIES, MICRO-MINIATURE SENSITIVE TYPE

2PDT / 40 MW PULL-IN / DRY-CIRCUIT TO 2 AMP LOADS / WELDED SEAL



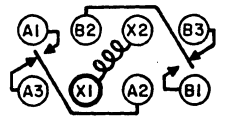
Series	Nominal Voltage	Coil Resist-ance	Max. Pick-Up Current −65°C - +125°C	Min. Drop-Out Current −65°C - +125°C	Adjust-ment Schedule	Prices 1-24	25-49
71N	3.6 6.0 9.0 12.0 26.5	100 200 500 1000 5000	20.0 14.2 9.0 6.3 2.8	2.00 1.42 0.90 0.63 0.28	A 40 mw	13.00	11.00

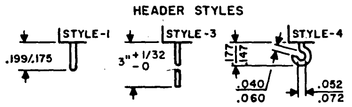
SPECIFICATIONS

Ambient Temperature ....−65°C to +125°C
Shock ....50 G's
Contact Life ....100,000 operations
Vibration ....20 G's maximum
Contact Ratings ....2.0 Amperes
Operate Time ....15.0 Milliseconds maximum
Release Time ....10.0 Milliseconds maximum

These balanced-armature, micro-miniature, sensitive, hermetically-sealed relays are especially designed for applications requiring low coil power input with dry-circuit to 2 ampere switching capability. The 71N series is designed to meet and exceed the requirements of MIL-D-5757F, and the part numbers of M5757/13.

The 71N series is ideally suited as a low cost replacement of the 80 and 80N high reliability series.





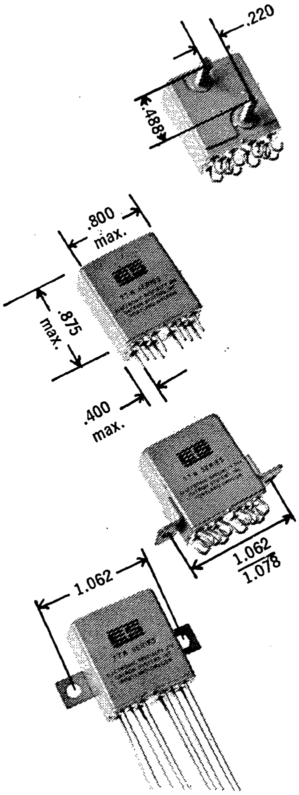
HOW TO ORDER

71G B 0 N - 1 - A 5K
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Construction
MOUNTING ARRANGEMENTS:
- 0—Plain Shell
- 3—Side Bracket
- 4—2 Side Studs ⅜"
- 5—Flange—Up ⅛"

CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT Sensitive)

77R 77R SERIES, CRYSTAL CAN SENSITIVE LATCHING TYPE

2PDT / 90 MW TRANSFER / DRY-CIRCUIT TO 2 AMP LOADS



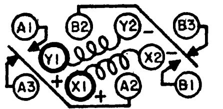
Series	Nominal Voltage	Coil Resist-ance	Max. Transfer Voltage +125°C	+25°C	Adjust-ment Schedule	Prices 1-24	25-49
77R	3.0 6.0 26.5 12.0 26.5	25 100 300 500 1800	2.1 4.2 6.9 9.3 17.6	1.5 3.0 5.0 6.7 12.7	A 90 mw	19.50	15.90

SPECIFICATIONS

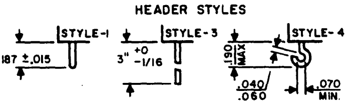
Ambient Temperature ....−65°C to +125°C
Shock ....50 G's
Contact Life ....100,000 operations
Vibration ....20 G's maximum
Contact Ratings ....2.0 Amperes
Operate and Reset Time ....5.0 Milliseconds maximum

These separate-coil, balanced-armature, crystal-can, sensitive hermetically-sealed relays are especially designed for applications demanding fast latching relays with dry-circuit to 2 ampere switching capability. The 77R series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

The 77R series incorporates a symmetrically designed magnetic circuit that enables the relay to be placed in a prewired socket in either of two positions, 180° apart, without any change in the transfer characteristics and still maintain the proper contact position, regardless of the presence or lack of coil power.



Y1 &Y2 LAST ENERGIZED



HOW TO ORDER

77G B 0 R - 1 - A - 1.8K
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "R" Resilient Construction
MOUNTING ARRANGEMENTS:
- 0—Plain Shell
- 3—Side Bracket
- 4—2 Side Studs ⅜"
- 5—Flange—Up ⅛"

CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT Latching)

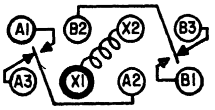
ELECTRONIC SPECIALTY DIVISION

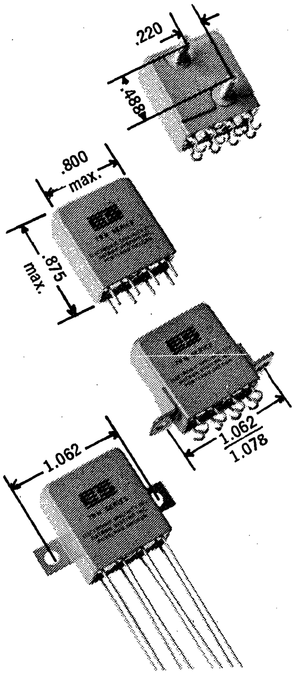
DATRON SYSTEMS INC. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97220 / (Area Code 503) 665-0121 / TWX 910-469-8782

79N

79N SERIES, CRYSTAL CAN TYPE

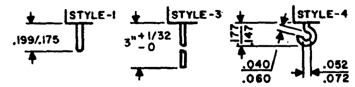
2PDT / 250 MW PULL-IN / DRY-CIRCUIT TO 3 AMP LOADS / WELDED SEAL





Series	Nominal Voltage	Coil Resistance	Max. Pick-Up Voltage +125°C	+25°C	Adjustment Schedule	Prices 1-24	25-49
79N	6.0 12.0 26.5 32.0 48.0 110.0	35 140 600 1000 2500 10,000	4.2 8.2 17.3 22.0 33.9 69.3	3.0 5.9 12.9 15.9 24.5 50.0	A 250 mw	8.50	7.00

HEADER STYLES



SPECIFICATIONS

Ambient Temperature .... −65°C to +125°C
Shock .... 100 G's
Contact Life .... 100,000 operations
Vibration .... 20 G's maximum
Contact Ratings .... 3.0 Amperes
Operate Time .... 5.0 Milliseconds maximum
Release Time .... 5.0 Milliseconds maximum

These balanced-armature, crystal-can, hermetically-sealed relays are especially designed for applications demanding fast operating relays with dry-circuit to 3 ampere switching capability. The 79N series is designed to meet and exceed the requirements of MIL-R-5757E, and the part numbers of M5757/10.

HOW TO ORDER

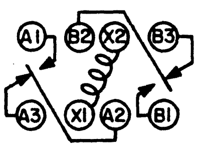
79G B 0 N - 1 - A - 600

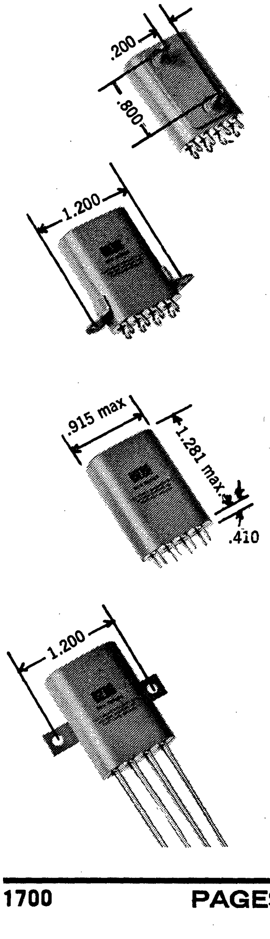
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction
MOUNTING ARRANGEMENTS:
  0—Plain Shell
  3—Side Bracket
  4—2 Side Studs ⅜″
  5—Flange—Up ⅛″
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT General Purpose)

80N

80N SERIES, MICRO-MINIATURE SENSITIVE TYPE

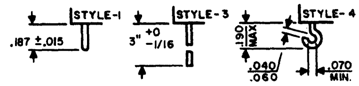
2PDT / 40 MW PULL-IN / DRY-CIRCUIT TO 3 AMP LOADS





Series	Nominal Voltage	Coil Resistance	Max. Pick-Up Current −65°C to +125°C	Min. Drop-Out Current −65°C to +125°C	Adjustment Schedule	Prices 1-24	25-49
80N	3.6 6.0 9.0 12.0 26.5	100 200 500 1000 5000	20.0 14.2 9.9 6.3 2.8	2.00 1.42 0.90 0.63 0.28	A 40 mw	30.00	28.50

HEADER STYLES



SPECIFICATIONS

Ambient Temperature .... −65°C to +125°C
Shock .... 50 G's
Contact Life .... 100,000 operations
Vibration .... 20 G's maximum
Contact Ratings .... 3.0 Amperes
Operate Time .... 15.0 Milliseconds maximum
Release Time .... 10.0 Milliseconds maximum

These balanced-armature, microminiature, sensitive, hermetically-sealed relays are especially designed for applications requiring low coil power input with dry-circuit to 3 ampere switching capability. The 80N series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

For increased reliability factors the coils are enclosed in a hermetically-sealed compartment, separate from the contact area. The resulting double sealed construction eliminates any possibility of contact contamination resulting from coil volatiles or particles.

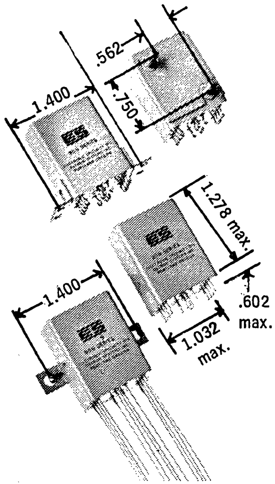
HOW TO ORDER

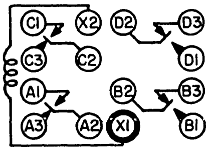
80G B 0 N - 1 - A - 5K

COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction.
MOUNTING ARRANGEMENTS:
  0—Plain Shell
  3—Side Bracket
  4—2 Side Studs ⅜″
  5—Flange—Up ⅛″
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT Sensitive)

ELECTRONIC SPECIALTY DIVISION
DATRON SYSTEMS INC. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97220 / (Area Code 503) 665-0121 / TWX 910-469-8782.

90N
90N SERIES, MICRO-MINIATURE SENSITIVE TYPE
4PDT / 80 MW PULL-IN / DRY-CIRCUIT TO 3 AMP LOADS


.562
.750
1.400
1.278 max.
1.400
.602 max.
1.032 max.

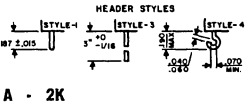

C1
X2
D2
D3
C3
C2
D1
A1
B2
B3
A3
A2
X1
B1

Series	Nominal Voltage	Coil Resist-ance	Max. Pick-Up Current −65°C to +125°C	Min. Drop-Out Current −65°C to +125°C	Adjust-ment Schedule	Prices 1-24	Prices 25-49
90N	6.0 9.0 12.0 26.5 48.0	100 200 500 2000 8000	28.3 20.0 12.6 6.3 3.1	2.83 2.00 1.26 0.63 0.31	A 80 mw	34.30	32.00

SPECIFICATIONS

Ambient Temperature	−65°C to +125°C
Shock	50 G's
Contact Life	100,000 operations
Vibration	20 G's maximum
Contact Ratings	3.0 Amperes
Operate Time	20.0 Milliseconds maximum
Release Time	5.0 Milliseconds maximum

These balanced-armature, microminiature, sensitive, hermetically-sealed relays are especially designed for applications requiring low coil power input with dry-circuit to 3 ampere switching capability. The 90N series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

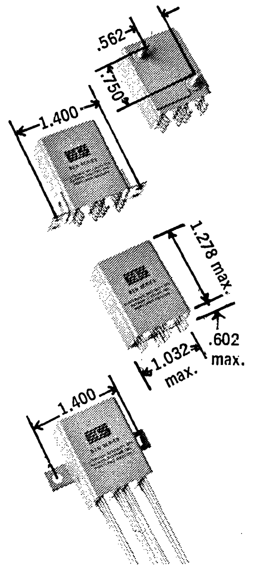

HEADER STYLES
STYLE-1
.187 ±.015
STYLE-3
3" +0 -1/16
STYLE-4
.190 MAX.
.040/.060
.070 MIN.

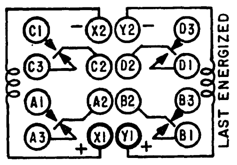
HOW TO ORDER

90H B 0 N - 1 - A - 2K

COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction
MOUNTING ARRANGEMENTS:
0—Plain Shell
3—Side Bracket
4—2 Side Studs ⅜"
16—Flange—Bottom Flush
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (4PDT Sensitive)

92N
92N SERIES, MICRO-MINIATURE SENSITIVE LATCHING TYPE
4PDT / 80 MW TRANSFER / DRY-CIRCUIT TO 3 AMP LOADS


.562
.750
1.400
1.278 max.
.602 max.
1.032 max.
1.400


C1
X2
Y2
D3
C3
C2
D2
D1
A1
A2
B2
B3
A3
X1
Y1
B1
+
+
LAST ENERGIZED

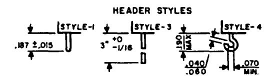
Series	Nominal Voltage	Coil Resist-ance	Max. Transfer Voltage +125°C	Max. Transfer Voltage +25°C	Adjust-ment Schedule	Prices 1-24	Prices 25-49
92N	3.6 6.0 9.0 12.0 26.5	50 100 250 500 2000	2.8 3.9 6.2 8.7 17.5	2.0 2.8 4.5 6.3 12.6	A 80 mw	45.90	42.00

SPECIFICATIONS

Ambient Temperature	−65°C to +125°C
Shock	50 G's
Contact Life	100,000 operations
Vibration	20 G's maximum
Contact Ratings	3.0 Amperes
Contact Operate and Reset Time	9.0 Milliseconds maximum

These Separate Coil, balanced-armature, micro-miniature, sensitive, hermetically-sealed relays are especially designed for latching applications requiring low coil power input with dry-circuit to 3 ampere switching capability. The 92N series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

The 92N series incorporates a symmetrically designed magnetic circuit that enables the relay to be placed in a prewired socket in either of two positions, 180° apart, without any change in the transfer characteristics and still maintain the proper contact position, regardless of the presence or lack of coil power.

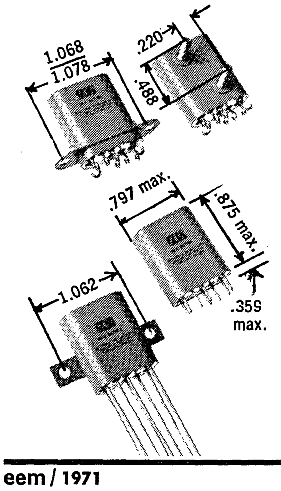

HEADER STYLES
STYLE-1
.187 ±.015
STYLE-3
3" +0 -1/16
STYLE-4
.190 MAX.
.040/.060
.070 MIN.

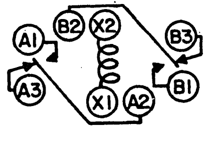
HOW TO ORDER

92H B 0 N - 1 - A - 2K

COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction
MOUNTING INSTRUCTIONS:
0—Plain Shell
3—Side Bracket
4—2 Side Studs ⅜"
16—Flange—Bottom Flush
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (4PDT Latching)

68N
68N SERIES, CRYSTAL CAN TYPE
2PDT / 300 MW PULL-IN / DRY-CIRCUIT TO 2 AMP LOADS


1.068
1.078
.220
.488
.797 max.
.875 max.
.359 max.
1.062

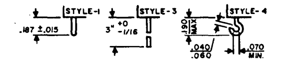

A1
B2
X2
B3
A3
X1
A2
B1

Series	Nominal Voltage	Coil Resist-ance	Max. Pick-Up Voltage +125°C	Max. Pick-Up Voltage +25°C	Adjust-ment Schedule	Prices 1-24	Prices 25-49
68N	6.0 12.0 26.5 72.0 110.0	35 140 552 5000 10,000	4.4 9.0 18.0 53.7 76.2	3.2 6.5 13.0 38.8 55.0	A 300 mw	11.10	9.25

SPECIFICATIONS

Ambient Temperature	−65°C to +125°C
Shock	50 G's
Contact Life	100,000 operations
Vibration	30 G's maximum
Contact Ratings	3.0 Amperes
Operate Time	5.0 Milliseconds maximum
Release Time	5.0 Milliseconds maximum

These balanced-armature crystal-can, hermetically-sealed relays are especially designed for applications demanding fast operating relays with 2 amperes switching capabilities. The 68N series is designed to meet and exceed the requirements of MIL-R-5757D, type designations RY4XX4BA and RY4NA3B3L02, (MIL-R-5757/10A).


HEADER STYLES
STYLE-1
.187 ±.015
STYLE-3
3" +0 -1/16
STYLE-4
.190 MAX.
.040/.060
.070 MIN.

HOW TO ORDER

68G B 0 N - 1 - A - 552

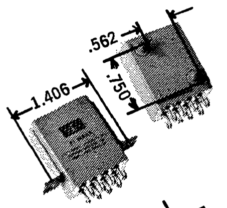
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction
MOUNTING ARRANGEMENTS:
0—Plain Shell
3—Side Bracket
4—2 Side Studs ⅜"
5—Flange—Up ⅛"
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT General Purpose)

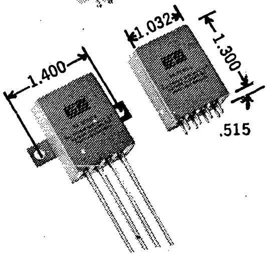
ELECTRONIC SPECIALTY DIVISION

DATRON SYSTEMS INC. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97220 / (Area Code 503) 665-0121 / TWX 910-469-8782

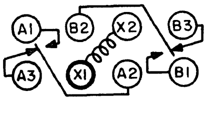
93 — 93 SERIES, MICRO-MINIATURE HIGH CURRENT TYPE

2PDT / 500 MW PULL-IN / 10 AMPERE LOADS

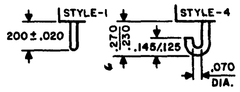




Series	Nominal Voltage	Coil Resistance	Max. Pick-Up Voltage +125°C	Max. Pick-Up Voltage +25°C	Adjustment Schedule	Prices 1-24	Prices 25-49
93	6.0	16	4.35	3.0	X 500 mw	19.80	16.50
	12.0	65	8.35	5.8			
	26.5	300	18.0	12.5			
	48.0	950	37.0	22.0			
	110.0	5500	75.0	53.0			



HEADER STYLES



SPECIFICATIONS

Ambient Temperature .... −65°C to +125°C
Shock .... 50 G's for 11.0 ±1.0 Millisecond
Contact Life .... 100,000 operations
Vibration .... 20 G's maximum
Contact Ratings .... 10.0 Amperes
Operate Time .... 7.0 Milliseconds maximum
Release Time .... 3.0 MSEC. maximum

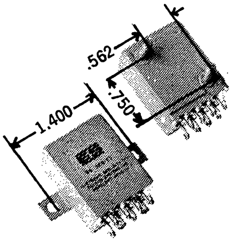
These balanced-armature microminiature, hermetically-sealed relays are especially designed for applications requiring low coil power input with 10 ampere switching capability. The 93 series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

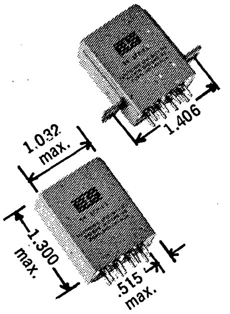
HOW TO ORDER

93G B 0 - 1 - X - 300
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
MOUNTING ARRANGEMENTS:
0—Plain Shell
3—Side Bracket
4—2 Side Studs ⅜″
61—Flange—Up ¼
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT High Current)

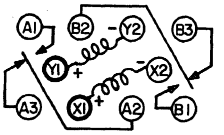
94 — 94 SERIES, MICRO-MINIATURE HIGH CURRENT LATCHING TYPE

2PDT / 150 MW TRANSFER / 10 AMPERE LOADS



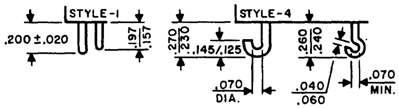


Series	Nominal Voltage	Coil Resistance	Max. Transfer Voltage +125°C	Max. Transfer Voltage +25°C	Adjustment Schedule	Prices 1-24	Prices 25-49
94	3.0	15	2.1	1.5	A 150 mw	25.50	23.50
	6.0	60	4.2	3.0			
	9.0	125	6.0	4.3			
	12.0	240	8.3	6.0			
	26.5	1000	17.0	12.3			



Y1 & Y2 LAST ENERGIZED

HEADER STYLES



SPECIFICATIONS

Ambient Temperature .... −65°C to +125°C
Shock .... 50 G's
Contact Life .... 100,000 operations
Vibration .... 20 G's maximum
Contact Ratings .... 10.0 Amperes
Operate and Reset Time .... 10.0 Milliseconds maximum

These separate coil, balanced-armature, micro-miniature, sensitive, hermetically-sealed relays are especially designed for latching applications requiring low coil power input with 10 ampere switching capability. The 94 series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

The 94 series incorporates a symmetrically designed magnetic circuit that enables the relay to be placed in a prewired socket in either of two positions, 180° apart, without any change in the transfer characteristics and still maintain the proper contact position, regardless of the presence or lack of coil power.

HOW TO ORDER

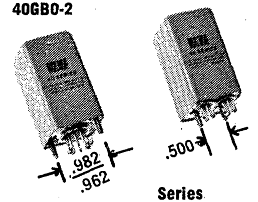
94G B 0 - 1 - A - 1K
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
MOUNTING ARRANGEMENTS:
0—Plain Shell
3—Side Bracket
4—2 Side Studs ⅜″
61—Flange—Up ¼″
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (2PDT High Current Latching)

40 — 40 SERIES, MINIATURE SENSITIVE TYPE

2PDT - 40 MW PULL-IN / 1PDT - 20 MW / DRY-CIRCUIT TO 5 AMP LOADS

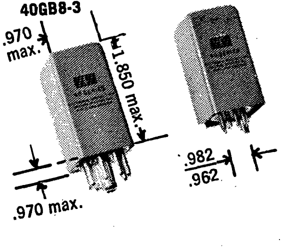
Series 40GB0-2

Series 40GB0-1

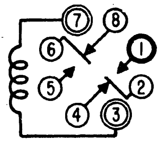


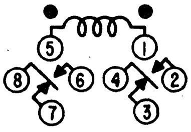
Series 40GB8-3

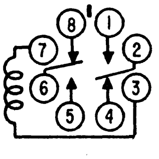
Series 40GB0-4

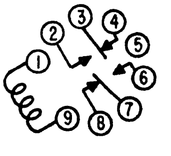


Series	Nominal Voltage	Coil Resistance	Max. Pick-Up Current −65°C - +125°C	Min. Drop-Out Current −65°C - +125°C	Adjustment Schedule	Prices 1-24	Prices 25-49
40	3.6	100	20.0	7.0	B 40 mw	17.00	15.50
	6.0	200	14.0	5.0			
	9.0	500	9.0	3.1			
	12.0	1000	6.3	2.3			
	26.5	5000	2.8	1.0			









SPECIFICATIONS

Shock .... 50 G's
Contact Life .... 100,000 operations
Vibration .... 10 G's maximum
Contact Ratings .... 2.0 Amperes
Operate Time .... 35.0 Milliseconds maximum
Release Time .... 15.0 Milliseconds maximum

These balanced-armature, miniature, sensitive, hermetically-sealed relays are especially designed for applications requiring low coil power input with dry-circuit to 5 ampere switching capability. The 40 series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX2B4.

The 40 series is a direct replacement of its dry-circuit to 2 amperes predecessor, the R400 series.

HOW TO ORDER

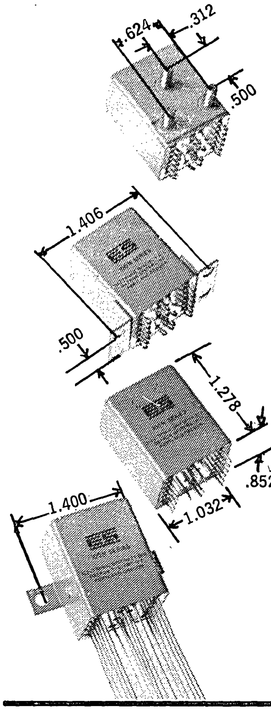
40 G B 0 - 1 - B - 5K
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
MOUNTING ARRANGEMENT
TEMP. RANGE (−65°C to +125°C)
CONTACT ARRANGEMENT: G(2PDT), C(1PDT)
SERIES TYPE (General Purpose)

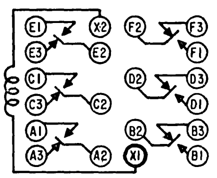
ELECTRONIC SPECIALTY DIVISION
DATRON SYSTEMS INC. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97220 / (Area Code 503) 665-0121 / TWX 910-469-8782

100N

100N SERIES, MICRO-MINIATURE SENSITIVE TYPE

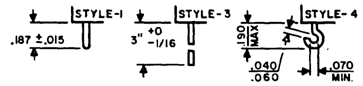
6PDT / 150 MW PULL-IN / DRY-CIRCUIT TO 3 AMP LOADS





Series	Nominal Voltage	Coil Resistance	Max. Pick-Up Current −65°C - +125°C	Min. Drop-Out Current −65°C to +125°C	Adjustment Schedule	Prices 1-24	24-59
100N	3.6 6.0 9.0 12.0 26.5 48.0	20 50 100 200 1000 4000	86.6 54.8 38.7 27.4 12.2 6.1	8.66 5.48 3.87 2.74 1.22 0.61	A 150 mw	45.70	36.75

HEADER STYLES



SPECIFICATIONS

Ambient Temperature .... −65°C to +125°C
Shock ....50 G's
Contact Life ....100,000 operations
Vibration ....20 G's maximum
Contact Ratings ....3.0 Amperes
Operate Time ....18.0 Milliseconds maximum above
Release Time ....5.0 Milliseconds maximum

These balanced-armature, microminiature, sensitive, hermetically-sealed relays are especially designed for applications requiring low coil power input with dry-circuit to 3 ampere switching capability. The 100N series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

HOW TO ORDER

100J B 0 N - 1 - A - 1K

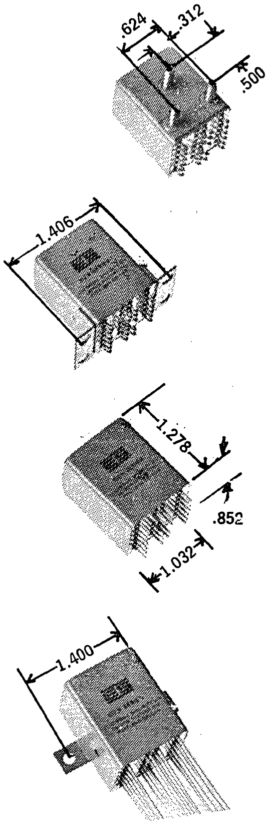
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction
MOUNTING ARRANGEMENTS:
- 0—Plain Shell
- 3—Side Bracket
- 17—3 Side Studs ⅜"
- 16—Flange—Bottom Flush

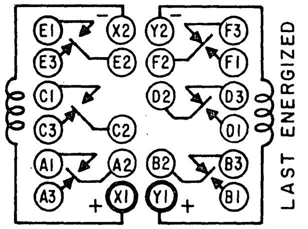
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (6PDT Sensitive)

102N

102N SERIES, MICRO-MINIATURE SENSITIVE LATCHING TYPE

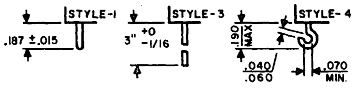
6PDT / 150 MW TRANSFER / DRY-CIRCUIT TO 3 AMP LOADS





Series	Nominal Voltage	Coil Resistance	Max. Transfer Voltage +125°C	+25°C	Adjustment Schedule	Prices 1-24	25-49
102N	3.6 6.0 9.0 12.0 26.5 48.0	25 50 100 250 1000 4000	2.6 3.7 5.4 8.5 17.0 33.9	1.9 2.7 3.9 6.1 12.3 24.5	A 150 mw	54.60	48.10

HEADER STYLES



SPECIFICATIONS

Ambient Temperature .... −65°C to +125°C
Shock ....50 G's
Contact Life ....100,000 operations
Vibration ....20 G's maximum
Contact Ratings ....3.0 Amperes
Operate and Reset Time ....8.0 Milliseconds maximum

These separate coil, balanced-armature, micro-miniature, sensitive, hermetically-sealed relays are especially designed for latching applications requiring low coil power input with dry-circuit to 3 amperes switching capability. The 102N series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

The 102N series incorporates a symmetrically designed magnetic circuit that enables the relay to be placed in a pre-wired socket in either of two positions, 180° apart, without any change in the transfer characteristics and still maintain the proper contact position, regardless of the presence or lack of coil power.

HOW TO ORDER

102J B 0 N - 1 - A - 1K

COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
CONTACTS: "N" Resilient Bifurcated Construction
MOUNTING ARRANGEMENTS:
- 0—Plain Shell
- 3—Side Bracket
- 17—3 Side Studs ⅜"
- 16—Flange—Bottom Flush

CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (6PDT Latching)

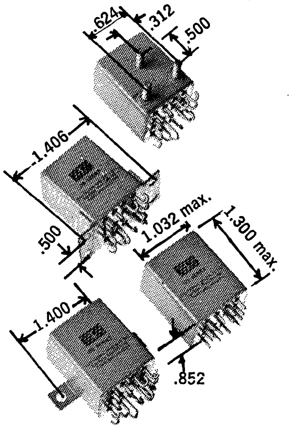
ELECTRONIC SPECIALTY DIVISION

DATRON SYSTEMS INC. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97220 / (Area Code 503) 665-0121 / TWX 910-469-8782

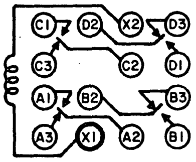
103

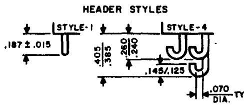
103 SERIES, MICRO-MINIATURE HIGH CURRENT TYPE

4PDT / 1000 MW PULL-IN / 10 AMP LOADS



Series	Nominal Voltage	Coil Resistance	Max. Pick-Up Voltage +125°C	Max. Pick-Up Voltage +25°C	Adjustment Schedule	Prices 1-24	Prices 25-49
103	6.0 12.0 26.5 48.5 110.0	8 32 150 475 2750	4.35 8.35 18.0 37.0 75.0	3.0 5.8 12.5 22.0 53.0	X 1000 mw	36.60	28.50





SPECIFICATIONS

Ambient Temperature .... −65°C to +125°C
Shock .... 50 G's
Contact Life .... 100,000 operations
Vibration .... 20 G's maximum
Contact Ratings .... 10.0 Amperes
Operate Time .... 8.0 Milliseconds maximum
Release Time .... 5.0 Milliseconds maximum

These balanced-armature micro-miniature, hermetically-sealed relays are especially designed for applications requiring low coil power input with 10 ampere switching capability. The 103 series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY-4XX4B4.

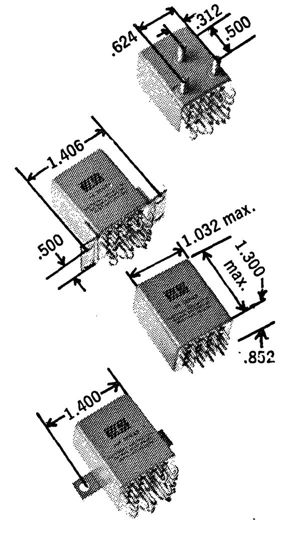
HOW TO ORDER

103H B 0 - 1 - X - 250
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
MOUNTING ARRANGEMENTS:
0—Plain Shell
3—Side Bracket
17—3 Side Studs ⅜″
16—Flange—Bottom Flush
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (4PDT High Current)

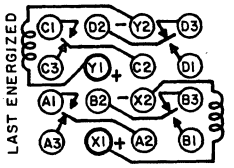
104

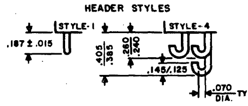
104 SERIES, MICRO-MINIATURE HIGH CURRENT LATCHING TYPE

4PDT / 300 MW TRANSFER / 10 AMP LOADS



Series	Nominal Voltage	Coil Resistance	Max. Transfer Voltage +125°C	Max. Transfer Voltage +25°C	Adjustment Schedule	Prices 1-24	Prices 25-49
104	3.0 9.0 12.0 26.5 72.0	10 60 125 500 5000	2.4 6.0 8.5 17.0 53.7	1.7 4.3 6.1 12.3 38.8	A 300 mw	45.00	37.25





SPECIFICATIONS

Ambient Temperature .... −65°C to +125°C
Shock .... 50 G's
Contact Life .... 100,000 operations
Vibration .... 20 G's maximum
Contact Ratings .... 10.0 Amperes
Operate and Reset Time .... 9.0 Milliseconds maximum

These separate-coil, balanced-armature, micro-miniature, sensitive, hermetically-sealed relays are especially designed for latching applications requiring low coil power input with 10 ampere switching capability. The 104 series is designed to meet and exceed the requirements of MIL-R-5757D, type designation RY4XX4B4.

The 104 series incorporates a symmetrically designed magnetic circuit that enables the relay to be placed in a prewired socket in either of two positions, 180° apart, without any change in the transfer characteristics and still maintain the proper contact position, regardless of the presence or lack of coil power.

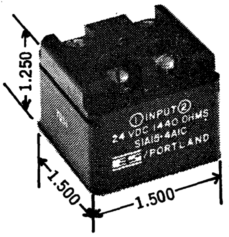
HOW TO ORDER

104H B 0 - 1 - A - 500
COIL RESISTANCE
ADJUSTMENT SCHEDULE
HEADER STYLE
MOUNTING ARRANGEMENTS:
0—Plain Shell
3—Side Bracket
17—3 Side Studs ⅜″
16—Flange—Bottom Flush
CLASS B TEMPERATURE (−65°C to +125°C)
SERIES TYPE (4PDT High Current Latching)

S1A

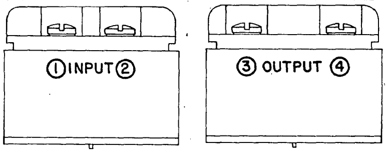
S1A SERIES, SOLID STATE HYBRID RELAY

1PST / 100 MW PULL-IN / 15 AMP LOAD*



STANDARD ADJUSTMENT SCHEDULE

Schedule	Input Resistance	Rated Operate Voltage Nom.	Rated Operate Voltage Max.	Max. Pull-In Voltage	Min. Drop-Out Voltage	Prices 1-24	Prices 25-49
A	90	6	12	3	1	56.00	46.00
B	360	12	24	6	2	56.00	46.00
C	1,440	24	48	12	4	56.00	46.00
D	3,600	120	240	60	20	56.00	46.00
E	14,000	240	480	120	40	56.00	46.00



This solid state hybrid relay is designed for applications that require reliable, high-current switching operations.

The current is switched by a bidirectional thyristor. The dv/dt is eliminated by an internal network across the switch. This enhances the ability of the device to withstand line transient voltages.

This device is also suitable for military applications.

* NOTE: 8 or 25 ampere output current rating also available

PHYSICAL DATA
Weight .... 3 Ounces Maximum
Size .... 1.5″ x 1.5″ x 1.25″
Terminals .... Nickel Plated, Brass Binding Head Screw, 5-40
Mounting .... One 6-32 Screw, 1½″ Long
Barrier Cover .... Clear ABS Plastic (Supplied But Not Shown)

INPUT DATA
Maximum Input Voltage .... 200% of Nominal (See Adjustment Schedule at Right)
Pull-In Voltage .... 50% of Nominal (See Adjustment Schedule at Right)
Drop-Out Voltage .... 33% of Pull-In Voltage (See Adjustment Schedule at Right)
Pull-In Power .... 100 Milliwatts
Isolation .... 10,000 Megohms at 500 VDC, Input to Contacts and Case
Dielectric Strength .... 1800 VRMS, Input to Contacts and Case
Response Time .... 1 Millisecond Maximum

ENVIRONMENTAL DATA
Ambient Temperature .... −55°C to +125°C
Maximum Case Temperature at Rated Load .... +70°C
Linearly Derate Load Current to Zero from .... +70°C to +125°C
Shock .... 100 G for 11 Milliseconds
Vibration .... 30 G, 10 to 3000 Hz
Life .... 100 Million, Typical

OUTPUT DATA
Current Rating .... 15 Amps Maximum Resistive or Inductive
Minimum Current .... 90 Milliamperes
Surge Current .... 85 Amps at 50 Hz, 100 Amps at 60 Hz for 1 Cycle
Voltage Rating .... As Specified by Part Number
Contact Resistance .... 0.100 OHMS, Typical
Isolation .... 10,000 Megohms at 500 VDC, Contacts to Input and Case
Dielectric Strength .... 1800 VRMS, Contacts to Input and Case
Response Time .... ½ Cycle Maximum

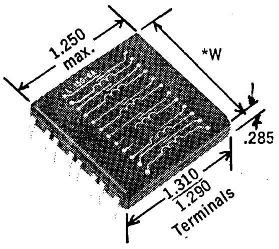
HOW TO ORDER

S1A 15 - 2 A 0 B
Adjustment Schedule
Input Signal: 0=AC, 1=DC
Output Load Voltage AC Only
Output Voltage Rating: 2, 140 VRMS; −4, 280 VRMS Max.
Output Current Rating: 15 Ampere (Also Available in 8 and 25 Ampere Ratings).
Denotes Solid State Hybrid Relay, 1PST, Form A

ELECTRONIC SPECIALTY DIVISION
DATRON SYSTEMS INC. / 18900 N.E. Sandy Blvd. / Portland, Oregon 97220 / (Area Code 503) 665-0121 / TWX 910-469-8782

REED RELAYS-LG/LF series

LF SERIES



GENERAL SPECIFICATIONS

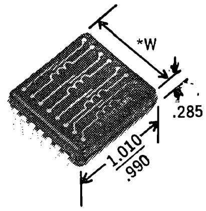
Temperature Range:
−55°C to +85°C operating ambient
Vibration: 30 G to 2000 Hz
Insulation Resistance:
1000 megohms min. @ 25°C
Shock: 100 G
Overvoltage: 100%
Switch Contacts:
Hermetically Sealed.

TYPICAL REED CHARACTERISTICS—LG & LF SERIES

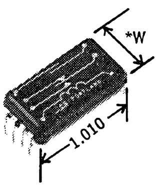
Reed Capsule Designation	Contact Config.	Max. Contact Rating		Minimum Life Expectancy (operations x 10^6)			Initial Contact Resistance (milliohms)	Contact Bounce Max. (microsec)	Typical Operate Time (microsec)	Typical Release Time (microsec)	Dielectric Strength Cont.-Cont. (volts)
		Amps	Power	Rated	Inter-med.	Low Level					
S	A	.50	10W	20	50	100	200	200	750	50	250
R	C	.25	4W	5	10	50	100	N.C. 800 N.O. 300	700	200	250
T	A	.50	10W	50	100	200	100	70	500	50	250
M	A	1.0	50W	50	100	500	50	0	2000	1000	1000

Electronic Specialty Division's lead frame Reed Relay represents a major manufacturing breakthrough that yields reliable Reed switch combinations never before available, at a remarkable savings in space and cost.

LG SERIES



LG SERIES



LG Series Reed Relays

The LG's unique high density, low profile concept lends itself to applications in present and future technology. The totally encapsulated package is suitable for the inclusion of integrated circuits or discrete transistors, diodes, capacitors, resistors, etc., to combine the values of solid state circuitry with the isolation and power switching characteristics of the reed relay.

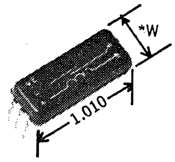
COIL SELECTION TABLE†

Coil Voltage (D.C.)	5	6	12	24	48
Power (MW sensitivity)*	150	150	150	200	300

† Non-standard coil voltages and degrees of sensitivity may be specified for multiple packages that utilize common or individual coils.

Less power consumption, through careful design and the winding of fine wire, results in greater efficiency and lower temperature rise.

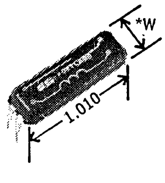
LG SERIES



WIDTH AND CONTACT CONFIGURATION

"W"	Common Coils	Individual Coils
.3	1A	1A
.4	2A (1A, 1B)* 1B 1C	1B 1C
.5	3A (1A, 1C)* 2B 2C	2A
.7	4A (2A, 2C)* 5A (2A, 2B)* 4B 3C	3A (1A, 1B)* 2B (1A, 1C)*
.9	6A (3A, 2C)* 4C (1A, 3B)*	4A (1A, 2B)* 3B (1A, 2C)*
1.3	10A (5A, 2B, 1C)* 8B (4A, 2B, 2C)* 7C	6A (2A, 1B, 2C)* 4B 4C

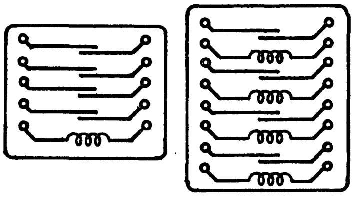
LG SERIES



*Reference contact configuration on all widths.

COMMON COILS vs. INDIVIDUAL COILS

Common coils save space and cost. When **individual** coils are needed to provide the additional flexibility for logic circuits, exclusive construction results in greatly reduced cost over separate relays. It generates substantial savings in PC board area, insertion and test. They permit truly high density packaging.



LF Series Reed Relays

The LF series is similar in design to the LG series but provides greater packaging volume. The greater volume facilitates the inclusion of solid state devices such as zero crossing detectors, timing circuits, transistor drivers and hybrid or integrated circuits.

COIL SELECTION TABLE†

Coil Voltage (D.C.)	5	6	12	24	48
Power (MW sensitivity)*	150	150	150	200	300

† The greater volume of the LF series permits the use of a greater number of turns of wire, for increased sensitivity, making it ideal for applications where power is limited. Different degrees of sensitivity and coil voltages may be specified in multiple packages, utilizing individual coils.

* Power (MW sensitivity) as low as 65 MW is available.

WIDTH AND CONTACT CONFIGURATION

"W"	Common Coils	Individual Coils
.4	1A 2A (1A, 1B)* 1B 1C	1A 1B 1C
.8	6A (3A, 2C)* 4B (1A, 2B)* 4C	3A (2A, 1B)* 2B (2A, 1C)* 2C
1.3	10A (5A, 2B, 1C)* 8B (4A, 2B, 2C)* 7C	6A (2A, 1B, 2C)* 4B 4C

HOW TO ORDER

Standard Relays

To specify your relay, refer to this catalog. Indicate, at least, the following items:

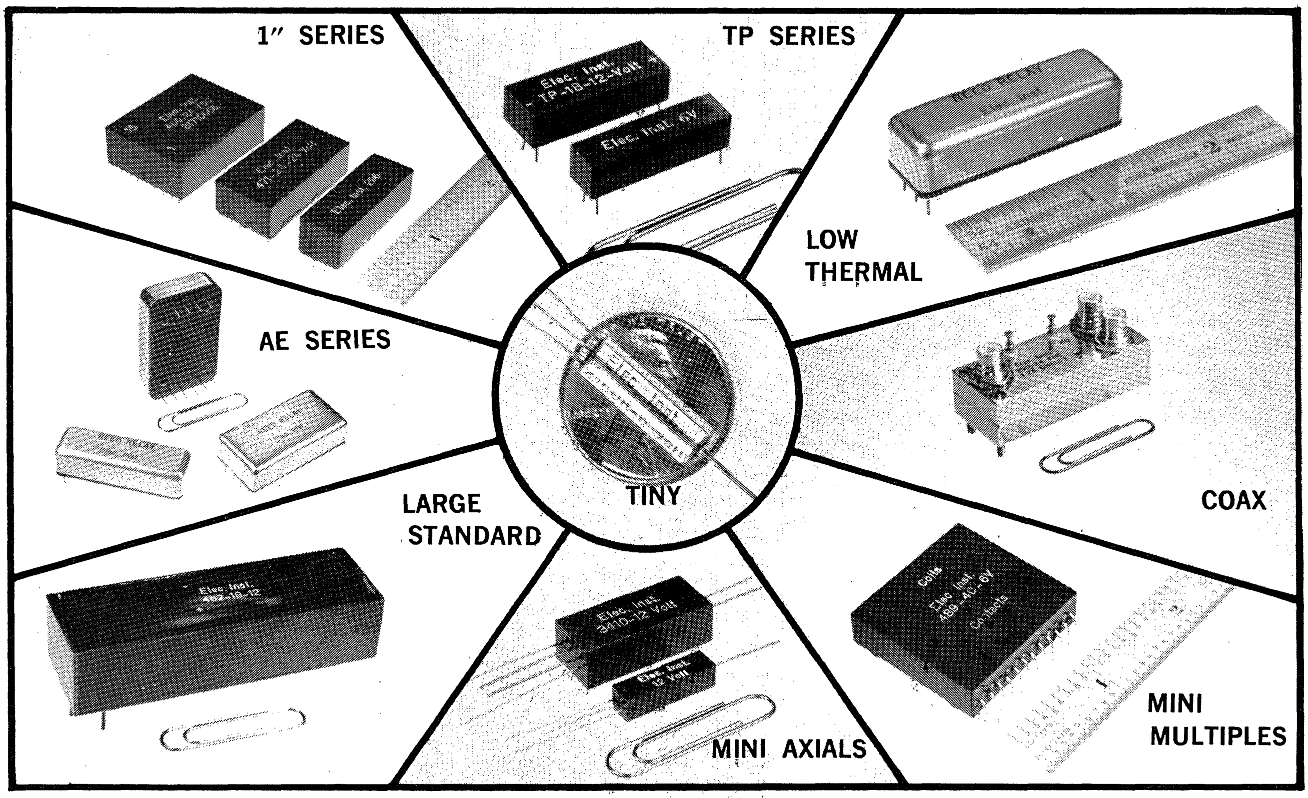
Package style - LF or LG
Grid Spacing - .1″ is standard, .15″ is optional
Form for each pole - (A, B or C)
Nominal coil voltage(s)
Coil configurations, if not common
Special Requirements such as:
Unusual environmental conditions
Shielding, (electrostatic) (electromagnetic)
Special contact load carrying characteristics
Special tests, etc.

Reed Relays

HIGH QUALITY • LOW COST
SMALL SIZE • MANY TYPES
QUICK DELIVERY • LONG LIFE

WE HAVE A BROAD LINE OF REED RELAY PRODUCTS AS REPRESENTED BELOW. MANY OF THESE TYPES CAN BE SHIPPED FROM STOCK. LET US PROVE OUR ABILITY TO RAPIDLY FURNISH SPECIAL UNITS IF OUR CATALOG ITEMS DO NOT MATCH YOUR REQUIREMENTS. DON'T BE A VICTIM OF INEFFECTIVE DESIGN. COME TO PEOPLE WHO CARE.

PHONE OR WRITE FOR COMPLETE DATA AND PRICES. 617-729-1202

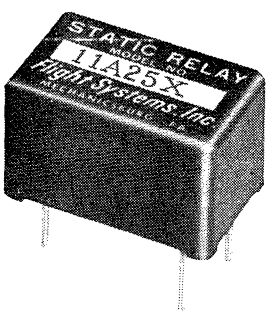

1" SERIES
TP SERIES
Elec. Inst. TP-18-12-Volt
Elec. Inst. 6V
LOW THERMAL
AE SERIES
TINY
COAX
LARGE STANDARD
Elec. Inst. 482-18-12
Elec. Inst. 3410-12 Volt
Elec. Inst. 12 Volt
Coils Elec. Inst. 489-4E-6V Contacts
MINI AXIALS
MINI MULTIPLES

ELECTRONIC INSTRUMENT & SPECIALTY CORP.

71 CROSS ST., WINCHESTER, MASS. 01890 • PHONE: (617) 729-1202

SOLID STATE RELAYS

	AC STATIC RELAY			DC STATIC RELAY				PRICE		
LOAD CURRENT RATING	CONTROL REQUIREMENTS	BIAS REQUIREMENTS	AC STATIC RELAY MODEL NUMBER	CONTROL REQUIREMENTS	BIAS REQUIREMENTS	DC STATIC RELAY MODEL NUMBER	SIZE (OD) L x W x H	1–10	11–25	26–50
SPST N. O. (Form A)										
300 ma				5VDC at 12 ma	None req'd.	11D3X	.688" x 1.125" x .750"	27.50	25.20	23.75
				3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 10 ma	11D3K		30.50	28.00	26.25
1 AMP	5VDC at 12 ma	None req'd	11A10X	5VDC at 30 ma	None req'd.	11D10X		27.85	25.45	23.90
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 10 ma	11A10K	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 30 ma	11D10K		30.85	28.25	26.40
2.5 AMPS	5VDC at 20 ma	None req'd.	11A25X	5VDC at 50 ma	None req'd.	11D25X		28.75	26.10	24.35
	3 to 6VDC at 20 ma TTL COMPATIBLE	5VDC at 2 ma	11A25K	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 50 ma	11D25K		31.75	28.90	26.85
6 AMPS	5VDC at 25 ma	None req'd	11A60X	12VDC at 100 ma	None req'd.	11D60X	1.50" x 1.50" x 1.00"	29.75	27.50	25.05
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 25 ma	11A60K	3 to 6VDC at 2 ma TTL COMPATIBLE	12VDC at 100 ma	11D60K		33.75	30.30	27.50
10 AMPS	5VDC at 50 ma	None req'd.	11A100X				1.90" x 2.50" x 1.00"	34.80	33.15	29.90
15 AMPS	12VDC at 75 ma	None req'd.	11A150X					39.50	37.85	34.30
DPST N. O. (2 Form A)										
300 ma				5VDC at 25 ma	None req'd.	21D3X	1.00" x 1.50" x .687"	39.80	36.50	32.00
				3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 25 ma	21D3K		42.80	39.25	34.25
1 AMP	5VDC at 25 ma	None req'd.	21A10X	5VDC at 60 ma	None req'd.	21D10X		41.75	38.50	34.05
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 25 ma	21A10K	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 60 ma	21D10K		44.75	42.25	36.55
2.5 AMPS	5VDC at 40 ma	None req'd.	21A25X	5VDC at 100 ma	None req'd.	21D25X		42.00	38.75	34.30
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 40 ma	21A25K	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 100 ma	21D25K		45.00	41.50	36.80
6 AMPS	5VDC at 60 ma	None req'd.	21A60X	12VDC at 200 ma	None req'd.	21D60X	1.25" x 2.50" x 1.00"	44.70	39.85	35.50
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 60 ma.	21A60K	3 to 6VDC at 2 ma TTL COMPATIBLE	12VDC at 200 ma	21D60K		48.70	42.60	38.00
SPDT (Form C)										
300 ma				5VDC at 15 ma	5VDC at 15 ma	12D3X	1.00" x 1.50" x .687"	39.80	36.50	32.75
				3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 30 ma	12D3K		42.80	39.25	35.25
1 AMP	5VDC at 15 ma	5VDC at 15 ma	12A10X	5VDC at 30 ma	5VDC at 30 ma	12D10X		40.30	37.00	33.20
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 30 ma	12A10K	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 60 ma	12D10K		43.30	39.75	35.70
2.5 AMPS	5VDC at 22 ma	5VDC at 22 ma	12A25X	5VDC at 50 ma	5VDC at 50 ma	12D25X		41.40	38.60	34.75
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 45 ma	12A25K	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 100 ma	12D25K		44.40	41.35	36.25
6 AMPS	5VDC at 30 ma	5VDC at 30 ma	12A60X	12VDC at 100 ma	12VDC at 100 ma	12D60X	1.25" x 2.50" x 1.00"	45.25	41.10	37.50
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 60 ma	12A60K	3 to 6VDC at 2 ma TTL COMPATIBLE	12VDC at 200 ma	12K60K		48.25	43.80	40.00
DPDT (2 Form C)										
300 ma				5VDC at 28 ma	5VDC at 28 ma	22D3X	1.50" x 1.50" x 1.00"	49.75	44.00	39.25
				3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 60 ma	22D3K		52.75	47.00	42.25
1 AMP	5VDC at 28 ma	5VDC at 28 ma	22A10X	5VDC at 64 ma	5VDC at 64 ma	22D10X		50.55	48.10	45.25
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 60 ma	22A10K	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 130 ma	22K10K		54.55	52.10	49.25
2.5 AMPS	5VDC at 44 ma	5VDC at 44 ma	22A25X	5VDC at 100 ma	5VDC at 100 ma	22D25X		52.15	50.50	47.15
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 90 ma	22A25K	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 200 ma	22D25K		56.15	54.50	51.15
6 AMPS	5VDC at 55 ma	5VDC at 55 ma	22A60X	12VDC at 200 ma	12VDC at 200 ma	22D60X	2.75" x 4.06" x 1.375"	64.50	62.05	59.75
	3 to 6VDC at 2 ma TTL COMPATIBLE	5VDC at 110 ma	22A60K	3 to 6VDC at 2 ma TTL COMPATIBLE	12VDC at 400 ma	22K60K		69.50	67.05	63.75



FLIGHT SYSTEMS, INC. OFFERS THE WIDEST AND MOST COMPLETE SELECTION OF ALL SOLID STATE RELAYS AVAILABLE ANYWHERE.

SPECIFICATIONS:

Load Voltage (min-max): DC STATIC RELAY: 0 to 60 VDC
AC STATIC RELAY: 0 to 300 VP, 1 to 500 HZ

Load Types: Resistive
Inductive: Max. Transient 1000 VP for 10 ms. (transient protection recommended)
Capacitive: Max. Inrush 3.5 times mas Load Current Rating for 1 second.
Reactive: Power Factor ≥ .5 Leading or Lagging

5V Control Response: On above 3.75V; Off below 2.00V

Actuating Time: 50 microseconds

Release Time: DC Static Relay: 50 microseconds
AC Static Relay: 1/2 cycle at Load Frequency

Repetition Rate: 2000 Operations per second

Operating Temperature Range: -20°C to +71°C

Construction: Potted Module in a Diallyl Phthalate case, Glass Filled.

Mounting: Gold Plated Pins for either Direct Solder-in PCB Mounting or Wire Wrap.

Shock, Vibration, Altitude, Humidity: Per Mil-E-5400

Isolation: Load-to-Control: 50 Megohms min
Pole-to-Pole; 50 Megohms min.

DESIGNED TO MEET MIL-R28750

DELIVERY FROM STOCK

Flight Systems, Inc. also offers Latching Relays, Voltage and Frequency Sensitive Relays, Telegraph, Teletype and Telephone Relays, Zero Switching AC Relays, AC/DC Load Relays, a complete selection of Timers, Current Sensors and Circuit Breakers, ALL SOLID STATE!

NEED A SPECIAL RELAY? Let us quote on manufacturing a Solid State Relay to your exact specifications. Through the use of modularized construction techniques, the cost of a relay to your exact requirements is surprisingly low. We offer 24 hour quote service and 2 to 3 week delivery on most custom designed relays.

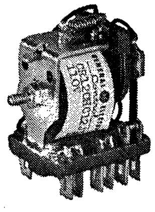
WRITE OR CALL FOR OUR NEW CATALOG - LISTS COMPLETE SPECS AND PRICES. ALSO SEE EEM PAGE SHOWING SOLID STATE CIRCUIT BREAKERS. SEE INDEX FOR PAGE NUMBER.

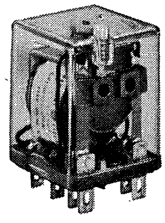
Flight Systems, Inc.

P. O. BOX 25, MECHANICSBURG, PA. 17055
PHONE (717) 697-0333

RELAYS

CR120 TYPE H GENERAL-PURPOSE RELAYS


Open, stud-mounting relay


General purpose control socket plug-in form with manual operator

These compact, economical relays are ideal for the highly repetitive operations required in the output of electronic equipment and in small, built-in chassis-type control panels where space is at a premium.

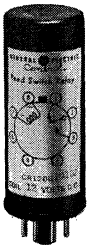
FEATURES

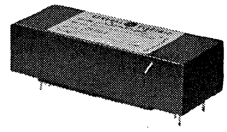
- **Variety of Forms** — 5-amp, 10-amp relays and latch forms and current sensitive relays are available.
- **Mounting Flexibility** — forms available for front- or back-connection, plug-in or channel-mounting. Open relays either stud- or screw-mounted.
- **Small Size** — occupies only 3 to 5 cubic inches.
- **Not Position Sensitive** — relays will operate in any position.
- **Easy Connection** — combination push-on, solder-type terminals (.110 and .205 inch) available for front, back or plug-in connection.
- **Manual Operator, Indicating Light 110-250 V** — available on dust-covered, back-connected and plug-in forms permits check of relay operation.

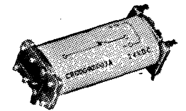
Write for Bulletin GEA-7882

REED SWITCH RELAYS

CR120 TYPE G


Tube-type plug-in


Enclosed printed-circuit


Open printed-circuit

CR120 Type G relays provide extremely long electrical and mechanical life.

They are available in a wide variety of mounting and connection arrangements including plug-in; printed-circuit; bracket-mount or stud-mount with solder-tab, wire-wrap or quick-connect terminals.

You can select relays which perform latching, timing, or current-sensing functions as well an ON-OFF switching.

Relays are magnetically shielded. High-fidelity contacts are hermetically sealed in an inert gas to prevent contamination.

Many standard factory modifications are available to meet wide application requirements.

Contact Characteristics

Maximum rating (a-c or d-c):
15 watts, resistive
1.0 ampere maximum
250 volts maximum (60 cycles rms)

Contact resistance (initial): 30-60 milliohms

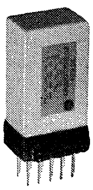
Life expectancy (electrical):
20 million operations at maximum rating
100 million operations at ½ max rating
200 million operations at low load

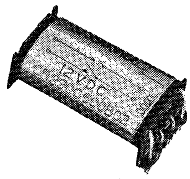
Resonant frequency (reed): 1080 cps

Operation

Nominal coil power:
SPDT 450 mw
DPDT 680 mw
3PDT 1000 mw
SPDT latch 270 mw
DPDT latch 580 mw

CR220 TYPE G


Plug-in with socket attached


Open printed-circuit

CR220 Type G relays are small, compact units that are ideal for applications where fast operating time and low power are required such as for scanning, instrumentation, counting and data processing.

These small relays are available in a variety of compact housings suitable for multi-relay applications. You can choose forms for timing functions as well as ON-OFF switching. Mounting arrangements include printed-circuit, plug-in, bracket or channel-mounting. Bracket or channel-mounted forms are available with one- or two-level solder/push-on (0.110 x 0.032 in.) or wire-wrap terminals.

Relays are magnetically shielded, contacts are hermetically sealed. A wide variety of factory modifications are offered.

Contact Characteristics

Maximum rating (a-c or d-c):
15 watts, resistive
1.0 ampere maximum
250 volts maximum (60 cycles rms)

Contact resistance (initial): 30-60 milliohms

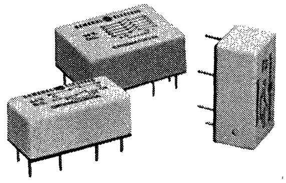
Life expectancy (electrical):
20 million operations at maximum rating
100 million operations at ½ max rating
200 million operations at low load

Resonant frequency (reed): 1100 cps

Operation

Nominal coil power:
Printed circuit: 1P 350 mw, 2P 600 mw, 3P 700 mw, 4P 900 mw, 5P 1200 mw, 6P 1600 mw
Plug-in & bracket: 1P 350 mw, 2P 600 mw, 3P 770 mw, 4P 1000 mw, 5P 1400 mw, 6P 2300 mw, 8P 2300 mw, 12P 4000 mw

CR120 TYPE M



CR120 Type M relays are miniature units that provide fast operating time, long life, and reliability in a minimum amount of space. You can get as many as five circuits in a relay only 0.88 x 1.12 inches. They are available as enclosed printed-circuit forms.

The relays perform ON-OFF switching, and are ideal for scanning, instrumentation, counting and data processing applications.

Enclosed forms assure mechanical protection and may be ordered with or without potting compound. They are not affected by magnetic fields created by adjacent relays. All contacts are hermetically sealed to give the highest possible fidelity. The miniature reed switches are manufactured and tested under clean-room conditions.

Forms with dual winding coils, special coil voltages, alternate pin length, and electrostatic shielding are also offered.

Contact Characteristics

Maximum rating (a-c or d-c):
4 watts, resistive
0.125 ampere maximum
120 volts maximum (60 cycles rms)

Contact resistance (initial): 200 milliohms

Life expectancy (electrical):
5 million operations at maximum rating
15 million operations at ½ max rating

Resonant frequency (reed): 2000 cps

Operation

Nominal coil Power:
1P 150 mw
2P & 3P 500 mw
4P & 5P 800 mw

Write for Bulletin GEA-7396

For complete information contact your nearby GE Sales Office, or write to General Electric Co., Section 998-80. Schenectady, N. Y. 12305.

GENERAL ELECTRIC

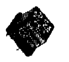
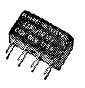
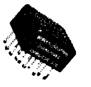
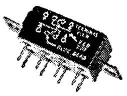
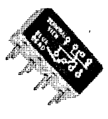
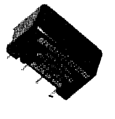
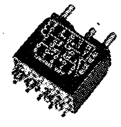
HERMETICALLY SEALED RELAYS

Unmatched for reliability, the light weight, thermal capabilities, and high resistance to shock of these hermetically sealed relays make them ideally suited for military and industrial electronic applications.

The reliability factor stems from exacting assembly (in a "White Room" where necessary), rigid quality control, well-equipped lab facilities and precise testing procedures. These manufacturing techniques, combined with GE's advanced engineering design, produce top-quality relays with dependable characteristics exceeding those of static switching devices.

Contact resistance is held to a minimum by silver contacts (with gold flash) combined with high contact forces.

All high-temperature components allow the operation of these relays in ambient temperatures between −65°C to + 125°C. Units are available with studs or brackets for mounting. The micro line has tab brackets for printed-circuit board application. Headers can be furnished with solder hooks, three-inch leads, plug-in (with socket availability information) and many special terminals. *Write for Bulletin GEA-6628*

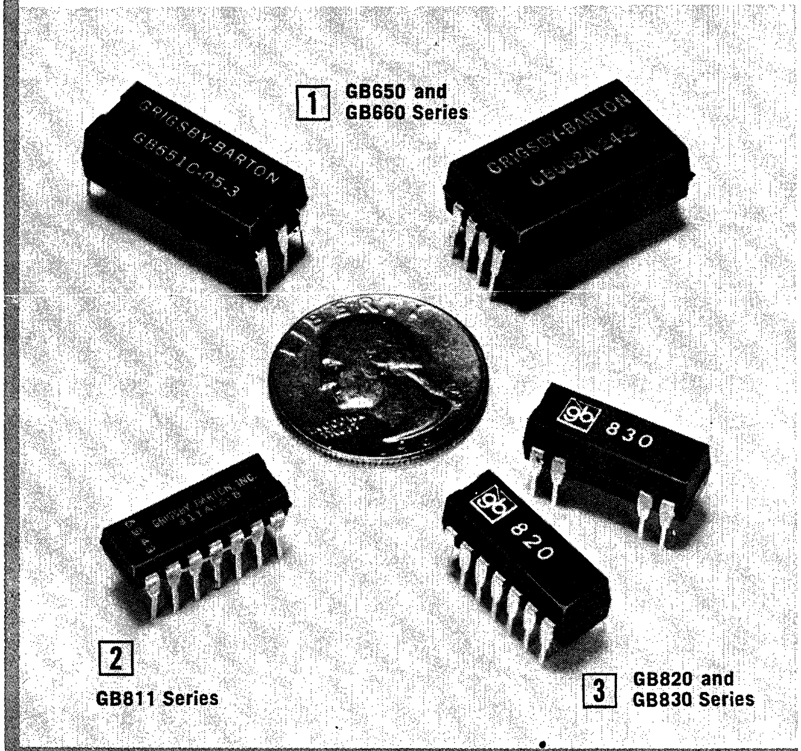
	Contact Form	Contact Rating	Sensitivity	Size & Weight	Vibration Capabilities	Shock	Operate Time	Release Time
 **TRANSISTOR SIZE TO-5^2 (3SBS)** All-welded including coils High contact forces, overtravel Low contact resistance High thermal margin Meets MIL-5757/40	2PDT	1A at 28 Vd-c 0.2A at 28 Vd-c Ind.	120 mw	0.37″x0.37″x0.275″ 0.09 oz.	30 G's to 3000 Hz	100 G's for 11 ms	2 ms max	1 ms max
 TRANSISTOR SIZE TO-5^2 (3SCS) INDUSTRIAL TYPE All welded Low cost	2PDT	1A at 28Vd-c 0.2A at 28Vd-c Ind.	160 mw	0.37″x0.37″x0.275″ 0.09 oz.	10 G's to 2000 Hz		4 ms max	3 ms max
 **150 GRID-SPACE (3SBC, 3SBH)** New small size Low profile — only 0.32″ high Terminals on 0.150″ centers All-welded construction Meets MIL-5757/37 and 80	1PDT 2PDT 4PDT	2A at 28Vd-c 2A at 28Vd-c ½ at 115Va-c	50 mw 135 mw 250 mw	0.32″x0.61″x0.31″ 0.13 oz. 0.32″x0.61″x0.61″ 0.24 oz.	30G's to 3000 Hz	50 G's for 11 ms	4 ms max	4 ms max
 **150 GRID MAGNETIC LATCH (3SBM)** New small size Low profile All-welded construction Snap action — no hang-up Meets MIL-5757/85	4PDT	2A at 28 Vd-c 0.5A 115 Va-c	Single coil 100 mw Dual coil 200 mw	0.61″x0.61″x0.32″ 0.28 oz.	30 G's to 3000 Hz	100 G's for 11 ms	4 ms max	4 ms max
 **HALF-SIZE MICRO (3SAV)** Terminals on 0.2″ centers All-welded construction Bifurcated contacts Power or low-level switching Meets MIL-5757/9	2PDT	2A at 28 Vd-c 1A at 115Va-c	260 mw	0.4″x0.8″x0.4″ 0.35 oz.	30 G's to 3000 Hz	50 G's for 11 ms	4 ms max	4 ms max
 **HALF-SIZE MICRO (3SCV) INDUSTRIAL TYPE** 100 million life at low level Low contact resistance Normal overload capability Replaces reeds	2PDT	10^5 at 2A 28Vd-c 10^8 low level	340 mw	0.4″x0.8″x0.4″ 0.35 oz.	10 G's to 2000 Hz		6 ms max	6 ms max
 **HALF-SIZE PLASTIC CASE (3SBV)** (Not Hermetically Sealed) Low profile — Low cost +85°C operation Bifurcated contacts Rugged construction	2PDT	2A at 30 Vd-c 0.5A 115Va-c	285 mw	0.48″x0.88″x0.49″ 0.3 oz.	——	——	5 ms max	5 ms max
 **4-POLE MICRO (3SAH)** All-welded construction No solder, solder flux Power or low-level switching Terminals on 0.2″ centers Meets MIL-5757/12	4PDT	2A at 26.5 Vd-c 1A at 115 Va-c	400 mw	0.81″x1.01″x0.61″ 1.0 oz.	30 G's to 3000 Hz	50 G's for 11 ms	6 ms max	5 ms max

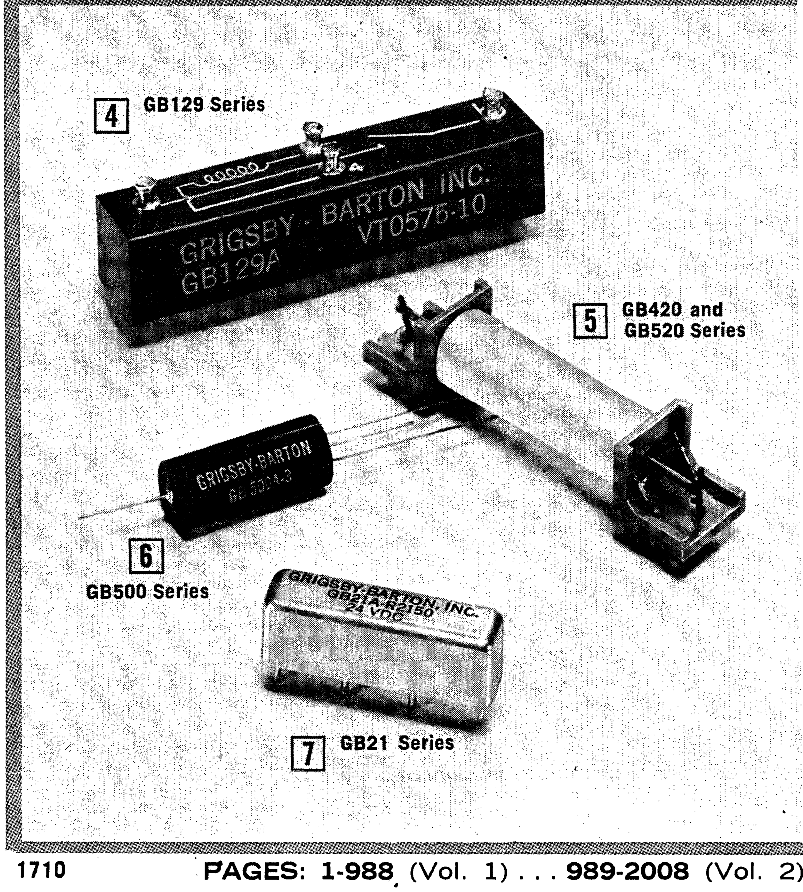
For complete information contact your nearby GE Sales Office, or write to General Electric Co., Section 998-80. Schenectady, N. Y. 12305.

GENERAL ELECTRIC

GRIGSBY-BARTON

Everything in Reed Relays





Miniature and DIP Models

1 **GB650, GB660 Series.** GB650 relays have .150 grid terminals, and the GB660, .100 grid. Both series come in single and double-pole Form A and Form C models. Contact types available in Form A are: general-purpose, instrument-grade, economy, high-voltage, mercury-wetted and ultra-sensitive. Form C contact types include: general-purpose, instrument-grade, economy and 10-watt-switching. All can be supplied with 5, 12 or 24 VDC coils. Magnetic shielding and internal clamp diodes are optional. Low .312 package height permits close PC board stacking.

2 **GB811 Series.** These micro-miniature, 14-pin DIP reed relays conform to JEDEC specifications. The .185 package height allows the densest possible PC board stacking. All models can be automatically inserted. Available in Form A, 2 Form A, and Form C—with optional internal clamp diodes and electrostatic shielding. Coils are designed for 10MA or 40MA 5 VDC drivers.

3 **GB820, GB830 Series.** These 14-pin (GB820) and 8-pin (GB830) DIP reed relays come in over 150 models—counting the many forms, coils and circuit options. Forms include Form A, 2 Form A, Form B, Form C, and mercury-wetted Form A, Form B, and Form C models. They can be supplied with 3, 5, 12 or 24 VDC coils, as well as internal clamp diodes and electrostatic shielding. Contact ratings range up to 10 watts in Form A and Form B, and 8 watts in Form C. They fit standard 14-pin DIP receptacles and can be automatically inserted. Package height is .275 from seating plane.

Conventional Models

4 **GB129 Series.** Compact high-reliability relays for high voltage switching. Can switch up to 20,000 volts and stand-off up to 25,000 volts. Switch contacts are vacuum-sealed in a glass envelope. Nylon screws in phenolic housing permit base mounting. Available in Form A and Form B.

5 **GB420, GB520 Series.** Rugged open-frame relays available in single and double-pole Form A and Form C models. Molded nylon bobbin. GB520 relays come in a steel jacket for electromagnetic shielding.

6 **GB500 Series.** Low-cost cylindrical relays suitable for PC, soldered or welded assembly. Miniature in size. Overall body length is 1 in. Maximum diameter is .425 in. Epoxy-molded housing. In Form A and Form C.

7 **GB21 Series.** Compact, single-pole relays for PC board applications. Displace less than ½ cu.in. Terminal spacing is in multiples of .100 grid pattern. Epoxy-filled interior protects components from physical shock.

Available in Form A and B, with a variety of coils to meet special needs. Choose either nylon or steel case. The steel case provides electromagnetic shielding and can be supplied with cadmium, clear irridite or chrome-plated finish.

GB31 Series (not shown). Comes in same cases as GB21 Series, but has different contact pin arrangement. Available in mercury-wetted Form A and dry-reed Form C. Mercury-wetted model combines high-speed switching with low contact resistance and high-power capacity. It's excellent for either dry-circuit switching or power switching.

Need Something Special?

If one of our thousands of standard models does not meet your needs, we can give a special-design relay that will—at a reasonable cost. This could be either a modified-standard, or an original design. For example, a 45,000-volt relay. Our capabilities in this area are well known throughout the industry.

GRIGSBY-BARTON

Solid-State Switches and Relays

When You Think Triacs, Think Reedacs®

Reedacs® are semi or purely solid-state heavy-duty switches with triac capabilities. All except miniature Reedacs come in models rated up to 30 amps at 120 or 240V RMS. Inrush load is ten times the rating.

8 **GB2200 Standard Reedacs.** These semi solid-state devices have random, bounceless turn-on, with turn-off at current zero. Exclusive circuitry (Patent Applied For) prevents premature triac failure. They can switch inductive, tungsten or resistive loads. Input can be any switch closure, DC pulse or 5 VDC logic. They offer operation in microseconds, 500 million cycles in life, and maximum input-output isolation. Available in nylon case with three terminal options; and, steel can with octal plug. UL listed.

9 **GB7200 Synchro-Reedacs®.** The patented circuitry of these solid-state, synchronous switches handles inductive, capacitive, resistive or tungsten loads—with no minimum load current. This circuitry also prevents "half-wave phenomena" and delivers virtually zero RFI. Turn-on occurs no later than 4 volts into the cycle; and turn-off at current zero. Input can be any switch closure, DC pulse or 5 VDC (T^2L, DTL) logic. Select from 60-Hz and 400-Hz models in three nylon-case designs or steel can with octal plug.

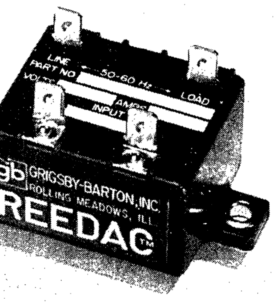
10 **GB4200 Miniature Reedacs.** Control resistive, capacitive or inductive loads up to 2 amps, 240 volts AC. Input can be DC logic or external switch. Available in PC, wire-wrap and flying-lead designs.

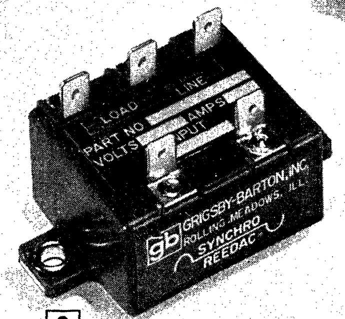
11 **GB5000 Reedac Phase Controllers.** Available in 480 models in all. They consist of a triac, a diac and passive components mounted on a PC board. This is packaged in a glass-filled nylon case you can mount on metal equipment frames.

Select from 16 circuit assemblies with ratings up to 30 amps (RMS) at 120 or 240V RMS. Besides the basic variable voltage circuitry, these circuit options are available in any combination: an RC network to minimize dv/dt to 10 volts per microsecond; an extended variable voltage circuit; an RFI suppression circuit; and a circuit that provides 5% variation between potentiometer input and load voltage. Choose from solder-lug, quick-connect and screw-type terminals.

8

GB2200 Standard Reedacs





9

GB7200 Synchro-Reedacs

gb GRIGSBY-BARTON, INC.
REEDAC
SERIES 4200

10

GB4200 Miniature Reedacs

LINE
50-60 Hz
LOAD
PART NO
AMPS
VOLTS
INPUT
gb GRIGSBY-BARTON, INC.
PHASE CONTROL
REEDAC TM

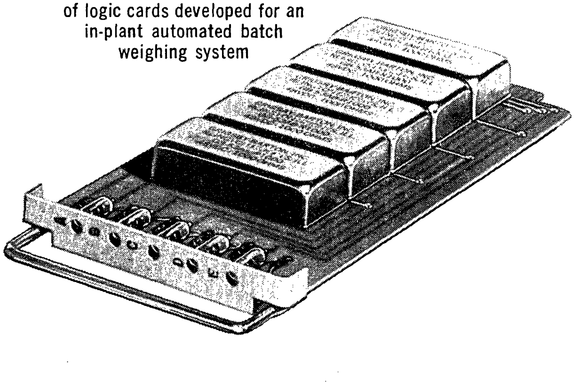
11

GB5000 Reedac Phase Controllers

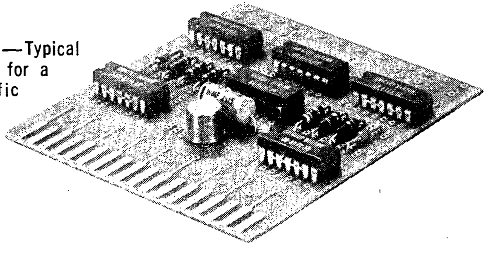
Systems, Sub Systems and Logic Cards

Grigsby-Barton can design and manufacture any type of switching or control system for you—from the simpplest reed-relay logic card to the most complex multiple-card systems.

Batch Weight Logic—One of a group of logic cards developed for an in-plant automated batch weighing system



Traffic Control Logic—Typical logic card designed for a computerized traffic control system



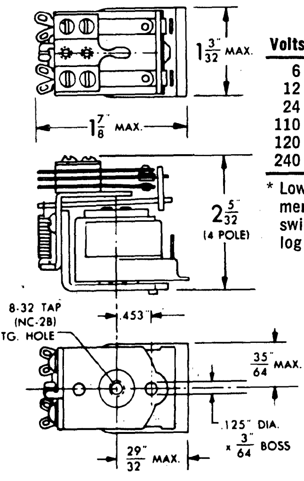
GRIGSBY-BARTON, INC.

3800 INDUSTRIAL DRIVE, ROLLING MEADOWS, ILLINOIS 60008 • TELEPHONE AREA CODE 312/392-5900

GUARDIAN® ELECTRIC GENERAL PURPOSE RELAYS

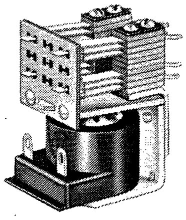
SERIES 640U-AC/645U-DC

U/L Recognized Component File #E-17260A



	Typical Data for Power* Coils			
	640U-AC		645U-DC	
Volts	Ohms	Amps	Ohms	Milli-amps
6	1.7	1.100	12	500
12	6.8	0.500	50	240
24	24	0.260	200	120
110	—	—	4000	27
120	550	0.068	—	—
240	2950	0.028	—	—

* Lower current coils often recommended for units with fewer switches. Complete data in catalog described below.



ALL PURPOSE ECONOMY RELAY

A rugged, lightweight relay capable of unusually heavy power control for its size. "Capsul-Coil" molded nylon coil cover protects against knocks, abuse and moisture.

COIL:

Typical Voltages: AC — 3, 6, 12, 18, 24, 32, 50, 120 and 240 VAC DC — 1.5, 3, 6, 12, 18, 24, 32, 48 and 110 VDC

Voltage Range: AC coils will operate satisfactorily at 15% below and 10% above rated voltage. DC coils at 20% below and 10% above rated voltage.

Terminals: Solder lug standard. Also available: 3/16″ quick connect.

CONTACTS:

Rating: Available in 1½, 5 and 10 ampere points at 120 V, 60 Hz non-inductive load.

Electrical Life: 250,000 operations min. at rated resistive load; 100,000 min. with 45% power factor inductive load at rated voltage.

Maximum Switches: 4PDT or 8PST.

Material: Silver standard; alloys as specified.

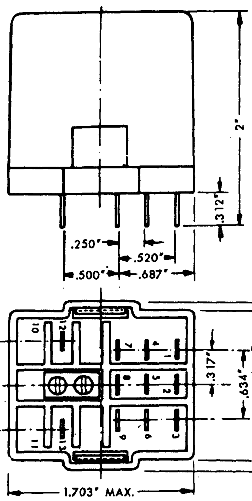
Insulation: Phenolic, tested at 1500 volts, 60 Hz

Terminals: Solder lug standard. Also available: Taper tab, 3/16″ or ¼″ quick connect.

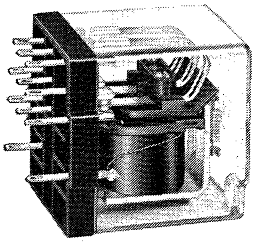
Enclosures: Available — including octal or Jones plug.

SERIES 1220AC/1225DC

U/L Recognition File #E-23524



	TYPICAL OPERATING CHARACTERISTICS (3PDT)			
	1220AC-60 Hz		1225DC	
Volts	Ohms	Max. Coil Current in M.A.	Ohms	Coil Current in M.A.
6	3.3	690	18	335
12	13	350	75	160
24	54	190	300	80
110	—	—	6500	17
120	1110	37	—	—
240	5000	21	—	—



2PDT or 3PDT ENCLOSED RELAY

Modern, compact design makes this the standard of the industry. "Uni-Guard" continuous-loop moving blades eliminate soldered connections; snap-lock cover does away with wire retainers. Uses terminal panel as the male plug. Versatile terminations: Solder lug, .110″ quick connect, or socket plug in. Also available: 3/16″ quick connect, taper tab and printed circuit .053″.

COIL:

Typical Voltages: From 6 to 240 VAC, 60 Hz and from 6 to 110 VDC.

Voltage Range: AC coils will operate satisfactorily at 15% below and 10% above rated voltage. DC coils at 20% below and 10% above.

CONTACTS:

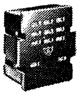
Rating: 10 amps at 120 VAC non-inductive. (7 amps U/L approved.)

Electrical Life: 1,000,000 operations min. at rated resistive load AC; 2,000,000 @ 30 V max. DC.

Material: Gold flashed silver standard; alloys as specified.

Combination: 2PDT or 3PDT switch capacity.

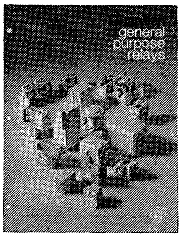
Insulation: Molded arc resistant thermosetting material, tested at 1500 V, 60 Hz.



Sockets: .500″ and .875″ thick sockets for chassis mounting available. Bracket available for mounting relay above chassis without socket. Complete data in catalog described below.

TEST A SAMPLE RELAY: ***Call your Guardian rep.***

CALL OR WRITE FOR THE GUARDIAN GENERAL PURPOSE RELAYS CATALOG



This free 24-page manual and catalog is full of relay facts, figures and dimensional drawings . . . covering the complete, comprehensive line of Guardian General Purpose relays. All in a single volume designed for easiest possible use.

GUARDIAN® ELECTRIC

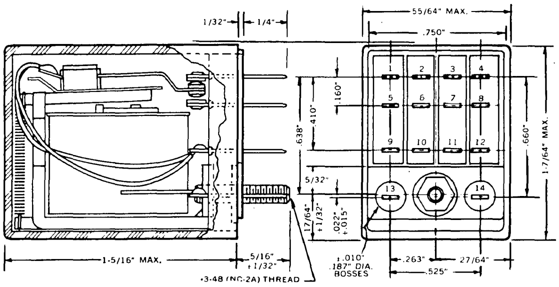
1562 WEST CARROLL AVENUE
CHICAGO, ILLINOIS 60607 — 312/243-1100

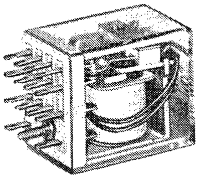
RELAYS • SOLENOIDS
SWITCHES • STEPPERS
SOLID STATE CONTROLS

GUARDIAN® ELECTRIC GENERAL PURPOSE RELAYS

SERIES 1310AC/1315DC

U/L Recognition File #E-23524





	TYPICAL OPERATING CHARACTERISTICS			
	1310AC		1315DC	
Nom. Volts 50/60 Hz	Ohms	Max. Attr. Voltage	Ohms	Max. Attr. Voltage
6	10.5	5.1	40	4.5
12	45.0	10.2	160	9.0
24	160.0	20.4	650	18.0
110	—	—	11,000	82.5
120	3,900.0	102.0	—	—

4PDT, 5 AMP ENCLOSED RELAY

Long life, plug-in miniature relay especially suitable for computers, data processing equipment, business machines. Rugged but sensitive; just a bit more than one cubic inch. Heat resistant Lexan cover.

Expected Mechanical Life: In excess of 50 million operations and 100,000 operations minimum @ rated AC load. In excess of 100 million operations and 100,000 operations minimum @ rated DC load.

Time Values: Nominal voltage @ 25°C; Maximum Time Values — Pull-in time, 13 milliseconds; Drop-out time, 10 milliseconds (DC).

Approximate Weight: 1½ oz.

Terminals: Solder lug standard.

CONTACTS:

Material: Silver, gold flashed standard. Alloys as specified.

COIL:

Power: 1.2 volt amps at nominal AC voltage @ 25°C; 0.9 watts at nominal DC voltage @ 25°C.

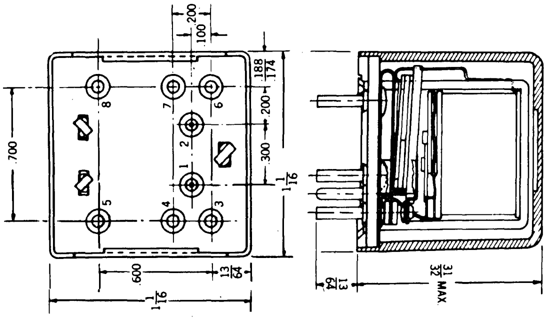
Sockets: Two socket designs available—with solder terminals or printed circuit terminals—for chassis mounting.

PRINTED CIRCUIT TERMINATION:

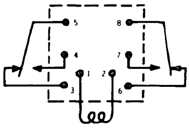
This relay also available as 1310P-AC and 1315P-DC with printed circuit termination. Complete data in catalog described on preceding page.

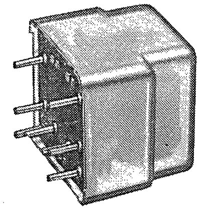
SERIES 1350AC/1355DC

Conforms to U/L requirements for business machines.



CIRCUIT DIAGRAM





2PDT PRINTED CIRCUIT RELAY

Unique, compact design with .060″ dia., 13/64″ long terminals on .1″ grid spacing for standard printed circuit board. Solders right on PC board. Mechanical life in excess of 10 million operations.

COIL:

Voltage Range: Will operate from 15% below to 10% above rated voltage.

CONTACTS:

Rating: Contacts rated for 3 amps at 120 VAC resistive.

Material: Fine silver or alloy.

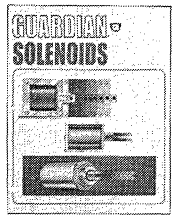
Insulation: Glass epoxy contact terminal board and molded nylon cover.

Contact Load Life: Up to 500,000 operations. Complete data in catalog described on preceding page.

OPERATING CHARACTERISTICS					
1355DC-DPDT			1350AC-DPDT		
Volts DC	Ohms	Milliamps	Volts 60 Hz	Ohms	Max. Coil Current in M.A.
6	38.0	158	6	9.5	420
12	150.0	80	12	38.0	210
24	600.0	40	24	150.0	110
48	2400.0	20	48	600.0	42
			120	3500.0	23

TEST A SAMPLE RELAY: ***Call your Guardian rep.***

NEED SOLENOIDS, TOO?
CALL OR WRITE FOR 44-PAGE GUIDE



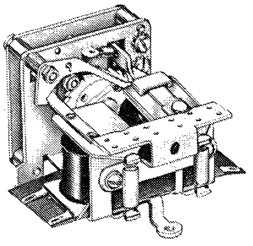
Everything you need to know to spec a solenoid. All in a catalog covering Guardian Solenoids in every imaginable shape and size to meet virtually any electro-mechanical requirement. Includes special "How to Select a Solenoid" section. Free for the asking.

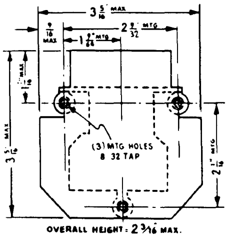
GUARDIAN® ELECTRIC
1562 WEST CARROLL AVENUE
CHICAGO, ILLINOIS 60607 — 312/243-1100

RELAYS • SOLENOIDS
SWITCHES • STEPPERS
SOLID STATE CONTROLS

GUARDIAN® ELECTRIC STEPPING RELAYS (STEPPERS)

MER ELECTRICAL RESET





OVERALL HEIGHT = $2\frac{3}{16}$" MAX.

VERSATILE 24 POINT STEPPER

Direct drive (steps on energization) with positive mechanical reset interlock actuated by the reset magnet and unlocked on the first energization of the step magnet. Assures positive reset on as short a pulse as 1/100 of a second.

Operating Voltages: From 6 to 240 VAC, 60 Hz, or 6 to 220 VDC.

Voltage Range: From 10% above to 15% below rated voltage.

Contacts: Deck contacts rated for 1.5 amps resistive at 120 VAC, 60 Hz. (Contact capacity can be increased to make and break 5 amps resistive or 3 amps inductive by adding a selection interrupter switch on step magnet. Consult factory.)

Terminals: Solder beads on deck. Solder lugs on auxiliary switches and coils. Other types of terminals available.

Speed of Operation:
- **Self Stepping:** AC approximately 25 steps per second
  DC approximately 30 steps per second
- **Pulse Operated:** AC up to 20 steps per second
  DC up to 25 steps per second

Stepping Pulse: Min. pulse of 25 milliseconds duration required for each individual step.

Reset Pulse: Minimum pulse of 10 milliseconds to initiate reset.

Decks: 24 bridging contacts. 22 active positions using single circuit level (2 positions required for stops).

Auxiliary Switches:
- **On step magnet:** Maximum of two poles.
- **On reset magnet:** Maximum of two poles.
- **On cam:** Single pole only. Home or zero position standard.

Circuit Levels: Single circuit level standard. Maximum total of two wipers on one or more decks.

Weight: Approximately 10.5 ounces.

Mounting: Three point mounting bracket.

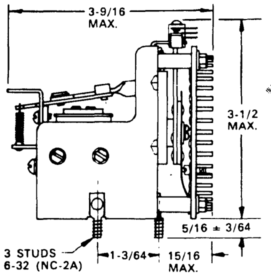
****OPERATING DATA**

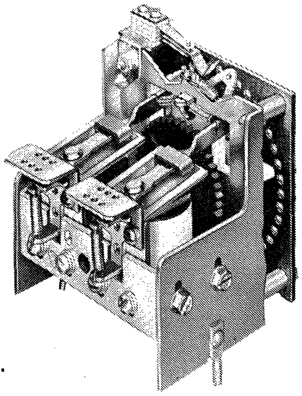
		AC Maximum Energization			DC Maximum Energization		
Coil	V.A.	Watts	Period Minutes	*Cycle On/Off	Watts	Period Minutes	*Cycle On/Off
Step	35	20	5	10%	20	5	10%
Reset	9	8	10	80%	8	10	80%

* % = ON time ÷ total time
** Based on standard unit. Modifications may require more power.

The Guardian "M" or Midget family of steppers also includes the MC 24-contact Continuous Rotation Stepper and the MAS Add and Subtract Stepper. Complete data in catalog described below.

PAS ADD & SUBTRACT





OVERALL WIDTH = 3½" MAX.

40 POINT BI-DIRECTIONAL STEPPER

Selector wiper moves either direction depending on which coil is energized. Positive mechanical stops to limit travel after any specified number of steps available. Expected life is 1,000,000 steps yet selling price is low.

Operating Voltages: From 6 to 240 VAC, 60 Hz, or from 6 to 220 VDC.

Voltage Range: From 10% above to 15% below rated voltage.

Speed of Operation:
- **Self Stepping:** AC/25 steps per second; DC/30 steps per second.
- **Pulse Operated:** AC/20 steps per second; DC/25 steps per second.

Stepping Pulse: Minimum of 25 milliseconds duration required for each individual step.

Decks: One deck of 40 bridging contacts standard. Maximum of three decks available.

Contacts: Deck contacts rated 1.5 amps resistive at 120 VAC, 60 Hz.

Auxiliary Switches:
- **On step magnets:** Maximum of two poles on each magnet.
- **On cam:** Maximum of one pole.

Terminals: .055" quick connect on deck. 3/16" quick connect on auxiliary switches and coils.

Circuit Levels: Single circuit level standard. Maximum total of four wipers on one to three decks.

Weight: Approximately 20 ounces.

Mounting: Three point mounting bracket.

****OPERATING DATA**

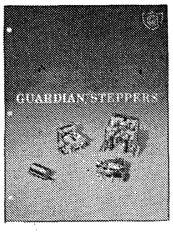
	AC Maximum Energization			DC Maximum Energization		
VA	Watts	Period Minutes	*Cycle On/Off	Watts	Period Minutes	*Cycle On/Off
50	35	4	15%	13	10	15%

* % = ON time ÷ total time
** Based on standard unit. Modifications may require more power.

The Guardian "P" family of steppers also includes the PER 36-point Electrical Reset Stepper and the PC 40-point Continuous Rotation Stepper. Complete data in catalog described below.

TEST A SAMPLE STEPPER: ***Call your Guardian rep.***

CALL OR WRITE FOR THE COMPLETE GUARDIAN STEPPERS CATALOG



This free 32-page manual and catalog is full of stepping relay facts, figures, dimensional drawings and application data . . . covering the complete line of Guardian Steppers. All in a single volume designed for easiest possible use.

GUARDIAN® ELECTRIC

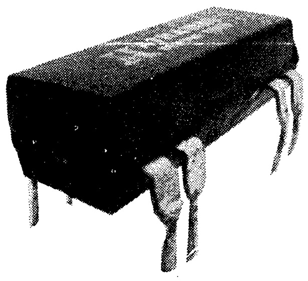
1562 WEST CARROLL AVENUE
CHICAGO, ILLINOIS 60607 — 312/243-1100

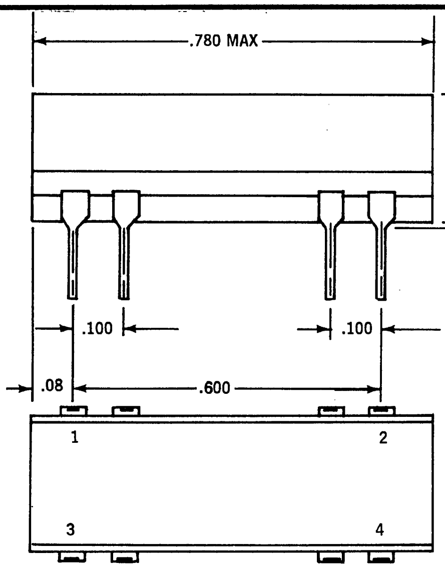
RELAYS • SOLENOIDS
SWITCHES • STEPPERS
SOLID STATE CONTROLS

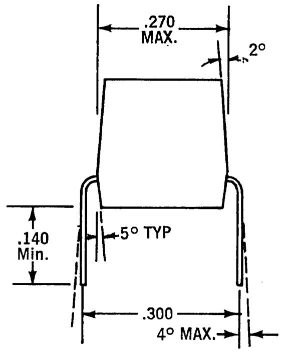
HATHAWAY
components
5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

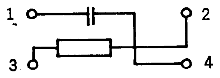
INTEGRATED DRIREED RELAY

"IDR" SERIES









SCHEMATIC
BOTTOM VIEW

The "IDR" Integrated Drireed Relay is a miniature sized relay for Digital Integrated Package, (DIP), mounting. It can be mounted in the standard in line, 14 pin, IC layout and operated from standard 5 Volt IC circuitry.

AVAILABLE IN SPNO CONTACT FORM ONLY.

OPERATING SPECIFICATIONS:

Contact Rating: Current; 0.5 Amp max.
Voltage; 100 Volts max.
Volt Amperes; 10 max.
Carry Load; 1.0 Amp max. (non-switching)
Contact Resistance: Initial; 0.100 Ohms max.
After Life; 1.0 Ohms max.
Life Expectancy: Low Level; 100 x 10^6 Operations.
28 V DC, 0.125 Amps; 5 x 10^6 Operations.
Dielectric Strength: 300 V AC, rms, 60 Hz.
Insulation Resistance: 10^8 Ohms min. @ 25°C.
Operate Time (including bounce): 500 microseconds.
Release Time (including bounce): 100 microseconds max.

COIL CHARACTERISTICS @ 25°C:

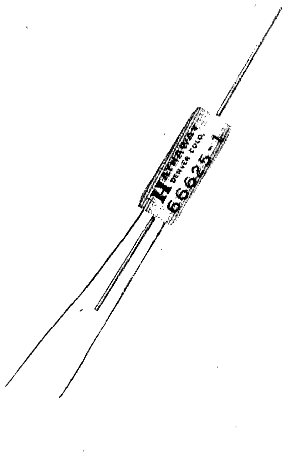
P/N	Nominal V DC	Must Operate	Must Release	Resistance Ω ±10%	Max. V DC
565-0001	3.0	2.0	0.2	24	5.0
565-0002	5.0	4.0	0.4	90	9.0
565-0003	12.0	8.0	0.8	385	19.5
565-0004	24.0	16.0	1.6	1200	34.5

ENVIRONMENTAL:

Temperature Range: −40°C to +85°C.
Vibration: 20 G's @ 0 - 5K Hz.
Shock: 100 G's.

MICRO-MINIATURE DRIREED RELAYS for high density packaging

adaptable for packaging with IC and monolithic solid state devices



SPECIFICATIONS

CONTACT CONFIGURATION: SPST - NO - (one form A)

DIELECTRIC STRENGTH:
200 V a-c rms 60 Hz between open contacts,
500V a-c rms 60 Hz contact to coil.

CONTACT RATING:
Switches up to ¼ Ampere.

INITIAL CONTACT RESISTANCE:
200 milliohms maximum.

MEAN TIME TO FAILURE*		
Load		Operations
.02mA	.012 V d-c	50,000,000
.01A	.05 V d-c	20,000,000
.125A	12 V d-c	10,000,000
.125A	28 V d-c	2,000,000
.250A	12 V d-c	1,000,000

*Failure is defined as 5 misses in 100,000 operations.

SWITCHING SPEED:
1.0 ms maximum including bounce.
Release time .5 ms

ENVIRONMENTAL CHARACTERISTICS:
Shock: 35 g's 11 ±1 ms duration.
Vibration: 15 g's 10 to 2000 Hz
Temperature — Operating: −55° to +75°C.
Storage: −65° to +85°C.

SIZE:
.230″ diameter x .600″ long.

LEADS:
Weldable, solderable.

CASE:
Polyvinylidene fluoride with nylon end covers.

INSULATION RESISTANCE: 10^{10} ohms at 100 V dc between mutually isolated terminals.

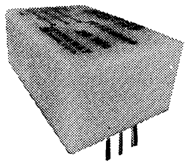
Part Number	66625-1	66625-2	66625-3	66625-4
Nominal rated coil voltage:	3 V d-c	6 V d-c	12 V d-c	26 V d-c
Maximum voltage:	3.8 V d-c	7.5 V d-c	15 V d-c	32 V d-c
Must operate (@ 25°C):	2.1 V d-c	4.2 V d-c	8.3 V d-c	16.5 V d-c
Must release (@ 25°C):	0.2 V d-c	0.4 V d-c	0.8 V d-c	1.5 V d-c
Coil Resistance ±10%:	50 Ohms	200 Ohms	800 Ohms	3750 Ohms

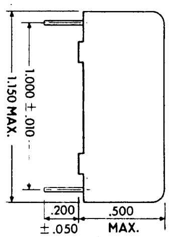
ORDER BY HATHAWAY PART NUMBER

HATHAWAY
components
5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

DRIREED RELAYS

"GP" SERIES





NOTE — COIL TERMINALS .028 ±.002 DIA.
SWITCH TERMINALS .018 x .028 MAX.

Nylon Case and Bobbin, Epoxy filled.

Printed Circuit mounting

Less than 1 ms switch time, 5 x 10⁸ Ohms minimum insulation resistance.

OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE	VIBRATION 20 g's to 1000 Hz
Operating: 0 to +75C°	SHOCK 35 g's
Storage: −55 to +85C°	ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. initial
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
200 VRMS 60 Hz Open Contacts (Form C)
500 VRMS 60 Hz Between Mutually Isolated Members

Contact Life — Up to 5 x 10⁹ Operations

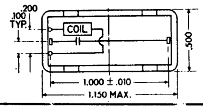
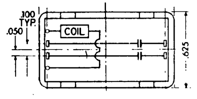
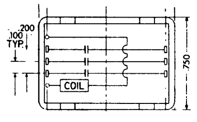
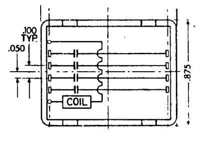
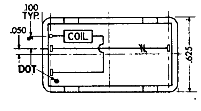
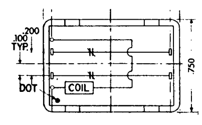
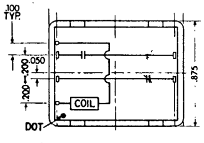
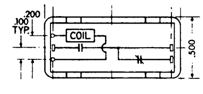
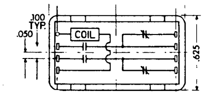
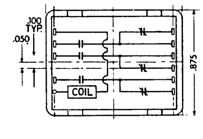
Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 watts max.
Gold Alloy Form "C": Dry to 125mA, 2 watts max.
Rhodium Form "A": 10mA to 1A, 10 watts max.

Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance—5 x 10⁸ Ohms Minimum @ 25°C

Contact Arrangement

1 Thru 4	Form A
1 Or 2	Form B
1 Thru 3	Form C

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice		Bottom View
1 Form A	65630-1	6	180	Gold Alloy	1A	
1 Form A	65630-8	12	720	Gold Alloy		
1 Form A	65630-15	26	3,300	Gold Alloy		
1 Form A	65630-22	6	180	Rhodium		
1 Form A	65630-29	12	720	Rhodium		
1 Form A	65630-36	26	3,300	Rhodium		
2 Form A	65630-2	6	145	Gold Alloy	2A	
2 Form A	65630-9	12	575	Gold Alloy		
2 Form A	65630-16	26	2,700	Gold Alloy		
2 Form A	65630-23	6	145	Rhodium		
2 Form A	65630-30	12	575	Rhodium		
2 Form A	65630-37	26	2,700	Rhodium		
3 Form A	65630-3	6	105	Gold Alloy	3A	
3 Form A	65630-10	12	410	Gold Alloy		
3 Form A	65630-17	26	1,900	Gold Alloy		
3 Form A	65630-24	6	105	Rhodium		
3 Form A	65630-31	12	410	Rhodium		
3 Form A	65630-38	26	1,900	Rhodium		
4 Form A	65630-4	6	80	Gold Alloy	4A	
4 Form A	65630-11	12	320	Gold Alloy		
4 Form A	65630-18	26	1,500	Gold Alloy		
4 Form A	65630-25	6	80	Rhodium		
4 Form A	65630-32	12	320	Rhodium		
4 Form A	65630-39	26	1,500	Rhodium		
1 Form B	65630-5	6	145	Gold Alloy	1B	
1 Form B	65630-12	12	575	Gold Alloy		
1 Form B	65630-19	26	2,700	Gold Alloy		
1 Form B	65630-26	6	145	Rhodium		
1 Form B	65630-33	12	575	Rhodium		
1 Form B	65630-40	26	2,700	Rhodium		
2 Form B	65630-6	6	105	Gold Alloy	2B	
2 Form B	65630-13	12	410	Gold Alloy		
2 Form B	65630-20	26	1,900	Gold Alloy		
2 Form B	65630-27	6	105	Rhodium		
2 Form B	65630-34	12	410	Rhodium		
2 Form B	65630-41	26	1,900	Rhodium		
1A 1B	65630-7	6	80	Gold Alloy	1A, 1B	
1A 1B	65630-14	12	320	Gold Alloy		
1A 1B	65630-21	26	1,500	Gold Alloy		
1A 1B	65630-28	6	80	Rhodium		
1A 1B	65630-35	12	320	Rhodium		
1A 1B	65630-42	26	1,500	Rhodium		
1 Form C	65627-1	6	180	Gold Alloy	1C	
1 Form C	65627-2	12	720	Gold Alloy		
1 Form C	65627-3	26	3,300	Gold Alloy		
2 Form C	65627-4	6	145	Gold Alloy	2C	
2 Form C	65627-5	12	575	Gold Alloy		
2 Form C	65627-6	26	2,700	Gold Alloy		
3 Form C	65627-7	6	80	Gold Alloy	3C	
3 Form C	65627-8	12	320	Gold Alloy		
3 Form C	65627-9	26	1,500	Gold Alloy		

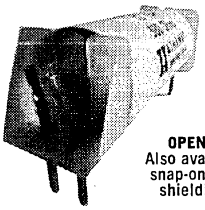
ORDER BY HATHAWAY PART NUMBER

HATHAWAY
components

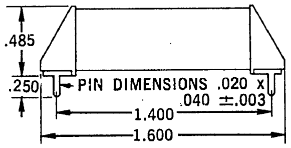
5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

INTERMEDIATE SIZE DRIREED RELAYS

"CR" SERIES



OPEN FRAME
Also available with
snap-on magnetic
shielding case.



OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE	VIBRATION 20 g's to 1000 Hz
Oper.: −55 to +75°C	SHOCK 35 g's
Storage: −65 to +85°C	ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 100 Milliohms max. initial
2 Ohms End of Life

Dielectric Strength
350 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated Members

Contact Life — Up to 5 x 10^9 Operations

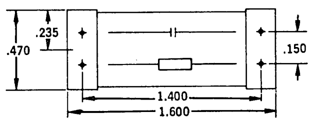
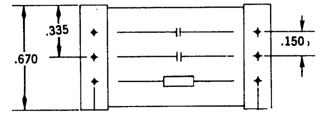
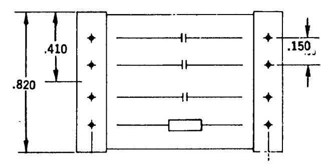
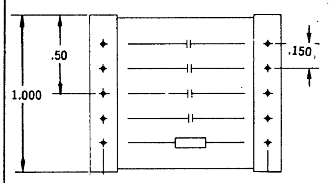
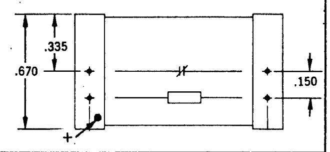
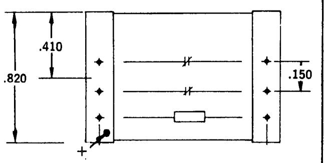
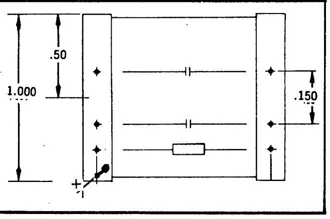
Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 watts max.
Gold Alloy Form "C": Dry to 125mA, 2 watts max.
Rhodium Form "A": 10mA to 1A, 10 watts max.

Operate Time (Including Bounce)
One Form A — 1.5 Millisecond

Insulation Resistance — 10^{10} Ohms Minimum @ 25°C

Contact Arrangement

1 Thru 4	Form A
1 Or 2	Form B
1	Form 1A 1B

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice	Bottom View
1 Form A	66800-1	6	145	Rhodium	1A 
1 Form A	66800-13	12	580	Rhodium	
1 Form A	66800-25	26	2,200	Rhodium	
2 Form A	66800-2	6	75	Rhodium	2A 
2 Form A	66800-14	12	280	Rhodium	
2 Form A	66800-26	26	1,500	Rhodium	
3 Form A	66800-3	6	55	Rhodium	3A 
3 Form A	66800-15	12	220	Rhodium	
3 Form A	66800-27	26	900	Rhodium	
4 Form A	66800-4	6	42	Rhodium	
4 Form A	66800-16	12	150	Rhodium	
4 Form A	66800-28	26	700	Rhodium	
1 Form B	66800-6	6	75	Rhodium	1B 
1 Form B	66800-18	12	280	Rhodium	
1 Form B	66800-30	26	1,500	Rhodium	
2 Form B	66800-7	6	55	Rhodium	2B 
2 Form B	66800-19	12	220	Rhodium	
2 Form B	66800-31	26	900	Rhodium	
1A 1B	66800-12	6	42	Rhodium	1A, 1B 
1A 1B	66800-24	12	150	Rhodium	
1A 1B	66800-36	26	700	Rhodium	

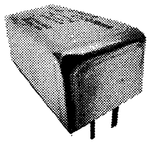
ORDER BY HATHAWAY PART NUMBER To Order With Magnetic Shielding Case Specify CRM Series

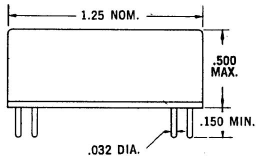
HATHAWAY
components

5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

DRIREED RELAYS

"R" SERIES





HEAVY WALL, SEAMLESS CONSTRUCTION
SHIELDED CASE
STRAIN RELIEVED COIL
WELDED TERMINATION

OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.2 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.0 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.0 V d-c
12 volt coils	8.0 V d-c
26 volt coils	18.0 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.2 V d-c
12 volt coils	0.5 V d-c
26 volt coils	1.0 V d-c

Environmental

AMBIENT TEMP. RANGE	VIBRATION 20 g's to 1000 Hz
Operating: 0 to +85C°	SHOCK 35 g's
Storage: −55 to +85C°	ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. initial
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated Members

Contact Life — Up to 5 x 10^9 Operations

Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 watts max.
Gold Alloy Form "C": Dry to 125mA, 2 watts max.
Rhodium Form "A": 10mA to 1A, 10 watts max.

Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance — 10^{10} Ohms Minimum @ 25°C

Capacitance
5PF Max. Between Any Two Switching Elements

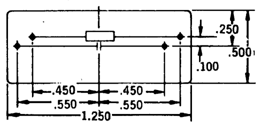
Contact Arrangement

1 Thru 12	Form A
1 Or 2	Form B
1 Thru 4	Form C

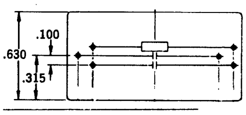
Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice
1 Form A	61450-1	6	300	Gold Alloy
1 Form A	61450-13	12	1,200	Gold Alloy
1 Form A	61450-25	28	5,000	Gold Alloy
1 Form A	61450-37	6	300	Rhodium
1 Form A	61450-49	12	1,200	Rhodium
1 Form A	61450-61	28	5,000	Rhodium
2 Form A	61450-2	6	100	Gold Alloy
2 Form A	61450-14	12	400	Gold Alloy
2 Form A	61450-26	28	2,200	Gold Alloy
2 Form A	61450-38	6	100	Rhodium
2 Form A	61450-50	12	400	Rhodium
2 Form A	61450-62	28	2,200	Rhodium
3 Form A	61450-3	6	100	Gold Alloy
3 Form A	61450-15	12	400	Gold Alloy
3 Form A	61450-27	28	2,200	Gold Alloy
3 Form A	61450-39	6	100	Rhodium
3 Form A	61450-51	12	400	Rhodium
3 Form A	61450-63	28	2,200	Rhodium
4 Form A	61450-4	6	75	Gold Alloy
4 Form A	61450-16	12	300	Gold Alloy
4 Form A	61450-28	28	1,650	Gold Alloy
4 Form A	61450-40	6	75	Rhodium
4 Form A	61450-52	12	300	Rhodium
4 Form A	61450-63	28	1,650	Rhodium
5 Form A	61450-5	6	75	Gold Alloy
5 Form A	61450-17	12	300	Gold Alloy
5 Form A	61450-29	28	1,650	Gold Alloy
5 Form A	61450-41	6	75	Rhodium
5 Form A	61450-53	12	300	Rhodium
5 Form A	61450-65	28	1,650	Rhodium
6 Form A	61450-6	6	50	Gold Alloy
6 Form A	61450-18	12	200	Gold Alloy
6 Form A	61450-30	28	1,100	Gold Alloy
6 Form A	61450-42	6	50	Rhodium
6 Form A	61450-54	12	200	Rhodium
6 Form A	61450-66	28	1,100	Rhodium
7 Form A	61450-7	6	50	Gold Alloy
7 Form A	61450-19	12	200	Gold Alloy
7 Form A	61450-31	28	1,100	Gold Alloy
7 Form A	61450-43	6	50	Rhodium
7 Form A	61450-55	12	200	Rhodium
7 Form A	61450-67	28	1,100	Rhodium
8 Form A	61450-8	6	50	Gold Alloy
8 Form A	61450-20	12	200	Gold Alloy
8 Form A	61450-32	28	1,100	Gold Alloy
8 Form A	61450-44	6	50	Rhodium
8 Form A	61450-56	12	200	Rhodium
8 Form A	61450-68	28	1,100	Rhodium
9 Form A	61450-9	6	50	Gold Alloy
9 Form A	61450-21	12	200	Gold Alloy
9 Form A	61450-33	28	1,100	Gold Alloy
9 Form A	61450-45	6	50	Rhodium
9 Form A	61450-57	12	200	Rhodium
9 Form A	61450-69	28	1,100	Rhodium

Bottom View

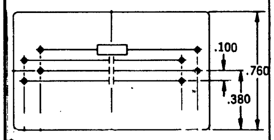
1A



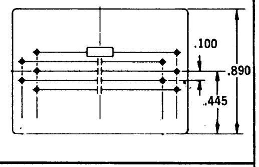
2A



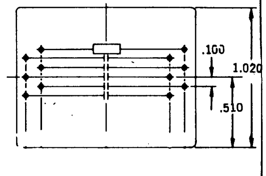
3A



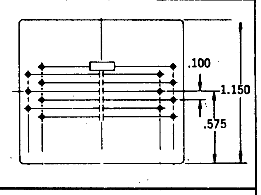
4A



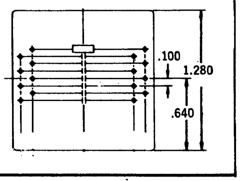
5A



6A



7A



ORDER BY HATHAWAY PART NUMBER

HATHAWAY
components
5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

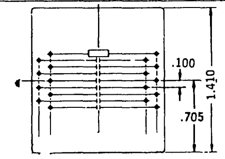
DRIREED RELAYS

"R" SERIES CONTINUED

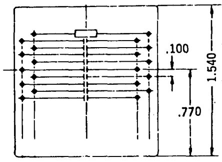
Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice
10 Form A	61450-10	6	25	Gold Alloy
10 Form A	61450-22	12	100	Gold Alloy
10 Form A	61450-34	28	550	Gold Alloy
10 Form A	61450-46	6	25	Rhodium
10 Form A	61450-58	12	100	Rhodium
10 Form A	61450-70	28	550	Rhodium
11 Form A	61450-11	6	25	Gold Alloy
11 Form A	61450-23	12	100	Gold Alloy
11 Form A	61450-35	28	550	Gold Alloy
11 Form A	61450-47	6	25	Rhodium
11 Form A	61450-59	12	100	Rhodium
11 Form A	61450-71	28	550	Rhodium
12 Form A	61450-12	6	25	Gold Alloy
12 Form A	61450-24	12	100	Gold Alloy
12 Form A	61450-36	28	550	Gold Alloy
12 Form A	61450-48	6	25	Rhodium
12 Form A	61450-60	12	100	Rhodium
12 Form A	61450-72	28	550	Rhodium
1 Form B	61542-1	6	100	Gold Alloy
1 Form B	61542-3	12	400	Gold Alloy
1 Form B	61524-5	28	2,200	Gold Alloy
1 Form B	61542-7	6	100	Rhodium
1 Form B	61542-9	12	400	Rhodium
1 Form B	61542-11	28	2,200	Rhodium
2 Form B	61542-2	6	100	Gold Alloy
2 Form B	61542-4	12	400	Gold Alloy
2 Form B	61542-6	28	2,200	Gold Alloy
2 Form B	61542-8	6	100	Rhodium
2 Form B	61542-10	12	400	Rhodium
2 Form B	61542-12	28	2,200	Rhodium
1A 1B	61540-1	6	75	Gold Alloy
1A 1B	61540-3	12	300	Gold Alloy
1A 1B	61540-5	28	1,650	Gold Alloy
1A 1B	61540-7	6	75	Rhodium
1A 1B	61540-9	12	300	Rhodium
1A 1B	61540-11	28	1,650	Rhodium
2A 2B	61540-2	6	50	Gold Alloy
2A 2B	61540-4	12	200	Gold Alloy
2A 2B	61540-6	28	1,100	Gold Alloy
2A 2B	61540-8	6	50	Rhodium
2A 2B	61540-10	12	200	Rhodium
2A 2B	61540-12	28	1,100	Rhodium
1 Form C	63961-1	6	300	Gold Alloy
1 Form C	63961-2	12	1,200	Gold Alloy
1 Form C	63961-3	28	5,000	Gold Alloy
2 Form C	63962-1	6	100	Gold Alloy
2 Form C	63962-2	12	400	Gold Alloy
2 Form C	63962-3	28	2,200	Gold Alloy
3 Form C	63963-1	6	100	Gold Alloy
3 Form C	63963-2	12	400	Gold Alloy
3 Form C	63963-3	28	2,200	Gold Alloy
4 Form C	63964-1	6	75	Gold Alloy
4 Form C	63964-2	12	300	Gold Alloy
4 Form C	63964-3	28	1,650	Gold Alloy

Bottom View

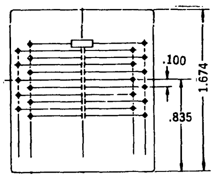
8A


.100
1.410
.705

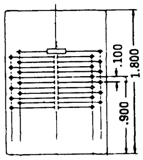
9A


.100
1.540
.770

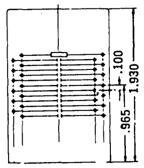
10A


.100
1.674
.835

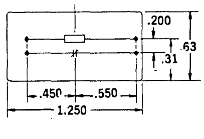
11A


.100
1.800
.900

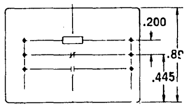
12A


.100
1.930
.965

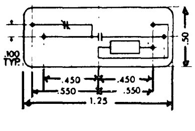
1B


.200
.63
.31
.450
.550
1.250

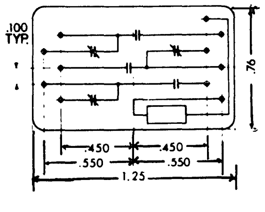
1A, 1B



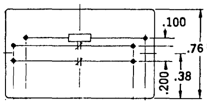
1C


.50
.100 TYP.
.450
.450
.550
.550
1.25

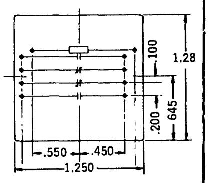
3C


.100 TYP.
.76
.450
.450
.550
.550
1.25

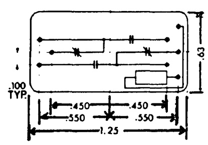
2B


.100
.76
.200
.38

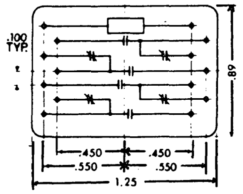
2A, 2B


.100
1.28
.200
.645
.550
.450
1.250

2C


.63
.100 TYP.
.450
.450
.550
.550
1.25

4C

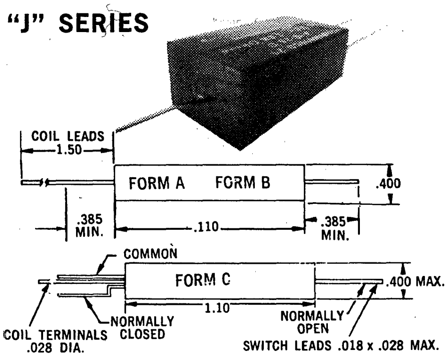

.100 TYP.
.89
.450
.450
.550
.550
1.25

ORDER BY HATHAWAY PART NUMBER

HATHAWAY
components
5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

DRIREED RELAYS

"J" SERIES



OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE	VIBRATION 20 g's to 1000 Hz
Operating: 0 to +75C°	SHOCK 35 g's
Storage: −55 to +85C°	ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. initial
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated Members

Contact Life — Up to 5 x 10^9 Operations

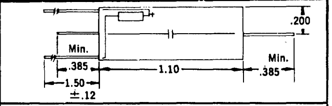
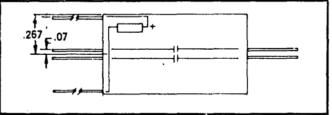
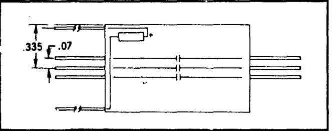
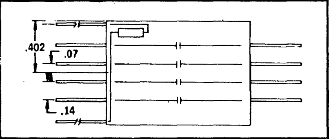
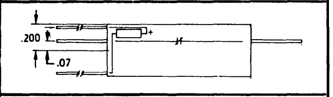
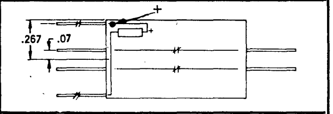
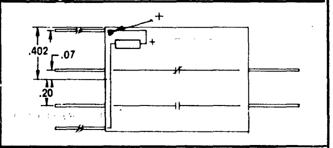
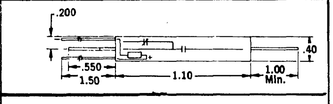
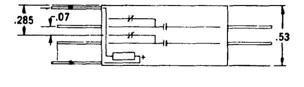
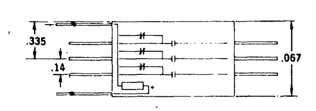
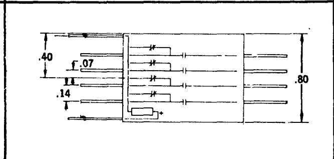
Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 watts max.
Gold Alloy Form "C": Dry to 125mA, 2 watts max.
Rhodium Form "A": 10mA to 1A, 10 watts max.

Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance — 10^{10} Ohms Minimum @ 25°C

Contact Arrangement

1 Thru 4	Form A
1 Or 2	Form B
1 Thru 4	Form C

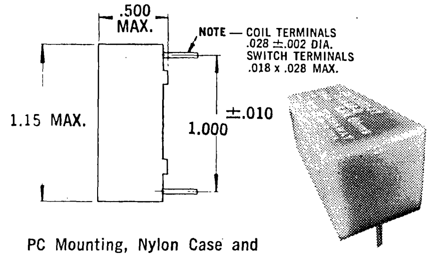
Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice	Bottom View	
1 Form A	61900-1	6	300	Gold Alloy	**1A**	
1 Form A	61900-9	12	1,200	Gold Alloy		
1 Form A	61900-17	26	5,600	Gold Alloy		
1 Form A	61900-25	6	300	Rhodium		
1 Form A	61900-33	12	1,200	Rhodium		
1 Form A	61900-41	26	5,600	Rhodium		
2 Form A	61900-2	6	200	Gold Alloy	**2A**	
2 Form A	61900-10	12	800	Gold Alloy		
2 Form A	61900-18	26	3,800	Gold Alloy		
2 Form A	61900-26	6	200	Rhodium		
2 Form A	61900-34	12	800	Rhodium		
2 Form A	61900-42	26	3,800	Rhodium		
3 Form A	61900-3	6	150	Gold Alloy	**3A**	
3 Form A	61900-11	12	600	Gold Alloy		
3 Form A	61900-19	26	2,800	Gold Alloy		
3 Form A	61900-27	6	150	Rhodium		
3 Form A	61900-35	12	600	Rhodium		
3 Form A	61900-43	26	2,800	Rhodium		
4 Form A	61900-4	6	125	Gold Alloy	**4A**	
4 Form A	61900-12	12	500	Gold Alloy		
4 Form A	61900-20	26	2,300	Gold Alloy		
4 Form A	61900-28	6	125	Rhodium		
4 Form A	61900-36	12	500	Rhodium		
4 Form A	61900-44	26	2,300	Rhodium		
1 Form B	61900-5	6	200	Gold Alloy	**1B**	
1 Form B	61900-13	12	800	Gold Alloy		
1 Form B	61900-21	26	3,800	Gold Alloy		
1 Form B	61900-29	6	200	Rhodium		
1 Form B	61900-37	12	800	Rhodium		
1 Form B	61900-45	26	3,800	Rhodium		
2 Form B	61900-6	6	150	Gold Alloy	**2B**	
2 Form B	61900-14	12	600	Gold Alloy		
2 Form B	61900-22	26	2,800	Gold Alloy		
2 Form B	61900-30	6	150	Rhodium		
2 Form B	61900-38	12	600	Rhodium		
2 Form B	61900-46	26	2,800	Rhodium		
1A 1B	61900-8	6	125	Gold Alloy	**1A, 1B**	
1A 1B	61900-16	12	500	Gold Alloy		
1A 1B	61900-24	26	2,300	Gold Alloy		
1A 1B	61900-32	6	125	Rhodium		
1A 1B	61900-40	12	500	Rhodium		
1A 1B	61900-48	26	2,300	Rhodium		
1 Form C	0515003	6	300	Gold Alloy	**1C**	
1 Form C	0515004	12	1,200	Gold Alloy		
1 Form C	0515005	26	5,600	Gold Alloy		
2 Form C	0515006	6	200	Gold Alloy	**2C**	
2 Form C	0515007	12	800	Gold Alloy		
2 Form C	0515008	26	3,800	Gold Alloy		
3 Form C	0515009	6	150	Gold Alloy	**3C**	
3 Form C	0515010	12	600	Gold Alloy		
3 Form C	0515011	26	2,800	Gold Alloy		
4 Form C	0515012	6	125	Gold Alloy	**4C**	
4 Form C	0515013	12	600	Gold Alloy		
4 Form C	0515014	26	2,300	Gold Alloy		

ORDER BY HATHAWAY PART NUMBER

HATHAWAY
components
5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

DRIREED RELAYS

"K" SERIES


.500 MAX.
NOTE — COIL TERMINALS .028 ±.002 DIA. SWITCH TERMINALS .018 x .028 MAX.
1.15 MAX.
1.000 ±.010

PC Mounting, Nylon Case and Bobbin, Epoxy filled.
Efficient coil with low power consumption.
High Insulation Resistance

OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE
Operating: 0 to +75C°
Storage: −55 to +85C°

VIBRATION 20 g's to 1000 Hz
SHOCK 35 g's
ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. initial
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated Members

Contact Life — Up to 5 x 10⁹ Operations

Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 watts max.
Gold Alloy Form "C": Dry to 125mA, 2 watts max.
Rhodium Form "A": 10mA to 1A, 10 watts max.

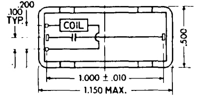
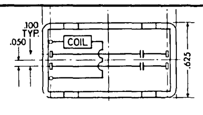
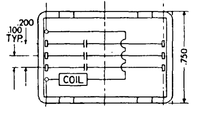
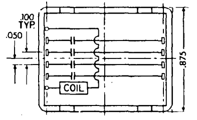
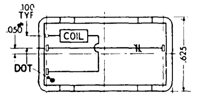
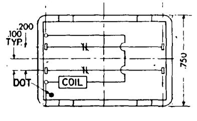
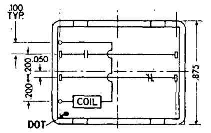
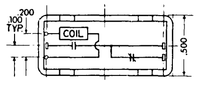
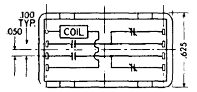
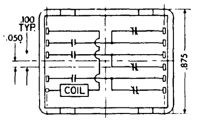
Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance—5 x 10⁸ Ohms Minimum @ 25°C

Contact Arrangement

1 Thru 4	Form A
1 Or 2	Form B
1 Thru 3	Form C

Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice
1 Form A	62057-1	6	300	Gold Alloy
1 Form A	62057-9	12	1,200	Gold Alloy
1 Form A	62057-17	26	5,600	Gold Alloy
1 Form A	62057-25	6	300	Rhodium
1 Form A	62057-33	12	1,200	Rhodium
1 Form A	62057-41	26	5,600	Rhodium
2 Form A	62057-2	6	200	Gold Alloy
2 Form A	62057-10	12	800	Gold Alloy
2 Form A	62057-18	26	3,800	Gold Alloy
2 Form A	62057-26	6	200	Rhodium
2 Form A	62057-34	12	800	Rhodium
2 Form A	62057-42	26	3,800	Rhodium
3 Form A	62057-3	6	150	Gold Alloy
3 Form A	62057-11	12	600	Gold Alloy
3 Form A	62057-19	26	2,800	Gold Alloy
3 Form A	62057-27	6	150	Rhodium
3 Form A	62057-35	12	600	Rhodium
3 Form A	62057-43	26	2,800	Rhodium
4 Form A	62057-4	6	125	Gold Alloy
4 Form A	62057-12	12	500	Gold Alloy
4 Form A	62057-20	26	2,300	Gold Alloy
4 Form A	62057-28	6	125	Rhodium
4 Form A	62057-36	12	500	Rhodium
4 Form A	62057-44	26	2,300	Rhodium
1 Form B	62057-5	6	200	Gold Alloy
1 Form B	62057-13	12	800	Gold Alloy
1 Form B	62057-21	26	3,800	Gold Alloy
1 Form B	62057-29	6	200	Rhodium
1 Form B	62057-37	12	800	Rhodium
1 Form B	62057-45	26	3,800	Rhodium
2 Form B	62057-6	6	150	Gold Alloy
2 Form B	62057-14	12	600	Gold Alloy
2 Form B	62057-22	26	2,800	Gold Alloy
2 Form B	62057-30	6	150	Rhodium
2 Form B	62057-38	12	600	Rhodium
2 Form B	62057-46	26	2,800	Rhodium
1A 1B	62057-8	6	125	Gold Alloy
1A 1B	62057-16	12	500	Gold Alloy
1A 1B	62057-24	26	2,300	Gold Alloy
1A 1B	62057-32	6	125	Rhodium
1A 1B	62057-40	12	500	Rhodium
1A 1B	62057-48	26	2,300	Rhodium
1 Form C	64819-1	6	300	Gold Alloy
1 Form C	64819-2	12	1,200	Gold Alloy
1 Form C	64819-3	26	5,600	Gold Alloy
2 Form C	64819-4	6	200	Gold Alloy
2 Form C	64819-5	12	800	Gold Alloy
2 Form C	64819-6	26	3,800	Gold Alloy
3 Form C	64819-7	6	125	Gold Alloy
3 Form C	64819-8	12	500	Gold Alloy
3 Form C	64819-9	26	2,300	Gold Alloy

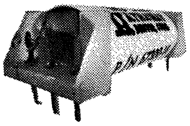
	Bottom View
1A	 .200 .100 TYP. COIL .500 1.000 ± .010 1.150 MAX.
2A	
3A	
4A	
1B	
2B	
1A, 1B	
1C	
2C	
3C	

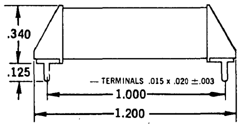
ORDER BY HATHAWAY PART NUMBER

HATHAWAY
components
5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

DRIREED RELAYS

"LS" SERIES





LOW SILHOUETTE OPEN FRAME
Low-loss, spot welded reed to pin connection.
Also available with snap-on magnetic shielding case.

OPERATING CHARACTERISTICS

Maximum Continuous Rating @ 25°C

6 volt coils	7.5 V d-c
12 volt coils	15.0 V d-c
26 volt coils	32.5 V d-c

Must Operate (Maximum) @ 25°C

6 volt coils	4.2 V d-c
12 volt coils	8.3 V d-c
26 volt coils	16.5 V d-c

Must Release (Minimum) @ 25°C

6 volt coils	0.4 V d-c
12 volt coils	0.8 V d-c
26 volt coils	1.5 V d-c

Environmental

AMBIENT TEMP. RANGE	VIBRATION 20 g's to 1000 Hz
Operating: 0 to +75C°	SHOCK 35 g's
Storage: −55 to +85C°	ALTITUDE 0 to 50,000 feet

ELECTRICAL SPECIFICATIONS

Contact Resistance — 200 Milliohms max. initial
2 Ohms End of Life

Dielectric Strength
250 VRMS 60 Hz Open Contacts (Form A)
500 VRMS 60 Hz Between Mutually Isolated Members

Contact Life — Up to 5 x 10^9 Operations

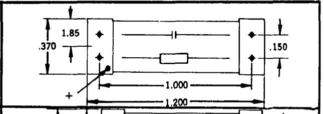
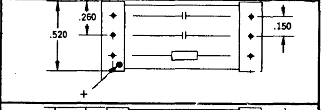
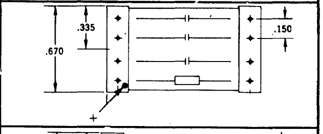
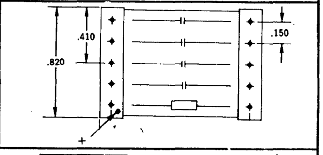
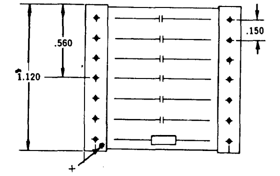
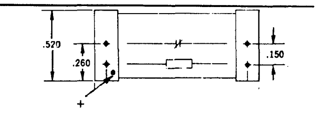
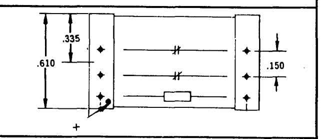
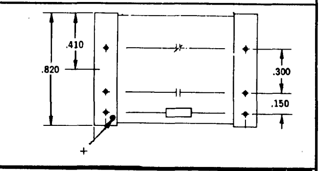
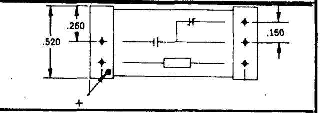
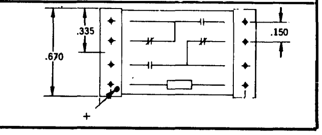
Load Rating
Gold Alloy Form "A": Dry to 125mA, 4 watts max.
Gold Alloy Form "C": Dry to 125mA, 2 watts max.
Rhodium Form "A": 10mA to 1A, 10 watts max.

Operate Time (Including Bounce)
One Form A — 1.0 Millisecond
One Form C — 1.5 Milliseconds

Insulation Resistance — 10^{10} Ohms Minimum @ 25°C

Contact Arrangement

1 Thru 4	Form A
1 Or 2	Form B
1 Thru 2	Form C

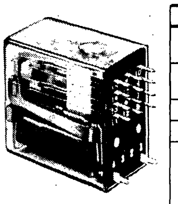
Contact Form	Part Number	Nominal Coil Voltage DC	Coil Resistance In Ohms	Contact Choice	Bottom View	
1 Form A	67300-1	6	180	Gold Alloy	1A	
1 Form A	67300-6	12	720	Gold Alloy		
1 Form A	67300-11	26	3,300	Gold Alloy		
1 Form A	67300-31	6	180	Rhodium		
1 Form A	67300-36	12	772	Rhodium		
1 Form A	67300-41	26	3,300	Rhodium		
2 Form A	67300-2	6	145	Gold Alloy	2A	
2 Form A	67300-7	12	575	Gold Alloy		
2 Form A	67300-12	26	2,700	Gold Alloy		
2 Form A	67300-32	6	145	Rhodium		
2 Form A	67300-37	12	575	Rhodium		
2 Form A	67300-42	26	2,700	Rhodium		
3 Form A	67300-3	6	105	Gold Alloy	3A	
3 Form A	67300-8	12	410	Gold Alloy		
3 Form A	67300-13	26	1,700	Gold Alloy		
3 Form A	67300-33	6	105	Rhodium		
3 Form A	67300-38	12	410	Rhodium		
3 Form A	67300-43	26	1,700	Rhodium		
4 Form A	67300-4	6	80	Gold Alloy	4A	
4 Form A	67300-9	12	320	Gold Alloy		
4 Form A	67300-14	26	1,500	Gold Alloy		
4 Form A	67300-34	6	80	Rhodium		
4 Form A	67300-39	12	320	Rhodium		
4 Form A	67300-44	26	1,500	Rhodium		
6 Form A	67300-5	6	55	Gold Alloy	6A	
6 Form A	67300-10	12	220	Gold Alloy		
6 Form A	67300-15	26	1,040	Gold Alloy		
6 Form A	67300-35	6	55	Rhodium		
6 Form A	67300-40	12	220	Rhodium		
6 Form A	67300-45	26	1,040	Rhodium		
1 Form B	67300-16	6	145	Gold Alloy	1B	
1 Form B	67300-20	12	575	Gold Alloy		
1 Form B	67300-24	26	2,700	Gold Alloy		
1 Form B	67300-46	6	145	Rhodium		
1 Form B	67300-48	12	575	Rhodium		
1 Form B	67300-50	26	2,700	Rhodium		
2 Form B	&7300-17	6	105	Gold Alloy	2B	
2 Form B	67300-21	12	410	Gold Alloy		
2 Form B	67300-25	26	1,700	Gold Alloy		
2 Form B	67300-47	6	105	Rhodium		
2 Form B	67300-49	12	410	Rhodium		
2 Form B	67300-51	26	1,700	Rhodium		
1A 1B	67300-28	6	80	Gold Alloy	1A, 1B	
1A 1B	67300-29	12	320	Gold Alloy		
1A 1B	67300-30	26	1,500	Gold Alloy		
1A 1B	67300-52	6	80	Rhodium		
1A 1B	67300-53	12	320	Rhodium		
1A 1B	67300-54	26	1,500	Rhodium		
1 Form C	67300-18	6	145	Gold Alloy	1C	
1 Form C	67300-22	12	575	Gold Alloy		
1 Form C	67300-26	26	2,700	Gold Alloy		
2 Form C	67300-19	6	105	Gold Alloy	2C	
2 Form C	67300-23	12	410	Gold Alloy		
2 Form C	67300-27	26	1,700	Gold Alloy		

ORDER BY HATHAWAY PART NUMBER **To Order With Magnetic Shielding Case Specify LSM Series**

HART-ADVANCE RELAY DIVISION
OAK ELECTRO/NETICS Corp. Dept. HE, Crystal Lake, Ill. 60014
Phone: (815) 459-5000 TWX: 910-634-3353 Telex: 722-447

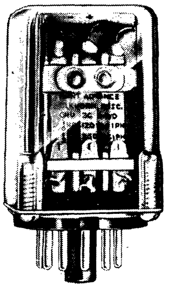
RELAYS & SOLENOIDS

GENERAL PURPOSE RELAYS



TYPE 67
UL RECOGNIZED

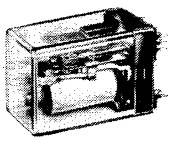
Specifications	Type 67		
Enclosure	Acrylonitrile Styrene Cover Std.; Lexan Available on Special Order.		
Contact Forms	C's with Bifurcated or Non-bifurcated Crossbar Contacts.		
Contact Arrange.	Standard 2C, 4C, 6C, 8C.		
Contact Material	Gold Flashed Silver Composite.		
Contact Ratings Available @ 28 VDC or 115 VAC	Adjustment	Resistive	Inductive
	Power	3A.	1.5A.
	Power	5A.	3A.
	Power	7A.	5A.
	Sensitive	1A.	0.5A.
	Sensitive	3A.	1.5A.
Terminals	Printed Circuit, Plug-in or Solder (Solder Lug or Printed Circuit Sockets Available).		
Mounting	Printed Circuit, Panel or Plug-in.		



TYPE GHU
CSA APPROVED &
UL RECOGNIZED

Specifications	Type GHU		
Enclosure	Open or Dustite		
Contact Arrange.	1, 2 or 3 Form C		
Contact Material	GHUA & GHUP—Silver Overlay & Silver-Gold Flashed GHUB & GHUH—Silver Overlay & Silver Cad. Oxide—Gold Flashed		
Contact Rating	Series	Rating	Volts AC
	GHUA & GHUP	5 Amps	115
		1/10 HP	120
	GHUB	10 Amps	115
		1/6 HP	120
		1/3 HP	240
	GHUH	8.5 Amps	115
		1/6 HP	120
		1/3 HP	240
Terminals	Open: Solder Lugs; Encl.: 8 or 11 Pin Octal Type Plug		

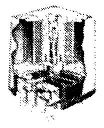
TELEPHONE RELAYS



Specifications	Type 8
Enclosure	Open, dustile, or hermetically sealed
Contact Forms	A, B, C, D, E
Contact Arrange.	8 form C max.
Contact Rating	Dry circuit to 10 Amps
Terminals	Solder, plug-in, taper tab, and printed circuit
Mounting	Two #6-32 tapped holes on ¾″ centers

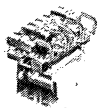
Many other styles and sizes of telephone type relays are available. Contact factory for details.

POWER RELAYS

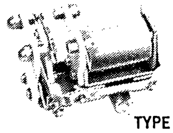


TYPE W
UL RECOGNIZED
CSA APPROVED

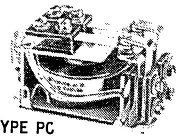
Specifications	Type W
Enclosure	Covered
Contact Arrange.	2 X's, 2 Y's, or 1 X and 1 Y
Contact Material	Silver or Silver Cad. Oxide
Contact Rating Based upon 10% duty cycle (1 sec. on, 9 sec. off)	25 amps res. or 12.5 amps inductive at 240 VAC @ .75 P.F.
	1 h.p. 120 VAC (96A Locked Rotor—50 Cycles)
	2 h.p. 240 VAC (72A Locked Rotor—50 cycles) 5 to 25 A at 28V D.C.
Terminals	Spade type—¼″ x .032 standard
Mounting	Socket, Stud or Panel



TYPE 33B



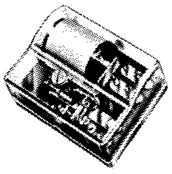
TYPE HV



TYPE PC

Type		Specifications
33B	Contact Arrange.	1 thru 5 Form A, B or C, or Combinations Thereof
	Contact Rating	Code 13—10 Amps., 125 Volts AC Resistive
		Code 14—20 Amps., 125 Volts AC Resistive
		Code 15—25 Amps., 125 Volts AC Resistive
		Code 31—25 Amps., 250 Volts AC Resistive
	Size	2⁵⁄₁₆″H x 2⁹⁄₁₆″W x 2″D
HV	Contact Arrange.	1 Form X, Y, or Z
	Contact Rating	Will break up to 5000 volts RMS at 200 MA current — 8000 volts on special order
	Size	3¹⁄₁₆″H x 2⁷⁄₃₂″W x 1²⁹⁄₃₂″D
PC	Contact Arrange.	Up to 4 Form A, B, or C; or Combinations Thereof
	Contact Rating	15 Amps Resistive at 115 VAC or 26.5 VDC
		5 Amps Inductive at 115 VAC or 26.5 VDC
	Size	1²⁹⁄₃₂″H x 2²³⁄₃₂″W x 3¹⁄₁₆″D

SENSITIVE RELAYS



TYPE SV

Specifications	Type SV
Weight	6.5 Ounces Max.
Enclosure	Clear Plastic Dustite Cover
Contact Arrange.	1 Form C (SPDT)
Contact Rating	1 Amp Resistive at 115 VAC or 26.5 VDC
	0.5 Amp Inductive at 115 VAC or 26.5 VDC
Mounting	Two ⁵⁄₁₆″ Dia. Holes
Sensitivity	.005 Watts (Factory Adjustment)

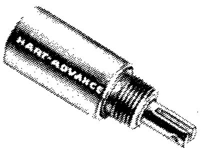
SOLENOIDS — TUBULAR, BOX FRAME, LAMINATED

Type	Size (in.)		Weight (oz.)	Coil Power Cont. Duty Watts	Pull (oz.) Cont. Duty*				Mounting† Threaded Bushing
	Dia.	Lgth.			⅛″	¼″	½″	¾″	
C7-18	⁷⁄₁₆	1⅛	½	2.0	1.5	.5	—	—	⁵⁄₁₆-32
C8-14	½	⅞	1	2.4	0.8	—	—	—	⅜-32
C8-24	½	1½	1½	3.5	3.0	1.3	0.2	—	⅜-32
C8-32	½	2	2	4.0	2.5	1.5	1.0	0.8	⅜-32
C12-24	¾	1½	3	3.5	7.0	3.0	2.0	1.0	¹⁵⁄₃₂-32
C16-18	1	1⅛	4	4.0	10.0	3.5	0.2	—	¾-24
C16-32	1	2	5½	5.5	20.0	8.0	3.0	1.0	¾-24
C24-26	1½	1⅝	10	7.0	50.0	15.0	5.0	1.0	1-27
C24-38	1½	2⅜	18	10.0	90.0	40.0	15.0	8.0	1-27

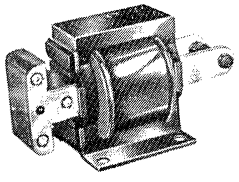
† Nut and Lockwasher Supplied.
* Higher forces available for intermittent duty cycles.

Type	Size (in.)	Dia. *	Wt. (oz.)	Coil Power Max.	Pull (oz.) Cont. Duty							
					⅛″		¼″		½″		¾″	
					AC	DC	AC	DC	AC	DC	AC	DC
41	1x1⁷⁄₃₂x1¼	⁷⁄₁₆″	6	3 W	4	3	1.5	1.5	—	—	—	—
42	1x1⁷⁄₃₂x2	⁷⁄₁₆″	8	6 W	3	16	3	8	1	2	—	—
38	1⁹⁄₁₆x1²⁷⁄₃₂x1⅝	½″	12	10 W	14	40	9	14	3	3	—	—
39	1⁹⁄₁₆x1²⁷⁄₃₂x2⅛	½″	16	12 W	8	40	6	12	5	2	—	—
40	1⁹⁄₁₆x1²⁷⁄₃₂x2⅝	½″	20	15 W	7	64	4	27	3	6	2	2
51	2¹⁄₁₆x1¹⁵⁄₁₆x3½	—	16	60 VA	272	—	72	—	56	—	40	—

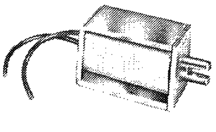
*Diameter of Plunger



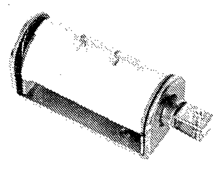
TUBULAR TYPES



LAMINATED
TYPE 51



BOX FRAME
TYPES 38, 39,
40, 41, 42

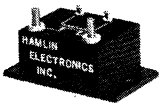


"C" FRAME —
Consult Factory
for Physical &
Elec. Details

CONTROL-PAK™

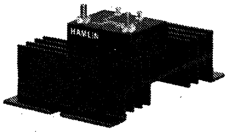
- **RELIABLE MAINTENANCE-FREE OPERATION**
- **RUGGED CONSTRUCTION**
- **RAPID RESPONSE**
- **LONG LIFE**

SERIES 723



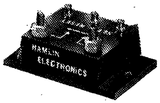
The 723 Series Control-Pak is a family of rapid response, self contained A.C. controllers designed for switching loads up to 6 amps. The unique design and rugged construction insure protection against contamination, moisture, vibration and shock. Control-Pak is capable of controlling inductive, capacitive, hi-inrush, and resistive loads; and provides reliable, arcless, bounceless, maintenance-free switching with a lifespan in excess of 50 million operations.

SERIES 724



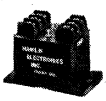
The 724 Series Control-Pak is a family of rapid response, self contained A.C. controllers designed for switching loads up to 12 amps. The unique design and rugged construction insure protection against contamination, moisture, vibration and shock. Control-Pak is capable of controlling inductive, capacitive, hi-inrush, and resistive loads; and provides reliable, arcless, bounceless, maintenance-free switching with a lifespan in excess of 50 million operations.

SERIES 733



The 733 Series Control-Pak is a family of rapid response, self contained A.C. controllers designed for switching loads up to 6 amps. The unique design and rugged construction insure protection against contamination, moisture, vibration and shock. Control-Pak is capable of controlling inductive, capacitive, hi-inrush, and resistive loads; and provides reliable, arcless, bounceless, maintenance-free switching with a lifespan in excess of 50 million operations.

SERIES 612



Developed primarily for the computer peripheral device market, this three phase solid state controller provides arcless "make" and zero current "break". These attributes reduce the R.F.I. and E.M.I. to levels where equipment drive motors can be operated adjacent to low level logic circuits.

SERIES 701

The 701 Series Control-Pak is a family of 1.5 amp printed circuit board solid state relay controllers for PCB mounting. The 701 Series is available in 120/240 volt 50/60 Hz at 1.5 amps.

	CONTROL-PAK PART NUMBERS	LOAD CURRENT AMPERES	60 HZ LINE VOLTAGE	SWITCH FORM(S)	INPUT CONTROL VOLTS D.C.	INPUT CONTROL VOLTS A.C.	INPUT CONTROL CURRENT MA	INPUT CONTROL RESISTANCE OHMS	EACH		
									1-9	10-24	25-49
ON/OFF SWITCHING	723-11-000	6	120	A	*	*	*	*	8.05	7.25	6.85
	723-11-100	6	120	A	6		28	175	9.40	8.50	8.00
	723-11-300	6	120	A	24		8.5	2.8K	9.40	8.50	8.00
	723-12-000	6	240	A	*	*	*	*	8.80	7.90	7.45
	723-12-100	6	240	A	6		28	175	10.55	9.40	8.95
	723-12-300	6	240	A	24		8.5	2.8K	10.55	9.40	8.95
ZERO SWITCHING	723-21-000	6	120	A	*	*	*	*	20.50	18.50	17.40
	723-21-100	6	120	A	6		28	175	23.00	20.70	19.60
	723-21-300	6	120	A	24		8.5	2.8K	23.00	20.70	19.60
	723-22-000	6	240	A	*	*	*	*	23.00	20.70	19.60
	723-22-100	6	240	A	6		28	175	25.50	23.00	21.75
	723-22-300	6	240	A	24		8.5	2.8K	25.50	23.00	21.75
ON/OFF SWITCHING	724-11-000	12	120	A	*	*	*	*	12.40	11.15	10.55
	724-11-100	12	120	A	6		28	175	14.35	12.90	12.20
	724-11-300	12	120	A	24		8.5	2.8K	14.35	12.90	12.20
	724-12-000	12	240	A	*	*	*	*	13.60	12.25	11.60
	724-12-100	12	240	A	6		28	175	15.60	14.05	13.30
	724-12-300	12	240	A	24		8.5	2.8K	15.60	14.05	13.30
ZERO SWITCHING	724-21-000	12	120	A	*	*	*	*	23.30	20.90	19.80
	724-21-100	12	120	A	6		28	175	25.90	23.30	22.00
	724-21-300	12	120	A	24		8.5	2.8K	25.90	23.30	22.00
	724-22-000	12	240	A	*	*	*	*	25.80	23.20	21.90
	724-22-100	12	240	A	6		28	175	28.30	25.40	24.00
	724-22-300	12	240	A	24		8.5	2.8K	28.30	25.40	24.00
ON/OFF SWITCHING	733-11-000	6	120	A	*	*	*	*	8.05	7.25	6.85
	733-11-100	6	120	A	6		28	175	9.40	8.50	8.00
	733-11-300	6	120	A	24		8.5	2.8K	9.40	8.50	8.00
	733-12-000	6	240	A	*	*	*	*	8.80	7.90	7.45
	733-12-100	6	240	A	6		28	175	10.55	9.40	8.95
	733-12-300	6	240	A	24		8.5	2.8K	10.55	9.40	8.95
ON/OFF SWITCHING	612-11-100	2.5	208	3A	6		52	100	37.70	33.90	32.00
	612-11-200	2.5	208	3A	12		31	380	37.70	33.90	32.00
	612-11-300	2.5	208	3A	24		16	1.5K	37.70	33.90	32.00
	612-11-400	2.5	208	3A	48		8	6.1K	37.70	33.90	32.00
	612-11-500	2.5	208	3A		24	16	1.5K	37.70	33.90	32.00
	612-11-600	2.5	208	3A		208	6	35K	37.70	33.90	32.00
ON/OFF SWITCHING	701-11-000	1.5	120	A	*	*	*	*	5.90	5.25	4.95
	701-11-100	1.5	120	A	6		28	175	6.40	5.70	5.35
	701-11-200	1.5	120	A	12		17	700	6.40	5.70	5.35
	701-11-500	1.5	120	A	2.5		4	700	7.05	6.25	5.90
	701-12-000	1.5	240	A	*	*	*	*	7.65	6.80	6.45
	701-12-100	1.5	240	A	6		28	175	8.15	7.25	6.85
	701-12-200	1.5	240	A	12		17	700	8.15	7.25	6.85
	701-12-500	1.5	240	A	2.5		4	700	8.95	7.95	7.50

* External Contact

HAMLIN

ELECTRONICS, INC.

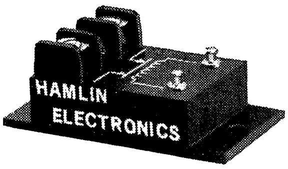
3600 WEST CLARENDON AVENUE PHOENIX, ARIZONA 85017 PHONE: 602/277-4834 TWX: 910-951-1535

HAMLIN
ELECTRONICS, INC.
3600 WEST CLARENDON AVENUE PHOENIX, ARIZONA 85017 PHONE: 602/277-4834 TWX: 910-951-1535

Hamlin Electronics, Inc. produces a broad line of rapid response, rugged, self-contained solid state A.C. controllers designed for switching resistive and inductive loads up to 25 amps. Offering the most complete selection of A.C. controllers available in the industry, Hamlin Electronics is able to supply a Control-Pak for your switching problem — no matter what it may be.

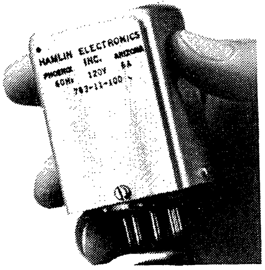
Utilizing basic triac circuitry Hamlin has adapted it to three phase, proportional temperature control, and to soft start motor and lamp controllers in addition to all the options of on/off and zero point switching.

SERIES 773



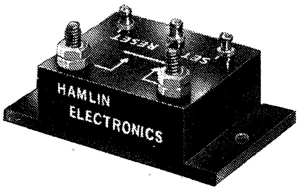
The 773 Series Control-Pak is a family of rapid response, self contained A.C. controllers designed for switching loads up to 6 amps. The unique design and rugged construction insure protection against contamination, moisture, vibration, and shock. Control-Pak is capable of controlling inductive, capacitive, hi-inrush, and resistive loads; and provides reliable, arcless, bounceless, maintenance-free switching with a lifespan in excess of 50 million operations.

SERIES 763



The Series 763 Octal Base Controller offers direct plug-in capabilities for ease in mounting and replacement of existing relays. Operate time of 1 millisecond and life in excess of 100 million operations are just two of the outstanding features offered in this Control-Pak line.

SERIES 733



The Latching Controller is an adaptation of the Hamlin Electronics, Inc.'s solid state 733 Series Controller. The control circuit provides for "on state" of the load when a pulse is applied to the "set" terminal and for "off state" of the load when a pulse is applied to the "reset" terminals. The pulse must be at least one (1) millisecond long at 5, 12, 24, or 48 volts.

	CONTROL-PAK PART NUMBERS	LOAD CURRENT AMPERES	60 HZ LINE VOLTAGE	SWITCH FORM (S)	INPUT CONTROL VOLTS D.C.	INPUT CONTROL VOLTS A.C.	INPUT CONTROL CURRENT MA	INPUT CONTROL RESISTANCE OHMS	EACH		
									1-9	10-24	25-49
ON/OFF SWITCHING	773-11-030	6	120	A	*	*	*	*	8.95	8.00	7.50
	773-11-130	6	120	A	6		28	175	10.75	9.75	9.25
	773-11-330	6	120	A	24		8.5	2.8K	10.75	9.75	9.25
	773-11-530	6	120	A	2.5		4	700	11.80	10.70	10.15
	773-12-030	6	240	A	*	*	*	*	10.05	9.50	8.55
	773-12-130	6	240	A	6		28	175	13.80	12.45	11.75
	773-12-330	6	240	A	24		8.5	2.8K	13.80	12.45	11.75
	773-12-530	6	240	A	2.5		4	700	15.20	13.70	12.90
ON/OFF SWITCHING	763-11-000	5	120	A	*	*	*	*	8.75	7.75	7.35
	763-11-100	5	120	A	6		40	1.5K	10.10	9.00	8.45
	763-11-500	5	120	A	24		10	2.4K	10.10	9.00	8.45
	763-11-500	5	120	A	2.5		4	700	11.10	9.85	9.30
	763-11-600	5	120	A		24	10	2.4K	12.20	10.85	10.25
	763-11-700	5	120	A		120	8.6	14K	12.20	10.85	10.25
	763-11-120	2.5	120	D	6		40	1.5K	11.10	9.90	9.30
	763-11-320	2.5	120	D	24		10	2.4K	11.10	9.90	9.30
	763-11-620	2.5	120	D		24	10	2.4K	13.40	11.90	11.20
	763-11-720	2.5	120	D		120	8.6	14K	13.40	11.90	11.20
	763-11-130	2.5	120	2A	6		60	100	12.20	10.80	10.20
	763-11-330	2.5	120	2A	24		15	1.6K	12.20	10.80	10.20
	763-11-630	2.5	120	2A		24	15	1.6K	13.40	11.90	11.20
	763-11-730	2.5	120	2A		120	15	8K	13.40	11.90	11.20
	763-11-140	2.5	120	2D	6		60	100	13.85	12.30	11.60
	763-11-340	2.5	120	2D	24		15	1.6K	13.85	12.30	11.60
	763-11-640	2.5	120	2D		24	15	1.6K	16.20	13.55	12.80
	763-11-740	2.5	120	2D		120	15	8K	16.70	14.90	14.10
ZERO SWITCHING	763-21-000	5	120	A	*	*	*	*	21.20	18.85	17.80
	763-21-100	5	120	A	6		40	1.5K	23.70	21.10	19.90
	763-21-300	5	120	A	24		10	2.4K	23.70	21.10	19.90
	763-21-500	5	120	A	2.5		4	700	26.10	23.20	21.90
	763-21-600	5	120	A		24	10	2.4K	28.70	25.50	24.10
	763-21-700	5	120	A		120	8.6	14K	28.70	25.50	24.10
LATCHING CONTROLLER	733-31-100	6	120	A	6	6	33	150	10.60	9.55	9.00
	733-31-200	6	120	A	12	12	20	600	10.60	9.55	9.00
	733-31-300	6	120	A	24	24	10	2.4K	10.60	9.55	9.00
	733-31-400	6	120	A	48	48	5	9.6K	10.60	9.55	9.00
	733-32-100	6	240	A	6	6	33	150	15.05	13.55	12.80
	733-32-200	6	240	A	12	12	20	600	15.05	13.55	12.80
	733-32-300	6	240	A	24	24	10	2.4K	15.05	13.55	12.80
	733-32-400	6	240	A	48	48	5	9.6K	15.05	13.55	12.80

* External Contact

CONTROL-PAK T.M.

Solid State AC Relays and Controllers

MA & MS TO-5 SERIES RELAY

Qualified
MIL-R-5757

GENERAL SPECIFICATIONS

CONTACT CAPABILITIES

RATING
10,000,000 operations at low level. 1,000,000 operations at 0.5 amp, 28V d-c resistive load. 100,000 operations at 1.0 amp, 28V d-c resistive load.

CONTACT RESISTANCE
0.1 ohm maximum before life (measured 1/8″ from header). 0.2 ohm maximum after life at maximum rated current (measured 1/8″ from header).

CONTACT BOUNCE
1.5 milliseconds maximum

OVERLOAD
2 amps at 28V d-c for 100 operations minimum

INSULATION RESISTANCE
10,000 megohms minimum between mutually insulated terminals

ENCLOSURE
Hermetically sealed. All welded.

ENVIRONMENTAL CHARACTERISTICS

TEMPERATURE RANGE
—65°C to +125°C. (Higher temperature ratings on special order)

VIBRATION
.06″ DA or 30G, 10-3000 cps.

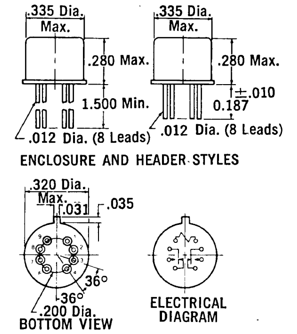
SHOCK
80 G's

MILITARY SPECIFICATIONS

All Hi-G MA and MS Series relays are manufactured in accordance with Military Specification MIL-R-5757 and its applicable detail specification.

MA

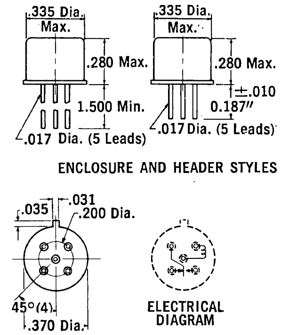
DPDT CONTACTS


.335 Dia. Max.
.280 Max.
1.500 Min.
.012 Dia. (8 Leads)
.335 Dia. Max.
.280 Max.
±.010
0.187
.012 Dia. (8 Leads)
ENCLOSURE AND HEADER STYLES
.320 Dia. Max.
.031
.035
36°
36°
.200 Dia.
BOTTOM VIEW
ELECTRICAL DIAGRAM

NOTE: TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON PART.

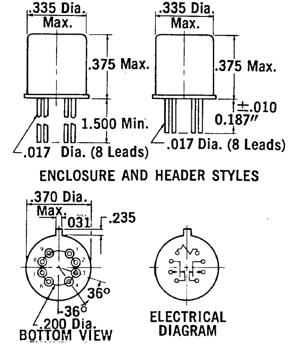
1MA

SPDT CONTACTS


.335 Dia. Max.
.280 Max.
1.500 Min.
.017 Dia. (5 Leads)
.335 Dia. Max.
.280 Max.
±.010
0.187″
.017 Dia. (5 Leads)
ENCLOSURE AND HEADER STYLES
.035
.031
.200 Dia.
45°(4)
.370 Dia.
ELECTRICAL DIAGRAM

MS

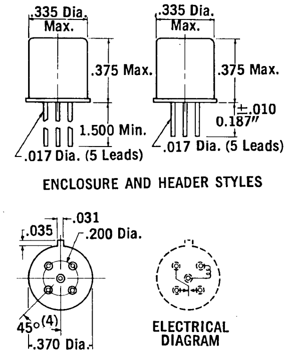
DPDT CONTACTS


.335 Dia. Max.
.375 Max.
1.500 Min.
.017 Dia. (8 Leads)
.335 Dia. Max.
.375 Max.
±.010
0.187″
.017 Dia. (8 Leads)
ENCLOSURE AND HEADER STYLES
.370 Dia. Max.
.031
.235
36°
36°
.200 Dia.
BOTTOM VIEW
ELECTRICAL DIAGRAM

NOTE: TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON PART.

1MS

SPDT CONTACTS


.335 Dia. Max.
.375 Max.
1.500 Min.
.017 Dia. (5 Leads)
.335 Dia. Max.
.375 Max.
±.010
0.187″
.017 Dia. (5 Leads)
ENCLOSURE AND HEADER STYLES
.035
.031
.200 Dia.
45°(4)
.370 Dia.
ELECTRICAL DIAGRAM

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prcmpt attention.

Qualified

Sensitivity:
130 milliwatts

Operate Time:
3.0 milliseconds maximum at nom. coil voltage over temperature range.

Release Time:
2.5 milliseconds maximum at nom. coil voltage over temperature range.

Dielectric Strength:
500V RMS 60 cycles at sea level
125V RMS 60 cycles at 70,000 feet

Weight:
0.07 ounce with leads trimmed to ⅛", add 0.02 ounce for leads

Hi-G Part No.	Military Part No.	Coil Voltage (VDC) Nom.	Max.	DC Coil Resistance Ohms ±10% at 25° C	Pull In Voltage VDC Max.*	Drop Out Voltage VDC* Max.	Min.
Wire Terminal							
MAW-6	M5757/40-001	6	8	98	4.5	3.2	.18
MAW-9	M5757/40-002	9	12	220	6.8	4.9	.35
MAW-12	M5757/40-003	12	16	390	9.0	6.5	.41
MAW-18	M5757/40-004	18	24	880	13.5	10.0	.59
MAW-26	M5757/40-005	26.5	32	1560	18.0	13.0	.89
Pin Terminal							
MAP-6	M5757/40-006	6	8	98	4.5	3.2	.18
MAP-9	M5757/40-007	9	12	220	6.8	4.9	.35
MAP-12	M5757/40-008	12	16	390	9.0	6.5	.41
MAP-18	M5757/40-009	18	24	880	13.5	10.0	.59
MAP-26	M5757/40-010	26.5	32	1560	18.0	13.0	.89

*Over temperature range

Qualified

Sensitivity:
100 milliwatts

Operate Time:
2.0 milliseconds maximum at nom. coil voltage over temperature range.

Release Time:
2.0 milliseconds maximum at nom. coil voltage over temperature range.

Dielectric Strength:
500V RMS 60 cycles at sea level
300V RMS 60 cycles at 70,000 feet

Weight:
0.06 ounce with leads trimmed at ⅛", add 0.02 ounce for leads

Hi-G Part No.	Military Part No.	Coil Voltage (VDC) Nom.	Max.	DC Coil Resistance Ohms ±10% at 25° C	Pull In Voltage VDC Max.*	Drop Out Voltage VDC* Max.	Min.
Wire Terminal							
1MAW-6	M5757/38-003	6	8	125	4.5	3.2	.18
1MAW-9	M5757/38-004	9	12	280	6.8	4.9	.35
1MAW-12	M5757/38-002	12	16	500	9.0	6.5	.41
1MAW-18	M5757/38-001	18	24	1130	13.5	10.0	.59
1MAW-26	M5757/38-005	26.5	32	2000	18.0	13.0	.89
Pin Terminal							
1MAP-6	M5757/38-008	6	8	125	4.5	3.2	.18
1MAP-9	M5757/38-009	9	12	280	6.8	4.9	.35
1MAP-12	M5757/38-007	12	16	500	9.0	6.5	.41
1MAP-18	M5757/38-006	18	24	1130	13.5	10.0	.59
1MAP-26	M5757/38-010	26.5	32	2000	18.0	13.0	.89

*Over temperature range

Qualified

Sensitivity:
60 milliwatts

Operate Time:
4.5 milliseconds maximum at nom. coil voltage over temperature range.

Release Time:
2.5 milliseconds maximum at nom. coil voltage over temperature range.

Dielectric Strength:
500V RMS 60 cycles at sea level
125V RMS 60 cycles at 70,000 feet

Weight:
0.10 ounce with leads trimmed to ⅛", add 0.02 ounce for leads

Hi-G Part No.	Military Part No.	Coil Voltage (VDC) Nom.	Max.	DC Coil Resistance Ohms ±10% at 25° C	Pull In Current (Ma) Max.	Drop Out Current (MA) Max.	Min.
Wire Terminal							
MSW-6	M5757/70-001	6	10	200	17.5	8.7	1.7
MSW-12	M5757/70-002	12	20	850	8.4	4.2	0.8
MSW-26	M5757/70-003	26	40	3300	4.2	2.1	0.4
MSW-36	M5757/70-004	36	57	6500	3.0	1.5	0.3
MSW-48	M5757/70-005	48	75	11000	2.4	1.2	0.2
Pin Terminal							
MSP-6	M5757/70-006	6	10	200	17.5	8.7	1.7
MSP-12	M5757/70-007	12	20	850	8.4	4.2	0.8
MSP-26	M5757/70-008	26	40	3300	4.2	2.1	0.4
MSP-36	M5757/70-009	36	57	6500	3.0	1.5	0.3
MSP-48	M5757/70-010	48	75	11000	2.4	1.2	0.2

Qualified

Sensitivity:
40 milliwatts

Operate Time:
4.0 milliseconds maximum at nom. coil voltage over temperature range

Release Time:
2.5 milliseconds maximum at nom. coil voltage over temperature range

Dielectric Strength:
500V RMS 60 cycles at sea level
300V RMS 60 cycles at 70,000 feet

Weight:
.08 ounce with leads trimmed to ⅛", add 0.02 ounce for leads

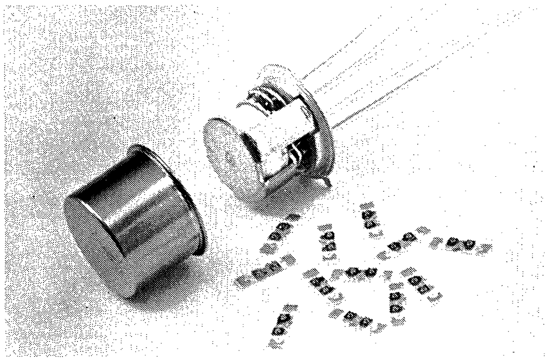
Hi-G Part No.	Military Part No.	Coil Voltage (VDC) Nom.	Max.	DC Coil Resistance Ohms ±10% at 25° C	Pull In Current (Ma) Max.	Drop Out Current (MA) Max.	Min.
Wire Terminal							
1MSW-6	M5757/69-001	6	11	255	12.5	6.25	1.2
1MSW-12	M5757/69-002	12	22	1025	6.25	3.12	0.6
1MSW-26	M5757/69-003	26	45	4000	3.16	1.58	0.3
1MSW-32	M5757/69-004	32	57	6500	2.47	1.23	0.2
1MSW-40	M5757/69-005	40	75	11000	1.91	0.96	0.15
Pin Terminal							
1MSP-6	M5757/69-006	6	11	255	12.5	6.25	1.2
1MSP-12	M5757/69-007	12	22	1025	6.25	3.12	0.6
1MSP-26	M5757/69-008	26	45	4000	3.16	1.58	0.3
1MSP-32	M5757/69-009	32	57	6500	2.47	1.23	0.2
1MSP-40	M5757/69-010	40	75	11000	1.91	0.96	0.15

Ordering Information: Standard items may be ordered by part number shown. For variation consult factory.

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

TO5 HYBRID SERIES RELAY



TO5 HYBRIDS FROM HI-G

- **Suppression**
- **Suppression with Steering**
- **Transistor Driven**

After an extensive period of research and development, the ultimate method of incorporation of hybrid components has been achieved within the TO5 relay. This new concept produces a totally integrated device and insures complimentary reliability. Hi-G, Inc., through its in-house Integrated Circuit Division, developed an integral thick film circuit compatible to the relay and its intended environments. The silicon planar expitaxial diodes and transistors are eutectically bonded to a thick film ceramic substrate. All electrical connections are accomplished utilizing the advanced techniques of integrated circuit technology. This discrete and totally independent component is subsequently bonded to the relay's coil terminals to insure reliable electrical and mechanical interconnections. We have eliminated exposed interwiring and the potential hazards of lead fatigue. Because of this process and on the basis that the relay and thick film circuitry comprise two independent and discrete components, each device retains its original and intended reliability.

SUPPRESSION

Each of Hi-G's relays are available with an integrated coil suppression diode to provide inhibitation of the inductive arc voltage produced by the coil.

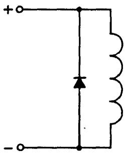
SUPPRESSION/STEERING

The addition of a series diode to the suppressed coil circuit provides the added advantage of polarity reversal protection and the elimination of diode damage.

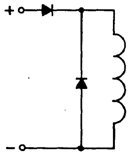
TRANSISTOR DRIVEN

The addition of an internal transistor coil drive provides increased operating sensitivity, high isolation while retaining the high level switching capability of the contacts.

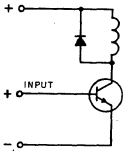
TYPE "D"



TYPE "DD"



TYPE "T"



GENERAL SPECIFICATIONS

RATING: 10,000,000 operations at low level. 1,000,000 operations at 0.5 amp, 28V d-c resistive load. 100,000 operations at 1.0 amp, 28V d-c resistive load.

CONTACT RESISTANCE: 0.1 ohm maximum before life (measured ⅛″ from header). 0.2 ohm maximum after life at maximum rated current (measured ⅛″ from header).

CONTACT BOUNCE: 1.5 milliseconds maximum.

OVERLOAD: 2 amps at 28V d-c for 100 operations minimum.

INSULATION RESISTANCE: 10,000 megohms minimum between mutually insulated terminals.

ENCLOSURE: Hermetically sealed. All welded.

TEMPERATURE RANGE: −65°C to +125°C.

VIBRATION: .06″ DA or 30G, 10-3000 cps.

SHOCK: 80G's for 11 milliseconds.

DIODE CHARACTERISTICS 25°C: PIV 100V min.

MAXIMUM COIL TRANSIENT:
Transistor Coil Drive: 1.0V Suppression: 2.0V

TRANSISTOR CHARACTERISTICS 25°C:
Emitter-Base Voltage: 6V max.
Collector-Base Breakdown Voltage: 80V min. @ 100 μa.

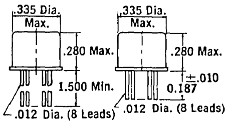
* Bifilar Suppression also Available; Consult Factory.

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

TO5 HYBRID RELAYS

MAW SERIES
DPDT



OPERATE TIME: 3.5 milliseconds maximum at nom. coil voltage over temperature range.

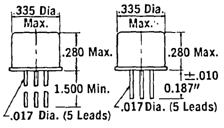
RELEASE TIME: Transistor Driven — 7.5 milliseconds maximum at nom. coil voltage over temperature range.

RELEASE TIME: Coil Suppression — 4.0 milliseconds maximum at nom. coil voltage over temperature range.

DIELECTRIC STRENGTH: 500V RMS 60 cycles at sea level. 125V RMS 60 cycles at 70,000 feet.

WEIGHT: 0.07 ounce with leads trimmed to ⅛″, add 0.02 ounce for leads.

1MAW SERIES
SPDT



OPERATE TIME: 3.5 milliseconds maximum at nom. coil voltage over temperature range.

RELEASE TIME: Transistor Driven — 7.5 milliseconds maximum at nom. coil voltage over temperature range.

RELEASE TIME: Coil Suppression — 4.0 milliseconds maximum at nom. coil voltage over temperature range.

DIELECTRIC STRENGTH: 500V RMS 60 cycles at sea level. 300V RMS 60 cycles at 70,000 feet.

WEIGHT: 0.06 ounce with leads trimmed at ⅛″, add 0.02 ounce for leads.

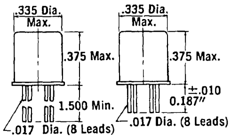
MAW SERIES DPDT

Relay Part No.	MAW-5			MAW-6			MAW-9			MAW-12			MAW-18			MAW-26		
Type	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	T
Coil Nominal	5VDC			6VDC			9VDC			12VDC			18VDC			26.5VDC		
Coil Resistance ±10%	50	39	50	98	78	98	220	220	220	390	390	390	880	880	880	1560	1560	1560
Pull-in (max.) VDC	3.5	3.5		4.5	5.2		6.8	7.8		9.0	10.0		13.5	14.5		18.0	19.0	
Base Current to turn-on (min.) MADC			3.00			2.04			1.36			1.03			0.68			0.50
Drop-out (max.) VDC	2.5	2.5		3.2	3.2		4.9	4.9		6.5	6.5		10.0	10.0		13.0	13.0	

1MAW SERIES SPDT

Relay Part No.	1MAW-5			1MAW-6			1MAW-9			1MAW-12			1MAW-18			1MAW-26		
Type	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	T
Coil Nominal	5VDC			6VDC			9VDC			12VDC			18VDC			26.5VDC		
Coil Resistance ±10%	63	50	63	125	98	125	280	280	280	500	500	500	1130	1130	1130	2000	2000	2000
Pull-in (max.) VDC	3.5	3.9		4.5	5.2		6.8	7.8		9.0	10.0		13.5	14.5		18.0	19.0	
Base Current to turn-on (min.) MADC			2.38			1.60			1.70			0.80			0.53			0.40
Drop-out (max.) VDC	2.5	2.5		3.2	3.2		4.9	4.9		6.5	6.5		10.0	10.0		13.0	13.0	

MSW SERIES
SENSITIVE
DPDT



OPERATE TIME: 5.5 milliseconds maximum at nom. coil voltage over temperature range.

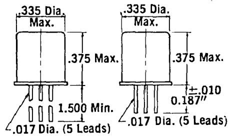
RELEASE TIME: Transistor Driven — 7.5 milliseconds maximum at nom. coil voltage over temperature range.

RELEASE TIME: Coil Suppression — 7.5 milliseconds maximum at nom. coil voltage over temperature range.

DIELECTRIC STRENGTH: 500V RMS 60 cycles at sea level. 125V RMS 60 cycles at 70,000 feet.

WEIGHT: 0.10 ounce with leads trimmed to ⅛″, add 0.02 ounce for leads.

1MSW SERIES
SENSITIVE
SPDT



OPERATE TIME: 5.5 milliseconds maximum at nom. coil voltage over temperature range.

RELEASE TIME: Transistor Driven — 7.5 milliseconds maximum at nom. coil voltage over temperature range.

RELEASE TIME: Coil Suppression — 7.5 milliseconds maximum at nom. coil voltage over temperature range.

DIELECTRIC STRENGTH: 500V RMS 60 cycles at sea level. 300V RMS 60 cycles at 70,000 feet.

WEIGHT: .08 ounce with leads trimmed to ⅛″, add 0.02 ounce for leads.

MSW SERIES SENSITIVE DPDT

Relay Part No.	MSW-5			MSW-6			MSW-9			MSW-12			MSW-18			MSW-26			MSW-36		MSW-48	
Type	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	D	DD
Coil Nominal	5VDC			6VDC			9VDC			12VDC			18VDC			26.5VDC			36VDC		48VDC	
Coil Resistance ±10%	100	64	100	200	125	200	400	400	400	850	850	850	1600	1600	1600	3300	3300	3300	6500	6500	11000	11000
Pull-in (max.) VDC	3.5	3.6		4.5	4.8		6.8	8.0		9.0	11.0		13.5	14.5		18.0	19.0		27.0	27.0	36.0	36.0
Base Current to turn-on (min.) MADC			1.50			1.0			0.75			0.47			0.36			0.24				
Drop-out (max.) VDC	2.5	2.5		3.2	3.2		4.9	4.9		6.5	6.5		10.0	10.0		13.0	13.0		19.0	19.0	26.0	26.0

1MSW SERIES SENSITIVE SPDT

Relay Part No.	1MSW-5			1MSW-6			1MSW-9			1MSW-12			1MSW-18			1MSW-26			1MSW-32		1MSW-40	
Type	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	T	D	DD	D	DD
Coil Nominal	5VDC			6VDC			9VDC			12VDC			18VDC			26.5VDC			36VDC		48VDC	
Coil Resistance ±10%	125	100	125	225	200	225	630	630	630	1025	1025	1025	2300	2300	2300	4000	4000	4000	6500	6500	11000	11000
Pull-in (max.) VDC	3.5	3.6		4.5	4.8		6.8	8.0		9.0	10.0		13.5	14.5		18.0	19.0		24.0	24.0	30.0	30.0
Base Current to turn-on (min.) MADC			1.20			0.28			0.48			0.39			0.26			0.20				
Drop-out (max.) VDC	2.5	2.5		3.2	3.2		4.9	4.9		6.5	6.5		10.0	10.0		13.0	13.0		17.0	17.0	21.0	21.0

ORDERING INFORMATION MAW D — 26

Series
D — Diode Suppression
DD — Suppression/Steering
T — Transistor Driven
Coil Voltage

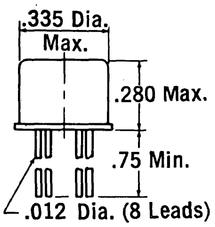
Authorized Hi-G dealers are located throughout the U. S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

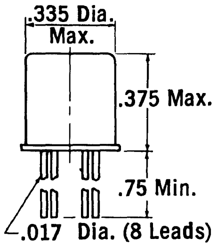
INDUSTRIAL TO5 SERIES

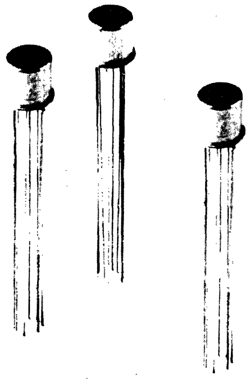
- **Standard Version**
- **Sensitive Version**
- **Coil Suppression**
- **Transistor Driven**

CAW



CSW





The Hi-G CA & CS Series relays are manufactured to the same exacting standards as its Military counterpart. Each relay boosts an all welded construction to afford hermeticy of seal and insurance of chamber cleanliness. This low price TO5 type relay will comply to all of your switching requirements between dry circuit and 1.0 ampere.

The commercial series has been designed for a mechanical life in excess of 10,000,000 operations.

GENERAL SPECIFICATIONS

OPERATE POWER: CA Series, 185mw; CS Series, 90mw.

OPERATE TIME: CA, 4.0ms; CS, 7.0ms @ nominal voltage.

RELEASE TIME: CA, 3.0ms (6.0ms Hybrid);
CS, 4.0ms (8.0ms Hybrid).

DIELECTRIC STRENGTH: 350VRMS 60Hz.

INSULATION RESISTANCE: 1,000 megohms min.

VIBRATION: .06″ DA 10-55Hz, 10G to 500Hz.

SHOCK: 30G Mil-Std 202 Method 213.

TEMPERATURE: −55°C to +71°C.

LIFE: 10,000,000 ops, mechanical; 1,000,000 ops, 0.5A 28VDC; 100,000 ops, 1.0A 28VDC.

WEIGHT: CA-0.08 oz., CS-0.15 oz.

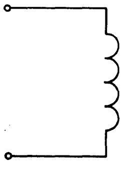
CAW SERIES DPDT

Relay Part No.	CAW-5			CAW-6			CAW-9			CAW-12			CAW-18			CAW-26		
Type	STD	D	T	STD	D	T	STD	D	T	STD	D	T	STD	D	T	STD	D	T
Coil Nominal	5VDC			6VDC			9VDC			12VDC			18VDC			26.5VDC		
Coil Resistance ±10%	50	50		100	100	100	200	200	200	390	390	390	880	880	880	1560	1560	1560
Pull-in (max.) VDC	3.6	3.6		4.2	4.2		6.5	6.5		8.4	8.4		13.0	13.0		17.0	17.0	
Base Current to turn-on (min) MADC			3.00			2.04			1.36			1.03			0.68			0.50

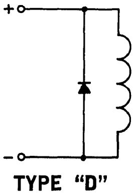
CSW SERIES DPDT

Relay Part No.	CSW-5			CSW-6			CSW-9			CSW-12			CSW-18			CSW-26		
Type	STD	D	T	STD	D	T	STD	D	T	STD	D	T	STD	D	T	STD	D	T
Coil Nominal	5VDC			6VDC			9VDC			12VDC			18VDC			26.5VDC		
Coil Resistance ±10%	100	100	100	200	200	200	400	400	400	850	850	850	1600	1600	1600	3300	3300	3300
Pull-in (max.) VDC	3.6	3.6		4.2	4.2		6.5	6.5		8.4	8.4		13.0	13.0		17.0	17.0	
Base Current to turn-on (min) MADC			1.50			1.00			0.75			0.47			0.36			0.24

STANDARD

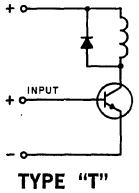


SUPPRESSION



TYPE "D"

TRANSISTOR DRIVEN



TYPE "T"

ORDERING INFORMATION

CAW D — 26
Series
D — Diode Suppression
T — Transistor Driven
Coil Voltage

Authorized Hi-G dealers are located throughout the U. S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

RELAYS WITH EXTRA DIMENSION

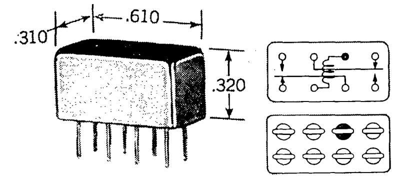
Qualified MIL-R-5757/37

the MINI- G®

150 GRID RELAY — SERIES G

Product Bulletin 95

All welded, DPDT relay manufactured in accordance with MIL-R-5757/37.



SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

SENSITIVITY AT 25°C: 135mW.

LIFE: 100,000 operations min. at rated load and 125°C.

OVERLOAD: 4 amps at 30VDC for 100 operations min.

CONTACT RESISTANCE:
(a) 50 milliohms initial at rated load.
(b) 150 milliohms after rated life.
(c) 3Ω max. during min. current life.
(d) 50Ω max. at 10mA and 30mV RMS.

CONTACT BOUNCE: 1.2ms max. at high level;
2.0ms max. at low level.

OPERATE TIME: 4.0ms max. at nom. coil voltage at 25°C.

RELEASE TIME: 4.0ms max. at 25°C.

DIELECTRIC STRENGTH: 500V RMS between all mutually insulated points at sea level; 750V RMS between contacts and case.

INSULATION RESISTANCE: 1000MΩ min. between mutually insulated terminals.

CONTACT RATING

- 1 ampere resistive at 30 volts DC max.
- 0.125 ampere resistive at 115 volts RMS, 400 Hz, case grounded.
- Low level 0 to 0.1 ampere at 50 mV DC or AC.
- Minimum Current per MIL-R-5757/37 (100,000 operations min.).
- 2 ampere resistive at 30 volts DC max. (50,000 operations min.).

ENVIRONMENTAL CHARACTERISTICS

TEMPERATURE RANGE: −65°C to +125°C.

VIBRATION: 0.5″ DA from 5-34Hz, 30G from 34-3000Hz, 10μs max. contact opening.

SHOCK: 100G, 10μs max. contact opening.

ACCELERATION: 100G.

LEAKAGE RATE: 1 x 10^{-8} cc/sec max.

WEIGHT: 0.13 oz .

STANDARD CATALOG RELAYS

Voltage Code	Coil Voltage (Vdc)		DC Coil Resistance (ohms ±10% @ 25°C)	Max. Pull-In Voltage (Vdc)		Min. Drop-Out Voltage (Vdc)	
	Max.	Nom.		25°C	125°C	25°C	−65°C
106	8	6	56	2.7	3.6	0.30	0.17
112	16	12	210	5.4	7.2	0.60	0.35
126	32	26.5	1350	13.5	18.0	1.50	0.88

QUALIFIED TO THE REQUIREMENTS OF MIL-R-5757/37

Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number
2G-3407-1	M5757/37-001	2G-3407-15	M5757/37-015	2G-3407-29	M5757/37-029	2G-3407-43	M5757/37-043
2G-3407-2	M5757/37-002	2G-3407-16	M5757/37-016	2G-3407-30	M5757/37-030	2G-3407-44	M5757/37-044
2G-3407-3	M5757/37-003	2G-3407-17	M5757/37-017	2G-3407-31	M5757/37-031	2G-3407-45	M5757/37-045
2G-3407-4	M5757/37-004	2G-3407-18	M5757/37-018	2G-3407-32	M5757/37-032	2G-3407-46	M5757/37-046
2G-3407-5	M5757/37-005	2G-3407-19	M5757/37-019	2G-3407-33	M5757/37-033	2G-3407-47	M5757/37-047
2G-3407-6	M5757/37-006	2G-3407-20	M5757/37-020	2G-3407-34	M5757/37-034	2G-3407-48	M5757/37-048
2G-3407-7	M5757/37-007	2G-3407-21	M5757/37-021	2G-3407-35	M5757/37-035	2G-3407-49	M5757/37-049
2G-3407-8	M5757/37-008	2G-3407-22	M5757/37-022	2G-3407-36	M5757/37-036	2G-3407-50	M5757/37-050
2G-3407-9	M5757/37-009	2G-3407-23	M5757/37-023	2G-3407-37	M5757/37-037	2G-3407-51	M5757/37-051
2G-3407-10	M5757/37-010	2G-3407-24	M5757/37-024	2G-3407-38	M5757/37-038	2G-3407-52	M5757/37-052
2G-3407-11	M5757/37-011	2G-3407-25	M5757/37-025	2G-3407-39	M5757/37-039	2G-3407-53	M5757/37-053
2G-3407-12	M5757/37-012	2G-3407-26	M5757/37-026	2G-3407-40	M5757/37-040	2G-3407-54	M5757/37-054
2G-3401-13	M5757/37-013	2G-3407-27	M5757/37-027	2G-3407-41	M5757/37-041		
2G-3407-14	M5757/37-014	2G-3407-28	M5757/37-028	2G-3407-42	M5757/37-042		

® *Trademark pending registration*

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

SPRING STREET
AND ROUTE 75
WINDSOR LOCKS
CONN. 06096
(203) 623-2481

qualified to the requirements of MIL-R-5757

HALF SIZE CRYSTAL CAN RELAY 2K-2299-M5757/9

Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number
2K-2299-1	M5757/9-001	2K-2299-38	M5757/9-038
2K-2299-2	M5757/9-002	2K-2299-39	M5757/9-039
2K-2299-3	M5757/9-003	2K-2299-40	M5757/9-040
2K-2299-4	M5757/9-004	2K-2299-41	M5757/9-041
2K-2299-5	M5757/9-005	2K-2299-42	M5757/9-042
2K-2299-6	M5757/9-006	2K-2299-43	M5757/9-043
2K-2299-7	M5757/9-007	2K-2299-44	M5757/9-044
2K-2299-8	M5757/9-008	2K-2299-45	M5757/9-045
2K-2299-9	M5757/9-009	2K-2299-46	M5757/9-046
2K-2299-10	M5757/9-010	2K-2299-47	M5757/9-047
2K-2299-11	M5757/9-011	2K-2299-48	M5757/9-048
2K-2299-12	M5757/9-012	2K-2299-49	M5757/9-049
2K-2299-13	M5757/9-013	2K-2299-50	M5757/9-050
2K-2299-14	M5757/9-014	2K-2299-51	M5757/9-051
2K-2299-15	M5757/9-015	2K-2299-52	M5757/9-052
2K-2299-16	M5757/9-016	2K-2299-53	M5757/9-053
2K-2299-17	M5757/9-017	2K-2299-54	M5757/9-054
2K-2299-18	M5757/9-018	2K-2299-55	M5757/9-055
2K-2299-19	M5757/9-019	2K-2299-56	M5757/9-056
2K-2299-20	M5757/9-020	2K-2299-57	M5757/9-057
2K-2299-21	M5757/9-021	2K-2299-58	M5757/9-058
2K-2299-22	M5757/9-022	2K-2299-59	M5757/9-059
2K-2299-23	M5757/9-023	2K-2299-60	M5757/9-060
2K-2299-24	M5757/9-024	2K-2299-61	M5757/9-061
2K-2299-25	M5757/9-025	2K-2299-62	M5757/9-062
2K-2299-26	M5757/9-026	2K-2299-63	M5757/9-063
2K-2299-27	M5757/9-027	2K-2299-64	M5757/9-064
2K-2299-28	M5757/9-028	2K-2299-65	M5757/9-065
2K-2299-29	M5757/9-029	2K-2299-66	M5757/9-066
2K-2299-30	M5757/9-030	2K-2299-67	M5757/9-067
2K-2299-31	M5757/9-031	2K-2299-68	M5757/9-068
2K-2299-32	M5757/9-032	2K-2299-69	M5757/9-069
2K-2299-33	M5757/9-033	2K-2299-70	M5757/9-070
2K-2299-34	M5757/9-034	2K-2299-71	M5757/9-071
2K-2299-35	M5757/9-035	2K-2299-72	M5757/9-072
2K-2299-36	M5757/9-036	2K-2299-73	M5757/9-073
2K-2299-37	M5757/9-037	2K-2299-74	M5757/9-074

CRYSTAL CAN RELAY 2B-1506-M5757/10

Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number
2B-1506-1	M5757/10-001	2B-1506-25	M5757/10-025
2B-1506-2	M5757/10-002	2B-1506-26	M5757/10-026
2B-1506-3	M5757/10-003	2B-1506-27	M5757/10-027
2B-1506-4	M5757/10-004	2B-1506-28	M5757/10-028
2B-1506-5	M5757/10-005	2B-1506-29	M5757/10-029
2B-1506-6	M5757/10-006	2B-1506-30	M5757/10-030
2B-1506-7	M5757/10-007	2B-1506-31	M5757/10-031
2B-1506-8	M5757/10-008	2B-1506-32	M5757/10-032
2B-1506-9	M5757/10-009	2B-1506-33	M5757/10-033
2B-1506-10	M5757/10-010	2B-1506-34	M5757/10-034
2B-1506-11	M5757/10-011	2B-1506-35	M5757/10-035
2B-1506-12	M5757/10-012	2B-1506-36	M5757/10-036
2B-1506-13	M5757/10-013	2B-1506-37	M5757/10-037
2B-1506-14	M5757/10-014	2B-1506-38	M5757/10-038
2B-1506-15	M5757/10-015	2B-1506-39	M5757/10-039
2B-1506-16	M5757/10-016	2B-1506-40	M5757/10-040
2B-1506-17	M5757/10-017	2B-1506-41	M5757/10-041
2B-1506-18	M5757/10-018	2B-1506-42	M5757/10-042
2B-1506-19	M5757/10-019	2B-1506-43	M5757/10-043
2B-1506-20	M5757/10-020	2B-1506-44	M5757/10-044
2B-1506-21	M5757/10-021	2B-1506-52	M5757/10-052
2B-1506-22	M5757/10-022	2B-1506-53	M5757/10-053
2B-1506-23	M5757/10-023	2B1506-141	M5757/10-141
2B-1506-24	M5757/10-024		

10 AMP CRYSTAL CAN RELAY 2T-2911/2T-2994-M5757/23 & 28

Hi-G Part Number	MIL Part Number	Hi-G Part Number	MIL Part Number
2T-2911-1	M5757/23-001	2T-2911-15	M5757/23-015
2T-2911-2	M5757/23-002	2T-2911-16	M5757/23-016
2T-2911-3	M5757/23-003	2T-2911-17	M5757/23-017
2T-2911-4	M5757/23-004	2T-2911-18	M5757/23-018
2T-2911-5	M5757/23-005	2T-2911-19	M5757/23-019
2T-2911-6	M5757/23-006	2T-2911-20	M5757/23-020
2T-2911-7	M5757/23-007	2T-2911-21	M5757/23-021
2T-2911-8	M5757/23-008	2T-2911-22	M5757/23-022
2T-2911-9	M5757/23-009	2T-2911-23	M5757/23-023
2T-2911-10	M5757/23-010	2T-2911-24	M5757/23-024
2T-2911-11	M5757/23-011	2T-2911-25	M5757/23-025
2T-2911-12	M5757/23-012		
2T-2911-13	M5757/23-013		
2T-2911-14	M5757/23-014		M5757/28-001

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

QPL PRODUCTS

SPRING STREET
AND ROUTE 75
WINDSOR LOCKS
CONN. 06096
(203) 623-2481

qualified to the requirements of MIL-R-5757

CURRENT SENSITIVE CRYSTAL CAN RELAY

2BC-1510-M5757/13

Hi-G Part No.	MIL-Part No.	Hi-G Part No.	MIL-Part No.
2BC-1510-11	M5757/13-011	2BC-1510-46	M5757/13-046
2BC-1510-12	M5757/13-012	2BC-1510-47	M5757/13-047
2BC-1510-13	M5757/13-013	2BC-1510-48	M5757/13-048
2BC-1510-14	M5757/13-014	2BC-1510-49	M5757/13-049
2BC-1510-15	M5757/13-015	2BC-1510-50	M5757/13-050
2BC-1510-16	M5757/13-016	2BC-1510-51	M5757/13-051
2BC-1510-17	M5757/13-017	2BC-1510-52	M5757/13-052
2BC-1510-18	M5757/13-018	2BC-1510-53	M5757/13-053
2BC-1510-19	M5757/13-019	2BC-1510-54	M5757/13-054
2BC-1510-20	M5757/13-020	2BC-1510-55	M5757/13-055
2BC-1510-31	M5757/13-031	2BC-1510-56	M5757/13-056
2BC-1510-32	M5757/13-032	2BC-1510-57	M5757/13-057
2BC-1510-33	M5757/13-033	2BC-1510-58	M5757/13-058
2BC-1510-34	M5757/13-034	2BC-1510-59	M5757/13-059
2BC-1510-35	M5757/13-035	2BC-1510-60	M5757/13-060
2BC-1510-36	M5757/13-036	2BC-1510-61	M5757/13-061
2BC-1510-37	M5757/13-037	2BC-1510-62	M5757/13-062
2BC-1510-38	M5757/13-038	2BC-1510-63	M5757/13-063
2BC-1510-39	M5757/13-039	2BC-1510-64	M5757/13-064
2BC-1510-40	M5757/13-040	2BC-1510-65	M5757/13-065
2BC-1510-41	M5757/13-041	2BC-1510-66	M5757/13-066
2BC-1510-42	M5757/13-042	2BC-1510-67	M5757/13-067
2BC-1510-43	M5757/13-043	2BC-1510-68	M5757/13-068
2BC-1510-44	M5757/13-044	2BC-1510-69	M5757/13-069
2BC-1510-45	M5757/13-045	2BC-1510-70	M5757/13-070

.150 GRID CRYSTAL CAN RELAY

2G-3407-M5757/37

Hi-G Part No.	MIL Part No.	Hi-G Part No.	MIL Part No.
2G-3407-1	M5757/37-001	2G-3407-28	M5757/37-028
2G-3407-2	M5757/37-001	2G-3407-29	M5757/37-029
2G-3407-3	M5757/37-003	2G-3407-30	M5757/37-030
2G-3407-4	M5757/37-004	2G-3407-31	M5757/37-031
2G-3407-5	M5757/37-005	2G-3407-32	M5757/37-032
2G-3407-6	M5757/37-006	2G-3407-33	M5757/37-033
2G-3407-7	M5757/37-007	2G-3407-34	M5757/37-034
2G-3407-8	M5757/37-008	2G-3407-35	M5757/37-035
2G-3407-9	M5757/37-009	2G-3407-36	M5757/37-036
2G-3407-10	M5757/37-010	2G-3407-37	M5757/37-037
2G-3407-11	M5757/37-011	2G-3407-38	M5757/37-038
2G-3407-12	M5757/37-012	2G-3407-39	M5757/37-039
2G-3407-13	M5757/37-013	2G-3407-40	M5757/37-040
2G-3407-14	M5757/37-014	2G-3407-41	M5757/37-041
2G-3407-15	M5757/37-015	2G-3407-42	M5757/37-042
2G-3407-16	M5757/37-016	2G-3407-43	M5757/37-043
2G-3407-17	M5757/37-017	2G-3407-44	M5757/37-044
2G-3407-18	M5757/37-018	2G-3407-45	M5757/37-045
2G-3407-19	M5757/37-019	2G-3407-46	M5757/37-046
2G-3407-20	M5757/37-020	2G-3407-47	M5757/37-047
2G-3407-21	M5757/37-021	2G-3407-48	M5757/37-048
2G-3407-22	M5757/37-022	2G-3407-49	M5757/37-049
2G-3407-23	M5757/37-023	2G-3407-50	M5757/37-050
2G-3407-24	M5757/37-024	2G-3407-51	M5757/37-051
2G-3407-25	M5757/37-025	2G-3407-52	M5757/37-052
2G-3407-26	M5757/37-026	2G-3407-53	M5757/37-053
2G-3407-27	M5757/37-027	2G-3407-54	M5757/37-054

TO5 TRANSISTOR CASE RELAY

1MA - M5757/38		MA - M5757/40		1MS - M5757/69		MS - M5757/70	
Hi-G Part No.	**MIL Part No.**	**Hi-G Part No.**	**MIL Part No.**	**Hi-G Part No.**	**MIL Part No.**	**Hi-G Part No.**	**MIL Part No.**
1MAW-18	M5757/38-001	MAW-6	M5757/40-001	1MSW-6	M5757/69-001	MSW-6	M5757/70-001
1MAW-12	M5757/38-002	MAW-9	M5757/40-002	1MSW-12	M5757/69-002	MSW-12	M5757/70-002
1MAW-6	M5757/38-003	MAW-12	M5757/40-003	1MSW-26	M5757/69-003	MSW-26	M5757/70-003
1MAW-9	M5757/38-004	MAW-18	M5757/40-004	1MSW-32	M5757/69-004	MSW-36	M5757/70-004
1MAW-26	M5757/38-005	MAW-26	M5757/40-005	1MSW-40	M5757/69-005	MSW-48	M5757/70-005
1MAP-18	M5757/38-006	MAP-6	M5757/40-006	1MSP-6	M5757/69-006	MSP-6	M5757/70-006
1MAP-12	M5757/38-007	MAP-9	M5757/40-007	1MSP-12	M5757/69-007	MSP-12	M5757/70-007
1MAP-6	M5757/38-008	MAP-12	M5757/40-008	1MSP-26	M5757/69-008	MSP-26	M5757/70-008
1MAP-9	M5757/38-009	MAP-18	M5757/40-009	1MSP-32	M5757/69-009	MSP-36	M5757/70-009
1MAP-26	M5757/38-010	MAP-26	M5757/40-010	1MSP-40	M5757/69-010	MSP-48	M5757/70-010

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

CRYSTAL CAN RELAYS

RADIO FREQUENCY RELAYS

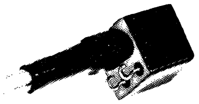
Product Bulletin 155

RF contacts are terminated with RG-196/U Teflon insulated coaxial cable, 6″ in length. Other lengths, types of cable, or coaxial connector terminations available on special order. These relays meet or exceed the applicable portions of MIL-R-5757 and MIL-R-3928.

RADIO FREQUENCY CHARACTERISTICS	
Frequency Range	0 - 500 MHz*
Voltage Standing Wave Ratio (VSWR)	<1.1:1 typical
Insertion Loss	0.16db typical
Characteristic Impedance	50 ohms†
Crosstalk	−50db typical

** Usable to 1000 MHz with reduced RF characteristics*
† Other impedances available on special order

DICE CUBE RADIO FREQUENCY RELAY — SERIES RFC

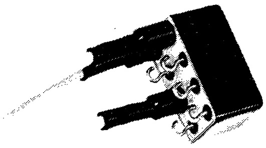


Operate Power 150 mW

Relay Type	RFC
Size	0.5-inch cube
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	0.3 ounce (without terminations)

NOTE: Electrical characteristics same as series C

HALF SIZE CRYSTAL-CAN RADIO FREQUENCY RELAY — SERIES RFK

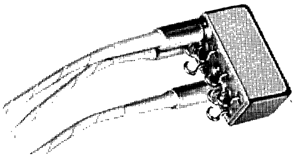


Operate Power 250 mW

Relay Type	RFK
Size	.4 x .8 x .4 inch
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	0.37 ounce (without terminations)

NOTE: Electrical characteristics same as series K

LATCHING HALF SIZE CRYSTAL-CAN RADIO FREQUENCY RELAY — SERIES RFKL

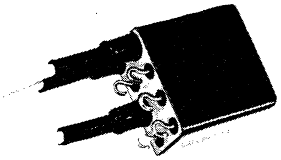


Operate Power 150 mW

Relay Type	RFKL
Size	.4 x .8 x .4 inch
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	0.37 ounce (without terminations)

NOTE: Electrical characteristics same as series KL

CRYSTAL-CAN RADIO FREQUENCY RELAY — SERIES RFB

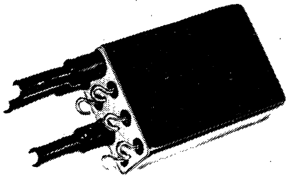


Operate Power 250 mW

Relay Type	RFB
Size	.875 x .800 x .400 inch
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	0.95 ounce (without terminations)

NOTE: Electrical characteristics same as series B

HIGH SENSITIVITY RADIO FREQUENCY RELAY — SERIES RFBC



Operate Power 40 mW

Relay Type	RFBC
Size	1.275 x .800 x .400 inch
Contact Rating	200 watts RF cold switching 75 watts RF hot switching
Maximum Weight	1.0 ounce (without terminations)

NOTE: Electrical characteristics same as series BC

ENVIRONMENTAL CHARACTERISTICS FOR STANDARD CRYSTAL CAN SERIES

Life: 100,000 operations at 125°C and rated load.
Temperature: −65°C to +125°C, operating.
Vibration: 10 to 2000 Hz, 20G min.
Shock: 100 G
Sealing: Hermetic, to 80,000′

Insulation Resistance: 1000 megohms min., except coil-to-case at high temperature 500 megohms min.
Dielectric Strength: Contacts-to-case: 1000 volts rms, 60 Hz, mutually insulated terminals: 500 volts rms standard.

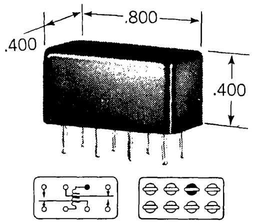
Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

CRYSTAL CAN RELAYS

Qualified MIL-R-5757/9

HALF-SIZE CRYSTAL CAN RELAY — SERIES 2K Product Bulletin 102

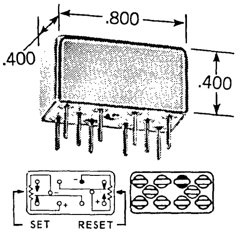


CONTACT RATING
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded and dry circuit.

ALL WELDED CONSTRUCTION

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3	.35	40
112	12	14.4	6	.75	150
126	26.5	32	13	1.5	675

HALF-SIZE LATCHING RELAY — DUAL COIL — DPDT — SERIES KL Product Bulletin 103

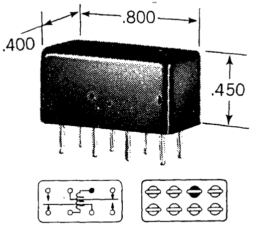


CONTACT RATING
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz case grounded and dry circuit.

ALL WELDED CONSTRUCTION

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Set/Reset Voltage @ + 25°C	DC Coil Resistance Ohms ±10% @ 25°C
112	12	14.4	6	250
126	26.5	32	13	1000

HALF-PINT® MINIATURE 4 AMP RELAY — SERIES 2HA Product Bulletin 100

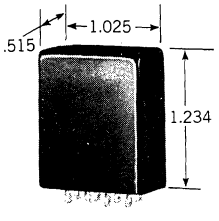


CONTACT RATING
4 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded

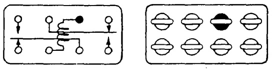
Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3.4	.35	40
112	12	14.4	6.5	.75	150
126	26.5	32	13.0	1.5	600

Qualified MIL-R-5757/23 & 28

10 AMP CRYSTAL CAN RELAY — SERIES T Product Bulletin 150



CONTACT RATING
Standard rating 10 amperes resistive at 30 VDC, 5 ampere resistive at 115 V or 115 V, 400 Hz, case grounded.



Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3.3	.5	22
112	12	14.4	6.7	1.0	90
126	26.5	32	13.0	2.0	330
215	115	125	52.0	5	5500

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

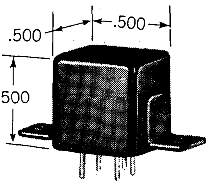
CRYSTAL CAN RELAYS

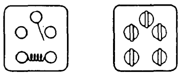
ENVIRONMENTAL CHARACTERISTICS FOR STANDARD CRYSTAL CAN SERIES

Life: 100,000 operations at 125°C and rated load.
Temperature: −65°C to +125°C, operating.
Vibration: 10 to 2000 Hz, 20G min.
Shock: 100 G
Sealing: Hermetic, to 80,000′

Insulation Resistance: 1000 megohms min., except coil-to-case at high temperature 500 megohms min.
Dielectric Strength: Contacts-to-case: 1000 volts rms, 60 Hz, mutually insulated terminals: 500 volts rms standard.

DICE CUBE® — MINIATURE RELAY — SERIES C Product Bulletin 101





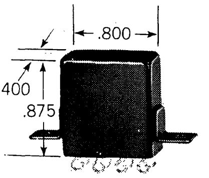
CONTACT RATING

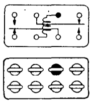
2 amperes resistive at 30 volts DC, 1 ampere 400 Hz, case grounded and dry circuit.

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3.5	.5	80
112	12	14.4	7	1.0	325
126	26.5	32	15	2	1500

Qualified MIL-R-5757/10

2 AMP CRYSTAL CAN RELAY —SERIES 2B Product Bulletin 120





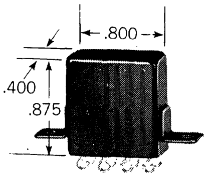
CONTACT RATING

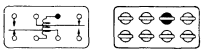
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded and dry circuit.

NOTE: BR types for operation at 60 to 400 Hz with specifications shown. Units may be used at higher frequencies, but individual values of voltage may change.
2-pole units only available as standard catalog item.

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
2B (DC only, 2-Pole Only)					
106	6	7.2	3.1	.5	40
112	12	14.4	6.3	.75	160
126	26.5	32	13.0	1.5	675
148	48	58	25.0	2.5	2500
176	76	90	35.0	3.0	5000
2BR (AC Only, 2-Pole Only)					
126	26.5	32	15	2	575
148	48	58	28	3	2000
176	76	90	44	4	3500
215	115	125	66	5	5000

5 AMP CRYSTAL CAN RELAY — SERIES 2BN Product Bulletin 120A





CONTACT RATING

5 amperes resistive at 30 volts DC; 3 ampere resistive at 115 volts rms, 400 Hz, case grounded; 2 ampere resistive at 115 volts rms, 60 Hz, case grounded.

NOTE: For AC operation BNR types are available on request.

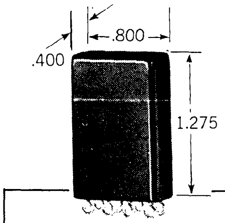
ALL WELDED CONSTRUCTION

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3.1	.5	35
112	12	14.4	6.3	.75	140
126	26.5	32	13.0	1.5	600
148	48	58	25.0	2.5	2200
176	76	90	35.0	3.0	4400

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

CRYSTAL CAN RELAYS



CURRENT SENSITIVE CRYSTAL CAN RELAY — 40 mW — SERIES BC

Product Bulletin 135

Qualified MIL-R-5757/13

CONTACT RATING

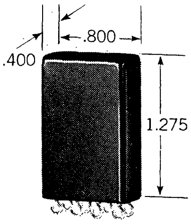
2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded.

	2 BC RELAY — DPDT — 40 mW					1 BC RELAY —SPDT—25 mW			
Voltage Code	Coil Res. at 25°C	Nominal Coil Voltage (VDC)	Nominal Coil Current (mA)	Max P.I. Current (mA)	Min D.O. Current (mA)	Nominal Coil Voltage (VDC)	Nominal Coil Current (mA)	Max P.I. Current (mA)	Min D.O. Current (mA)
101	20	1.8	89.2	44.6	4.5	1.4	70.6	35.3	3.5
102	30	2.2	73.0	36.5	3.7	1.8	57.6	28.8	2.9
103	50	2.8	56.6	28.3	2.8	2.2	44.6	22.3	2.3
104	75	3.5	46.2	23.1	2.3	2.8	36.6	18.3	1.8
105	100	4.0	40.0	20.0	2.0	3.2	31.6	15.8	1.6
106	200	5.7	28.4	14.2	1.4	4.5	22.4	11.2	1.2
107	300	7.0	23.0	11.5	1.2	5.5	18.2	9.1	.90
109	500	9.0	17.8	8.9	.90	7.1	14.2	7.1	.70
112	875	12.0	13.5	6.75	.70	9.4	10.7	5.34	.54
113	1000	12.6	12.6	6.32	.64	10.0	10.0	5.0	.50
118	2000	18.0	8.9	4.45	.50	14.2	7.1	3.53	.36
120	2500	20.0	8.0	4.0	.40	15.8	6.3	3.2	.32
128	5000	28.0	5.6	2.8	.30	22.5	4.5	2.23	.23
135	8000	36.0	4.5	2.23	.23	29.0	3.6	1.77	.18
140	10000	40.0	4.0	2.0	.20	32.0	3.2	1.58	.16

CURRENT SENSITIVE CRYSTAL CAN RELAY — 5 AMP — SERIES 2BCN

Product Bulletin 135A

ALL WELDED CONSTRUCTION



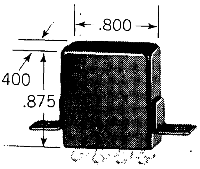
CONTACT RATING

5 amperes resistive at 30 volts DC, 3 ampere resistive at 115 volts rms, 400 Hz, case grounded, 2 amperes resistive at 115 volts rms, 60 Hz, case grounded.

2BCN (DC only, 2 pole only)					
Voltage Code	Nominal DC Coil Voltage	Nominal Coil Current (mA)	Max Pull-in Current (mA)	Min Drop-out Voltage (mA)	DC Coil Resistance Ohms ±10% @ 25°C
106	6	54.5	27.3	3.0	110
112	12	26.7	13.4	1.4	450
128	28	11.2	5.6	.6	2500
140	40	8.0	4.0	.4	5000

CURRENT SENSITIVE CRYSTAL CAN RELAY — 40 mW — SERIES BK

Product Bulletin 136



CONTACT RATING

2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded.

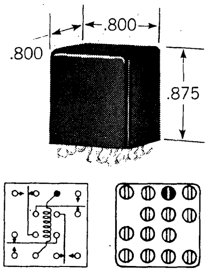
	2 BK RELAY — DPDT — 40 mW					1 BK RELAY —SPDT—25 mW			
Voltage Code	Coil Res. at 25°C	Nominal Coil Voltage (VDC)	Nominal Coil Current (mA)	Max P.I. Current (mA)	Min D.O. Current (mA)	Nominal Coil Voltage (VDC)	Nominal Coil Current (mA)	Max P.I. Current (mA)	Min D.O. Current (mA)
101	20	1.8	89.2	44.6	4.5	1.4	70.6	35.3	3.5
102	30	2.2	73.0	36.5	3.7	1.8	57.6	28.8	2.9
103	50	2.8	56.6	28.3	2.8	2.2	44.6	22.3	2.3
104	75	3.5	46.2	23.1	2.3	2.8	36.6	18.3	1.8
105	100	4.0	40.0	20.0	2.0	3.2	31.6	15.8	1.6
106	200	5.7	28.4	14.2	1.4	4.5	22.4	11.2	1.2
107	300	7.0	23.0	11.5	1.2	5.5	18.2	9.1	.90
109	500	9.0	17.8	8.9	.90	7.1	14.2	7.1	.70
112	875	12.0	13.5	6.75	.70	9.4	10.7	5.34	.54
113	1000	12.6	12.6	6.32	.64	10.0	10.0	5.0	.50
118	2000	18.0	8.9	4.45	.50	14.2	7.1	3.53	.36
120	2500	30.0	8.0	4.0	.40	15.8	6.3	3.2	.32
128	5000	28.0	5.6	2.8	.30	22.5	4.5	2.23	.23
135	7000	32.0	4.8	2.4	.24	28.0	3.8	1.88	.18

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

CRYSTAL CAN RELAYS

4PDT CRYSTAL CAN RELAY — SERIES 4B Product Bulletin 122

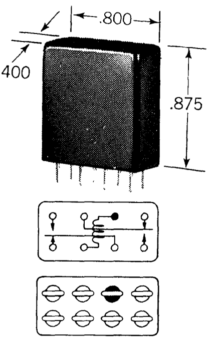


CONTACT RATING

2 amperes resistive at 30 volts DC, 1 ampere resistive at 115 volts rms, 400 Hz, case grounded.

Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
106	6	7.2	3.5	.5	30
112	12	14.4	7	1.0	125
126	26.5	32	15	2	570
148	48	58	28	3	2000
176	76	90	44	4	4500
215	115	125	66	5	9500

THERMAL EMF RELAYS — SERIES EK-EB Product Bulletin 156

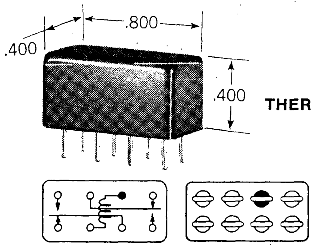


CONTACT RATING

The series EK & EB have been specifically designed to minimize the thermal EMF generation of the relay contacts during low level switching. Although the design is centered around this low level application, the relay is capable of switching signals up to and including 2 amperes at 30 VDC.

Relay Type	Series 2EK	Series 2EB
Rated Contact Current	2 Amperes	2 Amperes
Maximum Weight	0.37 Ounce	0.95 Ounce
Construction	All Welded	All Welded

Type	Voltage Code	Nominal DC Coil Voltage	Max Continuous Coil Voltage	Max Pull-in Voltage @ 25°C	Min Drop-out Voltage @ 25°C	DC Coil Resistance Ohms ±10% @ 25°C
2EK	**106**	6	7.2	3.1	.35	40
or	**112**	12	14.4	6.3	.75	160
2EB	**126**	26.5	32	13.0	1.5	675



THERMAL EMF: 10 microvolts max. between closed contacts with relay at room ambient and coil energized and stabilized with nominal rated voltage.

The thermal EMF generation is measured on EK and EB relays while enclosed in a chamber that provides a shielded test condition and a still air environment.

All inter-connections are symmetrical to minimize function variations. Measurements are made using a high impedance micro voltmeter.

ENVIRONMENTAL CHARACTERISTICS FOR STANDARD CRYSTAL CAN SERIES

Life: 100,000 operations at 125°C and rated load.
Temperature: −65°C to +125°C, operating.
Vibration: 10 to 2000 Hz, 20G min.
Shock: 100 G
Sealing: Hermetic, to 80,000′

Insulation Resistance: 1000 megohms min., except coil-to-case at high temperature 500 megohms min.

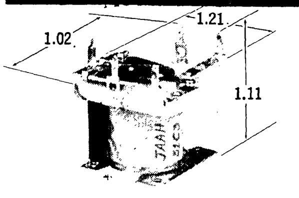
Dielectric Strength: Contacts-to-case: 1000 volts rms, 60 Hz, mutually insulated terminals: 500 volts rms standard.

Authorized Hi-G dealers are located throughout the U.S. and Canada

HI-G, INC. ELECTRO-MECHANICAL DIVISION Spring Street and Route 75, Windsor Locks, Connecticut 06096
Attention: Relay Sales Engineering . . . or call us at (203) 623-2481. Your inquiry will receive our prompt attention.

RELAYS • SWITCHES • MFG. BY ITT

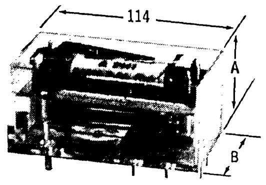
TYPE JAAH



SPDT/2PDT/1 & 3 AMPS/AC or DC COIL

Miniature DC operated relay for low currents up to 3 amperes 28 VDC or 115 VAC. Printed circuit terminals, chassis mounting offers low cost, high reliability for a variety of control and signal applications. Temperature range, —60°C to +50°C. Weight 1.4 oz. Other versions available.

SERIES JAE

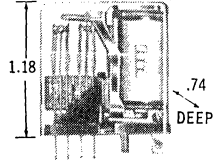


2, 4 & 6 PDT / 1 AMP / DC COIL

Our most compact relay for PC mounting. Extremely long life, twin contacts, and low profile make JAE ideally suited for many applications in logic, control, and communications equipment. Printed circuit board mounting. Bifurcated contacts. Plastic protective case. Mechanical life greater than 200 x 10⁶ operations. Life at rated load 100 x 10⁶ operations. Rated load 0.4 amperes. Max. current 1 amp. Temperature range —20°C to +65°C. Weight 1 oz. max.

Type	A	B
JAEA	.58	.63
JAEB	.65	.95
JAEC	.87	1.3

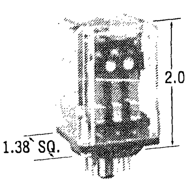
SERIES JAK



2 & 4 PDT / 2 & 5 AMP / DC COIL

Small plug-in relay suitable for signal, logic, general purpose switching and control functions. Gold plated single or bifurcated contacts switch 2 amps at 28 VDC. Single silver for 5 amps 28 VDC. Spade terminals standard (plug-in or solder); printed circuit terminals available. The JAK relays have 3-48 NC studs for chassis mounting. These relays carry U.L. component recognition. Temperature range —40°C to +80°C. Weight 1 oz. approx.

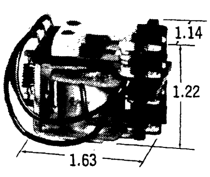
TYPE JBGA



1, 2 & 3 PDT / 5 & 10 AMP / AC or DC COIL

Economical tube base plug-in multipole relay for switching light power loads such as motors, solenoids and other relays and general automation equipment. Mechanical life expectation 30 million operations. Solid square laminated contacts of silver for 5 amps or silver cadmium oxide for 10 amp rating. Enclosed in high impact plastic dust cover. Temperature range AC version −20°C to +45°C. DC version −20°C to +50°C. Weight 2.6 oz. UL component recognized file 43220

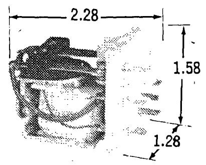
TYPE JBGC



1, 2 & 3 PDT / 5 & 10 AMP / AC or DC COIL

Open version, low cost, multipole relay. Highly efficient general purpose relay for switching industrial loads of 5 and 10 amperes or actuating small solenoids or other relays. Mounted by single 6-32 NC stud and ⅛ locating tab on .437 centers. Temperature range AC version −20°C to +50°C. DC version −20°C to +55°C. Weight 2.5 oz. UL component recognized file 43220

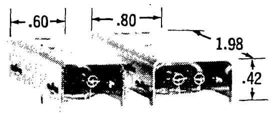
TYPE JBNG



1, 2 & 3 PDT / 15 AMP / AC or DC COIL

Open version 15 amp relay with AC or DC operated coil. 250 quick connect terminals for easy maintenance. Specifically designed to meet the needs of the appliance industry and ideally suited for harness wiring. Large arc barriers isolate contacts which extends voltage carrying capability to 240 Volts AC. Silver cadmium oxide contacts provide heavy load capability. AC or DC actuated coils as desired. Mounting by 6-32 stud and .150 locating tab on .437 centers. Transparent non-inflammable plastic protective cover available separately. Temperature range −35°C to +50°C. Weight 3.2 oz.

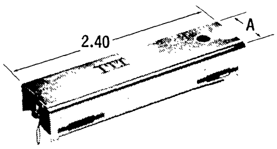
TYPE JDDD



1 & 2 PST / 25 WATT / DC COIL

Economical, dependable, magnetic shielded single and 2 pole reed relay. Sturdy construction proven by years of use in telephone circuits. Flexible pins prevents damage or reed capsule distortion during mounting. Employs the JDAA-50 standard capsule. 25 watt normal rating. Temperature range of −30°C to +85°C. Weight 1 Form .45 oz., 2 Form .60 oz.

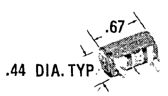
TYPE JDHL

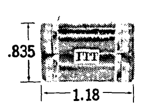


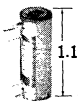
1 & 2 PST-NO / 50 WATT / DC COIL

Economical standard size reed relay. Magnetically shielded construction gives higher efficiency while shielding stray flux fields from adjacent parts. Flexible pin connection provides protection when mounting and prevents changes in the reed relay operating characteristics. .200 grid spacing makes this relay desirable for PC mounting. Uses standard switch capsule JDAA-80. Temperature range of −20°C to +70°C. Weight 1 Form .6 oz., 2 Form .88 oz.

TYPE JDYA



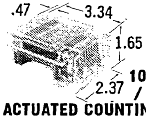




1, 2 & 4 PST / 1 AMP / DC COIL

The JDYA is a uniquely designed diaphragm relay with the contacts hermetically sealed in a separate housing from the coil. Switch contact surfaces are larger in area than conventional reeds which results in greater reliability. Printed circuit mounting. Switched power rating 30 VA or 30 W. Compact size for relatively heavy loads. Contacts exhibit excellent non-sticking characteristics. Temperature range of −40°C to +70°C. Weight .21 oz. 1 Form, 4 oz. 2 Form, 7 oz. 4 Form.

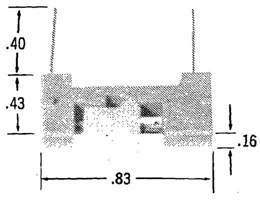
TYPE JKAA



10 COUNTS / DC or AC ACTUATED COUNTING RELAY

A DC or ½ wave AC operated counting and storing relay rated .3 amps @ 30 VDC or 10 W resistive max. Its compact size, and telephone system reliability render it invaluable for applications such as machine tool control, sending and packaging systems, traffic control, etc. Mount to either chassis or by bar or plug into socket. Transparent dust cover standard. 10 normally open (Form A) individually operated counting contacts plus one set of auxiliary contacts in choice of Form A or B. The contacts are electrically insulated from each other and can be used to control different circuits. Counts on each pulse to coil. Reset coil erases count anytime desired. Long life is assured as there is effectively no mechanical wear. Temperature range −10°C to +50°C. Weight 17.5 oz.

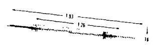
TYPE JRTA

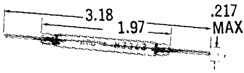


TRACK SWITCH

This switch is designed to mount directly on a conductive track on a printed circuit board. The wafer thin design avoids distortion of the circuit layout when switches are mounted side-by-side. Bifurcated contacts insure low contact resistance in the range of 10 milliohm. Plastic body with white slide button standard. Red, yellow, green, and blue slide buttons also available. Temperature range −40°C to +125°C.

TYPE JDAA-50/80

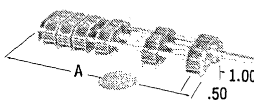




25 WATT & 50 WATT REED SWITCH

Standard 25 watt and 50 watt reed switches with gold diffused contacts. Excellent life characteristics as proven over years of reliable switching in telephone industry. Load can be switched from 10⁻⁸ VA to 1 ampere. Flashover 650 volts and 800 volts DC. Max. switched 1 amp AC or DC. Max. switched voltage 90 VDC, 220 VAC; 150 VDC, 250 VAC. Mechanical life 6 x 10⁹ ops. min. Temperature range −25°C to +85°C.

TYPE JSR-325



P.C. ROTARY SWITCH

JSR-325 is a miniature, low profile rotary switch specifically designed for printed circuit application. Completely enclosed sections insure uniformly low contact resistance below 30 milliohms for non-shorting contacts. Current rating 50 milliamps switching max. 2 amps max. carry, 60 volts or 3 watts max. All 12 spring loaded, silver bridging contacts insure 50,000 cycle life. Double ball 30° detent, and angle of throw mechanism. Up to five sliding switch sections per switch offer maximum flexibility. Twist tabs provide secure mounting to P.C. Board. Slotted shaft .125 inch diameter, 1 inch long. Temperature range of −40°C to +125°C. (Other combinations are available directly from factory including shorting switches.)

See Motor Section for Motors

ITT Jennings Industrial Products
Division of International Telephone and Telegraph Corporation
P. O. Box 1278 - 970 McLaughlin Avenue
San Jose, California 95108
Phone: (408) 292-4025
TWX: 910-338-0159, TELEX: 34-6311

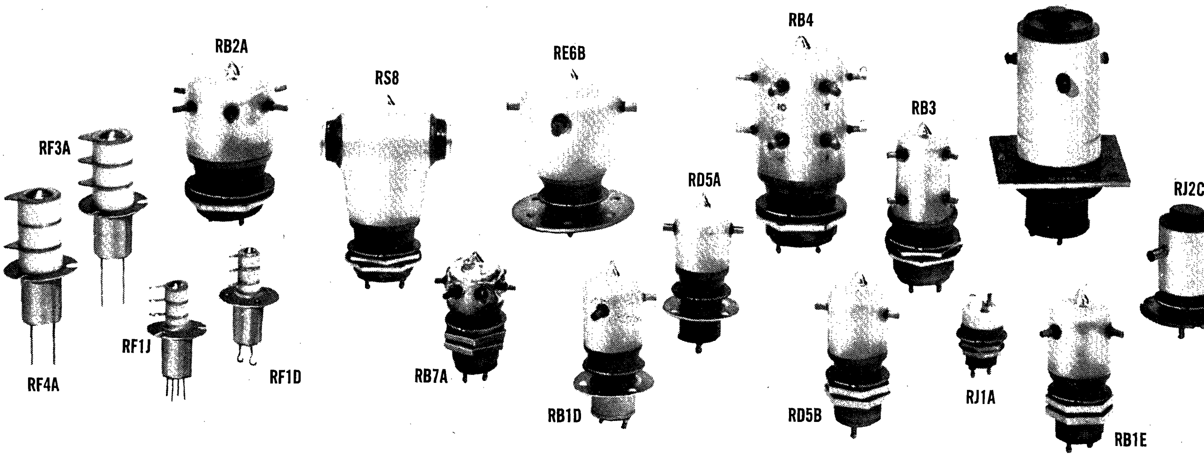
JENNINGS ITT

vacuum relays

INTRODUCTION: Vacuum relays as manufactured by ITT Jennings are available for utilization in the control of high power equipment and circuits. Standard units are available for current ratings of 75 amps, peak voltage levels to 30 kv, and transferring power at frequencies through the VHF band.

ADVANTAGES: Because of the higher dielectric strength of the vacuum relay (1000 volts/mil working), small contact spacing and lower resultant travel allows the design of small, low-bounce actuating mechanisms which lead to minimum size units.

APPLICATIONS: The majority of applications of these units include the switching of antennas, frequency bands, transmit-receive modes, power circuits, and elements in pulse forming networks.



RELAY TYPE	CONTACT ARRANGEMENT	RATED OPERATING VOLTAGE DC or 60 Hz (KV Peak)	2.5 MHz (KV Peak)	16 MHz (KV Peak)	CONTINUOUS CURRENT DC or 60 Hz (Amps RMS)	2.5 MHz (Amps RMS)	16 MHz (Amps RMS)	CONTACT CAPACITY Open Contact to Ground (pf)	Between Open Contacts (pf)	CONTACT RESISTANCE (Max. Ohms)	OPERATE TIME Max. (MS)	RELEASE TIME Max. (MS)	COIL RESISTANCE 26.5 V +10% (Ohms)
RF1D	SPDT	2	2	2	8	6	4	2.0	2.0	.020	10	10	920
RF1J	SPDT Latching	2	2	2	8	6	4	2.0	2.0	.020	10	N/A	18.3
RF3A RF3B	SPDT SPDT Latch	6	6	6	N/A	25	15	4.0	4.0	.015	18 10	18 N/A	156 6.7
RF4A RF4B	SPST N/C SPST Latch	6	6	6	N/A	25	15	2.5	2.5	.015	18 10	18 N/A	156 6.7
RJ1A	SPDT	3.5	2.5	2.0	N/A	14	7	2.5	2.0	.010	8	8	335
RJ2B	SPDT	12	10	8	50	22	15	1.0	0.7	.012	18	9	270
RF10B	SPDT	15	13	10	50	22	15	1.5	0.5	.012	35	10	225
RB7B	DPDT	7	4	3	14	9	4	2.0	1.0	.020	15	5	270
RB1D	SPDT	12	10	8	15	10	6	1.0	0.5	.012	18	9	265
RB1E	SPDT	12	10	8	15	10	6	1.0	0.5	.012	18	9	265
RD5A RD6A	SPST N/O SPST N/C	12	10	8	15	10	6	1.0	0.5	.012	18	9	265
RD5B RD6B	SPST N/O SPST N/C	12	10	8	15	10	6	1.0	0.5	.012	18	8	265
RB3	DPDT	12	10	8	15	10	6	2.5	1.0	.010	20	8	120
RB2A	DPDT	20	15	10	20	12	6	2.5	1.0	.010	20	10	225
RB4	4PDT	15	12	10	20	10	6	2.5	1.0	.010	45	10	131
RE6B	SPDT	25	15	12	25	13	8	2.5	1.0	.010	25	10	120
RS8 RS10	SPST N/O SPST N/C	28	25	12	75	35	22	1.5	0.7	.003	30	10	120

ITT JENNINGS

Post Office Box 1278 • 970 McLaughlin Ave. • San Jose, Calif. 95108
Telephone: (408) 292-4025 • TWX: 910-338-0159

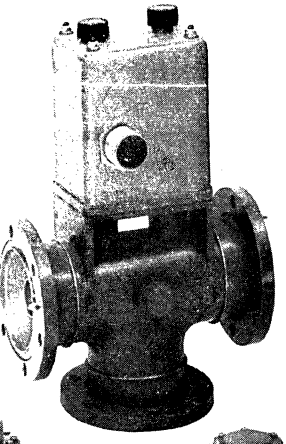
DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

vacuum coaxial relays

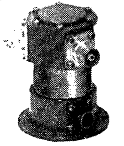
INTRODUCTION: The principal feature of the ITT Jennings coaxial vacuum relay is its high power handling capability at frequencies up to 1.7 ghz, where it is desired to contain circuit currents completely within a coax system.

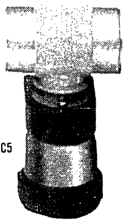
ADVANTAGES: Coaxial relay advantages include low insertion VSWR, high rf power capability, high isolation, fast operation, low and stable contact resistance, and wide pass band characteristics.

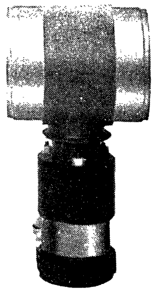
APPLICATIONS: Typical applications for this type of unit include antenna and load switching external to a transmitter, crossbar switching matrices, and general coaxial instrumentation.


RC21

RC53


RC41


RC5


RC10

MODEL NUMBER	RC41	RC53	RC5	RC6	RC10	RC21	RC31
POWER RATING	3 KW CW at 30 MHz	4 KW CW at 30 MHz	25 KW CW at 30 MHz	25 KW CW at 30 MHz	90 KW CW at 30 MHz	90 KW CW at 30 MHz 3 MW Peak Spec. Order	325 KW CW at 30 MHz
FREQUENCY RANGE	0 to 500 MHz	0 to 600 MHz	0 to 100 MHz	0 to 400 MHz	0 to 100 MHz	0 to 450 MHz	0 to 150 MHz
VSWR WITH RESPECT TO 50 OHMS	1.1:1 Max.	1.1:1 Max.	1.02:1 Max. to 30 MHz 1.05:1 Max. to 60 MHz	1.1: 1Max.	1.02:1 Max. to 30 MHz 1.05:1 Max. to 60 MHz	1.1:1 Max.	1.1:1 Max.
CROSSTALK	Greater than 30 dB isolation at 300 MHz	Greater than 30 dB isolation at 30 MHz	Greater than 70 dB isolation at 30 MHz	Greater than 65 dB isolation at 30 MHz	Greater than 65 dB isolation at 30 MHz	Greater than 60 dB isolation at 30 MHz	Greater than 37 dB isolation at 30 MHz
INSERTION LOSS	0.1 dB Max.	0.1 dB Max.	0.05 dB Max.	0.05 dB Max.	0.05 dB Max.	0.05 dB Max.	0.1 dB Max.
COIL RESISTANCE ±10% 26.5 VDC COIL	265 Ohms	18 Ohms	18.8 Ohms	15.4 Ohms	8.3 Ohms	4.8 Ohms	7.8 Ohms
CONTACT CONFIGURATION	SPDT	2 pole, 2 position crossover transfer	SPST	SPDT	SPST	SPDT	SPDT
LINE/CONNECTOR SIZE	C	SC	1⅝"	1⅝"	3⅛"	3⅛"	6⅛"
ACTUATION	Non-latching continuous duty coils	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual	Permanent magnet latching, electrical or manual
OPERATE TIME	25 Millisecs Max.	15 Millisecs Typ. 30 Millisecs Max.	15 Millisecs Typ. 30 Millisecs Max.	50 Millisecs Max.	15 millisecs Typ. 30 Millisecs Max.	40 Millisecs Max.	50 Millisecs Max.
WEIGHT	14.5 oz.	2 lbs., 12 oz.	1 lb., 13 oz.	8 lbs.	3 lbs., 12 oz.	14 lbs.	48 lbs., 8 oz.

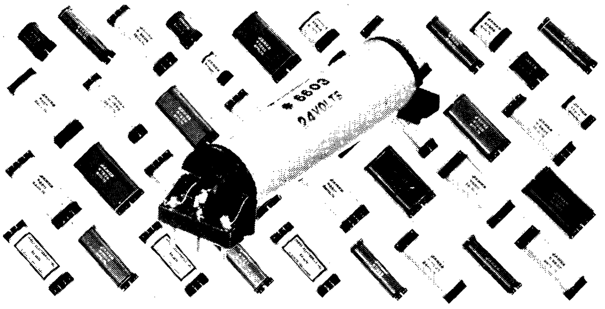
ITT JENNINGS

Post Office Box 1278 • 970 McLaughlin Ave. • San Jose, Calif. 95108
Telephone: (408) 292-4025 • TWX: 910-338-0159

DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

JAMES®
ELECTRONICS INC.
4050 N. ROCKWELL • CHICAGO, ILL. 60618 • 312-463-6500

REED RELAYS AND COILS



FEATURES:

- 163 Models in standard and miniature size
- All PC Board Design
- Operate voltages from 6 to 48 volts DC
- Switching circuits from low signal level to high power
- Mechanical and electrical interchangeability with other leading relay manufacturers.

JAMES Reed Relays and Coils are produced in a wide variety of sizes and specifications to meet the needs of the industrial and commercial designer. This catalog shows standard models of the four basic JAMES packages. Included are a wide variety of switching characteristics for use in signal and power control applications.

REED RELAYS

JAMES Reed Relays are offered in three basic packages with a variety of switching circuits. Two series use the standard size capsule and the third uses the miniature size capsule. Select the electrical specifications needed from the chart and then match to the package that meets your assembly and interchangeability needs.

Special relay designs can be supplied to the custom needs of the user. These can include a combination of switching circuits, special coil characteristics, dual coils, and latching.

RA SERIES

The **RA Series** is a standard size reed capsule relay that has PC board construction with pin spacing of 2.400″. This series of relays is directly interchangeable with the Automatic Electric "CR" series of relays. Custom single and dual coil systems can be supplied on special order.

STYLE	ELECT. SPEC.	SW. CKT.	MODEL NUMBERS				PKG. FIG.
			6 volt	12 volt	24 volt	48 volt	
Standard Signal	E-1	1-A	RA 6631	RA 6632	RA 6633	RA 6634	RA-1
Standard Signal	E-1	2-A	RA 6635	RA 6636	RA 6637	RA 6638	RA-2
Standard Signal	E-1	3-A	RA 6639	RA 6640	RA 6641	RA 6642	RA-3
Standard Signal	E-1	1-B	RA 14051	RA 14052	RA 14053	RA 14054	RA-2
Standard Signal	E-1	2-B	RA 14081	RA 14082	RA 14083	RA 14084	RA-3
Standard Signal	E-2	1-C	RA 14111	RA 14112	RA 14113	RA 14114	RA-3
Standard Signal	E-2	2-C	RA 14141	RA 14142	RA 14143	RA 14144	RA-3
High Current	E-3	1-A	RA 15291	RA 15292	RA 15293	RA 15394	RA-1
High Voltage	E-4	1-A	RA 15321	RA 15232	RA 15323	RA 15234	RA-1
Mercury Whetted	E-5	1-A	RA 15321	RA 15322	RA 15323	RA 15324	RA-1
Mercury Whetted	E-5	2-A	RA 15351	RA 15352	RA 15353	RA 15354	RA-2
Mercury Whetted	E-5	3-A	RA 15381	RA 15382	RA 15383	RA 15384	RC-3
Very High AC	E-6	1-A	RA 15428	RA 15429	RA 15430	—	RA-1
Very High AC	E-6	2-A	RA 15431	RA 15432	RA 15433	—	RA-2
Very High DC	E-7	1-A	RA 15434	RA 15435	RA 15436	—	RA-1
Very High DC	E-7	2-A	RA 15437	RA 15438	RA 15439	—	RA-2

RC SERIES

The **RC Series** is a standard size reed capsule relay that has PC based construction with pin spacing of 2.500″. This series of relays is directly interchangeable with the Clare "CRT" Series of relays. Custom single and dual coil systems can be supplied on special orders.

STYLE	ELECT. SPEC.	SW. CKT.	MODEL NUMBERS				PKG. FIG.
			6 volt	12 volt	24 volt	48 volt	
Standard Signal	E-1	1-A	RC 6601	RC 6602	RC 6603	RC 6604	RC-1
Standard Signal	E-1	2-A	RC 6605	RC 6606	RC 6607	RC 6608	RC-2
Standard Signal	E-1	3-A	RC 6609	RC 6610	RC 6611	RC 6612	RC-3
Standard Signal	E-1	1-B	RC 14066	RC 14067	RC 14068	RC 14069	RC-2
Standard Signal	E-1	2-B	RC 14096	RC 14097	RC 14098	RC 14099	RC-3
Standard Signal	E-2	1-C	RC 14126	RC 14127	RC 14128	RC 14129	RC-3
Standard Signal	E-2	2-C	RC 14156	RC 14157	RC 14158	RC 14159	RC-3
High Current	E-3	1-A	RC 15246	RC 15247	RC 15248	RC 15249	RC-1
High Voltage	E-4	1-A	RC 15306	RC 15307	RC 15308	RC 15309	RC-1
Mercury Whetted	E-5	1-A	RC 15336	RC 15337	RC 15338	RC 15339	RC-1
Mercury Whetted	E-5	2-A	RC 15366	RC 15367	RC 15368	RC 15369	RC-2
Mercury Whetted	E-5	3-A	RC 15396	RC 15397	RC 15398	RC 15399	RC-3

ELECTRICAL SWITCHING SPECIFICATIONS

All JAMES Reed Relays use sealed capsules designed, manufactured, and tested for reliable long life. The specifications of the reed capsule switching system are conservatively rated for trouble free operation. Where special switching requirements outside of these parameters are needed, we solicit your engineering requirement.

	E-1	E-2	E-3	E-4	E-5	E-6	E-7	E8	E9	E-10	E-11	E-12	E-13
General Use	Std. Sig.	Std. Sig.	Hi-Cur.	Hi-Volt.	Mercury Whetted	Very Hi AC Power	Very Hi DC Power	Std. Sig.	Std. Sig.	Hi-Cur.	Hi-Volt.	Mercury Whetted	RF Switch
Contact Power Rating (VA Max.)	15	10	50	50	50	700	800	10	3	28	10	28	.3
Switching Voltage (Max.)	250	250	1,000	7,500	400	240	110	100	28	100	500	100	28
Switching Current (Max.-Amps)	1.0	.500	3.0	3.0	3.0	3.0	3.0	.500	.250	1.0	.500	1.0	.010
Initial Contact Reist. (Ohms-Max.)	.075	.075	.100	.080	.050	—	—	.250	.150	.050	.100	.050	.150
Open Circuit Breakdown Voltage (Min.)	500	1,000	1,500	10,000	1,000	700	3,000	400	250	1,000	1,000	1,000	250
Open Circuit Capacitance (Pfd-Max.)	.80	.30	.80	.80	—	0.1	0.1	0.2	0.8	0.3	0.2	0.3	0.2
Insulation (Ohms-Min.)	10^8	10^8	10^{10}	10^{10}	$5x10^8$	10^8	10^8	10^{10}	10^9	10^{12}	10^{10}	10^{12}	10^{10}
Operate Time (Millisec.-Max.)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.5	0.4	1.5	1.0
Avail. in JAMES Pkg. Series	RA-RB-RC	RA-RC	RA-RC	RA	RA	RA	RA	RD	RD	RD	RD	RD	RD

JAMES®

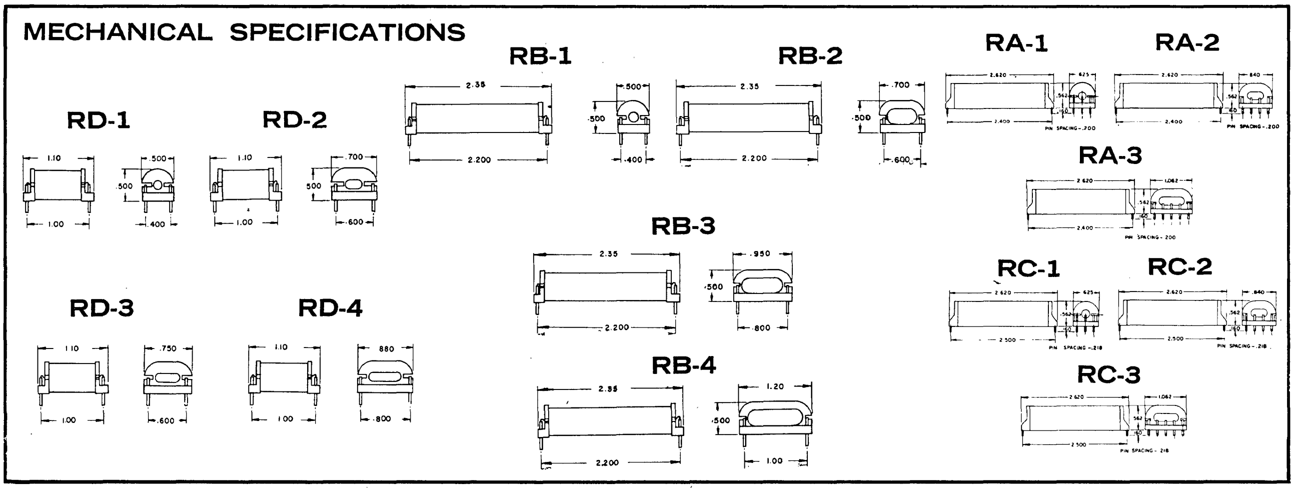
ELECTRONICS INC.
4050 N. ROCKWELL • CHICAGO, ILL. 60618 • 312-463-6500

RD SERIES

The **RD Series** is a miniature size reed capsule relay that has PC board construction with pin spacing of 1.000″ which is the industry standard. Custom single and dual coil systems can be supplied on special orders.

STYLE	ELECT. SPEC.	SW. CKT.	MODEL NUMBERS 6 volt	12 volt	24 volt	PKG. FIG.
Standard Signal	E-8	1-A	RD 6553	RD 6557	RD 6561	RD-1
Standard Signal	E-8	2-A	RD 6554	RD 6558	RD 6562	RD-2
Standard Signal	E-8	3-A	RD 6555	RD 6559	RD 6563	RD-3
Standard Signal	E-8	4-A	RD 6556	RD 6560	RD 6564	RD-4
Standard Signal	E-9	1-C	RD 15401	RD 15402	RD 15403	RD-2
Standard Signal	E-9	2-C	RD 15404	RD 15405	RD 15406	RD-3
High Current	E-10	1-A	RD 15407	RD 15408	RD 15409	RD-1
High Current	E-10	2-A	RD 15410	RD 15411	RD 15412	RD-2
High Voltage	E-11	1-A	RD 15413	RD 15414	RD 15415	RD-1
Mercury Whetted	E-12	1-A	RD 15416	RD 15417	RD 15418	RD-1
Mercury Whetted	E-12	2-A	RD 15419	RD 15420	RD 15421	RD-2
RF-52 ohms	E-13	1-A	RD 15422	RD 15423	RD 15424	RD-1
RF-52 ohms	E-13	2-A	RD 15425	RD 15426	RD 15427	RD-2

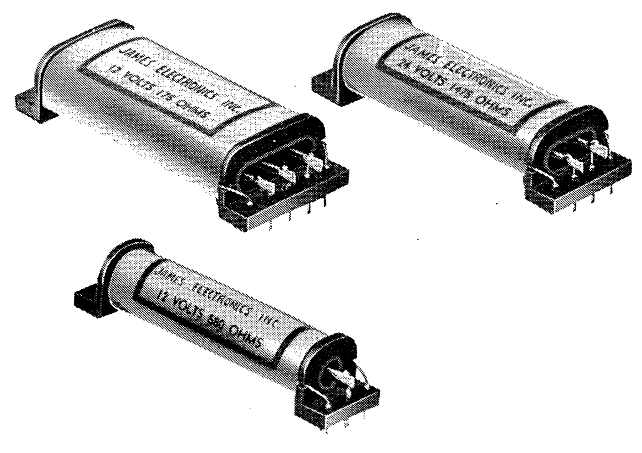
MECHANICAL SPECIFICATIONS


RB-1
2.35
.500
.500
2.200
.400
RB-2
2.35
.700
.500
2.200
.600
RA-1
2.620
.625
.562
2.400
PIN SPACING-.200
RA-2
2.620
.840
.562
2.400
PIN SPACING-.200
RD-1
1.10
.500
.500
1.00
.400
RD-2
1.10
.700
.500
1.00
.600
RA-3
2.620
1.062
.562
2.400
PIN SPACING-.200
RB-3
2.35
.950
.500
2.200
.800
RC-1
2.620
.625
.562
2.500
PIN SPACING-.218
RC-2
2.620
.840
.562
2.500
PIN SPACING-.218
RD-3
1.10
.750
1.00
.600
RD-4
1.10
.880
1.00
.800
RB-4
2.35
1.20
.500
2.200
1.00
RC-3
2.620
1.062
.562
2.500
PIN SPACING-.218

REED COILS

Standard Models — Reed Coil Specifications

MODEL NO.	NO. OF STANDARD REEDS	NOMINAL OPERATING VOLTAGE VOLTS	COIL RESISTANCE 10% OHMS	AMPERE TURNS	PKG. DWG.
7826	1	6.0	222	135	RB-1
7827	2	6.0	97	175	RB-2
7828	3	6.0	38	210	RB-3
7829	4	6.0	29	250	RB-4
7830	1	12.0	860	135	RB-1
7831	2	12.0	355	175	RB-2
7832	3	12.0	235	210	RB-3
7833	4	12.0	120	250	RB-4
7834	1	24.0	3400	135	RB-1
7835	2	24.0	1520	175	RB-2
7836	3	24.0	860	210	RB-3
7837	4	24.0	510	250	RB-4


JAMES ELECTRONICS INC.
12 VOLTS 175 OHMS
JAMES ELECTRONICS INC.
24 VOLTS 1475 OHMS
JAMES ELECTRONICS INC.
12 VOLTS 580 OHMS

Miniature Models — Reed Coil Specifications

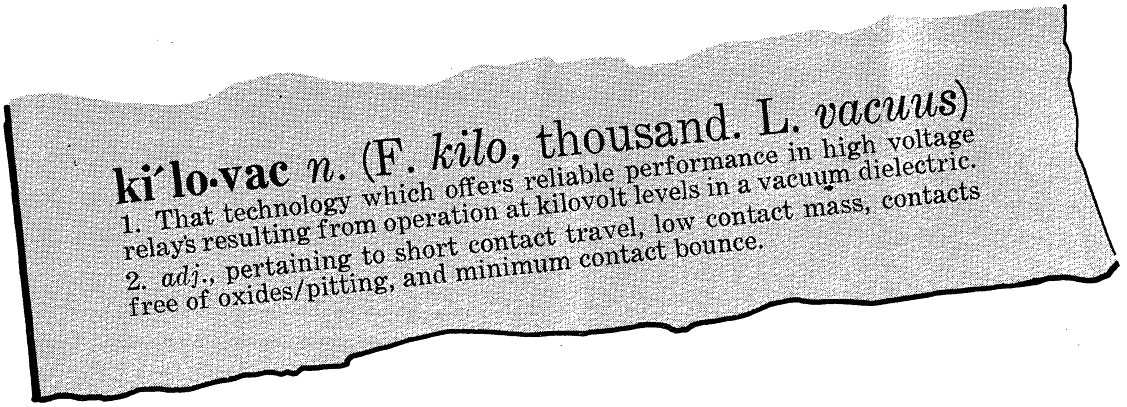
MODEL NO.	NO. OF STANDARD REEDS	NOMINAL OPERATING VOLTAGE VOLTS	COIL RESISTANCE 10% OHMS	AMPERE TURNS	PKG. DWG.
7801	1	6.0	250	95	RD-1
7802	2	6.0	142	120	RD-2
7803	3	6.0	71	150	RD-3
7804	4	6.0	38	180	RD-4
7805	1	12.0	1040	95	RD-1
7806	2	12.0	575	120	RD-2
7807	3	12.0	285	150	RD-3
7808	4	12.0	167	180	RD-4
7809	1	24.0	3520	95	RD-1
7810	2	24.0	2100	120	RD-2
7811	3	24.0	1090	150	RD-3
7812	4	24.0	650	180	RD-4
7823	TERMINAL LEAD (Required quantity supplied with each standard or miniature reed coil.)				

FEATURES:

- Full range of operating voltages with simplicity of control
- Flexibility of reed mounting, termination, and combinations
- Models for 1 to 4 reeds for combination logic systems
- Space saving miniature dry reeds
- Ease of replacement
- Positive cost savings over pre-assembled relays, logic boards
- Availability of a complete coil design kit
- Models available in standard and miniature sizes
- 125°C glass filled nylon bobbins.

REFER TO YELLOW PAGES FOR JAMES LOCAL SALES OFFICES

Vacuum Relays mean Reliability



ki′lo·vac *n.* (F. *kilo*, thousand. L. *vacuus*)
1. That technology which offers reliable performance in high voltage relays resulting from operation at kilovolt levels in a vacuum dielectric.
2. *adj.*, pertaining to short contact travel, low contact mass, contacts free of oxides/pitting, and minimum contact bounce.

KILOVAC vacuum relays (ceramic or glass) are specified by design engineers for performance and reliability not available in conventional relays:

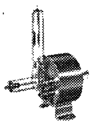
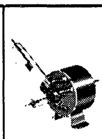
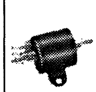
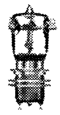
HIGH VOLTAGE ISOLATION: 2000 volts per mil of contact gap with predictable, repeatable isolation well in excess of rated values.

LOW AND STABLE CONTACT RESISTANCE: 0.015 ohms typical, with no contact oxidation or maintenance.

FAST SWITCHING TIME: 10 ms typical, due to small contact gap and short armature travel.

LONG LIFE: Millions of cycles with minimum degradation in electrical performance.

Any one of these standard features will justify your selection of KILOVAC vacuum relays. KILOVAC design and years of production experience permits immediate off-the-shelf delivery from a broad product line with voltages up to 100 KV. Special modifications provided in extremely short order.

										
KILOVAC TYPE	**HC-1†**	**KC-2†**	**KC-3**	**HVS-1**	**HVS-10**	**KM-30**	**H-5#**	**H-7**	**H-8**	**H-9**
Contact arrangement	SPDT	SPDT	SPDT	SPDT	SPDT	DPDT	SPST N.O.	SPDT	SPDT	SPST N.C.
Rated operating voltage (KV DC or 60 Hz peak)	2.5	15	8	17	17	18	5	5	15	15
Test voltage (KVDC)	5	18	11	22	25	20	7.5	7.5	20	20
Continuous current, contacts closed, max. (amps DC or 60 Hz RMS)	18	50	25	7	8	20	4	4	15	15
*Max. current at rated voltage switching under load (amps DC)	0.5	0.5	0.1	3.0	4.0	0.5	2.0	2.0	0.5	0.5
Contact resistance, max. (ohms)	0.010	0.012	0.015	0.015	0.015	0.015	0.035	0.035	0.015	0.015
Operating time, max. (ms)	6	18	18	20	20	25	10	10	15	15
Coil resistance (ohms ±10% @ 25°C)	335	265	220	128	65	65	250	200	265	265
Coil voltage (VDC, nominal)	26.5	26.5	26.5	26.5	40	40	26.5	26.5	26.5	26.5
Nominal dimensions (inches)	¾D x 1½H	1⅝D x 2⅜H	¾D x 2¾H	4¾L x 5H	5L x, 3¼H	3D x 3¾H	2L x ¾H	2⅞L x 2H	1D x 3H	1¼D x 2¾H
Nominal weight (oz)	1	3	2.5	15	14	12	1	1	3	3
Mounting style**	threaded base	threaded base	flange base	foot bracket	foot bracket	flange base	foot bracket	foot bracket	threaded base	solder flange
Approximate unit price (1-9 pcs)	$54	$98	$75	$55	$55	$125	$62	$62	$98	$98

*All ratings are for pure resistive circuits. Contact factory for other circuits vs. ratings. **Other styles available †Ceramic envelope
#H-6, Same Spec as H-5, Except H-6 is SPST, N.C.

...Reliability means KILOVAC

High vacuum technology has made high voltage switching practical with considerable savings in space and weight. KILOVAC uses the latest in vacuum pumping techniques, utilizing the "ion" type pump and achieving, in production, hard vacuums to 10^{-8} mm of mercury or better. Special manufacturing techniques include kovar-to-glass seals, final assembly in a dust and contaminant free area, specially selected glass and specially developed KILOVAC high voltage aging techniques.

KILOVAC relays are widely used in ECM, communications, sonar, radar, pulse-forming networks, medical electronics, and other high voltage equipment, or low voltage equipment where extreme reliability is a must. Many KILOVAC models are interchangeable with other manufacturers' types.

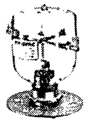
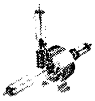
KILOVAC's broad line and "Quick Reaction Time" is geared to your most critical delivery schedule.

For complete technical information call your nearest KILOVAC sales-engineering representative or write directly to us.

KILOVAC, a company small enough to be responsive, large enough to be responsible.

Kilovac®
CORPORATION

P. O. Box 4422 / Santa Barbara, California 93103
Telephone (805) 684-4560 • TWX 910-336-1141
Cable Address: KILOVAC - SANTA BARBARA
Kilovac Vacuum Relays • **Penta** Power Tubes • **Dow-Key** Coaxial Relays

										
KILOVAC TYPE	**H-11/S2**	**H-12**	**H-14**	**H-16**	**H-17**	**H-18**	**H-19**	**H-23#**	**H-25**	**H-35**
Contact arrangement	SPST N.O.	SPDT	DPDT	DPDT	SPDT	DPDT	DPDT	SPST-N.C.	SPDT	SPDT
Rated operating voltage (KV DC or 60 Hz peak)	9	8	12	12	25	8	20	30	50	35
Test voltage (KVDC)	12	12	15	15	30	10	30	35	60	40
Continuous current, contacts closed, max. (amps DC or 60 Hz RMS)	15	15	30	30	30	10	30	30	30	10
*Max. current at rated voltage switching under load (amps DC)	0.1	0.1	0.3	0.5	0.1	0.1	0.1	0.1	0.1	5.0
Contact resistance, max. (ohms)	0.015	0.015	0.015	0.030	0.015	0.020	0.015	0.015	0.015	0.015
Operating time, max. (ms)	18	18	20	20	25	15	40	30	60	30
Coil resistance (ohms ±10% @ 25°C)	250	250	120	120	120	265	225	120	120	50
Coil voltage (VDC, nominal)	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
Nominal dimensions (inches)	1D x 1⅝H	1D x 1¾H	1¼D x 2¾H	1D x 3¼H	2D x 3½H	1D x 2H	2D x 3¼H	2D x 3¾H	3D x 7½H	8¼L x 5¼H
Nominal weight (oz)	2	2	8	5	5	4	7	7	30	15
Mounting style**	threaded base	threaded base	threaded base	threaded base	flange base	threaded base	threaded base	threaded base	threaded base	mounting bracket
Approximate unit price (1-9-pcs)	$98	$98	$128	$128	$128	$135	$135	$135	factory quote	$110

*All ratings are for pure resistive circuits. Contact factory for other circuits vs. ratings.
**Other styles available

#H-24, same spec as H-23, except H-24 is SPST, N.O.

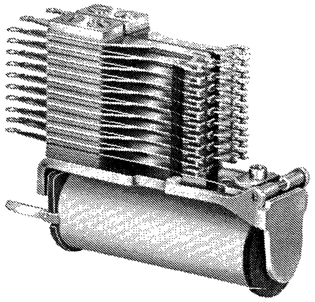
liberty controls, inc.

500 BROOK FOREST AVENUE • SHOREWOOD, ILLINOIS • R.F.D. 5, JOLIET, ILLINOIS 60431
PHONE JOLIET (815) 725-2241 • CHICAGO (312) 242-2409

RELAYS • SOLENOIDS • ELECTRO-MECHANICAL DEVICES

TELEPHONE TYPE RELAYS

B SERIES



SPECIFICATIONS

CONTACT MATERIALS: Many Available — Consult us.

CONTACT FORMS: A to E, max. 24 springs in each pile-up (one or two pile-ups). Single or twin contacts.

COIL: Single or double wound.

OPERATING VOLTAGE: Up to 250 volts D.C. Up to 220 volts A.C.

RESIDUAL: Adjustable or fixed.

OPERATE TIME: BQA - .002 to .030 Sec. BSO - .040 to .120 Sec. BAC - .010 to .025 Sec. BSR - .015 to .035 Sec.

RELEASE TIME: BQA - .005 to .050 Sec. BSO - .025 to .350 Sec. BAC - .008 to .020 Sec. BSR - .035 to .600 Sec.

MOUNTING: Heelpiece drilled and tapped for two 8-32 screws.

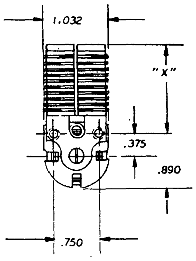
TYPES

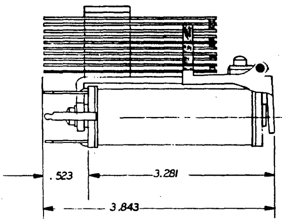
D.C.

BQA (Quick Acting)
BSO (Slow Operating)
BSR (Slow Releasing)

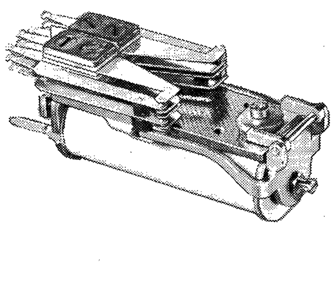
A.C.

BAC (Quick Acting)





C SERIES



SPECIFICATIONS

CONTACT MATERIALS: Many available — Consult us.

CONTACT FORMS: A to E max. 26 springs per pile-up (one or two pile-ups). Single or twin contacts.

COIL: Single or double wound.

RESIDUAL: Adjustable or fixed.

OPERATE TIME: .002 to .020 sec.

OPERATING VOLTAGE: CQA up to 250 volts d.c.; CSO and CSR up to 135 volts d.c.; CAC up to 220 volts a.c.

RELEASE TIME: .005 to .350 sec.

SENSITIVITY: As low as 32 milliwatts per C combination.

MOUNTING: Heelpiece drilled and tapped for two 8-32 screws.

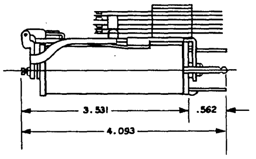
TYPES

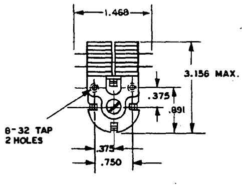
D.C.

CQA (Quick Acting)
CSO (Slow Operating)
CSR (Slow Releasing)

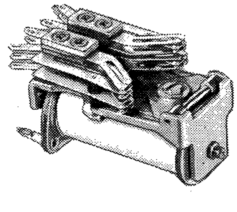
A.C.

CAC (Quick Acting)





F SERIES



SPECIFICATIONS

CONTACT MATERIALS: Standard, Gold Flashed Silver Palladium.

CONTACT FORMS: A to E max. 24 springs per pile-up (one or two pile-ups).

OPERATE TIME: .001 to .075 Sec.

RELEASE TIME: .005 to .150 Sec.

COIL: Single or double wound, armature end or heel end slug.

OPERATING VOLTAGE: FQA up to 150 volts d.c.; FSO and FSR up to 115 volts d.c.

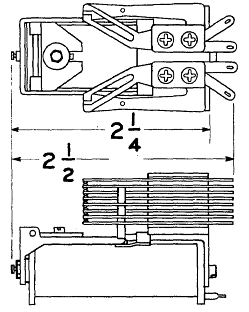
SENSITIVITY: As low as 40 milliwatts per C combination.

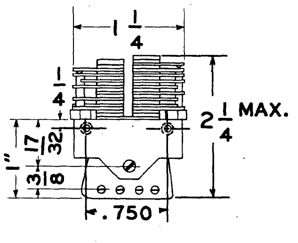
RESIDUAL: Adjustable or fixed.

MOUNTING: Heelpiece drilled and tapped for two 6-32 screws.

TYPES

FQA (Quick Acting)
FSO (Slow Operating)
FSR (Slow Releasing)





Special — Wiring, Terminations, Hermetic Sealing, Contact Arrangements and Coil Voltages are available.

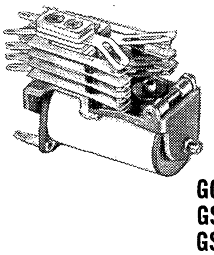
liberty controls, inc.

500 BROOK FOREST AVENUE • SHOREWOOD, ILLINOIS • R.F.D. 5, JOLIET, ILLINOIS 60431
PHONE JOLIET (815) 725-2241 • CHICAGO (312) 242-2409

RELAYS • SOLENOIDS • ELECTRO-MECHANICAL DEVICES

TELEPHONE TYPE RELAYS

G SERIES

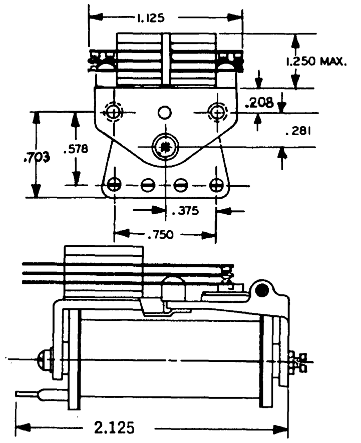


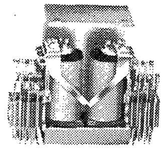
TYPES

- **GQA (Quick Acting)**
- **GSO (Slow Operating)**
- **GSR (Slow Releasing)**
- **GAC (Alternating Current)**
- **GML (Magnetic Latch)**

SPECIFICATIONS

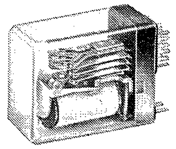
CONTACT FORMS: A to E max. 26 springs in each pile-up (one or two pile-ups). Single or twin contacts.
COIL: Single or double wound, armature end or heel end slug, or laminated core.
RESIDUAL: Adjustable or fixed.
OPERATING VOLTAGE: GQA up to 150 volts d.c.; GSO and GSR up to 110 volts d.c.; GAC up to 220 volts a.c.
OPERATE TIME: .002 to .050 sec.
RELEASE TIME: .005 to .125 sec.
SENSITIVITY: As low as 93 milliwatts per C combination.
INSULATION RESISTANCE: Available to 25 million megohms at 1000 V.
MOUNTING: Heelpiece drilled and tapped for two 6-32 screws.





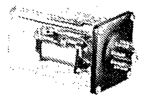
SERIES G LATCH RELAY

The Series G Latch Relay is made up of two Series G relays with provisions for mechanical interlock.



G SERIES PLUG-IN TYPE

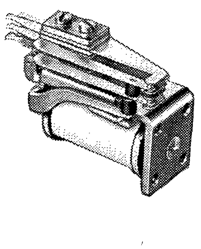
The Series GQIN in a Series G relay with a mating flush mounted socket and clear plastic cover which snaps over the socket. Outstanding benefits include pre-wiring socket possibilities, quick installation and removal of relay, environmental protection, and cost saving. The Series GQIN features no internal wiring to improve reliability.

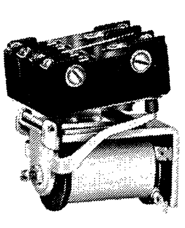


OCTAL TYPE PLUG-IN

Available in Open Types, Lexan Cover, Metal Cover and Hermetically Sealed.

M SERIES





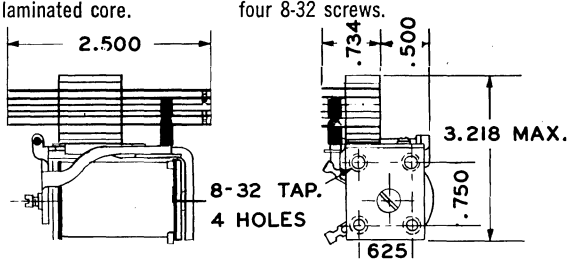
Type M relays may be equipped with snap-action switches to provide safe switching of heavier loads. These relays are available with either AC or DC coils and may have one or two snap-action switches or one snap-action switch and one standard pile-up.

SPECIFICATIONS

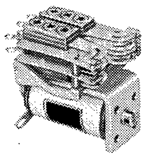
CONTACT MATERIAL: Standard, Gold Flashed Silver Palladium.
CONTACT FORMS: A to E max. 12 springs per pile-up (one pile-up).
OPERATE TIME: .002 to .050 sec.
RELEASE TIME: .005 to .200 sec.
COIL: Single or double wound armature end or heel end slug, sleeve or laminated core.
OPERATING VOLTAGE: MQA up to 135 volts d.c.; MSO and MSR up to 115 volts d.c. MAC up to 220 volts a.c.
SENSITIVITY: As low as 69 milliwatts per C combination.
RESIDUAL: Adjustable or fixed.
MOUNTING: Heelpiece is drilled and tapped for four 8-32 screws.

TYPES

- **MQA (Quick Acting)**
- **MSO (Slow Operating)**
- **MSR (Slow Releasing)**
- **MAC (Alternating Current)**



S SERIES



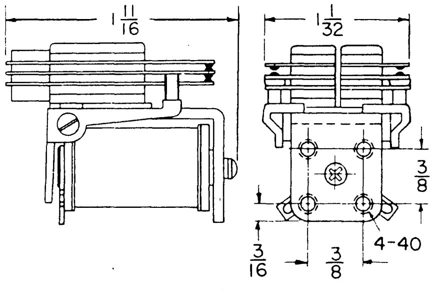
TYPES

D.C.

- **SQA (Quick Acting)**
- **SXQA (Quick Acting Oversized Coil)**
- **SAC (Quick Acting Rectified)**

SPECIFICATIONS

CONTACT FORMS: A, B, C and D, single or double pile-up, 6 springs per pile-up max. Form D only available on single contact series.
COIL: Up to 6000 ohms (single or double wound). 10,000 ohms on SXQA.
OPERATING VOLTAGE: Up to 150 volts d.c.
OPERATE TIME: .008 sec. min.
SENSITIVITY: As low as 200 milliwatts per C combination.
MOUNTING: Heelpiece drilled and tapped for four 4-40 screws.



Special — Wiring, Terminations, Hermetic Sealing, Contact Arrangements and Coil Voltages are available.

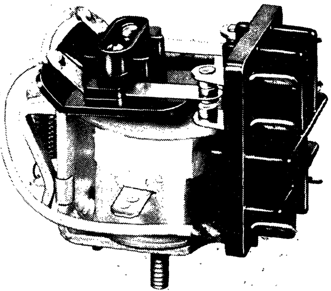
liberty controls, inc.

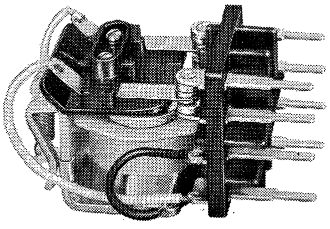
500 BROOK FOREST AVENUE • SHOREWOOD, ILLINOIS • R.F.D. 5, JOLIET, ILLINOIS 60431
PHONE JOLIET (815) 725-2241 • CHICAGO (312) 242-2409

RELAYS • SOLENOIDS • ELECTRO-MECHANICAL DEVICES

GENERAL PURPOSE AND POWER RELAYS

210 & 215 SERIES





SPECIAL CONTACT MATERIALS AVAILABLE

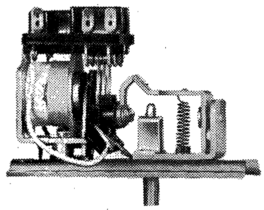
CONSULT US
Standard - Silver Cad Oxide - Gold Flashed

LISTED BY UNDERWRITERS LABORATORIES FILE #35253

For use where acceptability of the combination is determined by U/L

218 SERIES

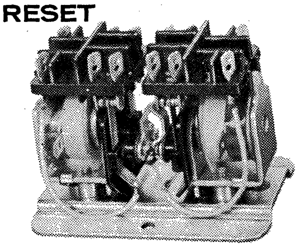
LATCHING TYPES MANUAL RESET



Any Relay up to 3PDT may be used on this unit.

214 SERIES

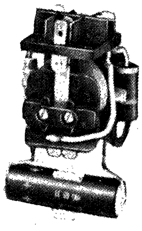
ELECTRICAL SWITCHING OR RESET



Any combination of Relays Up to 6PDT may be used, including 2 different coil voltages or resistances.

210 SERIES

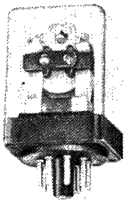
TIME DELAY RELAY



Delays of .01 to 180 seconds available. Contacts to 3PDT.

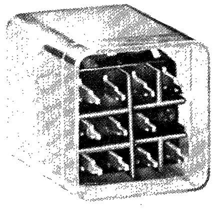
220 & 225 SERIES

GENERAL PURPOSE PLUG-IN



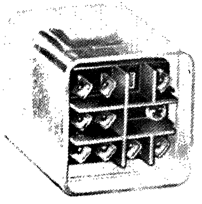
223 & 228 SERIES

PRINTED CIRCUIT MOUNT



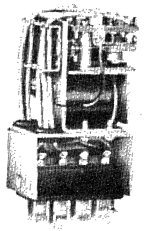
224 & 229 SERIES

COMBINATION .187″ OR SOLDER LUG



633 SERIES

PLUG-INS

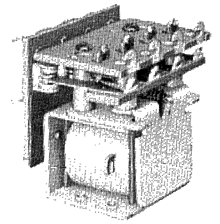


633 Series available with 8 Pin, 12 Pin, and 18 Pin Jones Plugs.

634 Series available with 8 Pin, 12 Pin, and 20 Pin Octal Type Plugs.

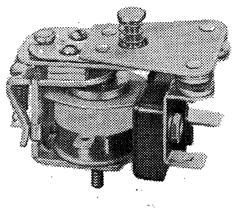
630 SERIES

2-3-4 POLE HEAVY DUTY RELAY



Rated at 15 Amps. 120V 60Hz Resistive Gold Plated Silver Contacts.

240 & 250 SERIES



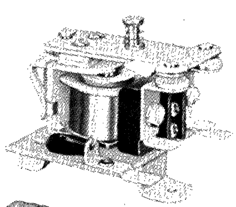
CONTACT RATING

25 AMPS @ 120-240 V.A.C.
RESISTIVE 1 HP 120-240 V.A.C.

LISTED BY UNDERWRITERS LABORATORIES FILE #35253

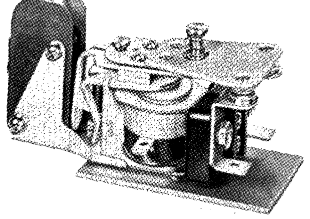
For use where acceptability of the combination is determined by U/L.

240 SERIES



Available with 5 Amp SPDT Auxiliary Switch — 241 Series.

251 SERIES



Available with 5 Amp SPDT Auxiliary Switch — 251 Series.

Special — Wiring, Terminations, Hermetic Sealing, Contact Arrangements and Coil Voltages are available.

liberty controls, inc.

500 BROOK FOREST AVENUE • SHOREWOOD, ILLINOIS • R.F.D. 5, JOLIET, ILLINOIS 60431
PHONE JOLIET (815) 725-2241 • CHICAGO (312) 242-2409

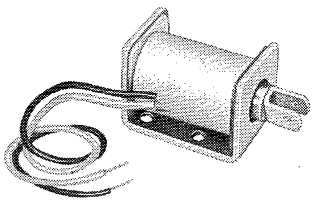
RELAYS • SOLENOIDS • ELECTRO-MECHANICAL DEVICES

SOLENOIDS

Efficient, useful and simple, Liberty Controls' solenoids are designed with the same thoroughness and manufactured with the same integrity that characterizes all Liberty Controls products.

The heavy one piece U-shaped frame and the end plate are made of pure magnetic ingot iron — properly annealed to obtain maximum magnetic efficiency. The dove-tailed frame and end plate are securely staked together, forming an assembly that is permanently tight and inherently efficient. Coils of top-grade magnet wire are precision wound on specially treated bobbins. For high temperature applications, special magnetic wire is used and coils are impregnated with a tough, inorganic electrical varnish. Available for either AC or DC.

TYPE 61

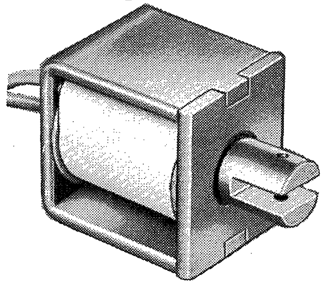


Size: .750" x .813" x 1³⁄₁₆" Long

Mounting: 3 — #6-32 Holes

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 81

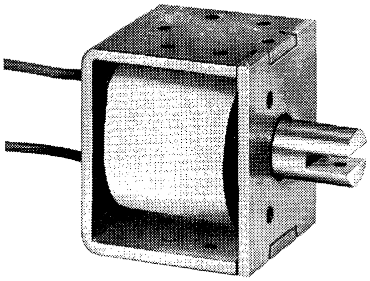


Size: 1" x 1¼" x 1⁹⁄₃₂" Long

Mounting: 4 — #8-32 Holes on ⅝" Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 88

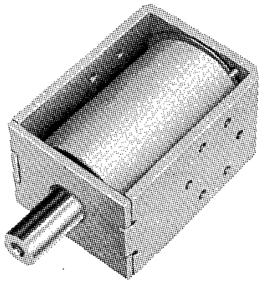


Size: 1.562" x 1.882" x 1⅝" Long

Mounting: 4 — #8-32 Holes on ½" x 1⁵⁄₁₆" Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 90

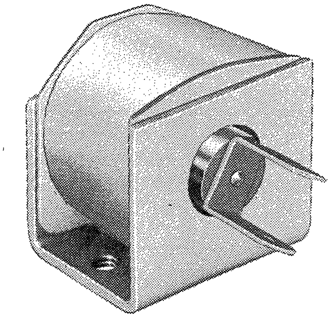


Size: 1.562" x 1.818" x 2⅝" Long

Mounting: 4 — #8-32 Holes on ½" x 1⁵⁄₁₆" Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 62

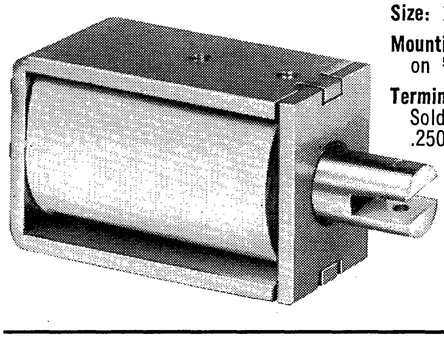


Size: 1.076" x 1.375" x 1.156" Long

Mounting: 2 — #10-32 Holes on 1" centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 82

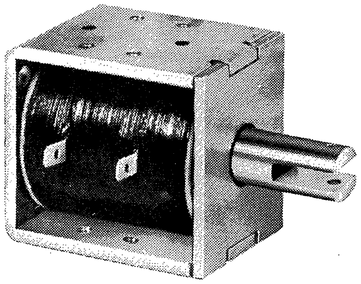


Size: 1" x 1¼" x 2" Long

Mounting: 4 — #8-32 Holes on ⅝" Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

TYPE 89



Size: 1⁹⁄₁₆" x 1¾" x 2⅛" Long

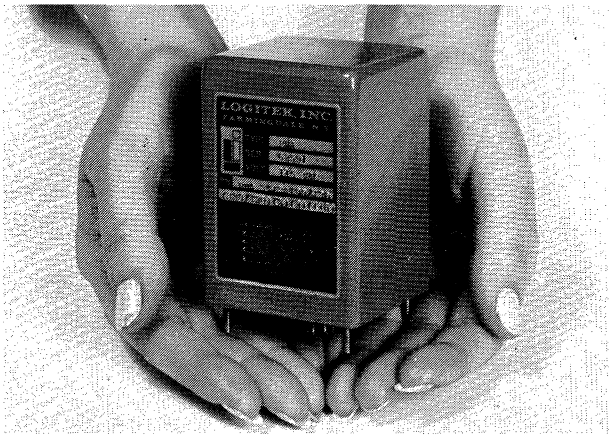
Mounting: 4 — #8-32 Holes on ½" x 1⁵⁄₁₆" Centers

Termination: Wire Leads, Solder Terminals, .187 & .250 Quick Disconnects

Shown are but a few of the many Liberty Control Solenoids available. We are prepared to assist you in designing a unit to meet your specific requirements.

Contact us for details on special arrangements, mounting, electrical characteristics and plunger styles.

POWER MONITORS



OPERATION

When the voltage and frequency of the input three-phase signal are within prescribed high and low limits, and the phase rotation is ABC, the output relay is energized. If the high or low voltage limits of any phase are exceeded for a time greater than the specified "drop-out" time delay, the relay de-energizes and remains de-energized until all phase voltages return within limits and remain at normal levels for longer than the specified "pick-up" time delay. If the input frequency exceeds the high or low frequency limits for a time exceeding the "drop-out" time delay, the relay de-energizes and remains de-energized until the frequency returns within limits and remains at normal levels for longer than the "pick-up" time delay. The output relay will not energize if the phase rotation is other than ABC or if any phase is disconnected.

GENERAL INFORMATION

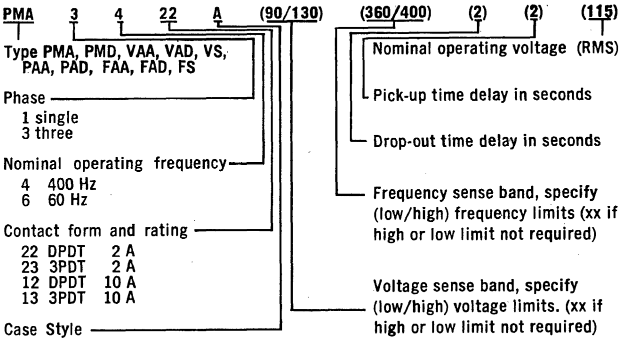
PMA, PMD, BPM 400, BPM 60

The Logitek Power Monitors are used to sense voltage, frequency and phase characteristics of single- or three-phase power lines, allowing normal operation of system loads when the power line characteristics are within predetermined limits. In the event that either voltage (any phase) or frequency is not within specification limits, or the phase sequence is other than ABC, the relay de-energizes to operate alarm indicators or system shutdown contactors. Voltage sensing is accomplished with the use of an "RMS" type detector and is insensitive to line distortion.

ORDERING INFORMATION

APPLIES TO POWER MONITORS, AC AND DC VOLTAGE SENSORS, FREQUENCY SENSORS AND PHASE SEQUENCE SENSORS.

To order, specify all parameters using the part numbering system shown below.



PMA 3 4 22 A (90/130) (360/400) (2) (2) (115)

Type PMA, PMD, VAA, VAD, VS, PAA, PAD, FAA, FAD, FS

Phase
1 single
3 three

Nominal operating frequency
4 400 Hz
6 60 Hz

Contact form and rating
22 DPDT 2 A
23 3PDT 2 A
12 DPDT 10 A
13 3PDT 10 A

Case Style

Nominal operating voltage (RMS)

Pick-up time delay in seconds

Drop-out time delay in seconds

Frequency sense band, specify (low/high) frequency limits (xx if high or low limit not required)

Voltage sense band, specify (low/high) voltage limits. (xx if high or low limit not required)

ELECTRICAL SPECIFICATIONS

ELECTRICAL	PMA	PMD
Input (operating)		
Voltage (nominal)	120/208 or 115/200 VRMS ±20%*	28 VDC ±15%
Frequency (nominal)	60/400 Hz ±20%*	—
Voltage Transients	MIL-STD-704 Limits 1 & 3	—
Input (sense)		
Voltage Band	As required*	As required*
Accuracy	±1%	±1%
Frequency Band	As required*	As required*
Accuracy	±1%	±1%
Phase Sequence	ABC	ABC
Phase Displacement	120 ±5 degrees max.	120 ±5 degrees max.
Time Delay (pick-up)	250 MS to 10 seconds*	250 MS to 10 seconds*
Time Delay (drop-out)	250 MS to 10 seconds*	250 MS to 10 seconds*

* Specify in Part Number

ELECTRICAL	BPM400	BPM60
Voltage		
Nominal	120/208 VAC 3ϕ, 4-wire, wye	120/208 VAC .3ϕ, 4-wire, wye
Underdeveloped Pick-Up	102 volts, all phases	102 volts, all phases
Overvoltage Drop-Out	124 volts, all phases	124 volts, all phases
Accuracy	±5%	±5%
Hysteresis	0.5 - 1.0 volts	0.5 - 1.0 volts
Frequency		
Nominal	400 Hz, all phases	60 Hz, all phases
Under Frequency Pick-Up	360 Hz	58 Hz
Over Frequency Drop-Out	440 Hz	62 Hz
Accuracy	±10 Hz	—
Hysteresis	2 - 4 Hz	—
Pick-Up Time Delay	50 MS to 10 Sec	1 sec ±10%
Drop-Out Time Delay	50 MS to 10 Sec	1 sec ±10%
Permissible Distortion		
Total Harmonic Content	8% of fundamental	8% of fundamental
Individual Harmonic Content	5% of fundamental	5% of fundamental
Transients	200 volts for 100 ms max.	200 volts for 100 ms max.
Phase Rotation		
Nominal	ABC, all phases connected	ABC, all phases connected
Phase Displacement	120 ±5 degrees max.	120 ±5 degrees max.

STANDARD ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

OUTPUT CONTACTS

Contact Form: DPDT or 3PDT

Contact Rating:	2 A res. 1 A ind.	10 A res. 6 A ind.
Contact Resistance:	.050 ohms max.	.020 ohms max.

Contact Life: 100,000 cycles max.

Dielectric Strength: 1000 vrms @ 60 Hz, all terminals to case

Insulation Resistance: 100 megohms @ 500 vdc, all terminals to case

ENVIRONMENTAL

Temperature: Operating: −55°C to +125°C
Storage: −65°C to +150°C

Vibration: 10 Hz to 80 Hz, .06" D.A. 80 to 2000 Hz 20 G's, any axis

Shock: 50 G's 11 ±1 ms any axis

Acceleration: 20 G's steady state any axis

Humidity: 95% R.H.

Altitude: 100,000 ft.

General: MIL-STD 704, MIL-R-5757, MIL-R-6106

PHYSICAL

Finish: Semi gloss blue #25177 FED-STD-595 Meet or exceed MIL-E-5556 or 5567

Connector: Glass-to-metal seal, solder hooks

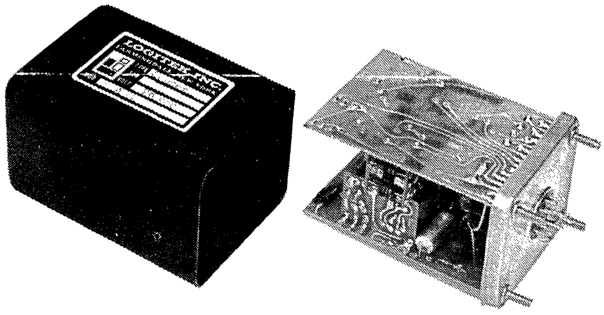
Marking: Model number, serial number, date code, operating voltage, and wiring diagram

Enclosure: Hemetically sealed encapsulated

Standard to Power Monitor, AC & DC Voltage Sensors, Frequency Sensors and Phase Sequence Sensors.

LOGITEK, INC.
42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

AC & DC VOLTAGE SENSORS



GENERAL INFORMATION

VAA, VAD, S221, VS

The Logitek Voltage Sensors are used to sense voltage on single and three-phase power lines, allowing normal operation of system loads when the voltage characteristics are within predetermined limits. In the event that the voltage (any phase) is not within specification limits the relay de-energizes to operate alarm indicators or system shut-down contactors. Voltage sensing is accomplished with the use of an "RMS" type detector and is insensitive to line distortion. Type VS voltage sensor uses a peak detector.

VDA, VDD, DVB

Logitek D.C. Voltage Sensors are used primarily as D.C. voltage monitors to provide alarm or power disconnect when the voltage is beyond pre-determined limits. The unit may be used to operate a power disconnect contactor or to provide signal voltage to a control panel warning light, and is designed so that normal line voltage transients do not falsely trigger alarms or cause equipment shut down.

OPERATION

VAA, VAD, S221, VS

When the voltage of the input three-phase signal is within prescribed high and low limits the output relay is energized. If the high or low voltage limits are exceeded by any phase for a time greater than the specified drop-out time delay, the relay de-energizes and remains de-energized until all phase voltages return within limits and remain at normal levels for longer than the specified pick-up time delay.

OPERATION

VDA, VDD, DVB

With operating power applied, signal voltage is connected to the designated terminals. When the signal voltage is within the specified normal operating band the relay is energized. If the voltage goes outside the normal voltage band limits, the output relay will de-energize and remain de-energized until the voltage returns to normal.

ELECTRICAL SPECIFICATIONS

ELECTRICAL	VAA	VAD	VS	VDA	VDD
Input (operating)					
Voltage (nominal)	120/208 or 115/200 VRMS ±20%*	28 vdc ±15%	120/208 or 115/200 VRMS ±20%*	120/208 or 115/200 VRMS ±20%*	28 vdc ±15%
Frequency (nominal)	60/400 Hz ±20%*	—	60/400 Hz ±20%*	60/400 Hz ±20%*	—
Voltage Transients	MIL-STD-704 Limits 1 & 3	—	MIL-STD-704 Limits 1 & 3	MIL-STD-704 Limits 1 & 3	—
Input (sense)					
Voltage Band	As required*	As required*	As required*	10 - 200 vdc*	10 - 200 vdc*
Accuracy	±1%	±1%	±5%	±1%	±1%
Time Delay (pick-up)	250 MS to 10 seconds*	250 MS to 10 seconds*	50 MS to 10 seconds*	—	—
Time Delay (drop-out)	250 MS to 10 seconds*	250 MS to 10 seconds*	50 MS to 10 seconds*	—	—
* Specify in part number					

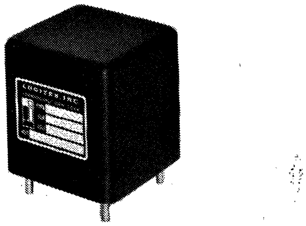
ELECTRICAL	S221
Input Voltage	115 vac nominal (line to neutral) 400 cycles ±5% per MIL-STD-704-Limit 1
Transient Protection	per MIL-STD-704 Limit 1
Under Voltage	
Pull-In Voltage	103.5 vac max., 400 cps (all phases)
Drop-Out Voltage	96.0 vac min., 400 cps (any phase)
Delay Time to Drop-Out	0.1 to 10 seconds, externally adjustable
Over Voltage	
Pull-In Voltage	130.5 vac ±3% (any phase) 400 cps ±5%
Drop-Out Voltage	126.5 vac min. 400 cps ±5% (all phases)
Pull-In Delay Time	50 ms to 8 sec. adjustable, Fig. 1
Delay Time to Drop-Out	50 milliseconds, max.

ELECTRICAL	DVB	
Input Voltage	0-35 vdc	
Transient Protection	MIL-STD-704, Limit 1 no damage	
Contacts		
Form	DPDT	
Rating (at 28 vdc or 115 vac)	2 A res. 1 A ind.	10 A res. 6 A ind.
Life (at rated load)	100,000 op. min.	100,000 op. min.
Contact Resistance	.050 ohms	.020 ohms
Current Drain	100 ma max.	200 ma max.
Low Voltage Pick-Up	21.0 vdc	
High Voltage Drop-Out	29.0 vdc	
Hysteresis (max.)	0.5 ±0.2 volts dc	
Accuracy	±0.6 volt dc	
Dielectric Strength	1000 vrms @ 60 Hz, any terminal to case	
Insulation Resistance	100 megohms @ 500 vdc	

LOGITEK, INC.

42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

FREQUENCY SENSORS



GENERAL INFORMATION

FREQUENCY SENSORS FAA, FAD, FS

Frequency Sensors are used in those applications where electrical systems must be de-energized, or alarm devices activated when the power line frequency departs from normal range of operation.

Frequency Sensors may be utilized for power line frequencies that vary above and below pre-specified limits.

OPERATION

FREQUENCY SENSORS FAA, FAD, FS
Signal voltage from the power line is applied to the designated terminals. If the line frequency is between the upper and lower specified limits the output relay energizes. Should the frequency deviate beyond the specified limits, and remain outside the normal band for longer than the specified drop-out time-delay, the relay de-energizes. After de-energizing, the frequency must return to within the normal band for longer than the pick-up time-delay in order to energize the output relay.

ELECTRICAL SPECIFICATIONS

ELECTRICAL	FAA	FAD	FS
Input (operating)			
Voltage (nominal)	120/208 or 115/200 VRMS ±20%*	28 vdc ±15%	120/208 or 115/200 VRMS ±20%*
Frequency (nominal)	60/400 Hz ±20%	—	60/400 Hz ±20%
Voltage Transients	MIL-STD-704 Limits 1 & 3	—	MIL-STD-704 Limits 1 & 3
Input (sense)			
Frequency Band	As required*	As required*	As required*
Accuracy	±1%	±1%	±5%
Time Delay (pick-up)	250 MS to 10 seconds*	250 MS to 10 seconds*	250 MS to 10 seconds*
Time Delay (drop-out)	250 MS to 10 seconds*	250 MS to 10 seconds*	250 MS to 10 seconds*

* Specify in part number

PHASE SEQUENCE SENSORS

GENERAL INFORMATION

PHASE SEQUENCE SENSORS PAA, PAD
Phase Sequence Sensors are used to protect three-phase loads, particularly rotating components, from the damage that could occur as a result of phase reversals or absence of any phase. Contacts may be used to disconnect the load or to operate alarm circuits or both.

OPERATION

PHASE SEQUENCE SENSORS PAA, PAD
Upon application of power, the output relay energizes if all phases are connected and the phase rotation is ABC. If any phase becomes disconnected or if the phase rotation is abnormal, the relay immediately de-energizes.

PVA
Upon application of power, the output relay energizes if all phases are connected, the phase rotation is ABC and the voltage level of each phase is above a preset low limit. If any phase becomes disconnected or if the phase rotation is abnormal, the relay immediately de-energizes.

PVA
Type PVA Phase Sequence and Voltage Level Sensors are used to protect three-phase loads, particularly rotating components, from the damage that could occur as a result of phase reversals, absence of any phase, or low voltage level. Contacts may be used to disconnect the load or to operate alarm circuits or both.

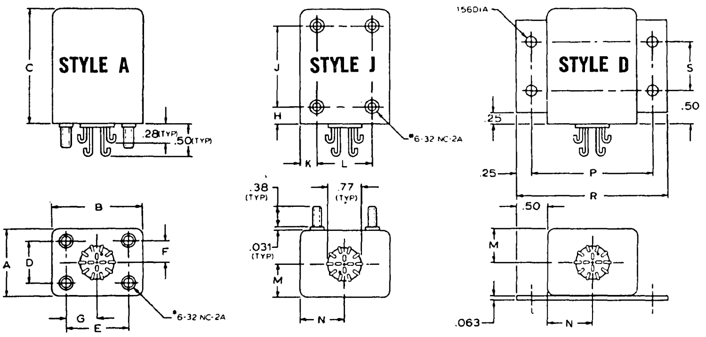
ELECTRICAL	PAA	PAD	PVA
Input (operating)			
Voltage (nominal)	120/208 or 115/200 VRMS ±20%*	28 vdc ±15%	120/208 or 115/200 vrms ±20%*
Frequency (nominal)	60/400 Hz ±20%	—	60/400 Hz ±20%*
Voltage Transients	MIL-STD-704 Limits 1 & 3	—	MIL-STD-704 Limits 1 & 3
Input (sense)			
Voltage	115/230 vrms ±20%*	115/230 vrms ±20%*	—
Frequency	60/400 Hz ±20%*	60/400 Hz ±20%*	—
Phase Sequence	ABC	ABC	ABC
Phase Displacement	120 ±5 degrees max.	120 ±5 degrees max.	120 ±5 degrees max.
Voltage Lower Limit			80 - 100 vrms ±5%**

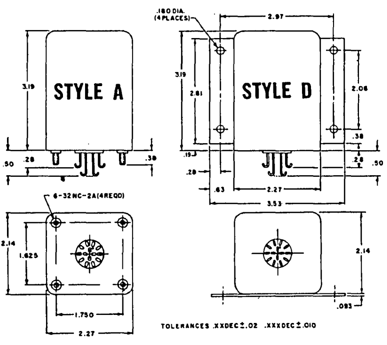
* Specify in part number ** Externally adjustable

LOGITEK, INC.
42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

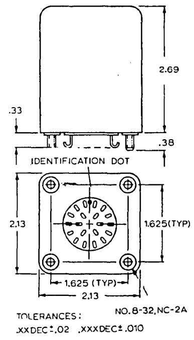
MECHANICALS

PMA, PMD, PAA, PAD, VAA, VAD, FAA, FAD, FS, VDA, VDD, PVA, BPM400, BPM60, S221


STYLE A
STYLE J
STYLE D
6-32 NC-2A
.156DIA

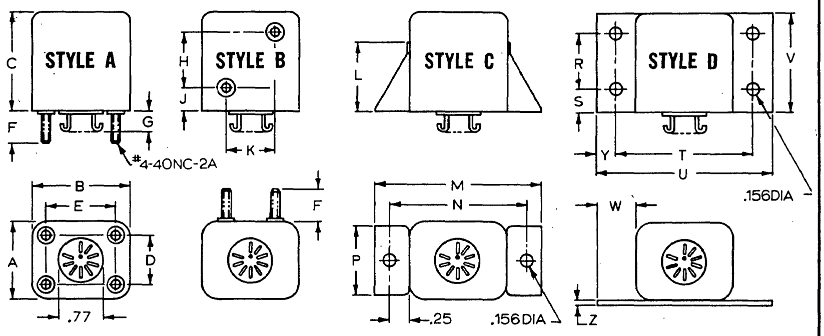

STYLE A
STYLE D
TOLERANCES .XXDEC±.02 .XXXDEC±.010

BPM 400, BPM 60


IDENTIFICATION DOT
TOLERANCES: .XXDEC±.02 .XXXDEC±.010
NO.8-32,NC-2A

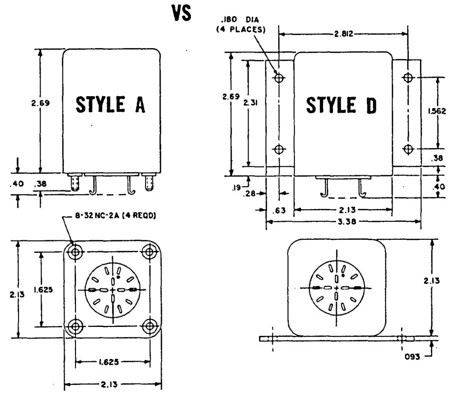
S221

DVB


STYLE A
STYLE B
STYLE C
STYLE D
#4-40NC-2A
.156DIA

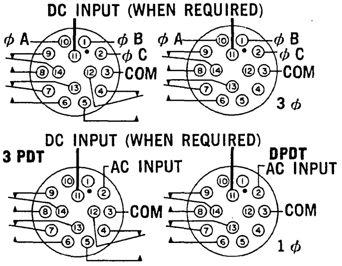
TOLERANCES: .XXDEC ± .02 .XXXDEC ± .010

VS

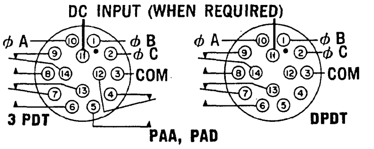

STYLE A
STYLE D
.180 DIA (4 PLACES)
8-32 NC-2A (4 REQD)

Symbols	PMA (10A, 60 Hz)	PMA (2A, 60 Hz)	PMA (2A & 10A, 400 Hz) PMD (2A: 10A)	VDD (2A: 10A) VDA (2A: 10A)	VAA (10A, 60 Hz) FAA, FS (10A, 60 Hz)	VDA (2A: 10A) PVA, PAD, FAD, FAA 2A, 60 Hz: 2A, 400 Hz) FAA, VAA, FS (2A, 400 Hz)	VAA, FAB, FAD, FAA, PAA, FS 10A, 60 Hz: 10A, 400 Hz) 2A, 60Hz; VAD (2A: 10A)
A	2.56	2.14	2.14	1.36	2.56	2.00	2.14
B	2.94	2.27	2.27	1.56	2.94	2.00	2.27
C	3.17	3.19	3.19	2.375	2.75	2.50	2.75
D	1.875	1.625	1.625	.937	1.875	1.437	1.625
E	2.250	1.750	1.750	1.000	2.250	1.437	1.750
F	.656	.375	.812	.468	.656	.718	.375
G	1.125	.875	.875	.50	1.125	.718	.875
H	.39	.41	.41	.28	.41	.31	.41
J	2.375	2.375	2.375	1.812	1.938	1.875	1.938
K	.39	.32	.32	.31	.39	.38	.32
L	2.156	1.625	1.625	.937	2.156	1.250	1.625
M	1.00	.63	1.07	.68	1.00	1.00	.63
N	1.47	1.13	1.13	.78	1.47	1.00	1.13
P	3.437	2.765	2.765	2.062	3.437	2.500	2.765
R	3.94	3.27	3.27	2.56	3.94	3.00	3.27
S	2.171	2.187	2.187	1.875	1.750	1.500	1.750

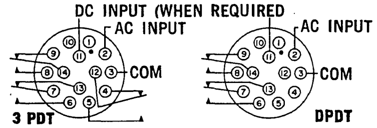
WIRING DIAGRAMS


DC INPUT (WHEN REQUIRED)
φ A
φ B
φ C
COM
3 φ
DC INPUT (WHEN REQUIRED)
3 PDT
DPDT
AC INPUT
COM
1 φ

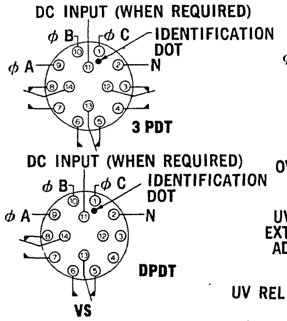
PMA, PMD, VAA, VAD


DC INPUT (WHEN REQUIRED)
φ A
φ B
φ C
COM
3 PDT
DPDT

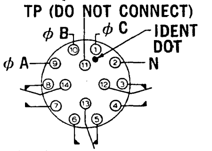
PAA, PAD


DC INPUT (WHEN REQUIRED
AC INPUT
COM
3 PDT
DPDT

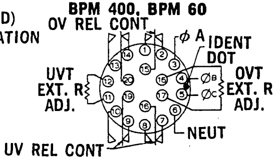
FAA, FAD, FS


DC INPUT (WHEN REQUIRED)
φ B
φ C
IDENTIFICATION DOT
φ A
N
3 PDT
DC INPUT (WHEN REQUIRED)
IDENTIFICATION DOT
DPDT

VS


TP (DO NOT CONNECT)
φ B
φ C
IDENT DOT
φ A
N

BPM 400, BPM 60


OV REL CONT
φ A
IDENT DOT
UVT EXT. R ADJ.
OVT EXT. R ADJ.
ØB
ØC
NEUT
UV REL CONT

S221

LOGITEK, INC.

42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

TIME DELAY RELAYS

OPERATION

FOR TYPE DO

Upon application of operating power, the relay contacts transfer immediately and remain transferred for the preset time interval. Upon expiration of the preset time the relay contacts return to the normally open condition. Removal and reapplication of input power will initiate a new cycle.

FOR TYPE DI, DMN1

Upon application of operating power, the unit begins to time. At the end of the preset time interval, relay contacts transfer and remain transferred until operating power is removed. The contacts then reset and the unit is ready to perform another cycle.

FOR TYPE DOT

Upon application of input voltage to the designated terminals, the relay contacts transfer immediately and remain transferred. Upon removal of input voltage, the unit begins to time. At the end of the preset time delay the contacts transfer to the initial condition. Input voltage may be short duration pulses.

FOR TYPE DOC

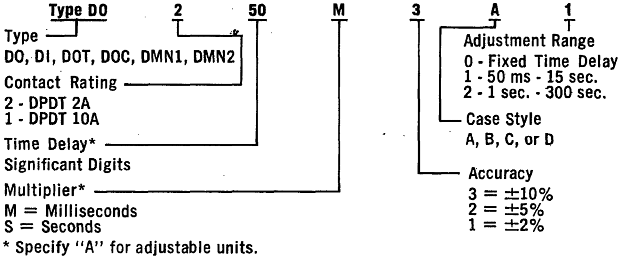
Operating power is continuously applied to the designated terminals. Upon application of control voltage, the relay contacts transfer immediately and remain transferred. Upon removal of control voltage, the unit begins to time and at the end of the preset time delay, the relay contacts return to the initial de-energized condition. In the absence of continuous voltage, application or removal of control voltage will cause the unit to operate as a normal relay without time delay.

GENERAL INFORMATION

Logitek, Inc. Time Delay Relays were designed primarily for military use where precise time intervals for equipment control are required. They maintain a high degree of performance, reliability and accuracy while exposed to combination of extreme vibration, shock, acceleration and temperature. Under these rugged conditions, Logitek timers continue to satisfy their specified accuracy requirements over their operating life. All Logitek Time Delay Relays may be interconnected to provide a variety of timing and sequencing functions.

ORDERING INFORMATION TIME DELAY RELAYS

To order, specify type, contact rating, delay time, accuracy, case style and adjustment range (if required), using the standard part numbering system shown here.



Type DO **2** **50** **M** **3** **A** **1**

Type
DO, DI, DOT, DOC, DMN1, DMN2

Contact Rating
2 - DPDT 2A
1 - DPDT 10A

Time Delay*
Significant Digits

Multiplier*
M = Milliseconds
S = Seconds

Adjustment Range
0 - Fixed Time Delay
1 - 50 ms - 15 sec.
2 - 1 sec. - 300 sec.

Case Style
A, B, C, or D

Accuracy
3 = ±10%
2 = ±5%
1 = ±2%

* Specify "A" for adjustable units.

FOR DMN2

Upon application of operating power, the unit begins to time. At the end of the preset time interval, the output transistor is turned on effecting a ground closure which remains until power is removed. The output then resets and the unit is ready to perform another cycle.

STANDARD ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

OUTPUT CONTACTS

Contact Form: DPDT

Contact Rating (at 28 vdc or 115 vac):	2 A res. 1 A ind.	10 A res. 5 A ind.
Contact Resistance:	50 milliohms max.	20 milliohms max.
Contact Life (at rated load):	100,000 operations min.	100,000 operations min.

ENVIRONMENTAL

Temperature:
Operating: −55°C to +125°C
Storage: −65°C to +150°C
Vibration: 10-80 cps @ .06″ D.A. 80-2000 cps, 20 G's
Shock: 50 G's 11 msec, any axis
Acceleration: 20 G's steady state, any axis
Altitude: 100,000 ft.
Humidity: 95% R.H.
General: MIL-R-5757D, MIL-R-6106C

PHYSICAL

Finish: Semi gloss blue #25177 FED-STD-595. Meet or exceed MIL-E-5556 or 5567
Connector: Glass-to-metal seal, solder hooks
Marking: Model number, serial number, date code, operating voltage, and wiring diagram
Enclosure: Hermetically sealed encapsulated

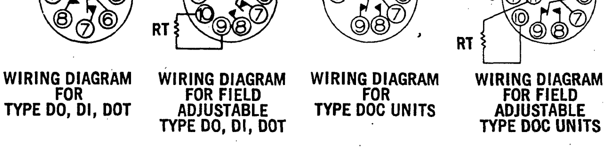
ELECTRICAL SPECIFICATIONS

ELECTRICAL	DO	DI	DOT	DOC	DMNI	DMNZ
Timing Range	50 msec - 300 sec.	50 msec - 300 sec.	50 msec - 300 sec.	50 msec - 300 sec.	50 msec - 200 sec.	50 msec - 200 sec.
Accuracy	±10%, ±5%, ±2%	±10%, ±5%, ±2%	±10%, ±5%, ±2%	±10%, ±5%, ±2%	±10%, ±5%	±10%, ±5%
Input Voltage	18 - 31 vdc (28 vdc nominal)	18 - 31 vdc (28 vdc nominal)	18 - 31 vdc (28 vdc nominal)	18 - 31 vdc (28 vdc nominal)	18 - 31 vdc (28 vdc nominal)	18 - 31 vdc (28 vdc nominal)
Repeatability	±1% at any specified voltage & temperature	±1% at any specified voltage & temperature	±1% at any specified voltage & temperature	±1% at any specified voltage & temperature	±1% at any specified voltage & temperature	±1% at any specified voltage & temperature
Reset Time	5 msec max.	5 msec max.	—	—	5 msec max.	5 msec max.
Recycle Time*	1% of nominal time delay or 10 msec	1% of nominal time delay or 10 msec	1% of nominal time delay or 10 msec	1% of nominal time delay or 10 msec	1% of nominal time delay or 10 msec	1% of nominal time delay or 10 msec
Insulation Resistance	100 megohms @ 500 vdc	100 megohms @ 500 vdc	100 megohms @ 500 vdc	100 megohms @ 500 vdc	100 megohms @ 500 vdc	100 megohms @ 500 vdc
Dielectric Strength	1000 vrms @ 60 cps, any terminal to case	1000 vrms @ 60 cps, any terminal to case	1000 vrms @ 60 cps, any terminal to case	1000 vrms @ 60 cps, any terminal to case	500 vrms @ 60 cps, any terminal to case	500 vrms @ 60 cps, any terminal to case
Inverse Voltage	To 60 volts, no damage	To 60 volts, no damage	To 60 volts, no damage	To 60 volts, no damage	To 60 volts, no damage	To 60 volts, no damage
Transient Protection	To MIL-STD-704 Limit 1	To MIL-STD-704 Limit 1	To MIL-STD-704 Limit 1	To MIL-STD-704 Limit 1	To MIL-STD-704 Limit 1	To MIL-STD-704 Limit 1

* Before drop-out (worst case): Reapplication of input power after an interruption of a minimum of 1% of nominal delay time will cause a new timing cycle within specified accuracy.

After drop-out: Providing that input power remains applied for a minimum of 10 ms after drop-out, a 10 msec power interruption will cause a new timing cycle within specified accuracy.

WIRING DIAGRAMS



WIRING DIAGRAM FOR TYPE DO, DI, DOT

WIRING DIAGRAM FOR FIELD ADJUSTABLE TYPE DO, DI, DOT

WIRING DIAGRAM FOR TYPE DOC UNITS

WIRING DIAGRAM FOR FIELD ADJUSTABLE TYPE DOC UNITS

FIELD ADJUSTABLE UNITS

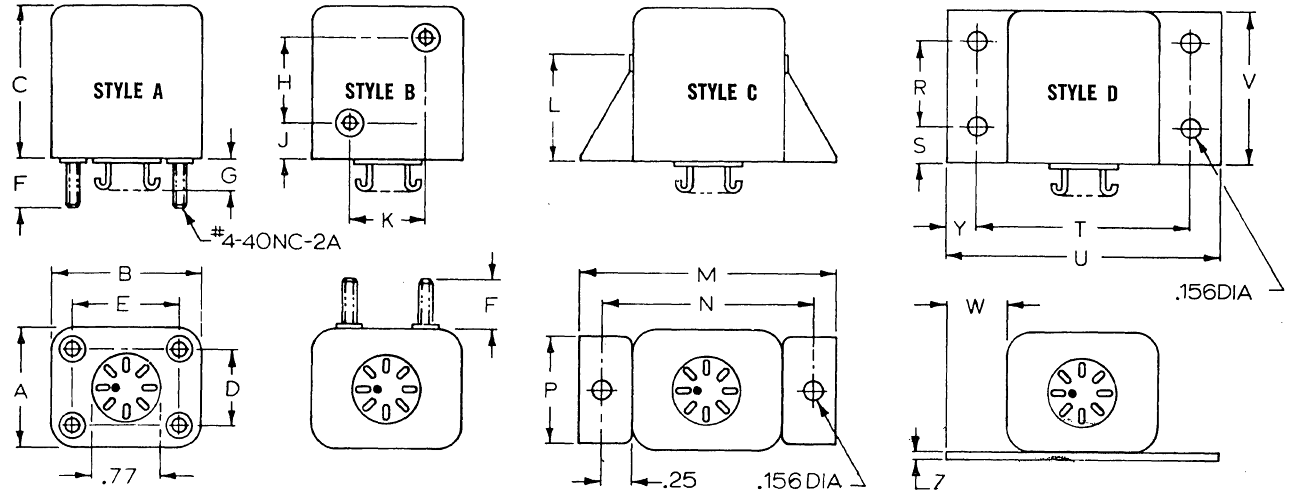
All Logitek Time Delay Relays are designed to permit field adjustment of the time interval. Standard models are available with timing ranges of 50 ms to 15 seconds and 1 second to 300 seconds. Standard accuracy, including linearity is ±5% and ±10%.

The time delay is set by connecting an external resistor between two designated terminals. These terminals are shorted for minimum specified delay. For low range units, delay is increased by adding 20 K ohms for each additional 50 ms of delay required. For high range units, add 20 K for each additional 1 second of delay required.

External resistors should be 1% tolerance, with temperature stability of 50 ppm/°C or better. Power rating should be ⅛ watt minimum. Units are also available with internal potentiometer control of time delay.

LOGITEK, INC.
42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

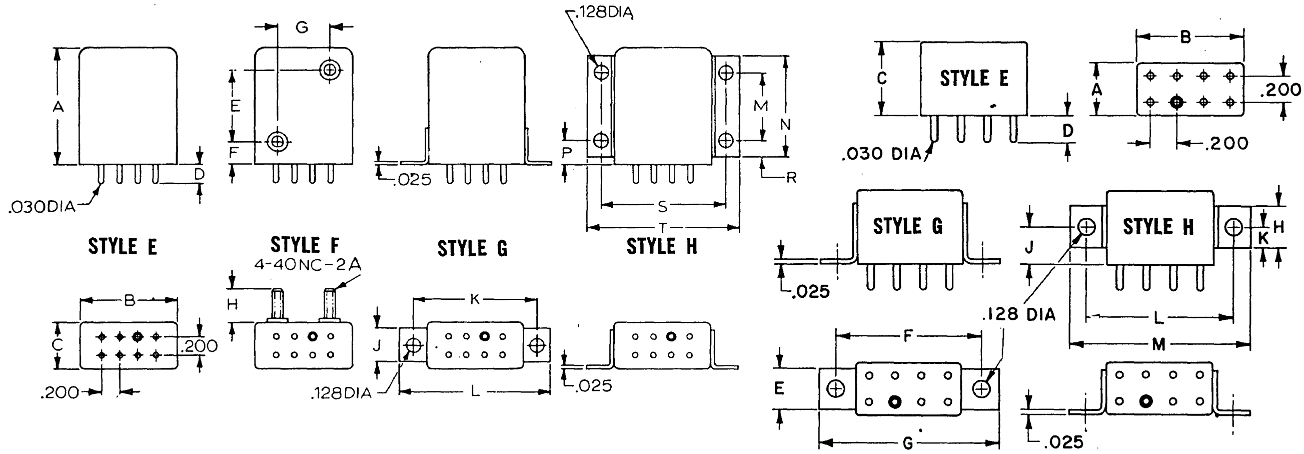
TIME DELAY RELAYS MECHANICALS


STYLE A
C
F
G
#4-40NC-2A
B
E
A
D
.77
STYLE B
H
J
K
F
STYLE C
L
M
N
P
.25
.156 DIA
STYLE D
R
S
V
Y
T
U
.156DIA
W
7

CASE DIMENSIONS

Symbol	DOT, DOC 2A Relay	DOC 10A Relay	Symbol	DOT, DOC 2A Relay	DOC 10A Relay	Symbol	DO 2A Relay	DO 10A Relay	Symbol	DO 2A Relay	DO 10A Relay	Symbol	DI 2A Relay	DI 10A Relay	Symbol	DI 2A Relay	DI 10A Relay
A	.98	1.36	M	2.11	2.56	A	.98	1.36	M	2.11	2.56	A	.98	1.36	M	2.11	2.56
B	1.23	1.56	N	1.734	2.062	B	1.23	1.56	N	1.734	2.062	B	1.23	1.56	N	1.734	2.062
C	2.00	1.88	P	.88	.88	C	1.50	1.88	P	.88	.88	C	1.25	1.50	P	.88	.88
D	.625	.937	R	1.500	1.375	D	.625	.937	R	1.500	1.375	D	.625	.937	R	.750	1.000
E	.875	1.000	S	.25	.25	E	.875	1.000	S	.25	.25	E	.875	1.000	S	.25	.25
F	.41	.41	T	1.734	2.062	F	.41	.41	T	1.734	2.062	F	.41	.41	T	1.734	2.062
G	.28	.28	U	2.23	2.56	G	.28	.28	U	2.23	2.56	G	.28	.28	U	2.23	2.56
H	1.438	1.312	V	2.00	1.88	H	1.438	1.312	V	2.00	1.88	..	.687	.937	V	1.25	1.50
J	.28	.28	W	.50	.50	J	—	—	W	.50	.50	J	.28	.28	W	.50	.50
K	.625	.937	Y	.25	.25	K	.625	.937	Y	.25	.25	K	.625	.937	Y	.25	.25
L	1.63	—	Z	.063	.063	L	1.63	—	Z	.063	.063	L	.88	1.38	Z	.063	.063

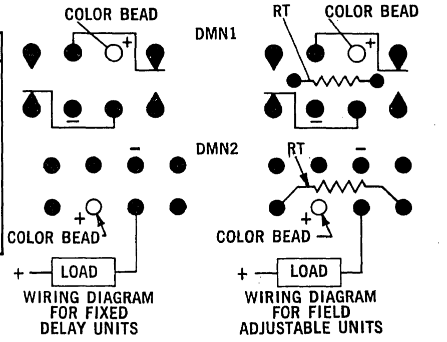
Tolerances: .XXDEC ±.02 .XXXDEC ±.010


A
.030DIA
D
STYLE E
G
E
F
STYLE F
4-40NC-2A
.025
STYLE G
.128DIA
M
N
P
R
S
T
STYLE H
C
STYLE E
.030 DIA
D
B
A
.200
.200
STYLE G
.025
STYLE H
J
H
K
.128 DIA
L
M
B
C
.200
.200
H
K
J
.128DIA
L
.025
F
E
G
.025

CASE DIMENSIONS

Symbol	DMN1	Symbol	DMN1	Symbol	DMN2	Symbol	DMN2
A	.800 MAX.	K	1.062	A	.400 MAX.	G	1.320 MAX.
B	.800 MAX.	L	1.320 MAX.	B	.800 MAX.	H	.312
C	.400 MAX.	M	.437	C	.555 MAX.	J	.275
D	.200	N	.81	D	.200	K	.156
E	.430	P	.219	E	.312	L	1.062
F	.225	R	.187	F	1.062	M	1.320 MAX.
G	.350	S	1.062				
H	.41	T	1.320 MAX.				
J	.312						

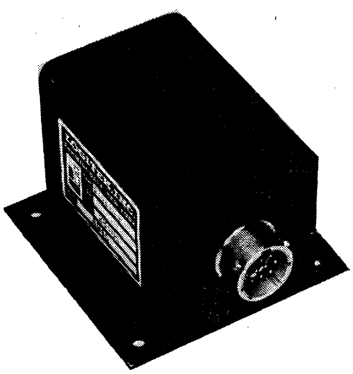
Tolerances: .XXDEC ±.02 .XXXDEC ±.005


COLOR BEAD
DMN1
RT
COLOR BEAD
DMN2
RT
COLOR BEAD
COLOR BEAD
LOAD
LOAD
WIRING DIAGRAM FOR FIXED DELAY UNITS
WIRING DIAGRAM FOR FIELD ADJUSTABLE UNITS

LOGITEK, INC.

42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

SOLID STATE FLASHERS



GENERAL INFORMATION

Logitek flashers are all solid-state flashers for lamp or inductive loads. These units are generally used as an aircraft position light or warning light flasher. Design and construction insures rigid conformity to applicable military specifications in the presence of the most severe environmental and operating conditions. Cordwood packaging technique is utilized to achieve maximum packaging density and the entire assembly is hard mounted and encapsulated for maximum mechanical rigidity.

OPERATION

Application of input voltage to the specified terminals will activate the flashing cycle. A load connected across the designated output terminals will be alternately energized and de-energized at the specified flash rate.

ORDERING INFORMATION

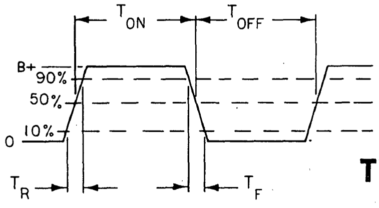
To order, specify type, flash rate and flash ratio, using the standard part numbering system shown here.

TYPE F659 3 A

Flash Ratio — A - 1:1 B — 2.4:1

Flash Rate 1 — 120 CPM 2 — 80 CPM 3 — 85 CPM

Type


T_{ON}
T_{OFF}
B+
90%
50%
10%
0
T_R
T_F

TIMING DIAGRAM

STANDARD ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

ENVIRONMENTAL

Temperature:
Operating: −55°C to +85°C
Storage: −65°C to +150°C

Altitude: 100,000 ft. hermetically sealed

Humidity: 95% R.H.

Vibration: 5 - 10 cps .08″ D.A. 10 - 80 cps .06″ D.A. 80 - 2000 cps, 20 G's

Shock: 50 G's 11 ms, any axis

Acceleration: 20 G's steady state, any axis

PHYSICAL

Finish: Semi gloss blue #25177 FED-STD-595 Meet or exceed MIL-E-5556 or 5567

Connector: Glass-to-metal seal, solder hooks

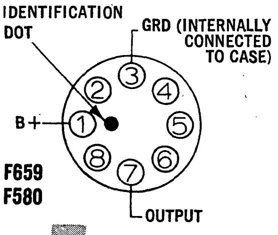
Marking: Model number, serial number, date code, operating voltage, and wiring diagram

Enclosure: Hermetically sealed encapsulated

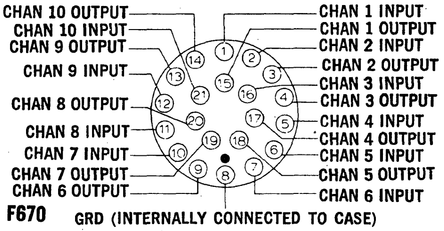
STANDARD ELECTRICAL SPECIFICATIONS

ELECTRICAL	F659	F670	F580	F945
Input Voltage	18-31 vdc (28 vdc nominal)	18-31 vdc (28 vdc nominal)	18-31 vdc (28 vdc nominal)	18-31 vdc (28 vdc nominal)
Flash Rate	80, 85, 120 per minute ±10%	120 per minute ±10%	80, 120 per minute ±10%	80, 85, 120 cpm ±10%
Flash Ratio	1:1, 2.4:1 +10% on-to-off (see timing diagram)	1:1 ±10% (see timing diagram)	2.4:1, 1:1 ±10% (see timing diagram)	2.4:1, 1:1 ±10% (see timing diagram)
Output Current	2.5 amperes max., lamp load	2A per channel max., lamp load	500 ma, lamp load	500 ma per channel max. lamp load
Output Voltage	input voltage minus 1.5 vdc max.	input voltage minus 1.5 vdc max., each channel	Input voltage — 1.5 vdc max.	Ground Closure
Number of Outputs	1	10	1	4
Dielectric Strength	1000 vrms @ 60 cps, any terminal to case	1000 vrms @ 60 cps, any terminal to case	1000 vrms @ 60 cps, any terminal to case	1000 vrms @ 60 cps, any terminal to case

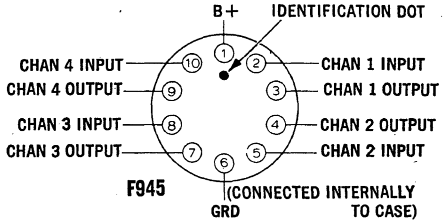
WIRING DIAGRAMS


IDENTIFICATION DOT
GRD (INTERNALLY CONNECTED TO CASE)
B+
OUTPUT
1
2
3
4
5
6
7
8

F659
F580


CHAN 10 OUTPUT
CHAN 10 INPUT
CHAN 9 OUTPUT
CHAN 9 INPUT
CHAN 8 OUTPUT
CHAN 8 INPUT
CHAN 7 INPUT
CHAN 7 OUTPUT
CHAN 6 OUTPUT
CHAN 1 INPUT
CHAN 1 OUTPUT
CHAN 2 INPUT
CHAN 2 OUTPUT
CHAN 3 INPUT
CHAN 3 OUTPUT
CHAN 4 INPUT
CHAN 4 OUTPUT
CHAN 5 INPUT
CHAN 5 OUTPUT
CHAN 6 INPUT
GRD (INTERNALLY CONNECTED TO CASE)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

F670

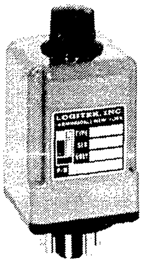

B+
IDENTIFICATION DOT
CHAN 4 INPUT
CHAN 4 OUTPUT
CHAN 3 INPUT
CHAN 3 OUTPUT
CHAN 1 INPUT
CHAN 1 OUTPUT
CHAN 2 OUTPUT
CHAN 2 INPUT
GRD
(CONNECTED INTERNALLY TO CASE)
1
2
3
4
5
6
7
8
9
10

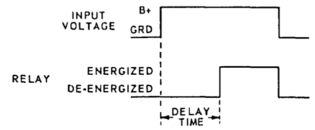
F945

LOGITEK, INC.

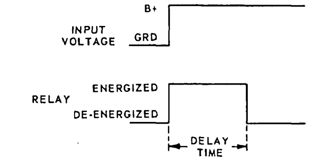
42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

INDUSTRIAL TIME DELAY RELAY





TIMING DIAGRAM DELAY ON PULL-IN



TIMING DIAGRAM DELAY ON DROP-OUT

OPERATION

Type DI Delay On Pull-In Relays are utilized in those applications where equipment must be operated after the elapse of a precise interval of time following the application of input power. Upon application of operating power, the unit begins to time. At the end of the preset time interval, relay contacts transfer and remain transferred until operating power is removed. The contacts then reset and the unit is ready to perform another cycle. Units may be interconnected with other Logitek Timers, to provide a variety of sequencing functions.

GENERAL INFORMATION

TYPE DI DELAY ON PULL-IN / TYPE DO DELAY ON DROP-OUT

Logitek, Inc. Type DI Time Delay Relays were designed primarily for industrial applications where precise time intervals for equipment control are required. They maintain a high degree of performance, reliability and accuracy while exposed to heavy industrial environments. Under these rugged conditions, Logitek timers continue to satisfy their specified accuracy requirements over their operating life. Both types of time delay relays are available with an adjustment knob on the top of the unit. Adjustment ranges are available as specified below.

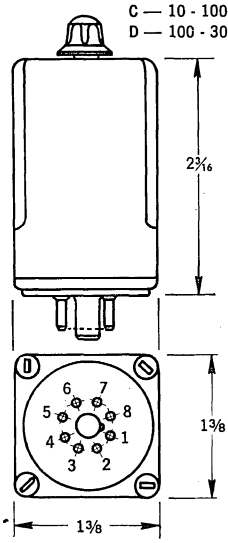
ORDERING INFORMATION

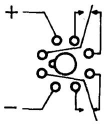
To order specify part number.

TDR-1 A

Type
1 — DI
2 — DO

Adjustment Range
A — .1 - 1.0
B — 1 - 10
C — 10 - 100
D — 100 - 300





STANDARD SPECIFICATIONS

ELECTRICAL
Accuracy: ±10%
Input Voltage: 18-31 vdc (28 vdc nominal)
Repeatability: ±1% at +25°C
Inverse Voltage: To 60 volts, no damage
Contact Form: 2 Form C (DPDT)
Contact Rating (at 28 vdc or 115 vac): 2 A res.
Contact Life (at rated load): 100,000 operations min.

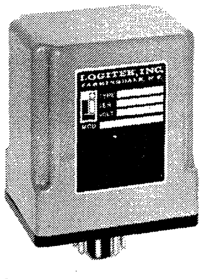
ENVIRONMENTAL
Operating Temperature: −10°C to +70°C

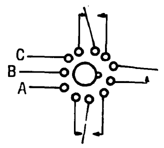
PHYSICAL
Finish: Semi gloss blue
Connector: Octal Socket

* Before pull-in (worst case): Reapplication of input power after an interruption of a minimum of 1% of nominal delay time will cause a new timing cycle within specified accuracy.
After pull-in: Providing that input power remains applied for a minimum of 10 ms after pull-in, a 10 msec power interruption will cause a new timing cycle within specified accuracy.

INDUSTRIAL PHASE SEQUENCE SENSOR

TYPE 50/60 Hz





GENERAL INFORMATION

Logitek Phase Sequence Sensors are used to protect three-phase loads, particularly rotating components, from the damage that could occur as a result of phase reversals or absence of any phase. Contacts may be used to disconnect the load, operate alarm circuits or both.

OPERATION

Upon application of power, the output relay energizes if all phases are connected and the phase rotation is ABC. If any phase becomes disconnected or if the phase rotation is abnormal, the relay immediately de-energizes.

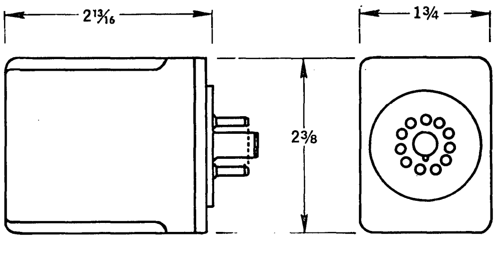
STANDARD SPECIFICATIONS

ELECTRICAL
Input (operating)
Voltage (nominal): 120/208 vrms ±20%
Frequency (nominal): 50-60 Hz ±20%
Phase Sequence: ABC
Phase Displacement: 120 ±5 degrees max.

OUTPUT CONTACTS
Contact Form: 1 Form A, 2 Form C (3PDT)
Contact Rating: 10 A res.
Contact Life: 100,000 cycles min.

ENVIRONMENTAL
Operating Temperature: −40°C to +70°C

PHYSICAL
Finish: Semi gloss blue
Connector: Octal Socket

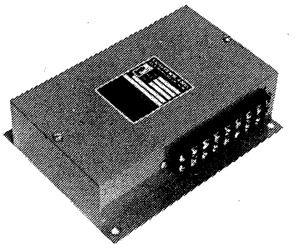


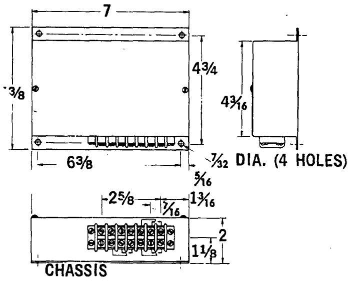
ORDERING INFORMATION

To order specify part number **LPS-1.**

LOGITEK, INC.
42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

INDUSTRIAL POWER MONITOR




7
3/8
4 3/4
4 3/16
6 3/8
7/32 DIA. (4 HOLES)
5/16
2 5/8
7/16
1 3/16
2
1 1/8
CHASSIS

OPERATION

When the voltage and frequency of the input three-phase signal are within prescribed high and low limits, and the phase rotation is ABC, the output relay is energized. If the high or low voltage limits of any phase are exceeded for a time greater than the specified "drop-out" time delay, the relay de-energizes and remain de-energized until all phase voltages return within limits and remain at normal levels for longer than the specified "pick-up" time delay. If the input frequency exceeds the high or low frequency limits for a time exceeding the "drop-out" time delay, the relay de-energizes and remains de-energized until the frequency returns within limits and remains at normal levels for longer than the "pick-up" time delay. The output relay will not energize if the phase rotation is other than ABC or if any phase is disconnected.

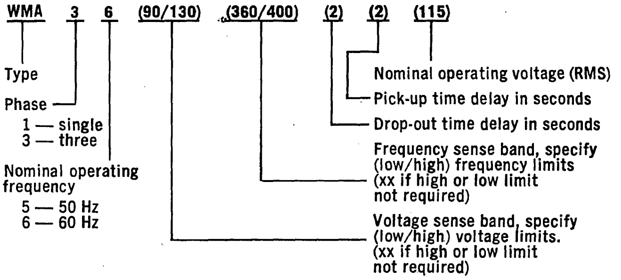
GENERAL INFORMATION

TYPE WMA 50/60 Hz SINGLE/THREE PHASE

Logitek Power Monitors are used to sense voltage, frequency and phase characteristics of single or three-phase power lines, allowing normal operation of system loads when the power line characteristics are within predetermined limits. In the event that either voltage (any phase) or frequency is not within specification limits, or the phase sequence is other than ABC, the relay de-energizes to operate alarm indicators or system shutdown contactors.

ORDERING INFORMATION

To order, specify all parameters using the part numbering system shown below.


WMA 3 6 (90/130) (360/400) (2) (2) (115)
Type
Phase
1 — single
3 — three
Nominal operating frequency
5 — 50 Hz
6 — 60 Hz
Nominal operating voltage (RMS)
Pick-up time delay in seconds
Drop-out time delay in seconds
Frequency sense band, specify (low/high) frequency limits (xx if high or low limit not required)
Voltage sense band, specify (low/high) voltage limits. (xx if high or low limit not required)

STANDARD SPECIFICATIONS

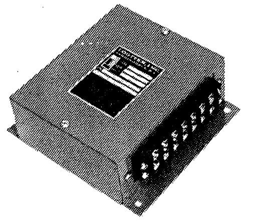
ELECTRICAL
Input (operating)
Voltage (nominal): 120/208 vrms ±20%*
Frequency (nominal): 50/60 Hz ±20%*
Input (sense)
Voltage Band: As required*
Accuracy: ±1%

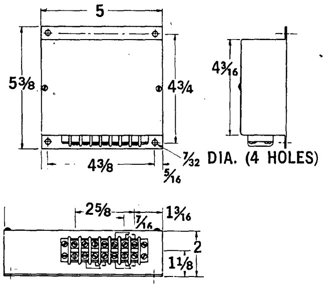
Frequency Band: As required*
Phase Sequence: ABC
Phase Displacement: 120 ±5 degrees max.
Time Delay (pick-up): 250 MS to 10 seconds*
Time Delay (drop-out): 250 MS to 10 seconds*
OUTPUT CONTACTS
Contact Form: 3PDT

Contact Rating: 10 A res.
ENVIRONMENTAL
Operating Temperature: −10°C to +70°C
PHYSICAL
Finish: Semi gloss blue
Connector: Barrier Strip

* Specify in Part Number

INDUSTRIAL AC VOLTAGE SENSOR




5
5 3/8
4 3/4
4 3/16
4 3/8
7/32 DIA. (4 HOLES)
5/16
2 5/8
7/16
1 3/16
2
1 1/8

OPERATION

When the voltage of the input three-phase signal is within prescribed high and low limits the output relay is energized. If the high or low voltage limits are exceeded by any phase for a time greater than the specified drop-out time delay, the relay de-energizes and remains de-energized until all phase voltages return within limits and remain at normal levels for longer than the specified pick-up time delay.

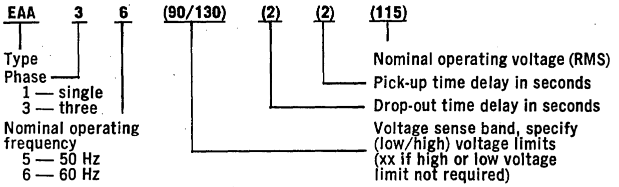
GENERAL INFORMATION

TYPE EAA 50/60 Hz SINGLE/THREE PHASE

Logitek Voltage Sensors are used to sense voltage on single or three-phase power lines, allowing normal operation of system loads when the voltage characteristics are within predetermined limits. In the event that the voltage (any phase) is not within specification limits the relay de-energizes to operate alarm indicators or system shut-down contactors. Voltage sensing is accomplished with the use of an "RMS" type detector and is insensitive to line distortion.

ORDERING INFORMATION

To order, specify all parameters using the part numbering system shown below.


EAA 3 6 (90/130) (2) (2) (115)
Type
Phase
1 — single
3 — three
Nominal operating frequency
5 — 50 Hz
6 — 60 Hz
Nominal operating voltage (RMS)
Pick-up time delay in seconds
Drop-out time delay in seconds
Voltage sense band, specify (low/high) voltage limits (xx if high or low voltage limit not required)

STANDARD SPECIFICATIONS

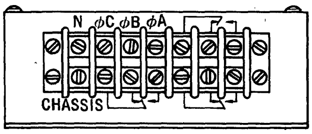
ELECTRICAL
Input (operating)
Voltage (nominal): 120/208 vrms ±20%*
Frequency (nominal): 50/60 Hz ±20%*
Input (sense)
Voltage Band: As required*

* Specify in Part Number

Accuracy: ±1%
Time Delay (pick-up): 250 MS to 10 seconds*
Time Delay (drop-out): 250 MS to 10 seconds*
OUTPUT CONTACTS
Contact Form: 3PDT
Contact Rating: 10 A res.

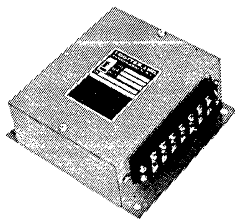
ENVIRONMENTAL
Operating Temperature: −10°C to +70°C
PHYSICAL
Finish: Semi gloss blue
Connector: Barrier Strip

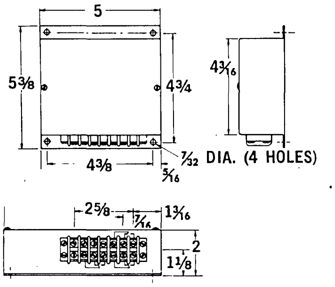
WIRING DIAGRAM
WMA, EAA, HZA, PHA


N
φC
φB
φA
CHASSIS

LOGITEK, INC.
42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

INDUSTRIAL PHASE SEQUENCE SENSOR





GENERAL INFORMATION
TYPE PHA 50/60/Hz

Logitek Phase Sequence Sensors are used to protect three-phase loads, particularly rotating components, from the damage that could occur as a result of phase reversals or absence of any phase. Contacts may be used to disconnect the load or to operate alarm circuits or both.

OPERATION

Upon application of power, the output relay energizes if all phases are connected and the phase rotation is ABC. If any phase becomes disconnected or if the phase rotation is abnormal, the relay immediately de-energizes.

ORDERING INFORMATION

To order, specify all parameters using the part numbering system shown below.

PHA 5 (115)

Type — PHA
Nominal operating frequency — 5
5 — 50 Hz
6 — 60 Hz
Nominal operating voltage (RMS) — (115)

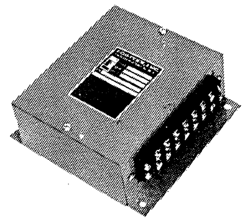
STANDARD SPECIFICATIONS

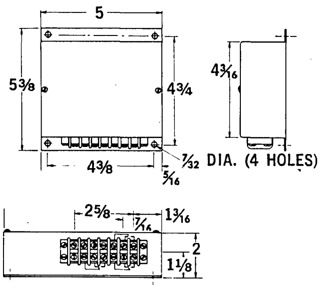
ELECTRICAL
Input (operating)
Voltage (nominal): 120/208 vrms ±20%*
Frequency (nominal): 50/60 Hz ±20%*
Input (sense)
Voltage: 120/208 vrms ±20%*
* Specify Part Number

Frequency: 50/60 Hz ±20%*
Phase Sequence: ABC
Phase Displacement: 120 ±5 degrees max.
OUTPUT CONTACTS
Contact Form: 3PDT
Contact Rating: 10 A res.

ENVIRONMENTAL
Operating Temperature: −10°C to +70°C
PHYSICAL
Finish: Semi gloss blue
Connector: Barrier Strip

INDUSTRIAL FREQUENCY SENSOR





GENERAL
TYPE HZA 50/60/Hz

Logitek Frequency Sensors are used in those applications where electrical systems must be de-energized, and/or alarm devices activated when the power line frequency departs from normal range of operation.

OPERATION

Signal voltage from the power line is applied to the designated terminals. If the line frequency is between the upper and lower specified limits the output relay energizes. Should the frequency deviate beyond the specified limits, and remain outside the normal band for longer than the specified drop-out time-delay, the relay de-energizes. After de-energizing, the frequency must return to within the normal band for longer than the pick-up time-delay in order to energize the output relay.

ORDERING INFORMATION

To order, specify all parameters using the part numbering system shown below.

HZA 5 (58/62) (2) (2) (115)

Type — HZA
Nominal operating frequency — 5
5 — 50 Hz
6 — 60 Hz
Frequency sense band, specify (low/high) frequency limits (xx if high or low limit not required) — (58/62)
Drop-out time delay in seconds — (2)
Pick-up time delay in seconds — (2)
Nominal operating voltage (RMS) — (115)

STANDARD SPECIFICATIONS

ELECTRICAL
Input (operating)
Voltage (nominal): 120/208 vrms ±20%*
Frequency (nominal): 50/60 Hz ±20%*
Input (sense)
Frequency Band: As required*
* Specify Part Number

Accuracy: ±1%
Time Delay (pick-up): 250 MS to 10 seconds*
Time Delay (drop-out): 250 MS to 10 seconds*
OUTPUT CONTACTS
Contact Form: 3PDT
Contact Rating: 10 A res.

ENVIRONMENTAL
Operating Temperature: −10°C to +70°C
PHYSICAL
Finish: Semi gloss blue
Connector: Barrier Strip

LOGITEK, INC.
42 CENTRAL DRIVE, FARMINGDALE, NEW YORK 11735 • (516) 694-3080

Lectrohm

Selection Guide
REED RELAYS

Thousands of catalog listings

Over 50 different types of switch contacts specifically matched to your requirements of voltage, current and power

Exceptional pin pattern. Versatility in both standard and miniature reed relays

All with:
- Individually supported reed switches
- Magnetic foil wrapped coils
- Non-magnetic terminals
- Rhodium plated contacts

	PIN CENTERS	
	Pin to Pin	**End to End**
STANDARD	0.200	2.000
	or 0.218	2.100
	or 0.218	2.150
	or 0.218	2.200
	or 0.218	2.250
	or 0.218	2.300
	or 0.218	2.400
	or 0.218	2.500
MINIATURE	0.100	1.000
	0.100	1.100
	0.100	1.200
	0.100	1.250
	0.100	1.300

CONSTRUCTION TYPES

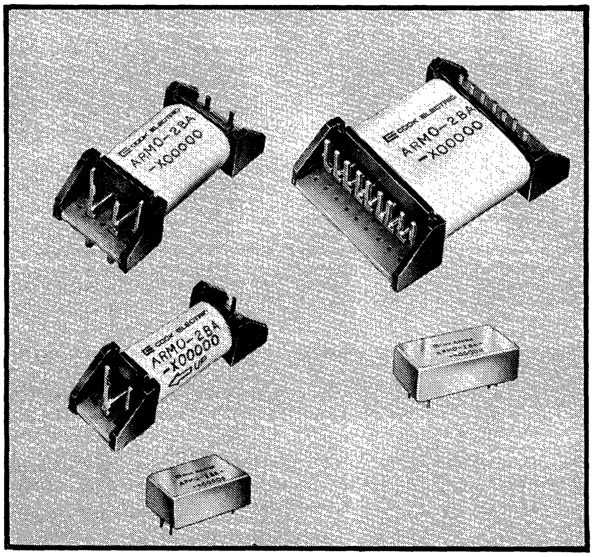
• OPEN CONSTRUCTION • STEEL COVERED • COVERED AND POTTED

All Lectrohm's Reed Relays are of the highest quality, featuring small size, superior isolation, fast operation and low power requirements. Choose from thousands of types and sizes to meet your needs exactly. And you save time and purchasing costs by dealing with one capable supplier.

FREE advice on YOUR Reed Relay applications

Write for the Complete Catalog on the full line

See pages 2854, 2855, 2856 for Resistors



CONTACT CONFIGURATIONS	
Standard	**Miniature**
1 to 4A 1 to 4C	1 to 7A 1 to 5C
Multiple A & B Bistable (Latch)	Multiple A & B Bistable (latch)

COILS FROM 1.6 OHMS to 86 K OHMS
MUST OPERATE VOLTAGES
FROM 0.19 VDC to 233 VDC
(DEPENDING ON COIL & SWITCH COMBINATION)

CONTACTS

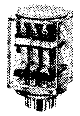
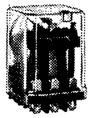
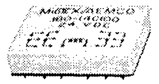
FORM A & B	VOLTAGE D.C.	DRY CIRCUIT TO 12,500
	CURRENT, AMPS	DRY CIRCUIT TO 3.0
	POWER VA	DRY CIRCUIT TO 700
FORM C	VOLTAGE D.C.	DRY CIRCUIT TO 500
	CURRENT, AMPS	DRY CIRCUIT TO 1.5
	POWER VA	DRY CIRCUIT TO 20

Lectrohm, Inc.
A subsidiary of
COOK ELECTRIC
5562 Northwest Highway • Chicago, Ill. 60630 • 312/763-1700

THE TOTAL RELAY COMPANY

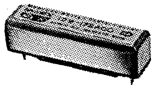
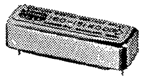
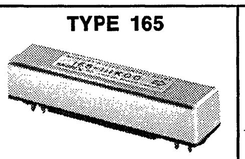
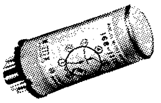
We're relay people. Industrial relays? We build 'em! Mercury wetted? We build 'em! Time Delays and Coaxial Crystal Cans? We build those, too! And many more special application relays. We know relays. We understand relays. We solve relay problems. Let us prove it. Midtex, the Total Relay Company.

INDUSTRIAL

	TYPE 155	TYPE 156	TYPE 157	TYPE 180/1
				
CONTACTS	U/L Recognized 1, 2, & 3 PDT 5 & 10 amp	U/L Recognized 1, 2, 3 & 4 PDT Low Level to 3 amp	1, 2 & 3 PDT 5 & 10 amp	2 & 4 PDT Low Level to 2 amp
COILS	6 to 240 VAC 6 to 110 VDC	6 to 240 VAC 6 to 110 VDC	6 to 240 VAC 6 to 110 VDC	5 to 48 VDC
ENCLOSURES	Open and Dust Cover 1-7/16"x1-17/32"x 2-9/32"	Dust Cover and Hermetically Sealed* 1.109"x.859"x1.281"	Open and Dust Cover 1.525"x1.40"x1.905"	Dust Cover 0.340" High 180: 1.4"x1.2"x0.34" 181: 1.1"x1.2"x0.34"
TERMINALS	Solder, Plug-in, Wire-wrap, 3/16" Quick Disconnect	Solder/Plug-in, Printed Circuit, #78 Taper Tab	Solder/Plug-in/ 3/16" Quick Disconnect	Printed Circuit

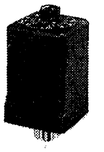
**Not U/L Recognized*

MERCURY WETTED

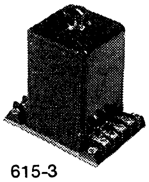
	TYPE 159	TYPE 160	TYPE 165	TYPE 168
				
CONTACTS	1 PDT Form C or D 2 amp	1 PDT Form C or D 2 amp	1 PDT-DM-DB Form D 5 amp	1 PDT Form C or D 2 amp
COILS	0.28 to 120 VDC 1 & 2 Coils	0.28 to 120 VDC 1 & 2 Coils	3.0 to 120 VDC 1 & 2 Coils	0.28 to 120 VDC 1, 2 & 4 Coils
ADJUSTMENT	Bi-Stable Monostable Polar	Bi-Stable Monostable Polar	Bi-Stable Monostable Chopper	Bi-Stable Monostable Polar
TERMINALS	.040" PCB Pins	.025" PCB Pins	.040" PCB Pins	Octal Plug

TIME DELAY RELAYS

TYPE 615



615-2



615-3

INPUT VOLTAGES
12, 24, 48 VDC
120 VAC

CONTACTS
1 to 3 PDT, 10 amp, 120/240 VAC

TERMINALS
Plug-in, Solder, Printed Circuit or Screw

DELAY TYPES
Delay on Operate
Delay on Release
Repeat Cycle Timing

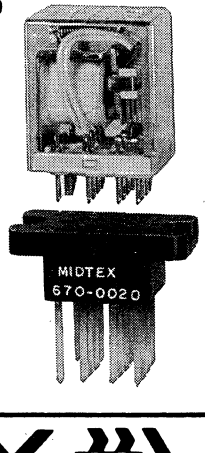
DELAY RANGE
0.1 to 1 sec.
1 to 10 sec.
1 to 100 sec.
1 to 300 sec.

REPEAT ACCURACY
2% at nominal voltage and 25°C ambient.
10% over/voltage and temperature range.

TEMPERATURE RANGE
—40°F. to +150°F.

NEW WIRE-WRAP RELAY SOCKET

TYPE 670-0020



First in the industry.
Specifically designed for the 4PDT 3 Ampere Type 156 Relay.

NUMBER OF TERMINALS
14

TERMINAL SIZE
.031"x.062"x0.75"

NUMBER OF WRAPS (Max.)
3

SOCKET BODY
U/L Approved G.P. Phenolic

MOUNTING CENTERS
1.3" (2-0.16" D.A. Holes)

ACCEPTS
20 to 26 AWG Solid Leadwires

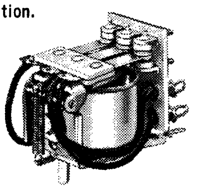
MIDTEX
INCORPORATED
AEMCO DIVISION
10 STATE STREET, MANKATO, MINNESOTA 56001
PHONE: 507-388-2985 TWX: 910-565-2244

Magnecraft® *general purpose relays*

IN STOCK FOR IMMEDIATE DELIVERY

class 88 open type

SPDT, DPDT, 3PDT — 10 amps.
AC or DC operation.



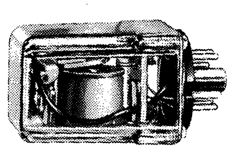
- Small Size: 1¹¹⁄₁₆ x 1³⁄₁₆ x 1¼″
- Silver alloy, gold-flashed, contacts rated at 10 amps at 115 VAC or 32 VDC resistive load.
- Solder terminals for easy wiring.
- Easy mounting: One #6-32 tapped mounting hole with locating boss.
- Rugged hinge-pin armature for long life and stability of operation.
- Weight: 2 oz. approx.

		COIL			
Stock Part No.	Contacts 10 Amps.	†Volt or ††Curr.	*Res. Ohms	Nominal Power	Prices 1-9
AC Voltage Specified					
W88AX1	SPDT	6VAC		3 VA	4.02
W88AX2		12VAC			4.02
W88AX3		24VAC			4.02
W88AX4		115VAC			4.02
W88AX34		230VAC			4.54
W88AX5	DPDT	6VAC		3 VA	4.70
W88AX6		12VAC			4.70
W88AX7		24VAC			4.70
W88AX8		115VAC			4.70
W88AX32		230VAC			5.22
W88AX9	3PDT	6VAC		3 VA	5.24
W88AX10		12VAC			5.24
W88AX11		24VAC			5.24
W88AX12		115VAC			5.24
W88AX36		230VAC			5.78
Direct Current Voltage Actuated					
W88X2	SPDT	6VDC	25		3.60
W88X3		12VDC	100	1.5W	3.60
W88X4		24VDC	400	1.5W	3.60

		COIL			
Stock Part No.	Contacts 10 Amps.	†Volt or ††Curr.	Ohms *Res.	Nominal Power	Prices 1-9
DC Voltage Specified Cont'd.					
W88X5	SPDT	110VDC	8000		4.24
W88X6	DPDT	6VDC	25	1.5W	4.16
W88X7		12VDC	100		4.16
W88X8		24VDC	400		4.16
W88X9		110VDC	8000		4.80
W88X10	3PDT	6VDC	25	1.5W	4.64
W88X11		12VDC	100		4.64
W88X12		24VDC	400		4.64
W88X13		110VDC	8000		5.24
DC Current Specified For Electronic Operation					
W88X14	SPDT	7.2 MA	2500	125MW	4.12
W88X15		5.0 MA	5000		4.22
W88X16		3.6 MA	10000		4.68
W88X17	DPDT	10 MA	2500	250MW	4.42
W88X18		7.2 MA	5000		4.52
W88X19		5.0 MA	10000		4.96
W88X20	3PDT	12.3 MA	2500	375MW	4.88
W88X21		8.7 MA	5000		5.00
W88X22		6.1 MA	10000		5.44

class 88CP plug in

AC or DC operation.
Crackproof, see through plastic dust cover.
SPDT, DPDT, 3PDT — 10 amps.



- Size: 2⅛ x 1⅜ x 1⅜″
- Silver alloy, gold-flashed, contacts rated 10 amps at 115 volts AC or 32 volts DC, resistive load.
- Furnished with 8 or 11 pin std. octal plug.
- Rugged hinge-pin armature for long life and stability of operation.
- Weight: 3 oz. approx.

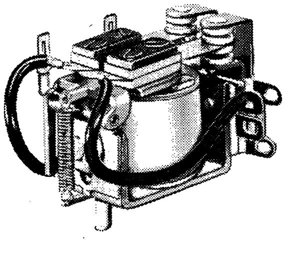
		COIL				
Stock Part No.	Contacts 10 Amps.	†Volt or ††Curr.	*Res. Ohms	Nominal Power	Plug	Prices 1-9
AC Voltage Specified						
W88ACPX1	SPDT	6VAC		3 VA	8-pin	6.17
W88ACPX2		12VAC				6.17
W88ACPX3		24VAC				6.17
W88ACPX4		115VAC				6.17
W88ACPX76		230VAC				6.94
W88ACPX5	DPDT	6VAC		3 VA	8-pin	6.91
W88ACPX6		12VAC				6.91
W88ACPX7		24VAC				6.91
W88ACPX8		115VAC				6.91
W88ACPX32		230VAC				7.69
W88ACPX9	3PDT	6VAC		3 VA	11-pin	8.59
W88ACPX10		12VAC				8.59
W88ACPX11		24VAC				8.59
W88ACPX12		115VAC				8.59
W88ACPX39		230VAC				9.36
DC Voltage Specified						
W88CPX1	SPDT	6VDC	25			5.94
W88CPX2		12VDC	100	1.5W	8-pin	5.94
W88CPX3		24VDC	400	1.5W	8-pin	5.94

		COIL				
Stock Part No.	Contacts 10 Amps.	†Volt or ††Curr.	*Res. Ohms	Nominal Power	Plug	Prices 1-9
DC Voltage Specified Cont'd.						
W88CPX4		110VDC	8000			6.55
W88CPX5	DPDT	6VDC	25	1.5W	3-pin	6.55
W88CPX6		12VDC	100			6.55
W88CPX7		24VDC	400			6.55
W88CPX8		110VDC	8000			7.16
W88CPX9	3PDT	6VDC	25	1.5W	11-pin	8.12
W88CPX10		12VDC	100			8.12
W88CPX11		24VDC	400			8.12
W88CPX12		110VDC	8000			8.75
DC Current Specified For Electronic Operation						
W88CPX13	SPDT	7.2 MA	2500	125MW	8-pin	6.49
W88CPX14		5.0 MA	5000			6.60
W88CPX15		3.6 MA	10000			7.04
W88CPX16	DPDT	10 MA	2500	250MW	8-pin	6.93
W88CPX17		7.2 MA	5000			7.04
W88CPX18		5.0 MA	10000			7.48
W88CPX19	3PDT	12.3 MA	2500	375MW	11-pin	8.47
W88CPX20		8.7 MA	5000			8.58
W88CPX21		6.1 MA	10000			9.02

class 88R power relays

DPDT 15 amps AC or DC operation.

- Small Size: 1⅞ x 1⁵⁄₁₆ x 1⁵⁄₃₂″
- Silver alloy, gold-flashed, contacts, rated at 15 amps at 115 volts AC, or 32 volts DC, resistive load.
- Solder terminals for easy wiring.
- Easy mounting: One #6-32 tapped mounting hole with locating boss.
- Designed for high current switching in small space.
- Rugged hinge pin armature for long life and stability of operation.
- Weight: 3 oz. approx.

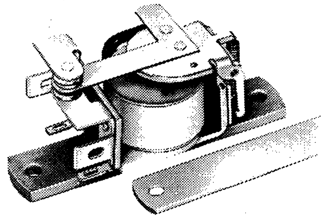


Stock Part No.	Contacts 15 Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
W88ARX-2	DPDT	12VAC	—	3VA	6.87
W88ARX-3		24VAC	—		6.87
W88ARX-4		115VAC	—		7.05
W88RX-2	DPDT	12VDC	100	1.5W	6.80
W88RX-3		24VDC	400		6.80

class 88K low cost relays

SPDT 15 amps AC or DC operation.

- Size: 2⅝ x 1³⁄₁₆ x 1¼″
- Silver alloy, gold-flashed, contacts, SPDT rated at 15 amps, 115 volts AC or 32 VDC, resistive load.
- Mounting base insulator furnished.
- Terminals accept AMP Faston 250 Quick-Disconnect receptacles for contacts, 110 Series for coil, or equivalent, or solder connection can be used.
- Weight: 3 ozs. approx.

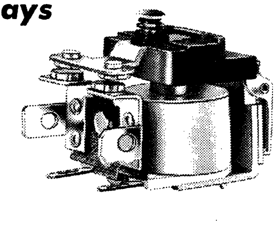


Stock Part No.	Contacts 15 Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
W88AKX-1	SPDT	24VAC	—	3VA	5.12
W88AKX-2		115VAC	—		5.12
W88AKX-3		230VAC	—		6.20
W88KX-1	SPDT	6VDC	25	1.5W	4.90
W88KX-2		12VDC	100		4.90
W88KX-3		24VDC	400		4.90
W88KX-4		110VDC	8000		5.68

class 88KD low cost power relays

50 amps SPST-NO-DM, 1 HP. AC or DC operation.

- Size: 1¹⁵⁄₁₆ x 1¹⁄₁₆ x 1½″
- 50 amp resistive, heavy duty silver alloy contacts for power switching.
- Terminals accept AMP Faston 250 Quick-Disconnect receptacles for contacts, 110 Series for coil, or equivalent, or solder connections can be used.
- Easy mounting: One #6-32 tapped mounting hole and locating boss.



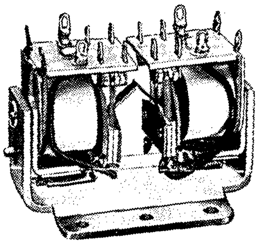
Stock Part No.	Contacts 50 Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
W88KDX-1	SPST-NO-DM	6VDC	25	1.5W	4.70
W88KDX-2		12VDC	100		4.70
W88KDX-3		24VDC	400		4.70
W88KDX-4		110VDC	8000		5.58
W88KADX-1	SPST-NO-DM	24VAC	—	3VA	5.30
W88KADX-2		115VAC	—		5.30
W88KADX-3		230VAC	—		5.68

*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nominal or less for DC relays and 85% of nominal or less for AC relays at 25°C.
††Current Specified Relays pull in at Specified Value or less.

MAGNECRAFT® ELECTRIC COMPANY

Magnecraft® general purpose relays

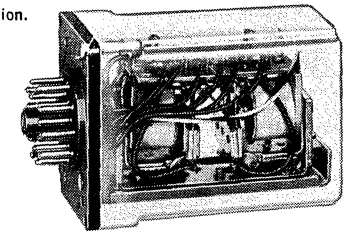
IN STOCK FOR IMMEDIATE DELIVERY



class 88L latching relay

AC or DC operation — 4PDT and 6PDT — 10 amps.

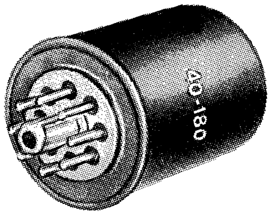
- Size: 3 x 1¾ x 1 15/16″
- Combination of two Class 88 Relays with interlocking latch-in levers mounted on a common base.
- Each armature latches when pulled in. Energizing one armature releases or resets the other.
- Silver alloy, gold-flashed, contacts rated 10 amps at 115 volts AC or 32 VDC resistive load.
- Easy mounting with clearance holes for six #6-32 screws.
- Rugged hinge pin armature for long life and stability of operation.
- Weight: 6½ oz. approx.



class 88LCP enclosed plug-in latching relays — 4 PDT 10 amp

AC or DC operation.

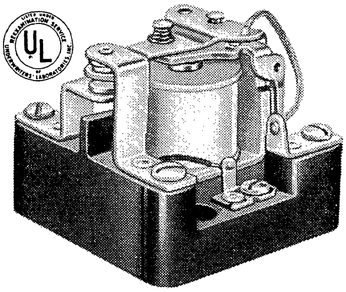
- Size: 2⅜ x 1¾ x 3 9/16″
- Enclosure: Crackproof, see-through plastic dust cover.
- Mounting: 20-pin octal style plug mates with std. amphenol 77-MIP-20 socket.
- Weight: 8 oz. approx.



class 88HP hermetically sealed plug-in relay

AC or DC operation — DPDT or 3PDT — 10 amps.

- Size: 2 1/32 x 1 11/16 dia.
- Hermetically sealed to afford maximum protection against severe ambient conditions.
- Silver alloy contacts, gold-flashed, rated 10 amps at 115 volts AC or 32 volts DC, resistive load.
- Mounting: Standard 8 or 11-pin octal style plug.
- Weight: 5 oz. approx.



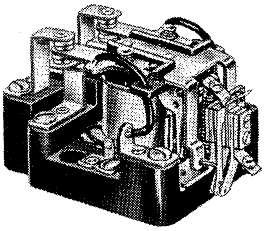
class 99 heavy duty power relays, UL listed

AC or DC operation — 25 amps 1 HP.
SPDT, DPST-NO, and DPDT.

- Size: SPDT — 2½ x 2½ x 2 3/16″, DPST-NO — 2½ x 2½ x 2⅜″, DPDT — 3 3/16 x 2½ x 2⅜″
- Oversize silver alloy, gold-flashed contacts, rated at 25 amps at 115 VAC or 32 VDC, resistive load, or 1 HP, AC.
- Heavy duty hinge-pin armature for long life and stability of operation. Screw type terminals and molded phenolic base.
- Easy mounting: Two 3/16″ diameter clearance holes on 1⅞″ centers.

class 99/power relay with aux. contacts

AC or DC operation. DPDT with SPDT Aux. contacts.

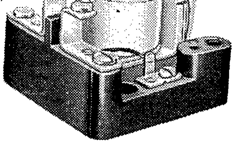


- Size: 4 3/32 x 2½ x 2⅜″
- Basic Class 99 Relay, equipped w/SPDT Auxiliary Contacts.
- DPDT power contacts rated 25 amps or 1 HP, SPDT auxiliary contacts rated 5 amps at 115 VAC or 32 VDC
- Screw type terminals.

class 99D power relay

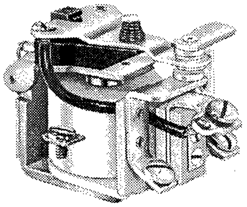
50 amps — SPST-NO-DM — 2 HP.

- Size: 2½ x 2½ x 2 3/32″
- AC or DC operation
- Oversize silver alloy, gold-flashed, contacts, rated at 50 amps at 115 VAC or 32 VDC resistive load, or 2 HP.



class 99S space saver power relay

25 amps — SPDT — 1 HP.

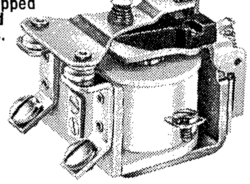


- Size: 2⅞ x 2 x 1 15/16″
- Power switching in small space.
- One #6-32 tapped mtg. hole and locating boss.
- AC or DC operation.
- Screw terminals.
- SPDT silver alloy, gold-flashed, contacts rated at 25 amps or 1 HP.

class 99SD space saver power relay

50 amps — SPST-NO-DM — 2 HP.

- Size: 2½ x 2 x 1 15/16″
- 50 amp switching in small space.
- Screw terminals.
- One #6-32 tapped mtg. hole and locating boss.
- AC or DC operation.



*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nominal or less for DC relays and 85% of nominal or less for AC relays at 25°C.

Stock Part No.	Contacts 10 Amps	COIL		Nominal Power	Prices 1-9
		†Volts	*Ohms		
CLASS 88L					
W88ALX-2	4PDT	6VAC	—	6VA prox.	11.98
W88ALX-3		24VAC	—		11.98
W88ALX-4		115VAC	—		11.98
W88ALX-5	6PDT	6VAC	—	6VA prox.	14.46
W88ALX-6		24VAC	—		14.46
W88ALX-7		115VAC	—		14.46
W88LX-1	4PDT	6VDC	12	3W	10.91
W88LX-2		12VDC	50		10.91
W88LX-3		24VDC	200		10.91
W88LX-4		110VDC	4000		12.26
W88LX-5	6PDT	6VDC	12	3W	13.28
W88LX-6		12VDC	50		13.28
W88LX-7		24VDC	200		13.28
W88LX-8		110VDC	4000		14.63
CLASS 88LCP					
W88ALCPX-10	4PDT (20 Pins)	6VAC	—	6VA prox.	17.26
W88ALCPX-11		24VAC	—		17.26
W88ALCPX-12		115VAC	—		17.26
W88LCPX-9	4PDT (20 Pins)	6VDC	12	3W	15.99
W88LCPX-10		12VDC	50		15.99
W88LCPX-11		24VDC	200		15.99
W88LCPX-12		110VDC	4000		16.26
CLASS 88HP					
W88AHPX-21	DPDT	6VAC	—	3VA	11.30
W88AHPX-22		12VAC	—		11.30
W88AHPX-23		24VAC	—		11.30
W88AHPX-24		115VAC	—		11.30
W88HPX-32	DPDT	6VDC	25	1.5W	10.77
W88HPX-33		12VDC	100		10.77
W88HPX-34		24VDC	400		10.77
W88HPX-35		110VDC	8000		11.92
W88AHPX-36	3PDT	115VAC	—	3VA	13.43
W88HPX-51		24VDC	400	1.5W	12.88

Stock Part No.	Contacts 25 Amps	COIL		Nominal Power	Prices 1-9
		†Volts	*Ohms		
CLASS 99					
W99AX-1	SPDT	24VAC	—	3VA	5.66
W99AX-2		115VAC	—		5.68
W99AX-3		230VAC	—		5.86
W99X-1	SPDT	6VDC	18	2.0W	5.42
W99X-2		12VDC	70		5.42
W99X-3		24VDC	290		5.44
W99X-4		110VDC	6000		5.83
W99AX-8	DPST-NO	24VAC	—	3VA	6.65
W99AX-9		115VAC	—		6.67
W99AX-10		230VAC	—		6.85
W99X-9	DPST-NO	6VDC	18	2.0W	6.36
W99X-10		12VDC	70		6.36
W99X-11		24VDC	290		6.38
W99X-12		110VDC	6000		6.77
W99AX-4	DPDT	24VAC	—	3VA	8.43
W99AX-5		115VAC	—		8.43
W99AX-6		230VAC	—		8.63
W99AX-7**		440VAC	—		8.68
W99X-5	DPDT	6VDC	18	2.0W	8.12
W99X-6		12VDC	70		8.12
W99X-7		24VDC	290		8.14
W99X-8		110VDC	6000		8.53
W99AX-15‡	DPDT (Relay)	115VAC	—	3VA	10.43
W99AX-16‡		230VAC	—		10.63

**W99AX-7 440VAC relay not UL Listed.
‡With Aux. contacts

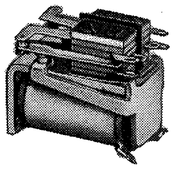
Stock Part No.	Contacts	COIL		Nominal Power	Prices 1-9
		†Volts	*Ohms		
CLASS 99D					
W99ADX-1	SPST-NO-DM 50 Amps	24VAC	—	3VA	5.64
W99ADX-2		115VAC	—		5.64
W99ADX-3		230VAC	—		5.85
W99DX-1	SPST-NO-DM 50 Amps	6VDC	18	2.0W	5.35
W99DX-2		12VDC	70		5.35
W99DX-3		24VDC	290		5.37
W99DX-4		110VDC	6000		5.74
CLASS 99S					
W99SAX-1	SPDT 25 Amps at 115VAC	24VAC	—	3VA	7.35
W99SAX-2		115VAC	—		7.40
W99SAX-3		230VAC	—		7.62
W99SX-1	SPDT 25 Amps at 115VAC	6VDC	18	2.0W	7.11
W99SX-2		12VDC	70		7.13
W99SX-3		24VDC	290		7.15
W99SX-4		110VDC	6000		7.47
CLASS 99SD					
W99SADX-1	SPST-NO-DM 50 Amps at 115VAC	24VAC	—	3VA	6.26
W99SADX-2		115VAC	—		6.34
W99SADX-3		230VAC	—		6.56
W99SDX-1	SPST-NO-DM 50 Amps at 115VAC	6VDC	18	2.0W	6.10
W99SDX-2		12VDC	70		6.10
W99SDX-3		24VDC	290		6.14
W99SDX-4		110VDC	6000		6.44

MAGNECRAFT® ELECTRIC COMPANY

Magnecraft® telephone type relays

class 33

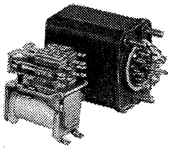
Sub-miniature $\frac{11}{16}$ x $1\frac{1}{4}$ x $1\frac{1}{4}$"



- DPDT — 4PDT, 3 amp contacts.
- Hinge pin assures long life.
- Telephone type switching versatility.
- Fast operate and release time.
- Rigid mount — Four 4-40 mtg. holes.
- Weight: 1 oz.

class 33HS

Miniature Hermetically Sealed
Hermetically Sealed to Afford Maximum Protection Against Severe Ambient Conditions.



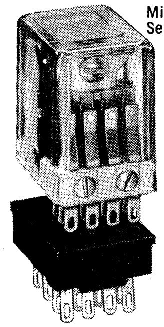
- Size: $\frac{31}{32}$ x $1\frac{11}{32}$ x $1\frac{41}{64}$"
- DPDT — 4PDT 5 amp contacts.
- Telephone versatility and reliability.
- High resistance to shock and vibration.
- Widely used in military and civilian equipment.
- #4-40 3 stud mtg. — 8 or 14 pin solder terminal header.
- Weight: 3 oz.

IN STOCK FOR IMMEDIATE DELIVERY

Stock Part No.	Contacts Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
CLASS 33					
W33X237	**DPDT** 3 Amps	6VDC	17	2.0W	4.87
W33X238		12VDC	75		4.87
W33X239		24VDC	280		4.92
W33X240		110VDC	6500		5.50
W33X241	**4PDT** 3 Amps	6VDC	17	2.0W	6.58
W33X242		12VDC	75		6.58
W33X243		24VDC	280		6.63
W33X244		110VDC	6500		7.23
CLASS 33HS					
W33HSX177	**DPDT** 5 Amps	6VDC	17	2.0W	13.21
W33HSX178		12VDC	75		13.21
W33HSX179		24VDC	280		13.26
W33HSX180		110VDC	6500		13.87
W33HSX181	**4PDT** 5 Amps	6VDC	17	2.0W	16.65
W33HSX182		12VDC	75		16.65
W33HSX183		24VDC	280		16.70
W33HSX184		110VDC	6500		17.36

class 77CS

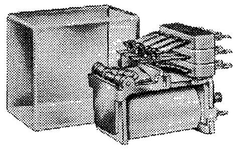
Miniature 5 amp 4PDT
See-thru Dust Cover and Sockets



- Size: $\frac{55}{64}$ x $1\frac{7}{64}$ x $1\frac{9}{32}$"
- 70-161-1 solder terminal socket with retainer .58¢.
- 70-161-3 printed circuit terminal socket .58¢.

class 77PC

Miniature Printed Circuit Mtg.
5 amp 4PDT, See-thru Dust Cover



- Size: $\frac{55}{64}$ x $1\frac{7}{64}$ x $1\frac{9}{32}$"
- Telephone type relays having greater contact forces, precision hinge-pin armature and unitized design assuring stabilized operation over very long life. Printed circuit type is assembled directly to P.C. board. Solder type can be soldered to directly or used with solder or P.C. socket.

CLASS 77CS

77CS Socket Terminal					
W77CSX-1‡	**4PDT** 5 Amps	6VDC	40	1.0W	5.30
W77CSX-2‡		12VDC	160		5.30
W77CSX-3‡		24VDC	600		5.40
W77CSX-4‡		48VDC	2500		5.55
W77CSX-5‡		110VDC	10000		5.97
W77ACSX-1‡		115VAC	—	3VA	5.96

CLASS 77PC

Stock Part No.**	†Nom. Coil Volt.	*Coil Ohms	Prices 1-9
W77PCX-12	6VDC	40	5.60
W77PCX-13	12VDC	160	5.60
W77PCX-14	24VDC	600	5.69
W77PCX-15	48VDC	2500	5.84
W77PCX-16	110VDC	10000	6.25

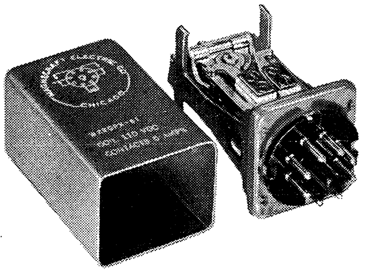
** Do not order this part no. when socket is required.

‡ When relays are required to plug into sockets 70-161-1, 70-161-3, order from this table only. Sockets ordered separately.

class 22CP

Plug-in Removable Dust Cover
Hinge Pin Telephone Type Relay

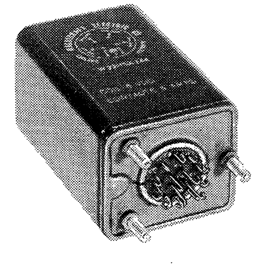
- Small: $1\frac{7}{16}$ x $1\frac{41}{64}$ x $3\frac{3}{32}$"
- 5 amp, DPDT, 3PDT — AC DC types.
- Long life and stable operation.
- Std. 8 or 11 pin octal plug.



class 22HS

Hermetically Sealed 5 amp 4PDT AC DC Types

- Small: $1\frac{7}{16}$ x $1\frac{5}{8}$ x $2\frac{11}{16}$"
- Long life hinge pin construction.
- Herm. sealed against severe ambient cond.
- #6-32 — 3 stud mtg.
- 14 pin solder terminals.



CLASS 22CP

Stock Part No.	Contacts 5 Amps	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
Alternating current voltage actuated					
W22ACPX60	**DPDT**	115VAC	—	5VA	10.23
Direct current voltage actuated					
W22CPX49	**DPDT**	12VDC	80	2.0W	9.85
W22CPX50		24VDC	375	1.5W	9.90
W22CPX51		110VDC	8000	1.5W	11.14
W22CPX54	**3PDT**	24VDC	375	1.5W	11.92
W22CPX56	**DPDT**	4.5MA	10000	200MW	11.14
CLASS 22HS					
Alternating current voltage actuated					
W22AHSX32	**4PDT**	115VAC	—	5VA	17.30
Direct current voltage actuated					
W22HSX144	**4PDT**	6VDC	20	2.0W	17.00
W22HSX145		12VDC	80	2.0W	17.00
W22HSX146		24VDC	375	1.5W	17.05

Magnecraft® coaxial relays

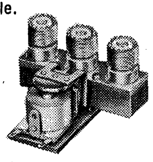
IN STOCK FOR IMMEDIATE DELIVERY

class 128

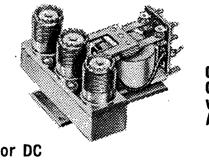
- Size: $2\frac{7}{8}$ x $2\frac{5}{8}$ x $1\frac{7}{16}$"
- SPDT RF switching silver alloy contacts.
- Rated 100 watts of RF power.
- Impedance matched to 50 ohms cable.

- Equipped with std. UHF connectors.
- VSWR 1.25: 1 max. from 0 to 500 MC.
- Operate Time: 25 ms. max.
- Long life hinge pin construction.
- Coaxial cavity, machined brass, with removable plug, for contact inspection.

- AC or DC operation.
- Release Time: 25 ms. max.
- 4-40 thd. — 4 mtg. holes.



CLASS 128
Coaxial Relay



CLASS 128
Coaxial Relay with 10 amp DPDT Aux. Contacts

CLASS 128

Stock Part No.	Coaxial Contacts	COIL †Volts	COIL *Ohms	Nominal Power	Prices 1-9
Class 128 Relay					
W128AX-7	**SPDT**	115VAC	—	3VA	18.47
W128X-9	**SPDT**	12VDC	100	1.5W	18.13
W128X-10	**SPDT**	24VDC	400	1.5W	18.20
Class 128 Relay with DPDT Auxiliary Contacts					
W128AX-11	**SPDT**	115VAC	—	3VA	20.85
W128X-14	**SPDT**	12VDC	100	1.5W	20.02
W128X-15	**SPDT**	24VDC	400	1.5W	20.08

*Resistance Values ±10% at 25°C.

†Voltage Specified Relays pull in at 80% of nominal or less for DC relays and 85% of nominal or less for AC relays at 25°C.

††Current Specified Relays pull in at Specified Value or less.

MAGNECRAFT® ELECTRIC COMPANY

Magnecraft® *dual-inline package reed relay*

class 107DIP

NEW

Contact Load Rating: 3 VA at .5 amps max. or 28 VDC max. resistive
Contact Combination: SPST-NO (1 form A)
Operate Time: 200 microseconds typical
Dielectric Strength between Contacts: 200 VDC min.
Contact Resistance: 200 milliohms average
Typical Life at Rated Load: 10 million operations, longer at reduced loads
Epoxy molded construction

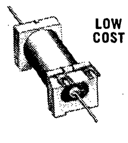
IN STOCK FOR IMMEDIATE DELIVERY

Stock Part Number	COIL Max. Pickup Voltage	COIL Volts	COIL Typical Power Req.	Prices 1-24
W107DIP-1	4 VDC	5 VDC	50 MW	4.00
W107DIP-2	4.8 VDC	6 VDC	500 MW	3.50
W107DIP-3	9.6 VDC	12 VDC	500 MW	3.50
W107DIP-4	19.2 VDC	24 VDC	500 MW	3.50

Magnecraft® *miniature dry reed relays*

IN STOCK FOR IMMEDIATE DELIVERY

class 101M & 104M

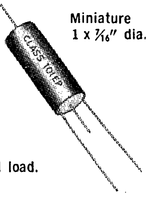


Miniature 1 x ½ x 7⁄16″

LOW COST

- 101M — SPST-NO — 10 VA @ .05 amp.
- 104M — SPDT — 3 VA @ .25 amp.
- In-line axial lead.
- Molded bobbin.
- Nom. Power: 101M, 600 MW 104M, 500 MW.
- Life: 10 x 10^6 at rated load.
- Weight: 1 oz. approx.

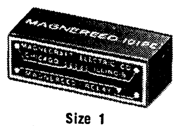
class 101EP & 104EP



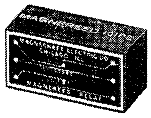
Miniature 1 x 7⁄16″ dia.

- 101EP — SPST-NO — 10 VA @ .5 amp.
- 104EP — SPDT — 3 VA @ .25 amp.
- In-line axial lead.
- Encapsulated.
- Nom. Power: 600 MW.
- Life: 10 x 10^6 at rated load.
- Weight: 1 oz. approx.

class 101PC & 104PC



Size 1
SPST-NO or SPDT
1½ x ½ x 9⁄16″

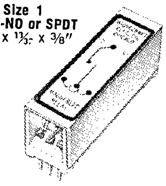


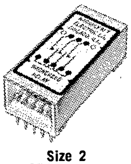
Size 2
DPST-NO or DPDT
1½ x 11⁄16 x 9⁄16″

- 101PC — 10 VA @ .5 amp.
- SPST-NO — DPST-NO.
- 104PC — 3 VA @ .25 amp.
- SPDT, DPDT.
- Encapsulated — Printed circuit mtg.
- Nom. Power: Size 1: 600 MW Size 2: 900 MW.
- Life: 10 x 10^6 at rated load.
- Weight: 1 oz. approx.

class 101MPC & 104MPC

Size 1
SPST-NO or SPDT
1⅛ x 13⁄32 x ⅜″





Size 2
3PST-NO or DPDT
1⅛ x 39⁄64 x ⅜″

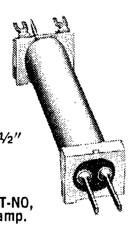
- 101MPC — 10 VA @ .5 amp.
- SPST-NO or 3PST-NO.
- 104MPC — 3 VA @ .25 amp.
- SPDT or DPDT.
- Printed circuit mtg. — Low profile.
- Nom. Power: Size 1: 500 MW Size 2: 700MW.
- Life: 10 x 10^6 at rated load.
- Weight: Size 1: 1 oz. Size 2: 2 oz. approx.

Stock Part No.	Contacts	COIL — DC ‡MA	COIL — DC †Volts	COIL — DC *Ohms	Prices 1-24
W101MX-1	SPST-NO	—	6	100	2.20
W101MX-2		—	12	250	2.25
W101MX-3		—	24	500	2.25
W101MX-4		9	—	2500	2.43
W104MX-1	SPDT	—	6	100	5.63
W104MX-2		—	12	250	5.68
W104MX-3		—	24	500	5.68
W104MX-4		9	—	2500	5.87
W101EPX-5	SPST-NO	—	6	65	3.62
W101EPX-6		—	12	225	3.62
W101EPX-7		—	24	1000	4.24
W101EPX-8		8	—	5000	4.68
W104EPX-2	SPDT	—	6	65	7.37
W104EPX-3		—	12	225	7.37
W104EPX-4		—	24	1000	8.05
W104EPX-5		8	—	5000	8.55
W101PCX-5	SPST-NO Size 1	—	6	65	5.11
W101PCX-6		—	12	250	5.16
W101PCX-7		—	24	1000	5.26
W101PCX-8		8	—	5000	5.68
W104PCX-7	SPDT Size 1	—	6	65	10.07
W104PCX-8		—	12	225	10.12
W104PCX-9		—	24	1000	10.22
W104PCX-10		8	—	5000	10.64
W101PCX-9	DPST-NO Size 2	—	6	40	7.15
W101PCX-10		—	12	150	7.18
W101PCX-11		—	24	650	7.24
W101PCX-12		8	—	5000	7.69
W104PCX-3	DPDT Size 2	—	6	40	14.59
W104PCX-4		—	12	150	14.62
W104PCX-5		—	24	650	14.68
W104PCX-6		8	—	5000	15.13
W101MPCX-1	SPST-NO	—	6	70	3.60
W101MPCX-2		—	12	300	3.60
W101MPCX-3		—	24	1100	3.63
W101MPCX-4		—	48	4300	3.77
W104MPCX-1	SPDT Size 1	—	6	70	6.82
W104MPCX-2		—	12	300	6.83
W104MPCX-3		—	24	1100	6.85
W104MPCX-4		—	48	4300	6.98
W101MPCX-5	3PST-NO Size 2	—	6	50	6.75
W101MPCX-6		—	12	220	6.75
W101MPCX-7		—	24	850	6.77
W101MPCX-8		—	48	3300	6.85
W104MPCX-5	DPDT Size 2	—	6	50	11.62
W104MPCX-6		—	12	220	11.63
W104MPCX-7		—	24	850	11.65
W104MPCX-8		—	48	3300	11.73

Magnecraft® *standard reed relays*

IN STOCK FOR IMMEDIATE DELIVERY

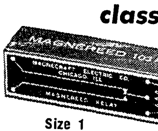
class 102M & 103M



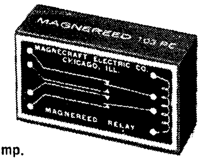
Size
2⅛ x 19⁄32 x ½″

- 102M — SPST-NO, 15 VA @ 1 amp.
- 103M — SPDT, 10 VA @ .5 amp.
- In-line axial lead.
- Molded bobbin.
- Nom. Power: 300 MW.
- Life: 20 x 10^6 at rated load.
- Weight: 1 oz. approx.

class 102PC & 103PC



Size 1
SPST-NO or SPDT
2¼ x 21⁄32 x ⅝″



Size 2
DPST-NO or DPDT
2¼ x 1¼ x ⅝″

- 102PC — 15 VA @ 1 amp.
- SPST-NO or DPST-NO.
- 103PC — 10 VA @ .5 amp.
- SPDT or DPDT.
- Encapsulated — Printed circuit mtg.
- Nom. Power: Size 1: 400 MW. Size 2: 700 MW.

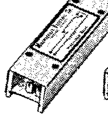
Life: 20 x 10^6 at rated load.
Weight: Size 1: 1 oz. — Size 2: 2 oz.

class 102MPC & 103MPC

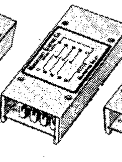
- 102MPC — 15 VA @ 1 amp.
- Size 1: SPST-NO — Size 2: 3PST-NO — Size 3: 6PST-NO.
- 103MPC — 10 VA @ .5 amp.
- Size 1: SPDT — Size 2: DPDT — Size 3: 4PDT.
- Printed circuit mtg. — low profile.
- Nom. Power: Size 1: 500 MW — Size 2: 750 MW — Size 3: 1.5 W.

Life: 20 x 10^6 at rated load.

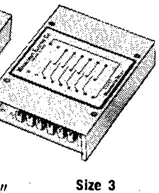
- Weight: Size 1: 1 oz. — Size 2: 2 oz. — Size 3: 3 oz. approx.



Size 1
SPST-NO or SPDT
2⅝ x ¾ x 41⁄64″



Size 2
3PST or DPDT
2⅝ x 113⁄16 x 41⁄64″



Size 3
6PST-NO or 4PDT
3⅝ x 131⁄32 x 41⁄64″

Stock Part No.	Contacts	COIL — DC ‡MA	COIL — DC †Volts	COIL — DC *Ohms	Prices 1-24
W102MX-1	SPST-NO	40	—	100	2.18
W102MX-2		—	6	200	2.25
W102MX-3		—	12	500	2.25
W102MX-4		—	24	2000	2.47
W102MX-5		5.5	—	5000	2.63
W103MX-1	SPDT	—	6	200	4.23
W103MX-2		—	12	500	4.23
W103MX-3		—	24	2000	4.45
W103MX-4		5.5	—	5000	4.62
W102PCX-1	SPST-NO Size 1	—	6	100	4.77
W102PCX-2		—	12	400	4.83
W102PCX-3		—	24	1500	4.87
W102PCX-4		6.5	—	5000	5.32
W103PCX-1	SPDT Size 1	—	6	100	7.22
W103PCX-2		—	12	400	7.27
W103PCX-3		—	24	1500	7.32
W103PCX-4		6.5	—	5000	7.76
W102PCX-5	DPST-NO Size 2	—	6	50	6.22
W102PCX-6		—	12	200	6.28
W102PCX-7		—	24	800	6.33
W102PCX-8		9	—	5000	6.78
W103PCX-5	DPDT Size 2	—	6	50	10.77
W103PCX-6		—	12	200	10.79
W103PCX-7		—	24	800	10.84
W103PCX-8		9	—	5000	11.31
W102MPCX-5	SPST-NO	140	—	30	3.29
W102MPCX-6		—	6	70	3.29
W102MPCX-7		—	12	250	3.29
W102MPCX-8		—	24	1000	3.29
W102MPCX-9		—	48	4000	3.46
W102MPCX-10		9	—	7000	4.14
W102MPCX-48	3PST-NO	—	6	50	5.62
W102MPCX-49		—	12	175	5.63
W102MPCX-50		—	24	750	5.77
W102MPCX-51		—	48	3000	5.97
W102MPCX-52	6PST-NO	—	6	25	9.18
W102MPCX-53		—	12	100	9.30
W102MPCX-54		—	24	375	9.35
W102MPCX-55		—	48	1500	9.43
W103MPCX-1	SPDT	140	—	30	5.83
W103MPCX-2		—	6	70	5.83
W103MPCX-3		—	12	250	5.83
W103MPCX-4		—	24	1000	5.83
W103MPCX-5		—	48	4000	6.00
W103MPCX-6		9	—	7000	6.68
W103MPCX-30	DPDT	—	6	50	8.33
W103MPCX-31		—	12	175	8.33
W103MPCX-32		—	24	750	8.47
W103MPCX-33		—	48	3000	8.67
W103MPCX-34	4PDT	—	6	25	14.60
W103MPCX-35		—	12	100	14.70
W103MPCX-36		—	24	375	14.77
W103MPCX-37		—	48	1500	14.88

*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nominal or less for DC relays at 25°C.
††Current Specified Relays pull in at Specified Value or less.

MAGNECRAFT® ELECTRIC COMPANY

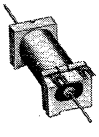
Magnecraft® reed relays

IC compatible reed relays

class/101M & 104M

SPST-NO, 101M — 10 VA @ 0.5 amp.
SPDT, 104M — 3 V @ 0.25 amp.
In-Line Axial Lead.
Molded Bobbin.

Nom. Power: 40 MW (Sensitive).
Life: 5 x 10⁶ at rated load.
Weight: 1 oz. approx.

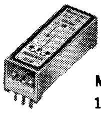


Miniature Size
2¼ x ½ x 7⁄16″

class 101MPC & 104MPC

SPST-NO 101MPC — 10 VA @ 0.5 amp.
SPDT 104MPC — 3 VA @ 0.25 amp.
Printed Circuit — Low Profile.
Molded Bobbin and Steel Cover.

Nom. Power: 101MPC 40 MW, 104MPC 50 MW.
Life: 5 x 10⁶ at rated load.
Weight: 1 oz. approx.



Miniature Size
1⅛ x 11⁄32 x ⅜″

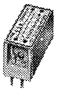
IN STOCK FOR IMMEDIATE DELIVERY

Stock Part No.	Contacts	Max. Pick-up Voltage	COIL — DC Volts	COIL — DC *Ohms	Prices 1-24
CLASS 101M					
W101MX-35	SPST-NO	4VDC	5	500	2.68
W101MX-41		2.4VDC	3	250	2.68
CLASS 104M					
W104MX-9	SPDT	4VDC	5	500	6.20
W104MX-10		2.4VDC	3	250	6.20
CLASS 101MPC					
W101MPCX-104	SPST-NO	4VDC	5	450	4.12
CLASS 104MPC					
W104MPCX-46	SPDT	4VDC	5	300	7.53

class 105MPC

SPST-NO 0.1 VA @ 10 MA.
Printed Circuit Mtg. — Low Profile.
Molded Bobbin — Steel Cover.

Nom. Power: 300 MW.
Life: 25 x 10⁶ at rated load.
Weight: 1 oz. approx.



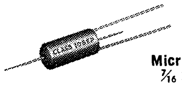
Micro-Miniature
⅝ x 5⁄16 x 11⁄32″

Stock Part No.	Contacts	COIL — DC			Prices
		‡MA	†Volts	*Ohms	1-24
W105MPCX-1	SPST-NO	—	6	120	5.45
W105MPCX-2		—	12	500	5.47
W105MPCX-3		—	24	2000	5.58

class 105EP

SPST-NO 0.1 VA @ 10 MA.
Encapsulated-In-Line
Axial Leads.

Nom. Power: 400 MW.
Life: 10 x 10⁶ at rated load.
Weight: 1 oz. approx.



Micro-Miniature
7⁄16 x ¼″ dia.

W105EPX-1	SPST-NO	—	6	90	6.18
W105EPX-2		—	12	350	6.18
W105EPX-3		—	24	·1300	6.30

class 101MPC low cost!

SPST-NO 10VA @ .5 amp.
Printed Circuit Mtg.
Molded Bobbin.

Nom. Pow: 500MW
Life: 5x10⁶ at rated load.
Weight: 1 oz. approx.

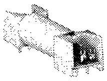
Miniature Size
1⅛ x ⅜ x ⅜″

W101MPCX-122	SPST-NO .5 amp	—	6	70	2.65
W101MPCX-123		—	12	300	2.65
W101MPCX-124		—	24	1100	2.65

class 102MPC low cost!

SPST-NO 15VA @ 1 amp.
Printed Circuit Mtg.
Molded Bobbin.

Nom. Pow: 500MW
Life: 20x10⁶ at rated load
Weight: 1 oz. approx.

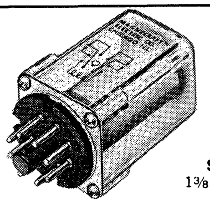


Small Size
2⅝ x ⅝ x 23⁄32″

W102MPCX-146	SPST-NO 1 amp	—	6	70	2.50
W102MPCX-147		—	12	250	2.50
W102MPCX-145		—	24	1000	2.50

class 103CP plug-in mtg.

10 VA @ 0.5 amp.
DPDT or 3PDT.
8 or 11 Pin Octal Style Plug.
Nom. Power: DPDT 500 MW — 3PDT 800 MW.
Life: 25 x 10⁶ at rated load.
Weight: 5 oz. approx.



Small Size
1⅜ x 1⅜ x 2⅜″

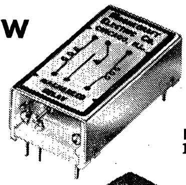
Stock Part No.	Contacts	COIL — DC			Prices
		‡MA	†Volts	*Ohms	1-24
W103CPX-7	DPDT	—	6	75	12.92
W103CPX-8		—	12	300	12.95
W103CPX-9		—	24	1000	13.01
W103CPX-10		8	—	5000	13.57
W103CPX-11	3PDT	—	6	40	16.77
W103CPX-12		—	12	150	16.83
W103CPX-13		—	24	650	16.95
W103CPX-14		10	—	5000	17.50

Magnetic latching reed relay class 101LMPC

NEW

Uses no biasing magnet — no standby power

SPST 3 VA @ .010 amp. or 28 VDC max.
Double Wound Coil.
Molded Bobbin and Steel Cover.
Printed Circuit Mounting-Low Profile
Intermittent Duty, 50% Duty Cycle, 4 min. max. on time.
Life: 1 x 10⁶ at rated load.
Vibration and Shock Resistant.

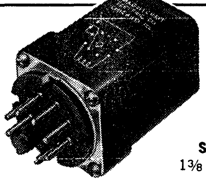


Miniature Size
1⅛ x ⅜ x 39⁄64″

Stock Part No.	Contacts	COIL				Prices 1-24
		Min. VDC	Nom. VDC	Max. VDC	*Ohms	
W101LMPCX-9	SPST	2.4	3	3.5	5.5/33	9.20
W101LMPCX-10		4	5	6	20/150	9.20
W101LMPCX-11		4	6	8	30/250	9.20
W101LMPCX-12		10	12	14	85/585	9.20
W101LMPCX-13		22	24	26	265/3200	9.20

††class 103LCP plug-in mtg.

Latching-Bi-Stable.
SPDT 10 VA @ 0.2 amp.
Single and Double Wound Coils.
8 or 11 Pin Octal Style Plug.
Nom. Power: Single Coil 150 MW — Double Coil 300 MW.
Life: 25 x 10⁶ at rated load.
Weight: 5 oz. approx.



Small Size
1⅜ x 1⅜ x 2 11⁄16″

Single Wound Coils

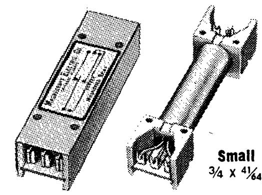
W103LCPX-7	SPDT	—	6	250	8.30
W103LCPX-8		—	12	1000	8.33
W103-LCPX-9		—	24	4000	8.57
W103LCPX-10		4	—	7000	8.80

Double Wound Coils

W103LCPX-11	SPDT	—	6	120/120	9.87
W103LCPX-12		—	12	460/460	9.97
W103LCPX-13		—	24	1800/1800	10.02
W103LCPX-14		8	—	3000/3000	10.32

††class 103LMPC

Latching-Bi-Stable.
SPDT 10 VA @ 0.2 amp.
Single and Double Wound Coils.
Molded Bobbin and Steel Cover.
Printed Circuit Mtg. — Low Profile.
Nom. Power: Single Coil 150 MW — Double Coil 300 MW.
Life: 25 x 10⁶ at rated load.
Weight: 1 oz. approx.



Small Size
¾ x 41⁄64 x 2⅝″

Single Wound Coils

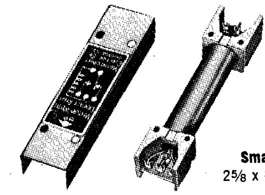
W103LMPCX-3	SPDT	40	—	70	7.07
W103LMPCX-4		—	6	250	7.07
W103LMPCX-5		—	12	1000	7.07
W103LMPCX-6		—	24	4000	7.26
W103LMPCX-7		4	—	7000	8.01

Double Wound Coils

W103LMPCX-8	SPDT	80	—	30/30	8.22
W103LMPCX-9		—	6	120/120	8.33
W103LMPCX-10		—	12	460/460	8.33
W103LMPCX-11		—	24	1800/1800	9.00
W103LMPCX-12		8	—	3000/3000	10.04

††class 133LMPC

Latching-Bi-Stable.
SPDT 50 VA @ 2 amp.
Mercury Wetted Contacts.
Single and Double Wound Coils.
Molded Bobbin — Steel Cover.
Printed Circuit Mtg.
Nom. Power: Single Coil 150 MW — Double Coil 300 MW.
Life: 25 x 10⁶ at rated load.



Small Size
2⅝ x ¾ x 41⁄64″

Single Wound Coils

W133LMPCX-17	SPDT	40	—	70	9.87
W133LMPCX-18		—	6	250	9.88
W133LMPCX-19		—	12	1000	9.92
W133LMPCX-20		—	24	4000	10.07
W133LMPCX-21		4	—	7000	10.17

Double Wound Coils

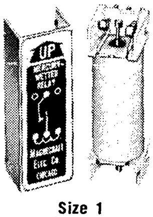
W133LMPCX-22	SPDT	80	—	30/30	11.23
W133LMPCX-23		—	6	120/120	11.25
W133LMPCX-24		—	12	460/460	11.32
W133LMPCX-25		—	24	1800/1800	11.42
W133LMPCX-26		8	—	3000/3000	11.50

*Resistance Values ±10% at 25°C. †Voltage Specified. Relays pull in at 80% of nominal or less for DC relays at 25°C. ††Single Wound Coil — Switching by reversing polarity. Double Wound Coil — Switching by use of dual input. ‡Current specified relays pull-in at specified values or less.

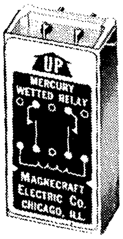
MAGNECRAFT® ELECTRIC COMPANY

Magnecraft® mercury wetted relays

class 131MPC



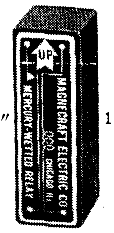
Size 1
SPST-NO
1 1/8 x 13/32 x 3/8″



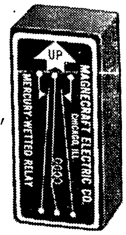
Size 2
DPST-NO
1 1/8 x 39/64 x 3/8″

28 VA @ 1 amp.
Miniature.
Mercury Wetted Contacts.
Molded Bobbin and Steel Cover.
Printed Circuit Mtg. —
Low Profile.
Operating Position: Upright.
Nom. Power: Size 1 — 500 MW,
Size 2 — 700 MW.
Life: 25 x 10^6 at rated load.
Wt. Size 1: 1 oz. — Size 2: 2 oz.

class 131PC



Size 1
SPST-NO
1 1/2 x 1/2 x 9/16″



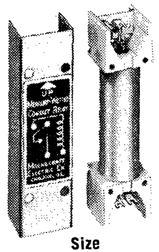
Size 2
DPST-NO
1 1/2 x 11/16 x 9/16″

28 VA @ 1 amp.
Encapsulated — Miniature.
Mercury Wetted Contacts.
Printed Circuit Mtg. —
Low Profile.
Operation Position: Upright.
Nom. Power: Size 1 — 600 MW,
Size 2 — 900 MW.
Life: 25 x 10^6 at rated load.
Wt. Size 1: 1 oz. — Size 2: 2 oz.

class 132MPC & 133MPC

132MPC — SPST-NO — 50 VA @ 3 amp.
133MPC — SPDT — 50 VA @ 2 amp.
Operating Position: Upright.
Printed Circuit Mtg.

Molded Bobbin and Steel Cover.
Nom. Power: 500 MW.
Life: 25 x 10^6 at rated load.
Weight: 2 oz. approx.



Size
2 5/8 x 3/4 x 41/64″

IN STOCK FOR IMMEDIATE DELIVERY

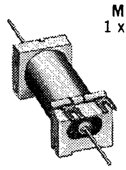
Stock Part No.	Contacts	COIL—DC †Volts	COIL—DC *Ohms	PRICES 1-24
W131MPCX-2	SPST-NO	6	70	6.40
W131MPCX-3		12	300	6.48
W131MPCX-4		24	1100	6.53
W131MPCX-5		48	4300	6.98
W131MPCX-6	DPST-NO	6	50	11.53
W131MPCX-7		12	220	11.58
W131MPCX-8		24	850	11.65
W131MPCX-9		48	3300	11.93

Stock Part No.	Contacts	COIL—DC ††MA	COIL—DC †Volts	COIL—DC *Ohms	PRICES 1-24
W131PCX-8	SPST-NO	—	6	65	8.38
W131PCX-9		—	12	250	8.44
W131PCX-10		—	24	1000	8.55
W131PCX-11		8	—	5000	9.01
W131PCX-12	DPST-NO	—	6	40	10.62
W131PCX-13		—	12	150	10.66
W131PCX-14		—	24	650	10.71
W131PCX-15		8	—	5000	11.21
W132MPCX-1	SPST-NO	140	—	30	5.83
W132MPCX-2		—	6	70	5.83
W132MPCX-3		—	12	250	5.83
W132MPCX-4		—	24	1000	5.83
W132MPCX-5		—	48	4000	6.00
W132MPCX-6		9	—	7000	6.68
W133MPCX-1	SPDT	140	—	30	8.42
W133MPCX-2		—	6	70	8.42
W133MPCX-3		—	12	250	8.42
W133MPCX-4		—	24	1000	8.42
W133MPCX-5		—	48	4000	8.60
W133MPCX-6		9	—	7000	9.35

Magnecraft® high voltage reed relays

class 101VM

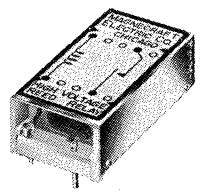
1,000 volts Peak @ .001 amp.
SPST-NO — Hi-Voltage.
In-Line Axial Leads.
Molded Bobbin.
Nom. Power 600 MW.
Life: 1 x 10^6 at rated load.
Weight: 1 oz. approx.



Miniature
1 x 1/2 x 7/16″

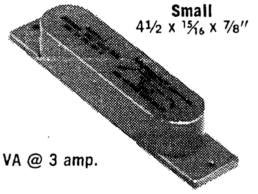
class 101VMPC

1,000 volts Peak @ .001 amp.
SPST-NO — Hi-Voltage.
Printed Circuit Mtg. —
Low Profile.
Nom. Power: 700 MW.
Life: 1 x 10^6
at rated load.
Weight: 2 oz. approx.



Miniature
1 1/8 x 39/64 x 3/8″

class 102V

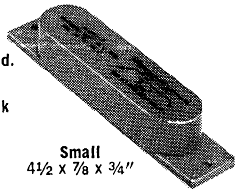


Small
4 1/2 x 15/16 x 7/8″

5,000 volts Peak or 50 VA @ 3 amp.
SPST-NO or SPST-NC.
Solder Terminals.
Nom. Power: SPST-NO — 500 MW, SPST-NC — 225 MW.
Life: 10 x 10^6 at rated load.
Weight: 3 oz. approx.

class 102HV & 102UHV

Molded Case — Encapsulated.
102HV — 10,000 volts Peak
@ .001 amp.
102UHV — 20,000 volts Peak
@ .001 amp.
SPST-NO — Hi-Voltage.
102HV Solder Terminals —
102UHV 6″ Coil Leads.
Nom. Power: 1.5 W.
Life: 1 x 10^6 at rated load.
Weight: 2 oz. approx.



Small
4 1/2 x 7/8 x 3/4″

IN STOCK FOR IMMEDIATE DELIVERY

Stock Part No.	Contacts	COIL — DC ‡MA	COIL — DC †Volts	COIL — DC *Ohms	Prices 1-24
W101VMX-1	SPST-NO	—	6	100	10.90
W101VMX-2		—	12	250	10.92
W101VMX-3		—	24	500	10.93
W101VMX-4		9	—	2500	11.12
W101VMPCX-1	SPST-NO	—	6	50	11.90
W101VMPCX-2		—	12	220	11.97
W101VMPCX-3		—	24	850	12.00
W101VMPCX-4		—	48	3300	12.22
W102VX-49	SPST-NO	—	6	70	13.69
W102VX-50		—	12	250	13.73
W102VX-51		—	24	1000	13.78
W102VX-52		—	48	4000	14.15
W102HVX-1	SPST-NO	—	6	25	19.88
W102HVX-2		—	12	100	19.88
W102HVX-3		—	24	400	19.88
W102UHVX-1	SPST-NO	—	6	25	33.62
W102UHVX-2		—	12	100	33.62
W102UHVX-3		—	24	400	33.62

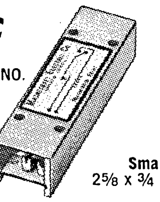
Stock Part No.	Contacts	COIL — DC †Volts	COIL — DC *Ohms	Nominal Power	Prices 1-24
W102VX-55	SPST-NC	24	2900	225mw	16.76

Magnecraft® power reed relays

IN STOCK FOR IMMEDIATE DELIVERY

class 102RMPC

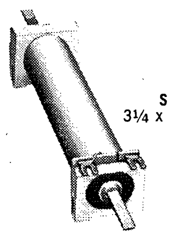
100 VA @ 3 amps — SPST-NO.
Printed Circuit Mtg. —
Low Profile.
Molded Bobbin and
Steel Cover.
Nom. Power:
500 MW.
Weight: 1 oz.
approx.



Small
2 5/8 x 3/4 x 41/64″

class 102RM

100 VA @ 3 amps —
SPST-NO.
Molded Bobbin.
In-Line Axial Leads
Nom. Power: 300 MW.
Weight: 1 oz. approx.



Small
3 1/4 x 19/32 x 1/2″

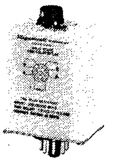
Stock Part No.	Contacts	COIL — DC ‡MA	COIL — DC †Volts	COIL — DC *Ohms	Prices 1-24
W102RMPCX-1	SPST-NO	—	6	70	7.87
W102RMPCX-2		—	12	250	7.88
W102RMPCX-3		—	24	1000	7.93
W102RMPCX-4		—	48	4000	8.18
W102RMX-5	SPST-NO 3-amps.	—	6	200	4.18
W102RMX-6		—	12	500	4.22
W102RMX-7		—	24	2000	4.33
W102RMX-8		—	48	5000	4.53

*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nominal or less for DC relays at 25°C.
††Current Specified Relays pull in at Specified Value or less.

MAGNECRAFT® ELECTRIC COMPANY

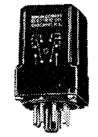
Magnecraft® time delay relays

solid state (hybrid) time delay relays



- Size 2⅞ x 2⅜ x 1¾".
- DPDT 10 amp output contacts.
- ±5% repeat accuracy.
- Adjustable delay up to 300 sec.
- 8 or 11 pin octal style plug.
- Solid state timing circuit.
- Weight: 10 oz. approx.

Stock Part No.	Contacts 10 Amps	Coil Voltage	Time Delay	Prices 1-9
Operate Delay				
W211ACPSOX-18			.2-1 Second	$18.98
W211ACPSOX-5			1-10 Second	18.98
W211ACPSOX-7	DPDT	120 VAC	1-180 Second	18.98
W211ACPSOX-8			2-300 Second	18.98
W211CPSOX-10			.2-1 Second	18.98
W211CPSOX-1			1-10 Second	18.98
W211CPSOX-3	DPDT	24 VDC	1-180 Second	18.98
W211CPSOX-4			2-300 Second	18.98
Release Delay				
W211ACPSRX-14			.2-1 Second	22.93
W211ACPSRX-5			1-10 Second	22.93
W211ACPSRX-7	DPDT	120 VAC	1-180 Second	22.93
W211ACPSRX-8	WD-12		2-300 Second	22.93
W211CPSRX-9			.2-1 Second	22.93
W211CPSRX-1	DPDT		1-10 Second	22.93
W211CPSRX-3	WD-12	24 VDC	1-180 Second	22.93
W211CPSRX-4			2-300 Second	22.93



NEW

Compact Size
2⅛ x
1⅜ x
1⅜"

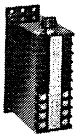
CLASS 214CP

Now in the size of a general purpose relay, Magnecraft has developed a fully adjustable solid state time delay relay.

- Repeat Accuracy: ±5% at nominal voltage, 25°C.
- Contacts: DPDT, 5 amps at 32VDC or 115VAC, res.
- Nominal Input: 120VAC.
- Steady State Current: 20 ma.
- Mode of Time Delay: Delay on operate.
- Timing Range: .300 to 30 sec.; 3 to 240 sec.
- Convenient top screw driver time adjustment.
- Reset and Recycle Time: Typically 100 ms.
- Transient protection to twice input voltage for 8 ms.
- Enclosure: Molded dust cover.
- Mounting: Standard 8 pin octal style plug-in.
- Weight: 3 oz. approx.

Stock Part No.	Con-tact	Input Volts	Timing Range	Price 1-9
W214ACPSOX-1	5 amp	120VAC	.300 to 30 sec.	21.27
W214ACPSOX-2	DPDT	120VAC	3 to 240 sec.	21.27

CLASS 211M

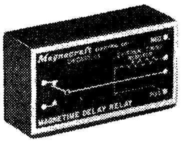


- Size 4½ x 4⅓₂ x 1½".
- DPDT 10 amp output contacts.
- ±5% repeat accuracy.
- Adjustable delay up to 300 sec.
- Mounting: Six 3⁄16" holes ½" x 4⅛" centers.
- Solid state timing circuit.
- Weight: 10 oz. approx.

Stock Part No.	Cont. 10 Amp	Nominal Voltage	Timing Range	Prices 1-9
TIME DELAY ON OPERATE				
W211MASOX-1			.2-1	$24.56
W211MASOX-2	DPDT	120 VAC	1.0-10	24.56
W211MASOX-3			1.0-180	24.56
W211MASOX-4			2.0-300	24.56
W211MSOX-1			.2-1	24.56
W211MSOX-2	DPDT	24 VDC	1.0-10	24.56
W211MSOX-3			1.0-180	24.56
W211MSOX-4			2.0-300	24.56
TIME DELAY ON RELEASE				
W211MASRX-1			.2-1	28.92
W211MASRX-2	DPDT	120 VAC	1.0-10	28.92
W211MASRX-3			1.0-180	28.92
W211MASRX-4			2.0-300	28.92
W211MSRX-1			.2-1	28.92
W211MSRX-2	DPDT	24 VDC	1.0-10	28.92
W211MSRX-3			1.0-180	28.92
W211MSRX-4			2.0-300	28.92

printed circuit mounting

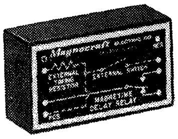
CLASS 502PCSO & 503PCSO



Size 2¼ x 1¼ x ¾"

- 15 VA @ 1 amp SPST-NO, 10 VA @ .5 amp SPDT reed output contacts.
- Repeat Accuracy: Slow operate ±5%.
- Adjustable delay up to 5 minutes, using a remote pot, or fixed resistor.
- Printed circuit mtg.
- Encapsulated solid state timing circuit.

CLASS 502PCSR & 503PCSR



Size 2¼ x 1¼ x ¾"

- 15 VA @ 1 amp SPST-NO, 10 VA @ .5 amp SPDT reed output contacts.
- Repeat Accuracy: Slow release ±2%.
- Adjustable delay up to 5 minutes, using a remote pot, or fixed resistor.
- Printed circuit mtg.
- Encapsulated solid state timing circuit.

SLOW OPERATE

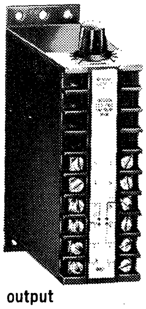
Stock Part No.	Volts DC ± 15%	Timing Range	*External Adjustment	Prices 1-9
SPST-NO (Form A)				
W502PCSOX-2	12	100 m sec. to 100 sec.	60K ohm/sec.	18.96
W502PCSOX-3	24	100 m sec. to 100 sec.	60K ohm/sec.	18.96
W502PCSOX-5	12	3 sec. to 5 min.	10K ohm/sec.	21.30
W502PCSOX-6	24	3 sec. to 5 min.	10K ohm/sec.	21.30
SPDT (Form C)				
W503PCSOX-2	12	100 m sec. to 100 sec.	60K ohm/sec.	20.82
W503PCSOX-3	24	100 m sec. to 100 sec.	60K ohm/sec.	20.82
W503PCSOX-5	12	3 sec. to 5 min.	10K ohm/sec.	22.31
W503PCSOX-6	24	3 sec. to 5 min.	10K ohm/sec.	22.31

SLOW RELEASE

Stock Part No.	Volts DC ± 15%	Timing Range	*External Adjustment	Prices 1-9
SPST-NO (Form A)				
W502PCSRX-2	12	200 m sec. to 100 sec.	25K ohm/sec.	26.73
W502PCSRX-3	24	200 m sec. to 100 sec.	25K ohm/sec.	26.73
W502PCSRX-5	12	1 sec. to 5 min.	6.5K ohm/sec.	29.84
W502PCSRX-6	24	1 sec. to 5 min.	6.5K ohm/sec.	29.84
SPDT (Form C)				
W503PCSRX-2	12	200 m sec. to 100 sec.	25K ohm/sec.	28.59
W503PCSRX-3	24	200 m sec. to 100 sec.	25K ohm/sec.	28.59
W503PCSRX-5	12	1 sec. to 5 min.	6.5K ohm/sec.	31.70
W503PCSRX-6	24	1 sec. to 5 min.	6.5K ohm/sec.	31.70

*External Resistor and/or switch, not furnished.

surface mounting with screw type terminals



CLASS 212M

±1% Repeat Accuracy

Size
4½ x
4⅓₂ x
1½"

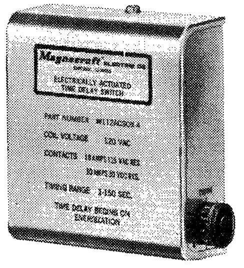
- DPDT 10 amp output contacts.
- ±1% repeat accuracy.
- Adjustable delay up to 500 sec.
- Mounting: Six 3⁄16" holes ½" x 4⅛" centers.
- Solid state timing circuit
- Weight: 10 oz. approx.

Stock Part Number†	Input Voltage	Time Delay	Mode Of Operation	Prices 1 — 9
W212MASOX-2	120VAC	.5 - 10 Sec.	Slow Operate	36.15
W212MASOX-3	120VAC	5 - 100 Sec.	Slow Operate	37.74
W212MASOX-4	120VAC	50 - 500 Sec.	Slow Operate	43.24
W212MASRX-2	120VAC	.5 - 10 Sec.	Slow Release	42.06
W212MASRX-3	120VAC	5 - 100 Sec.	Slow Release	43.82
W212MASRX-4	120VAC	50 - 500 Sec.	Slow Release	49.73

*Resistance Values ±10% at 25°C.
†Voltage Specified Relays pull in at 80% of nominal or less for DC relays and 85% of nominal or less for AC relays at 25°C.

air dashpot time delay relay

CLASS 112C

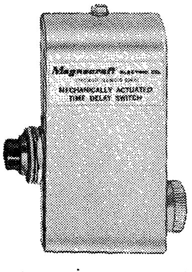


Size
3¹³⁄₁₆ x
4³⁄₁₆ x
1¾"

- DPDT 10 amp output contacts.
- ±10% repeat accuracy.
- Adjustable delay 1 to 150 sec.*
- Mounting: Two 3⁄16" holes on 3" centers.
- Air dashpot delay mechanism.
- Weight: 20 oz. approx.

* Mtd. in illustrated position.

CLASS 113C

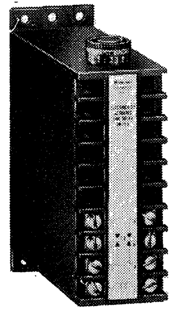


Size
3⅝ x
2⅟₁₆ x
1⁵⁄₃₂"

- SPDT 10 amp output contacts.
- Manually operated.
- Push button . . . release bottom . . . time delay is on adjustable delay 1 to 180 sec.*
- Weight: 8 oz. approx.

CLASS 112M

±10% Repeat Accuracy



Size
4½ x
4⅓₂ x
1½"

- DPDT 10 amp output contacts.
- ±10% repeat accuracy.
- Adjustable delay 1 to 150 sec.*
- Mounting: Six 3⁄16" holes ½" x 4⅛" centers.
- Air dashpot delay mechanism.
- Weight: 14 oz. approx.

IN STOCK FOR IMMEDIATE DELIVERY

Stock Part No.	Contacts 10 Amps	COIL		Prices 1-9
		†Volts	*Ohms	
		SLOW OPERATE		
W112ACSOX-4		120VAC	—	24.30
W112CSOX-3	DPDT	24VDC	80	24.30
		SLOW RELEASE		
W112ACSRX-4		120VAC	—	24.30
W112CSRX-3	DPDT	24VDC	80	24.30

Operate and release delay adjustable 1-150 sec.

Stock Part No.	Contacts 10 Amps	COIL		Adjustment Type	Prices 1-9
		†Volts	*Ohms		
		SLOW OPERATE			
W112MASOX-1		120VAC	—	Knob	28.23
W112MASOX-2	DPDT	120VAC	—	Screw	28.23
W112MSOX-2		24VDC	80	Knob	28.23
W112MSOX-3	DPDT	24VDC	80	Screw	28.23
		SLOW RELEASE			
W112MASRX-1		120VAC	—	Knob	28.23
W112MASRX-2	DPDT	120VAC	—	Screw	28.23
W112MSRX-1		24VDC	80	Knob	28.23
W112MSRX-2	DPDT	24VDC	80	Screw	28.23

*** Operate and Release Delay Adjustable 1-150 seconds.**

Stock Part No.	Contact Comb.	Contact Rating	Timing Range	Button Diameter	Prices 1 — 9
W113CX-1	SPDT	10 Amps	1-180 Sec.	½" Dia.	12.96

OHMITE SOLID STATE RELAYS

1
6
SOLID STATE RELAY
CAT. NO. SSB-3-SS-1
OHMITE MFG. CO.
SKOKIE, ILL. U.S.A.
2
7+

Originators of the **HIGH POWER SOLID STATE RELAY**

- for interfacing I.C. logic with power devices.
- highly sensitive, fast acting.
- complete false actuation protection
- positive turnoff of inductive loads.

MODEL SSB — TTL/DTL Compatible (ALL SOLID STATE)

"COIL"

Input Voltage: Any voltage within the range of 2.5 to 32 volts D.C. maximum.
Threshold Voltage: 3.5 V. maximum, 2.5 V minimum. (Specific threshold voltages between 2.5 and 3.5 V available on special order.)
Operate-Release Voltage: D.C. hysteresis maximum is 0.2 volts.
Input Current: 2 milliamps, maximum; 1.7 milliamps, typical, independent of voltage. Requires 7 milliwatts maximum, 5 milliwatts, typical.

MODEL SSA (ALL SOLID STATE)

"COIL"

Input Voltage: Any voltage within the range of 15 to 120 volts A.C. RMS or 10 to 185 volts D.C. maximum (non-polar).
Drop-out Voltage: 3 volts A.C. or D.C.
Input Current: 2 milliamps, maximum; 1.7 milliamps, typical, independent of voltage.

"CONTACTS"

Form: SPST-N.O., form A, 50/60 Hz, A.C. only.
Ratings: Maximum: 13 Amperes at 25°C (10 A. @ 40°C) mounted to an aluminum panel 6" x 6" x .125" or equivalent. 3 Amperes at 25°C (2 A. @ 40°C) unmounted, depending on model.
Minimum: 100 milliamps.
Voltage: 120, 240 VAC, RMS, depending on model.
Surge Current: Withstands at least 10 times rated current for 1 cycle of load current.
Voltage Drop: Closed ("ON"), 1 to 1.5 Volts, typical.
Impedance: Open ("OFF"), 26K ohms, typical.
Isolation: 500 gigaohms — "coil" to "contacts," "contacts" to mounting plate, mounting plate to "coil."
Dielectric Strength: 1500 V RMS — "coil" to "contacts," "contacts" to mounting plate, mounting plate to "coil."
Transient Protection: The relay is protected from transient voltages in both the "coil" and "contact" circuitry. Protection from **false actuation** resulting from transient voltages is a primary design feature. External transient protection devices are not only unnecessary, they are undesirable.
Speed of Operation: Pull-in: 0.5 millisec. max. **Drop-out:** ½ cycle load current.

TYPES AND RATINGS

All relays are SPST-N.O. SPDT and DPST-N.O. "contact" form also available.

MODEL SSB Catalog Number	MODEL SSA Catalog Number	Termination Style	Volts (RMS) 50/60 Hz	Ratings (Ambient, A.C.)			
				@ 25°C ambient		@ 40°C ambient	
				MTD*	Free Air	MTD*	Free Air
SSB-3-SS-1	SSA-3-SS-1	Quick-connect					
SSB-3-SS-3	SSA-3-SS-3	Screw		13	3	10	2
SSB-3-SS-4	SSA-3-SS-4	P.C. pins	120				
SSB-3-SS-5	SSA-3-SS-5	Octal base		3	3	2	2
SSB-3-SS-6	SSA-3-SS-6	Octal base with heat dissipator		—	7	—	6
SSB-4-SS-1	SSA-4-SS-1	Quick-connect					
SSB-4-SS-3	SSA-4-SS-3	Screw		13	3	10	2
SSB-4-SS-4	SSA-4-SS-4	P.C. pins	240				
SSB-4-SS-5	SSA-4-SS-5	Octal base		3	3	2	2
SSB-4-SS-6	SSA-4-SS-6	Octal base with heat dissipator		—	7	—	6

MODEL SSH — HYBRID RELAY (Reed Input, Triac Output)

"COIL"

Input Voltage: 5 to 30 volts DC, depending on Model.
Input Current: 10 to 33 milliamps, nominal, depending on Model.

"CONTACTS"

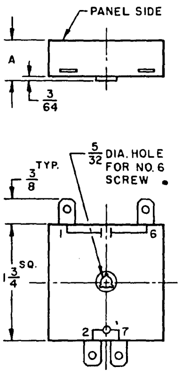
Form: SPST-N.O., form A, 50/60 Hz, 120 VAC.
Rating: See table for maximum ratings.
Surge Current: Withstands at least 10 times rated current for 1 cycle of load current.
Voltage Drop: Closed ("on"), 1.6 volt, typical.
Impedance: Open ("off"), 26K ohms, typical.
Isolation: 500 gigaohms between "coil" and "contacts," coil and case and contacts and case.
Dielectric Strength: 1500 V RMS.
Transient Protection: Components used in both the "coil" and "contact" are self-protecting devices. Protection from false actuation provided. Special commutator circuitry assures turn off under inductive loads.
Speed of Operation: Pull-in: Less than 1 millisecond. **Drop-out:** ½ cycle of load current.

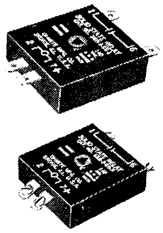
TYPES AND RATINGS

Catalog Number	Termination/Mounting Style	"COIL"					"Contact" Ratings (Max. Amperes @ 120 VAC)			
							@ 25°C ambient		@ 40°C ambient	
		Volts Input (D.C.)	Input Current milli-amps	Thresh-old Voltage	Dropout Voltage	Imped-ance	Mtd*	Free Air	Mtd*	Free Air
SSH6-3A-SS-1	Quick-Connect/Solder									
-3	Screw	5 to 9	33 ma. nom.	5 V. max. 1 V. min.	0.5 V.	150 Ω nom.	8	3.5	8	2.5
-4	P.C. pins									
-5	Octal base						—	3.5	—	2.5
-6	Octal base with heat dissipator						—	5.0	—	4.0
SSH6-3C-SS-1	Quick-Connect/Solder									
-3	Screw	5 to 9	33 ma. nom.	5 V. max. 1 V. min.	0.5 V.	150 Ω nom.	15	3.5	10.5	2.5
-4	P.C. pins									
-5	Octal base						—	3.5	—	2.5
-6	Octal base with heat dissipator						—	7.5	—	5.0
SSH12-3A-SS-1	Quick-Connect/Solder									
-3	Screw	10 to 18	17 ma. nom.	10 V. max. 3 V. min.	1 V.	600 Ω nom.	8	3.5	8	2.5
-4	P.C. pins									
-5	Octal base						—	3.5	—	2.5
-6	Octal base with heat dissipator						—	5.0	—	4.0
SSH12-3C-SS-1	Quick-Connect/Solder									
-3	Screw	10 to 18	17 ma. nom.	10 V. max. 3 V. min.	1 V.	600 Ω nom.	15	3.5	10.5	2.5
-4	P.C. pins									
-5	Octal base						—	3.5	—	2.5
-6	Octal base with heat dissipator						—	7.5	—	5.0
SSH24-3A-SS-1	Quick-Connect/Solder									
-3	Screw	20 to 30	10 ma. nom.	20 V. max. 5 V. min.	2 V.	2000 Ω nom.	8	3.5	8	2.5
-4	P.C. pins									
-5	Octal base						—	3.5	—	2.5
-6	Octal base with heat dissipator						—	5.0	—	4.0
SSH24-3C-SS-1	Quick-Connect/Solder									
-3	Screw	20 to 30	10 ma. nom.	20 V. max. 5 V. min.	2 V.	2000 Ω nom.	15	3.5	10.5	2.5
-4	P.C. pins									
-5	Octal base						—	3.5	—	2.5
-6	Octal base with heat dissipator						—	7.5	—	5.0

*Mounted to aluminum panel 6" x 6" x ⅛" or equivalent.

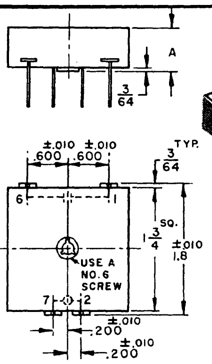
STYLE 1
STYLE 3

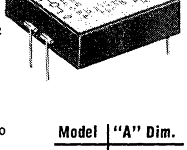




Model	"A" Dim.
SSA	39/64
SSB	39/64
SSH	51/64

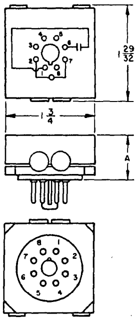
STYLE 4

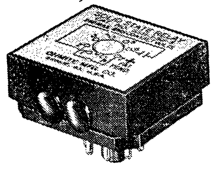




Model	"A" Dim.
SSA	39/64
SSB	39/64
SSH	51/64

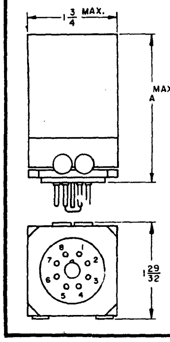
STYLE 5

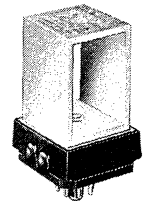




Model	"A" Dim.
SSA	27/32
SSB	27/32
SSH	1 1/32

STYLE 6





Model	"A" Dim.
SSA	2 27/32
SSB	2 27/32
SSH	3 1/32

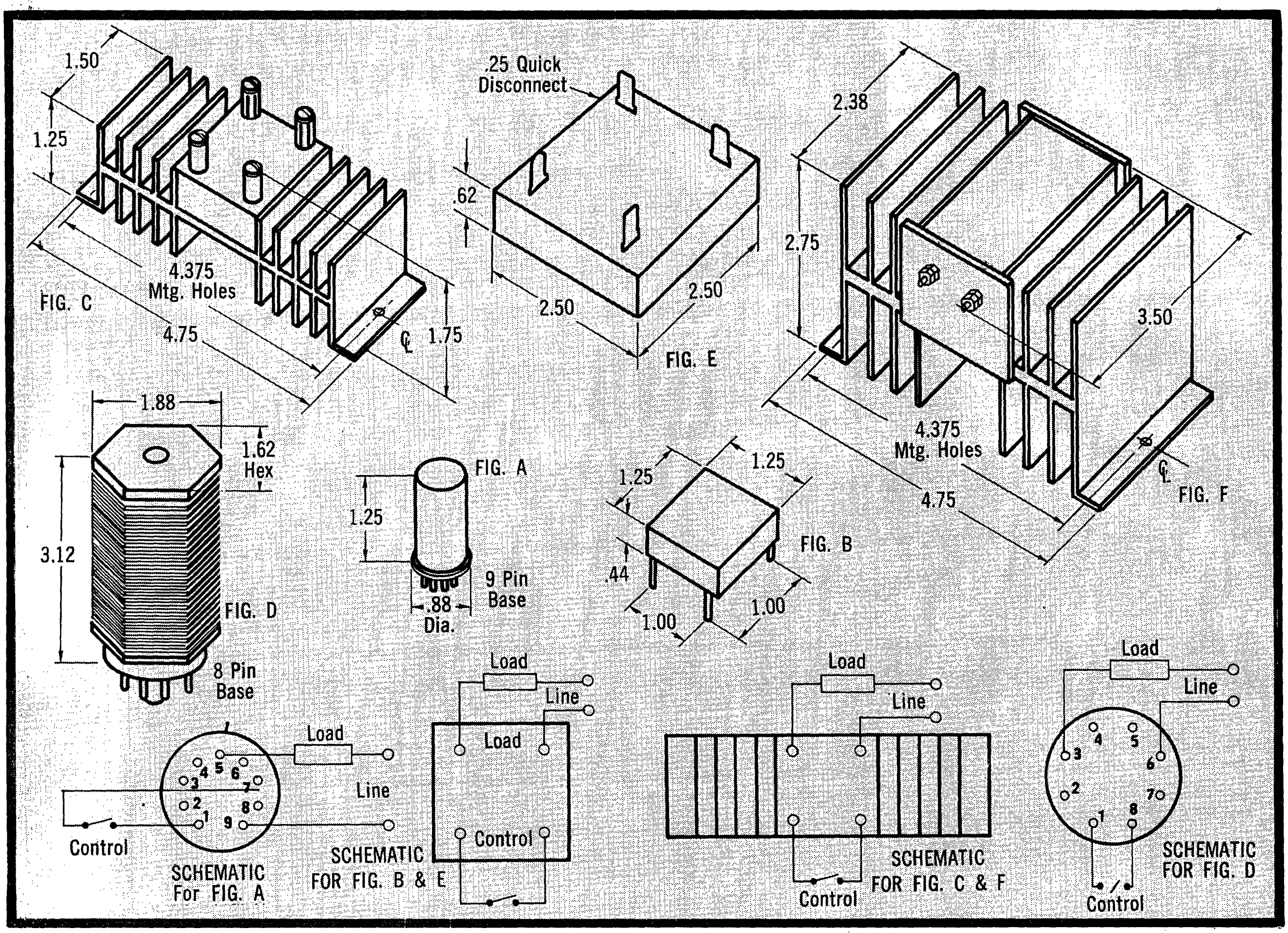
ELECTROMECHANICAL RELAYS

For complete details on General Purpose 5 & 10 A Relays, Series GPR & DO, see Radio Master Catalog or write for Catalog 700.

OHMITE MFG. CO., a NORTH AMERICAN PHILIPS company • 3635 HOWARD STREET, SKOKIE, ILLINOIS 60076 / PHONE (312) 675-2600 / TWX: 910-223-0805 / TELEX 72-4433

PHILADELPHIA SCIENTIFIC CONTROLS INCORPORATED
MANUFACTURER OF PRECISION THERMO, ELECTRONIC CONTROLS AND EDUCATIONAL EQUIPMENT
1135 CEDAR AVENUE • CROYDON, PENNSYLVANIA 19020 • TELEPHONE (215) 785-3282

PSC SOLID STATE "NON DRIVEN" RELAYS


1.50
1.25
4.375 Mtg. Holes
FIG. C
4.75
℄ 1.75
.25 Quick Disconnect
.62
2.50
2.50
FIG. E
2.38
2.75
3.50
4.375 Mtg. Holes
4.75
℄
FIG. F
1.88
1.62 Hex
3.12
FIG. D
8 Pin Base
FIG. A
1.25
9 Pin Base
.88 Dia.
1.25
1.25
.44
1.00
1.00
FIG. B
Load
Line
Control
1 2 3 4 5 6 7 8 9
SCHEMATIC For FIG. A
Load
Line
Load
Control
SCHEMATIC FOR FIG. B & E
Load
Line
Control
SCHEMATIC FOR FIG. C & F
Load
Line
1 2 3 4 5 6 7 8
Control
SCHEMATIC FOR FIG. D

PSC solid state relays have no moving parts, no contacts and no coils, thereby eliminating all possibility of burnt contacts, open coils, and mechanical failures due to ware inherent in mechanical relays. Contact resistance always remains constant. The absence of contacts allows operation in explosive atmospheres. The absence of moving parts permits operation in all positions and in high shock and vibration environments. All PSC relays are encased in high temperature epoxy hermetically sealing the components against hostile atmosphere.

PSC solid state relays are self-powered and require no drive voltage. The control current is exceptionally low permitting the use of extremely sensitive switches and the use of long control lines.

PC Board and 9 pin socket mounting provide versatile design latitudes.

Semiconductor contacts in PSC relays have very high "off" resistances and a voltage drop of less than 1 volt in the-on-condition.

APPLICATIONS

- VENDING MACHINE — REMOTE INDICATORS
- SIGNS — VALVE CONTROLS — ALARMS
- PHOTO RELAYS—TEMP. SWITCHES
- AIR HANDLING CONTROLS
- LONG DISTANCE LINES — GRAIN ELEVATORS
- PLASTIC GRANULATORS
- EXPLOSIVE GAS SOLENOIDS
- INFLAMMABLE FUELS
- PUMPING AND DISTILLING
- HEATING BLANKET CONTROLS

FEATURES

INFINITE LIFE — NO DRIVE VOLTAGE REQD. INTRINSICALLY SAFE

LOW R.F.I. — LOW PHASE DISTORTION INSENSITIVE TO VIBRATION

VOLTAGES: AC 115V — 220V — DC 5-48V

CURRENTS: 1 AMP, 5 AMP, 16 AMP, 25 AMP

FREQUENCY: 50-400

CONTROL CURRENT: 5 MA. TYPICALLY

NORMALLY OPEN OR NORMALLY CLOSED AVALANCHE PROTECTION

OPERATING CHARACTERISTICS (COMMON)

CONTROL CURRENT: 5 MA
AMBIENT OPERATION TEMP.:
−20° TO +135°F
CONTACT ARRANGEMENT:
SINGLE POLE SINGLE THROW
NORMALLY OPEN OR NORMALLY CLOSED
CLOSED SERIES RESISTANCE: 2 OHMS
OPEN SERIES RESISTANCE: 10K TO 15 MEG

OPERATING CHARACTERISTICS (SPECIAL)

OPERATING VOLTAGE: 115 TO 220 VAC
LOAD CURRENT: 1 TO 25 AMP
FREQUENCY 50 TO 400
(SPECIFY IF NOT 60)
MODE NORMALLY OPEN OR NORMALLY CLOSED

Model No.	Load Current	Figure	Load Voltage
SS01115A	1A	A or B	115 VAC
SS05115A	5A	C or D	
SS16115A	16A	E or F	
SS25115A	25A	E or F	
SS01220A	1A	A or B	220 VAC
SS05220A	5A	C or D	
SS16220A	16A	E or F	
SS25220A	25A	E or F	
SS01028D	1A	A or B	5-48 VDC
SS05028D	5A	C or D	
SS16028D	16A	E or F	
SS25028D	25A	E or F	

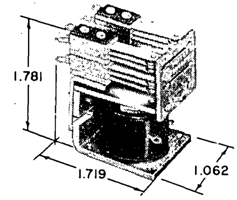
When Ordering: Give Model No. and Arrangement, "O" — Normally Open "C" — Normally Closed

FOR FURTHER INFORMATION FEEL FREE TO CALL OR WRITE PSC

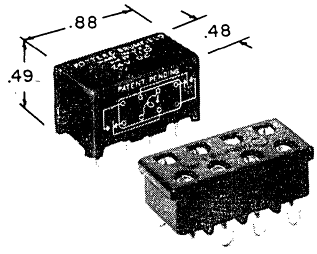
AMF | POTTER & BRUMFIELD
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

GENERAL PURPOSE RELAYS

GA SERIES Low cost, all purpose, multiple contact, voltage switching relay. Used for many industrial control applications. Tinned, pierced solder type terminals. Contacts: 3/16" dia. silver, designed for maximum self-cleaning action. Mounting: No. 8-32 tapped core with locating boss. Weight: 3½ ozs. See GF series for similar relays having 10 amp ratings.



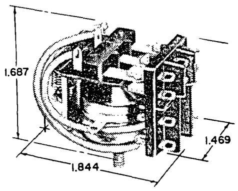
HP SERIES This commercial microminiature relay is recommended for applications requiring high performance in minimum space, such as TV cameras, dictating machines, desk top computers, copying machines and others. For circuit board or socket mounting and encased in a high impact dust cover, the HP is a half crystal case size relay with terminals on a .200" grid.



9HP1 solder terminal socket and retainer for HP relay. Box of 10 **NET $4.75**

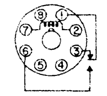
Additional specifications of HP series.

KA AND KAP SERIES Small, low cost, highly efficient general purpose relays for handling light power loads such as small motors, solenoids and other relays, and general automation work. All KA and KAP relays with "Y" suffix bear CSA* listing and carry U/L component recognition (File No. E22575). Mechanical life expectancy: 10 million operations. Duty: Continuous. Contacts: Movable, 1/8" dia. gold-flashed silver; stationary, 5/32" dia. wide silver overlay.

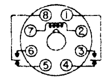


The KA is the open version of this series. Mounting: One No. 6-32 threaded stud and locating tab on 7/16" centers. Weight: 2 ozs. The KAP is the enclosed model and is protected by a clear, high impact plastic dust cover. Terminals: 8 or 11-pin plug. Weight: 3 ozs.

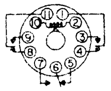
"G" suffix indicates silver-cadmium-oxide contacts on movables rated 10 amps.



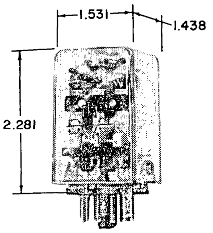
KAP5



KAP11



KAP14

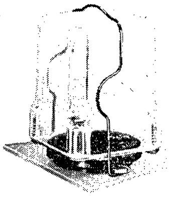


HOLD DOWN SPRINGS Designed to insure secure mounting of relays in any position. Will accommodate machine screws or rivets.

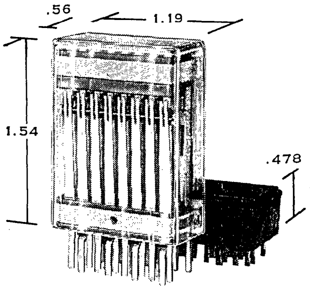
For KAP relays: (shown above)
9KA1 50 per box **NET $5.80**

For KCP and KRP relays (pages 5 and 2)
9KR15 50 per box **NET $5.80**

For KUP plain case relays (page 3)
9KU3 50 per box **NET $5.25**



KDP SERIES This compact, general purpose DC relay offers 8 Form C (8PDT) switching with bifurcated gold over silver contacts rated 1 amp @ 30V DC, resistive, or 0.5 amp @ 120V AC. Designed for dense packaging applications, the KDP provides electrical isolation on both the input and switching sides. Operate speed is 15 milliseconds @ nominal voltage @ 25°C. Mechanical life expectancy: in excess of 10 million operations. Duty: Continuous. Enclosure: Clear polycarbonate dust cover. Mounting: Solder terminal sockets with snap-lock spring for front insertion into chassis or panel. Approximate weight without socket: 1.3 ozs.



9KD2 Solder terminal sockets
Box of 10 **NET $9.50**

9KD3 Hold down springs
Box of 50 **NET $5.50**

GENERAL PURPOSE RELAYS

TYPE	COILS		CONTACTS			SUGG. RE-SALE PRICE
	Voltage or Current	Res. in Ohms	Nom. Power	Arrange-ment	Amp Rating	
GA11A	6V 12V 24V 120V	1.7 6.8 24 690	6VA	DPDT	5	$3.85 3.85 3.85 3.85
GA11D	6V 12V 24V 110V	18 72 288 6,050	2.0W	DPDT	5	3.85 3.85 3.85 4.35
GA14A	24V 120V	24 690	6VA	3PDT	5	4.60 4.60
GA17A	6V 12V 24V 120V 240V	1.7 6.8 24 690 2,950	6VA	4PDT	5	5.55 5.55 5.55 5.55 5.95
GA17D	6V 12V 24V 110V	18 72 288 6,050	2.0W	4PDT	5	5.55 5.55 5.55 6.05
HP11D§	12V 24V	218 870	.662W	DPDT	2	8.35 8.35
KA5AY	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	SPDT	5	3.70 3.70 3.70 3.70 4.20
KA5AG	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	SPDT	10	3.75 3.75 3.75 3.75 4.25
KA5DY	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	5	3.55 3.55 3.55 4.25
KA5DG	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	10	3.60 3.60 3.60 4.30
KA11AY	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	DPDT	5	4.50 4.50 4.50 4.50 4.90
KA11AG	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	DPDT	10	4.60 4.60 4.60 4.60 5.00
KA11DY	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	5	3.95 3.95 3.95 4.65
KA11DG	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	10	4.10 4.10 4.10 4.80
KA14AY	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	3PDT	5	4.90 4.90 4.90 4.90 5.40
KA14AG	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	3PDT	10	5.10 5.10 5.10 5.10 5.60
KA14DY	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	5	4.45 4.45 4.45 5.15
KA14DG	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	10	4.65 4.65 4.65 5.35
KAP5AG§	24V 120V	75 2,250	2VA	SPDT	10	6.40 6.40
KAP5DG§	24V 110V	472 10,000	1.2W	SPDT	10	6.30 7.00
KAP11AY§	24V 120V 240V	75 2,250 9,110	2VA	DPDT	5	7.05 7.05 7.45
KAP11AG§	6V 24V 120V	6 75 2,250	2VA	DPDT	10	7.15 7.15 7.15
KAP11DG§	24V 110V	472 10,000	1.2W	DPDT	10	7.10 7.80
KAP11DY§	12V 24V 110V	120 472 10,000	1.2W	DPDT	5	7.00 7.00 7.70
KAP14AY§	24V 120V 240V	75 2,250 9,110	2VA	3PDT	5	8.70 8.70 9.10
KAP14AG§	24V 120V	75 2,250	1.2W	3PDT	10	8.85 8.85
KAP14DG§	24V 110V	472 10,000	1.2W	3PDT	10	8.80 9.50
KAP14DY§	12V 24V 110V	120 472 10,000	1.2W	3PDT	5	8.60 8.60 9.30
KDP29D11§	24V	580	1W	8PDT	.5	9.35

§ Enclosed Relay
† Sealed Relay

---

* Canadian Standards Assoc. File No. LR-15734

GENERAL PURPOSE RELAYS (CONTINUED)

KL SERIES Multiple contact relay. Varied contact combinations and high dielectric phenolic insulation affords extreme versatility and utility. Widely used in such applications as industrial controls, elevator controls, communications equipment and electronic measuring devices. Mounting: All models — Two No. 6-32 tapped holes on 1$\frac{7}{16}$" centers. Contacts: $\frac{1}{8}$" dia. gold-flashed silver. Weight: 5 ozs.

KHU/KHP/KHS SERIES Small, rugged, 4PDT, available for AC or DC operation. Only KHU relays carry Underwriters' Laboratories component recognition. KHU and KHP have nylon dust covers; KHS is hermetically sealed in metal enclosure. These relays are designed to meet the exacting requirements of data processing, computer and process control applications. Contacts are $\frac{3}{32}$" gold-flashed silver and are rated 3 amps @ 30V DC or 120V AC resistive for 100,000 operations. "12" suffix indicates silver-cadmium-oxide contacts. Mounting: Solder terminals with a No. 3-48 $\frac{5}{16}$" long. Adaptable to sockets (below) with printed circuit or solder lug terminals. Weights without sockets; KHU or KHP 1$\frac{1}{8}$ ozs. KHS 1$\frac{5}{8}$ ozs.

KHU/KHP hold down spring (similar to KCP-KRP, above).

9KH3 50 per box, weight 3 ozs. **NET $5.50**

9KH1 Solder terminal sockets and retainers.
Box of 10 **NET $6.60**

9KH2 Printed circuit terminal sockets.
Box of 10 **NET $6.60**

Weight per box: 4 ozs.

KRP SERIES Versatile, multi-contact arrangement. Enclosed in a clear high impact plastic dust cover. Standard 8-pin octal-type plug for KRP5 and KRP11, 11-pin for KRP-14. Weight: Approx. 3 ozs. Contacts: 5 amp, $\frac{3}{16}$" dia. gold-flashed silver, 10 amp $\frac{3}{16}$" dia. silver cadmium-oxide. See KCP-KRP hold down spring for special mounting applications. See KRP-N indicator lamp relay for current monitoring applications.

KRP-N INDICATOR LAMP RELAY A general purpose relay incorporating a lamp to indicate current or voltage availability in power circuit. Contacts: $\frac{3}{16}$" dia. silver cadmium-oxide. Enclosure: Clear, high impact plastic dust cover. Mounting: Standard octal plug. Weight: Approx. 3 ozs.
Hold down spring (Please see page 1).

"P" — CASE A clear high impact plastic case for mounting rectifiers, capacitors, resistors or a combination of these. Available with octal-type plug with 8 or 11-pins. Comes complete with four screws. Weight: .5 ozs. each. See KCP-KRP Hold Down Spring for special mounting applications.

35D070 Case (8-pin plug) **NET $ .65**

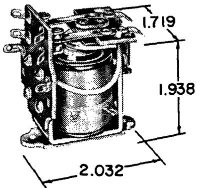
35D072 Case (11-pin plug) **NET $ .80**

R40 SERIES SLIMLINE DC operated 4PDT relays are designed for printed circuit board use. Provide low profile — only .43" thick. Allows easy PC board layout and .6" board mounting centers. Switching range is from true dry circuit to 5 amperes in a variety of contact styles. A wide range of coil voltages offered. Pull-in power: 400 mw.

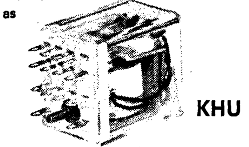
9XR40-1 Right angle sockets with printed circuit pin terminals for R40 Slimline relays, retainers included.
Box of 10 **NET $13.50**

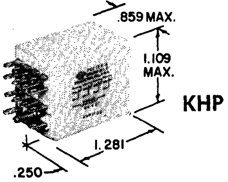
9XR40-2 Vertical socket with printed circuit pin terminals for R40 Slimline relays, retainers included.
Box of 10 **NET $9.50**

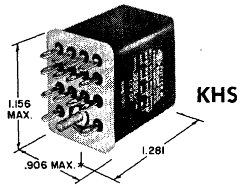
9XR40-3 Chassis mount socket with solder terminals for R40 Slimline relays, retainers and mounting clip included.
Box of 10 **NET $10.00**

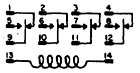


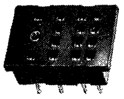
Dimensions same as KHP

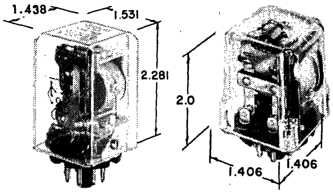


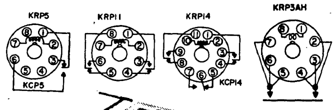


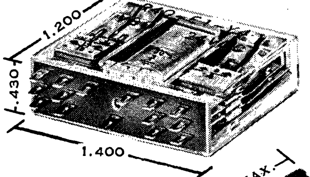


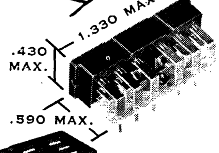


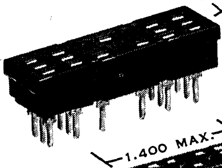


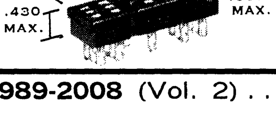












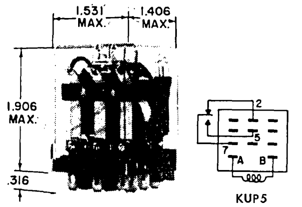
	GENERAL PURPOSE RELAYS					
TYPE	COILS			CONTACTS		SUGG. RESALE PRICE
	Voltage or Current	Resistance in Ohms	Nominal Power	Arrangement	Rate in Amps	
KL5A	120V	760	2.9VA	SPDT	5	$4.25
KL5D	24V	600	1.1W	SPDT	5	4.00
KL11A	12V 24V 120V	7.8 33 760	2.9VA	DPDT	5	5.30 5.30 5.30
KL14A	24V 120V	33 760	2.9VA	3PDT	5	5.90 5.90
KL14D	24V 110V	600 10,000	1.1W	3PDT	5	5.65 6.35
KL17A	6V 24V 120V	2.25 33 760	2.9VA	4PDT	5	7.35 7.35 7.35
KL17D	12V 24V 110V	140 600 10,000	1.1W	4PDT	5	6.95 6.95 7.65
KHP17A11§	6V 12V 24V 120V	10.5 43 160 3,900	1.2VA	4PDT	3	5.55 5.55 5.55 6.05
KHU17D11§	6V 12V 24V	40 160 650	900MW	4PDT	3	5.05 5.05 5.05
KHU17D11§	48V 90V 110V	2,600 9,000 11,000	900MW	4PDT	3	5.25 5.90 5.90
KHU17D12§	24V 110V	650 11,000	900MW 900MW	4PDT 4PDT	3 3	5.20 5.05
KHU17A11§	6V 12V 24V 120V	10.5 43 160 3,900	1.2VA	4PDT	3	5.55 5.55 5.55 6.05
KHP17D11§	6V 12V 24V	40 160 650	900MW	4PDT	3	5.05 5.05 5.05
KHP17D11§	48V 90V 110V	2,600 9,000 11,000	900MW	4PDT	3	5.25 5.90 5.90
KHP17D12§	24V 110V	650 11,000	900MW 900MW	4PDT 4PDT	3 3	5.20 6.05
KHS17A11†	6V 12V 24V 120V	10.5 43 160 3,900	1.2VA	4PDT	3	9.55 9.55 9.55 9.90
KHS17D11†	6V 12V 24V 110V	40 160 650 11,000	900MW	4PDT	3	8.55 8.55 8.55 9.40
KRP5A§	6V 24V 120V	6 75 2,250	2VA	SPDT	5	6.30 6.30 6.30
KRP5AG§	6V 24V 120V	6 75 2,250	2VA	SPDT	10	6.45 6.45 6.45
KRP5D§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	5	6.25 6.25 6.25 6.95
KRP5DG§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	SPDT	10	6.40 6.40 6.40 7.10
KRP11A§	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	DPDT	5	7.00 7.00 7.00 7.00 7.45
KRP11AG§	6V 12V 24V 120V 240V	6 21 75 2,250 9,100	2VA	DPDT	10	7.25 7.25 7.25 7.25 7.70
KRP11D§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	5	6.95 6.95 6.95 7.65
KRP11DG§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	DPDT	10	7.20 7.20 7.20 7.90
KRP14A§	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	3PDT	5	8.70 8.70 8.70 8.70 9.15
KRP14AG§	6V 12V 24V 120V 240V	6 21 75 2,250 9,100	2VA	3PDT	10	9.05 9.05 9.05 9.05 9.50
KRP14D§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	5	8.60 8.60 8.60 9.30
KRP14DG§	6V 12V 24V 110V	32.1 120 472 10,000	1.2W	3PDT	10	8.95 8.95 8.95 9.65
KRP11AN§	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	DPDT	10	8.30 8.30 8.30 8.30 8.75
KRP11DN§	6V 12V 24V 110V	32.1 120 420 10,000	1.2W	DPDT	10	8.20 8.20 8.20 8.95
KRP14AN§	6V 12V 24V 120V 240V	6 21 75 2,250 9,110	2VA	3PDT	10	10.10 10.10 10.10 10.10 10.55
R40-E1-X4 -V200 -V800	12VDC 24VDC	200 800	1.6W	4PDT	5	5.60 5.60
R40-E1-Y4 -V50 -V200 -V800 -V3.2K	6VDC 12VDC 24VDC 48VDC	50 200 800 3.2K	1.6W	4PDT	2	5.35 5.35 5.35 5.35
R40-E1-Z4 -V200 -V800	12VDC 24VDC	200 800	1.6W	4PDT	100mA	5.85 5.85
R40-E1-L4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	500μA	6.80 6.80 6.80
R40-E2-X4 -V50 -V200 -V800	6VDC 12VDC 24VDC	50 200 800	1.6W	4PDT	5	5.60 5.60 5.60
R40-E2-Y4 -V200 -V800	12VDC 24VDC	200 800	1.6W	4PDT	2	5.35 5.35
R40-E2-Z4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	100mA	5.85 5.85 5.85
R40-E3-X4 -V200 -V800	12VDC 24VDC	200 800	1.6W	4PDT	5	5.60 5.60
R40-E3-Y4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	2	5.35 5.35 5.35
R40-E3-Z4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	100mA	5.85 5.85 5.85
R40-E3-L4 -V200 -V800 -V3.2K	12VDC 24VDC 48VDC	200 800 3.2K	1.6W	4PDT	500μA	6.80 6.80 6.80

† Sealed Relay
§ Enclosed Relay

AMF | POTTER & BRUMFIELD
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

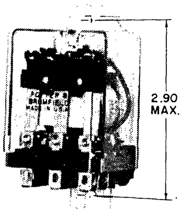
GENERAL PURPOSE RELAYS (CONTINUED)

KUP SERIES This reliable 10-ampere relay for industrial control is available with a socket that is also rated 10 amperes. The .187" terminals of the relay are of the quick-connect/solder type. Sockets are priced separately and their terminals are of the pierced solder type. The KUP is enclosed in a clear, high impact plastic dust cover. Silver-cadmium-oxide contacts assure long contact life. Operation: Continuous.



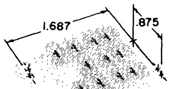
KUP SERIES With slotted flange for direct-to-chassis mounting. Identical in both electrical and mechanical specifications as the KUP described above, except that they are not suitable for socket mounting. The .187" terminals are of the quick-connect/solder type. Slot width: .156". Weight: 3 ozs.

All models carry U/L Component Recognition.



9KU1 Pierced solder terminals sockets for KUP plain case relays. Rated 10 amperes; molded nylon. Mounting hole .165" dia.

Box of 5 **NET $3.95**

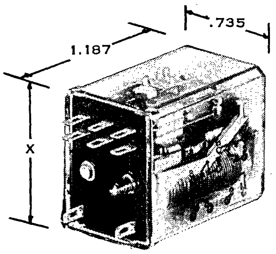


9KU5 Sockets with .187" quick-connect terminals. Mounting hole .165" dia.

Box of 5 **NET $6.30**

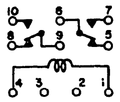
9KU2 Printed circuit pin terminal sockets for KUP relays. Will accept .187" terminals of KUP in plain case. Molded nylon. Mounting hole .165" dia.

Box of 5 **NET $4.75**

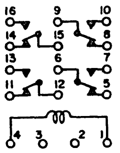


X= .950 (2PDT)
1.165 (4PDT)
1.375 (6PDT)

R10-E1 SERIES DC operated industrial relays provide sensitivity of 125 mw per pole. DPDT to 6PDT contact arrangements are available with three contact styles for .100 mA 2 amps or 5 amps. Operating temperature is −55°C to +72°C. U/L File No. 42810. Solder terminals, No. 3-48 stud or plug-in sockets are available for relay mounting (see sockets below). Wire retainer and pre-installed grounding provision included with sockets. R10-E1-Z SERIES has bifurcated low level contacts. "J" Sensitive Current Adjustment: 85 mw (DPDT); 175 mw (4PDT).



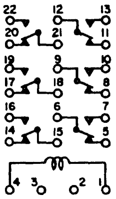
2 POLE



4 POLE

9XR10-1 Solder terminal sockets and retainers for 2PDT R10 relays.

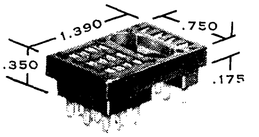
Box of 10 **NET $5.50**



6 POLE

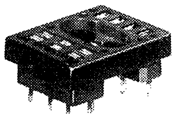
9XR10-2 Solder terminal sockets and retainers for 4PDT R10 relays.

Box of 10 **NET $7.00**



9XR10-3 Solder terminal sockets and retainers for 6PDT R10 relays.

Box of 10 **NET $9.00**



GENERAL PURPOSE RELAYS

TYPE	COILS			CONTACTS		SUGG. RESALE PRICE
	Input	Resistance in Ohms	Nominal Power	Arrangement	Amp Rating	
KUP5A15§	6V	6	2VA	SPDT	10	$4.10
	12V	21				4.10
	24V	75				4.10
	120V	2,250				4.10
	240V	9,110				4.55
KUP5D15§	6V	32.1	1.2W	SPDT	10	3.95
	12V	120				3.95
	24V	472				3.95
	110V	10,000				4.60
KUP11A15§	6V	6	2VA	DPDT	10	5.00
	12V	21				5.00
	24V	75				5.00
	120V	2,250				5.00
	240V	9,110				5.45
KUP11D15§	6V	32.1	1.2W	DPDT	10	4.50
	12V	120				4.50
	24V	472				4.50
	110V	10,000				5.20
KUP14A15§	6V	4.2	2.75VA	3PDT	10	5.60
	12V	18				5.60
	24V	72				5.60
	120V	1,700				5.60
	240V	7,200				6.05
KUP14D15§	6V	32.1	1.2W	3PDT	10	5.15
	12V	120				5.15
	24V	472				5.15
	110V	10,000				5.60
KUP5A55§*	120V	2,250	2VA	SPDT	10	4.10
KUP5D55§*	24V	472	1.2W	SPDT	10	3.95
KUP11A55§*	24V	75	2VA	DPDT	10	5.00
	120V	2,250				5.00
KUP11D55§*	6V	32.1	1.2W	DPDT	10	4.50
	12V	120				4.50
	24V	472				4.50
	110V	10,000				5.20
KUP14A55§*	6V	4.2	2.75VA	3PDT	10	5.60
	12V	18				5.60
	24V	72				5.60
	120V	1,700				5.60
	240V	7,200				6.05
KUP14D55§*	6V	32.1	1.2W	3PDT	10	5.15
	12V	120				5.15
	24V	472				5.15
	110V	10,000				5.60
R10-E1-Y2			690mW	2PDT	2	
-V52	6VDC	52				3.25
-V185	12VDC	185				3.25
-V700	24VDC	700				3.25
-V2.5K	48VDC	2,500				3.25
-V15.0K	115VDC	15,000				4.95
R10-E1-Y4			690mW	4PDT	2	
-V52	6VDC	52				3.60
-V185	12VDC	185				3.60
-V700	24VDC	700				3.60
-V2.5K	48VDC	2,500				3.60
-V15.0K	115VDC	15,000				5.30
R10-E1-Y6			1.4W	6PDT	2	
-V25	6VDC	25				4.65
-V90	12VDC	90				4.65
-V430	24VDC	430				4.65
-V1.5K	48VDC	1,500				4.65
-V9.0K	115VDC	9,000				5.55
R10-E1-X2			690mW	2PDT	5	
-V52	6VDC	52				3.35
-V185	12VDC	185				3.35
-V700	24VDC	700				3.35
-V2.5K	48VDC	2,500				3.35
-V15.0K	115VDC	15,000				5.05
R10-E1-X4			690mW	4PDT	5	
-V52	6VDC	52				3.85
-V185	12VDC	185				3.85
-V700	24VDC	700				3.85
-2.5K	48VDC	2,500				3.85
-V15.0K	115VDC	15,000				5.55
R10-E1-X6			1.4mW	6PDT	5	
-V25	6VDC	25				5.05
-V90	12VDC	90				5.05
-V430	24VDC	430				5.05
-V.15K	48VDC	1,500				5.05
-V9.0K	115VDC	9,000				5.95
R10-E1-X2 -115VAC	115VAC	4.8K (Diodes)	2VA	2PDT	5	4.50
R10-E1-X4 -115VAC	115VAC	4.8K (Diodes)	2VA	4PDT	5	5.40
R10-E1-Z2			690mW	2PDT	100mA	
-52	6VDC	52				3.65
-V185	12VDC	185				3.65
-V700	24VDC	700				3.65
-V2.5K	48VDC	2,500				3.65
-V15.0K	115VDC	15,000				5.35
R10-E1-Z4			690mW	4PDT	100mA	
-V52	6VDC	52				4.10
-V185	12VDC	185				4.10
-V700	24VDC	700				4.10
-V2.5K	48VDC	2,500				4.10
-V15.0K	115VDC	15,000				5.80
R10-E1-Z6			1.4W	6PDT	100mA	
-V25	6VDC	25				5.30
-V90	12VDC	90				5.30
-V430	24VDC	430				5.30
-V1.5K	48VDC	1,500				5.30
-V9.0K	115VDC	9,000				6.20
R10-E1-V2			85mW	2PDT	2	
-J2.5K	5.8mA	2,500				3.55
-J5.0K	4.1mA	5,000				4.05
-J10.0K	3.1mA	10,000				4.45
R10-E1-Y4			175mW	4PDT	2	
-J2.5K	8.4mA	2,500				3.95
-J5.0K	6.2mA	5,000				4.45
-J10.0K	4.5mA	10,000				4.85
R10-E1-Z4			175mW	4PDT	100mA	
-J1.0K	13.0mA	1,000				4.45
-J2.5K	8.4mA	2,500				4.45
-J5.0K	6.2mA	5,000				4.95
R10-E2-Y2			690mW	2PDT	2	
-V185	12VDC	185				3.25
-V700	24VDC	700				3.25
R10-E2-Y4			690mW	4PDT	2	
-V185	12VDC	185				3.60
-V700	24VDC	700				3.60
R10-E2-Z4			690mW	4PDT	100mA	
-V185	12VDC	185				4.10
-V700	24VDC	700				4.10

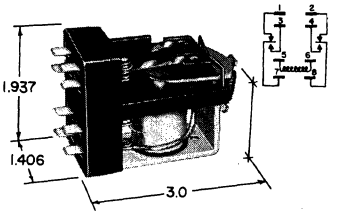
† Sealed Relay
§ Enclosed Relay

AMF | POTTER & BRUMFIELD

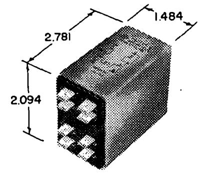
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

POWER RELAYS

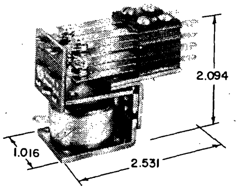
AB SERIES For appliance and general purpose applications where rugged construction, long life and quiet operation are required. All equipped with terminals to fit snap-on connectors and may also be applied to printed circuits using dip soldering. Snap-on screw adaptors packed with each relay. All AC models carry U/L component recognition (File No. E29244) and CSA* listing. Mounting: Two No. 8-32 tapped holes, on 1¼" centers. Silver contacts. Weight: Approx. 5 ozs.



ABC SERIES Medium duty power relay with dust cover. For small motors, industrial control and similar applications. All equipped with terminals to fit snap-on connectors and may also be applied to printed circuits using dip soldering. Snap-on screw adaptors packed with each relay. All AC models carry U/L component recognition (File No. E292-44) and CSA* listing. Mounting: One No. 8-32 threaded stud ⅜" long and locating tab on 9⁄16" centers. Contacts: ¼" dia. silver. Weight: Approx. 7 ozs.



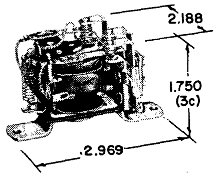
GF SERIES Medium duty power relay for industrial control applications. Long contact arms have ¼" dia. silver contacts rated at 10 amps at 120V AC or 28V DC resistive. Contacts have excellent wipe or self-cleaning action. Tinned, pierced solder terminals. Mounting: 8-32 tapped core with locating boss. Weight: 4.75 ozs. (See GA series, page 1, for similar voltage actuated relays.)



MR SERIES A medium duty power relay that can handle small motors, transmitters, and general purpose applications. Mounting: Two 5⁄32" dia. holes on 2¼" centers for MR3 and 11, 2⅝" centers for MR2, 5 and 14. Contacts: 7⁄32" dia. silver. Weight: 4 ozs.

MS/MR Metal dust cover similar to PM/PR shown below. 3⅝" x 2⅜" x 2 19⁄32". Weight: 7.5 ozs.

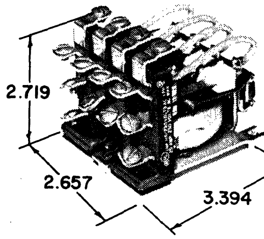
35D130 fits MS/MR **NET $2.20**



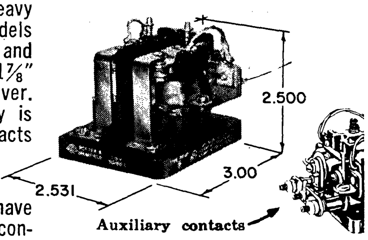
PM SERIES A compact heavy duty 4PDT power relay for polyphase and heavy duty switching applications. Screw terminals. Has ¼" silver-cadmium-oxide contacts rated at 25 amps at 120V., 25 amps at 240V. 50/60 Hz resistive AC, 1HP per movable arm at 120V. or 240V. AC single phase, U/L (File No. E22575) and CSA* listed, except 480V. Mounts by one front keyhole and two rear channel slots for 8-32 screws on 2" x 2½" triangular centers. Weight: 14 ozs.

9PM1 Adaptor plates for mounting PM on PR mounting holes. Box of 10 **NET $1.75**

Enclosures for PM relay — see below.



PR SERIES Heavy duty relay for industrial control applications requiring long life and fast action. Heavy duty screw type terminals. All AC and DC models except PR-11AL5 carry U/L (File No. E22575) and CSA* listing. Mounting: Two 3⁄16" dia. holes on 1⅞" centers. Weight: 11 ozs. max. Contacts: 5⁄16" dia. silver. Enclosure: See "PR" cover. The PR11AL5 relay is equipped with 3⁄16" dia. silver SPDT auxiliary contacts rated at 5 amps.

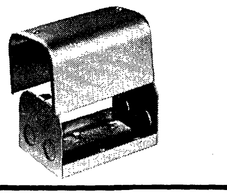


PM and PR DUST COVERS These dust covers have a sheet metal base with knockouts for ½" dia. conduit and an aluminum cover fitted with two screws. Finished in gray hammertone. Mounting: Three No. 10 holes on 1⅞" x 4⅛" centers. Approx. weight: 1 lb.

35D227 Metal cover for PM only **NET $3.45**

9PM2 Plastic dust cover for PM only. Box of 4 **NET $1.90**

35D013 Metal cover for PR only **NET $3.45**



PM:
L 5.313
W 3.812
H 3.812

PR:
L 5.312
W 3.375
H 3.125

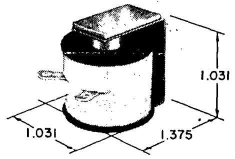
POWER RELAYS						
	COILS			CONTACTS		
TYPE	Input	Resistance in Ohms	Nominal Power	Arrangement	Amp. Rating	SUGG. RESALE PRICE
AB11AY	6V 24V 120V 240V	1.3 23 510 2,050	6.4VA	DPDT	10	$6.15 6.15 6.15 6.65
AB11D	12V 24V 110V	72 288 6,050	2W	DPDT	10	6.00 6.00 6.50
ABC11AY	6V 24V 120V 240V	1.3 23 510 2,050	6.4VA	DPDT	10	7.40 7.40 7.40 7.90
ABC11D	6V 12V 24V 110V	18 72 288 6,050	2W	DPDT	10	7.30 7.30 7.30 7.80
GF17A	12V 24V 120V 240V	6.8 24 690 2,950	6VA	4PDT	10	7.60 7.60 7.60 8.05
GF17D	6V 12V 24V 110V	18 72 288 6,050	2W	4PDT	10	7.60 7.60 7.60 8.15
MR3A	6V 24V 120V	2.75 50 1,250	3.25VA	SPST-NO-DM	10	4.50 4.50 4.50
MR3D	6V 12V 24V	24 96 360	1.6W	SPST-NO-DM	10	4.10 4.10 4.10
MR5A	6V 12V 24V 120V 240V	2.75 13.25 50 1,250 4,600	3.25VA	DPDT	8	4.05 4.05 4.05 4.05 4.50
MR5D	6V 12V 24V 110V	24 96 360 8,000	1.6W	DPDT	8	3.75 3.75 3.75 4.30
MR11A	6V 12V 24V 120V 240V	2.75 13.25 50 1,250 4,600	3.25VA	DPDT	8	5.70 5.70 5.70 5.70 6.15
MR11D	6V 12V 24V 110V	24 96 360 8,000	1.6W	DPDT	8	5.40 5.40 5.40 5.95
MR14A	6V 12V 24V 120V 240V	2.75 13.25 50 1,250 4,600	3.25VA	3PDT	8	6.80 6.80 6.80 6.80 7.25
MR14D	6V 12V 24V 110V	24 96 360 8,000	1.6W	3PDT	8	6.40 6.40 6.40 6.95
PM17AY	6V 12V 24V 120V 240V	.37 1.4 5 120 587	14VA	4PDT	25	14.30 14.30 14.30 14.30 14.85
PM17A	480V	1,790	14VA	4PDT	25	15.75
PM17DY	6V 12V 24V 110V	8.2 33 132 2,760	4.4W	4PDT	25	13.65 13.65 13.65 14.25
PR1AY	24V	12	9.8VA	SPST-NO	25	4.70
PR3AY	6V 12V 24V 120V 208V 240V	.86 3.2 12 290 850 1,200	9.8VA	SPST-NO-DM	25	4.80 4.80 4.80 4.80 5.30 5.30
PR3DY	6V 12V 24V 110V	18 71 288 6,050	2W	SPST-NO-DM	25	4.80 4.80 4.80 5.50
PR5AY	6V 12V 24V 120V 208V 240V	.86 3.2 12 290 850 1,200	9.8VA	SPDT	25	5.05 5.05 5.05 5.05 5.55 5.55
PR5DY	6V 12V 24V 110V	18 71 288 6,050	2W	SPDT	25	5.05 5.05 5.05 5.75
PR7AY	6V 12V 24V 120V 208V 240V	.86 3.2 12 290 850 1,200	9.8VA	DPST-NO	25	5.65 5.65 5.65 5.65 6.15 6.15
PR7DY	6V 12V 24V 110V	18 71 288 6,050	2W	DPST-NO	25	5.70 5.70 5.70 6.40
PR11AY	6V 12V 24V 120V 208V 240V 480V	.86 3.2 12 290 850 1,200 4,500	9.8VA	DPDT	25	7.45 7.45 7.45 7.45 7.95 7.95 9.05
PR11AL5	6V 12V 24V 120V 240V	.86 3.2 12 290 1,200	9.8VA	DPDT	20	9.45 9.45 9.45 9.45 9.95
PR11DY	6V 12V 24V 110V	18 71 288 6,050	2W	DPDT	25	7.45 7.45 7.45 8.15

AMF | POTTER & BRUMFIELD

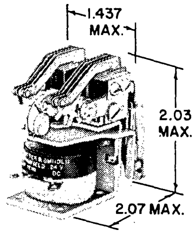
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

SPECIAL PURPOSE RELAYS

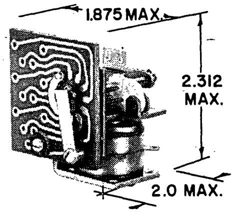
BU BUZZER AC operated coil with a spring steel armature which buzzes when coil is energized. Used extensively in test equipment, laboratories and a host of other applications where a small lightweight, dependable buzzer is required. Weight: 1⅝ ozs. Mounting: No. 6-32 tapped core.



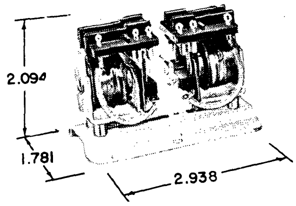
GB SERIES Unusually versatile switching makes this impulse/sequencing relay especially suitable for single coil latching. The 2 Form C contact arrangement is switched alternately by cam action during drop-out of the armature. It can also be furnished with additional 2 Form C auxiliary contacts (designated by "L"). AC version operates on a 50% coil duty cycle (5 Min. max.). Mounting: 8-32 tapped core with locating boss. Weights: With aux. contacts 4¾ ozs. Without aux. contacts 4 ozs.



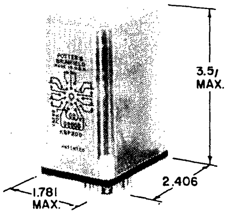
The GM1N10 and GM1N12 AC or DC use the basic GM structure with uni-directional printed circuit boards with 10 or 12-steps, respectively. The board is attached to an extension of the ratchet shaft. The movable contact arm advances one position each time the armature **drops out.** Contact rating: .25 amps. Contact arrangement: SP-10 pos. and SP-12 pos. Size: 2.312" x 1.875" x 2".



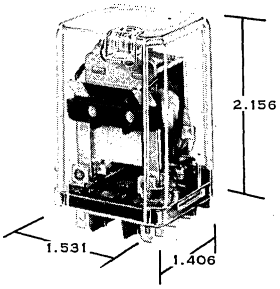
KB SERIES LATCHING RELAY Both release and trip coils must be for the same voltage. One coil operates relay to set latch and other coil releases it. Ideal for memory work and overload applications. Operates on momentary impulse to either coil. Mounting: Two 5⁄32" dia. holes on 1⅜" centers. Weight: 6 ozs. Contacts: ⅛" dia. silver rated 5 amps; "G" suffix indicates silver-cadmium-oxide contacts on movables rated 10 amps. AC relays with 5 amp. Contacts carry U/L component recognition (File No. 29244) and are CSA* listed. AC coil for intermittent duty only.



KBP SERIES LATCHING RELAY Enclosed in a translucent polypropylene dust cover, the KBP is furnished with 20-pin octal type plugs for socket mounting. Contact arrangements of 4PDT and 5PDT are available. Otherwise all specifications are identical to the KB series described above. U/L component recognition does not apply to the KBP series. Weight: 8 ozs.



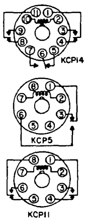
KUL SERIES Small, magnetic latching relay requiring approximately half the space needed for mechanical latching relays. Designed for continuous duty in applications demanding good memory stability, the KUL is ideal for machine tools, process controls and business machines. SPDT or DPDT silver-cadmium oxide contacts are rated 10 amps @ 28V DC, resistive or 120V AC, 80% PF. All AC DPDT relays include diodes inside the clear polycarbonate dust cover. Mounting: Various 10 amp rated nylon sockets available (see KU sockets page 3). Weight: 3.4 ozs. 9KUL21 hold down springs.

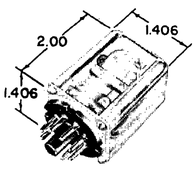


Box of 25 **NET $4.50**

SENSITIVE RELAYS

KCP SERIES Low cost plate circuit relay enclosed in clear high impact plastic cover. Sensitivity 125 mw single pole; 250 mw double pole; 375 mw three pole. Mounting: Standard octal plug-in type. Eight pin for KCP5 and KCP11. Eleven pin for KCP14. Contacts: ⅛" dia. gold-flashed silver. Weight: Approximately 3 ozs. Use KCP-KRP hold down spring when vibration is a factor or when using inverted or horizontal mounting.





*Canadian Standards Assoc. File No. LR-15734

SPECIAL PURPOSE RELAYS

	COILS			CONTACTS		SUGG. RE-SALE PRICE
TYPE	Input	Resistance in Ohms	Nominal Power	Arrangement	Amp Rating	
BU	6V 12V 24V 120V	2.7 13.2 50 1,250	4.6VA	—	—	$2.05 2.05 2.05 2.05
GM11A	24V 120V	16 420	9.4VA	DPDT	3	8.40 8.40
GM11AL11	120V	420	9.4VA	DPDT/DPDT	3	11.95
GM11D	12V 24V 110V	36 144 3,050	4W	DPDT	3	8.05 8.05 8.60
GM11DL11	12V 24V	36 144	4W	DPDT/DPDT	3	11.70 11.70
GM1N10A GM1N12A GM1N10D GM1N12D	120V 120V 24V 24V	510 510 144 144	9.4VA 9.4VA 4W 4W	SP-10 pos. SP-12 pos. SP-10 pos. SP-12 pos.	.25	10.35 10.50 10.10 10.25
GPA	6V 12V 24V 120V 240V	1.7 6.8 24 690 2,950	6VA	None	—	1.95 1.95 1.95 1.95 2.40
GPD	— — — 6V 12V 24V 110V	2,500 5,000 10,000 18 72 288 6,050	— — — 2W	None	—	1.80 2.05 2.40 2.40 2.40 2.40 3.60
KB17AY	6V 12V 24V 120V 240V	2.3 10 42 1,030 4,100	5VA	4PDT	5	12.20 12.20 12.20 12.20 13.10
KB17AG	6V 12V 24V 120V 240V	2.3 10 42 1,030 4,100	5VA	4PDT	10	12.30 12.30 12.30 12.30 13.20
KB17D	6V 12V 24V 110V	13.1 52 230 4,560	2.7W	4PDT	5	10.95 10.95 10.95 12.40
KB17DG	6V 12V 24V 110V	13.1 52 230 4,560	2.7W	4PDT	10	11.20 11.20 11.20 12.65
KB23AY	24V 120V	27 700	7.8VA	6PDT	5	14.60 14.60
KB23AG	24V 120V	27 700	7.8VA	6PDT	10	14.80 14.80
KB23D	24V	230	2.7W	6PDT	5	13.25
KB23DG	24V 110V	230 4,560	2.7W	6PDT	10	13.60 15.05
SPECIFY COIL VOLTAGE OR RESISTANCE WHEN ORDERING						
KBP17A§	120V	1,030	5VA	4PDT	5	17.15
KBP17AG§	120V	1,030	5VA	4PDT	10	17.35
KBP17D§	24V	230	2.7W	4PDT	5	15.90
KBP17DG§	12V 24V	52 230	2.7W	4PDT	10	16.20 16.20
KBP20A§	120V	700	7.8VA	5PDT	5	17.65
KBP20AG§	120V	700	7.8VA	5PDT	10	17.90
KBP20DG§	12V 24V	52 230	2.7W	5PDT	10	17.05 17.05
KUL5A15S	120V	3,700	—	SPDT	10	6.30
KUL5D15S	24V	472	1.2W	SPDT	10	5.45
KUL11A15S	12V 24V 120V	37 176 3,700	—	DPDT	10	7.10 7.10 7.10
KUL11D15S	12V 24V	120 472	1.2W	DPDT	10	6.05 6.05
KCP5§	7.2mA 5.0mA 3.6mA	2,500 5,000 10,000	125mW	SPDT	2	6.85 6.95 7.40
KCP11§	10mA 7.2mA 5.0mA	2,500 5,000 10,000	250mW	DPDT	2	7.30 7.40 7.85
KCP14§	12.3mA 8.7mA 6.1mA	2,500 5,000 10,000	375mW	3PDT	2	9.00 9.10 9.55

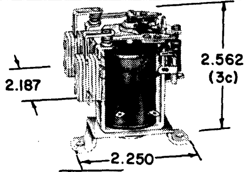
§ Enclosed Relay † Sealed Relay

AMF | POTTER & BRUMFIELD

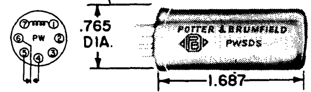
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

SENSITIVE RELAYS (CONTINUED)

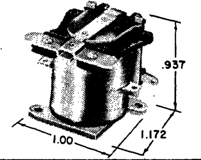
LM SERIES (See KL page 2 for similar voltage actuated relays.) Sensitivity: 100 milliwatts for single pole and 200 milliwatts for double pole. Medium cost, high quality relay with 7/32" dia. gold-flashed silver contacts. Pick-up adjustable by tail spring adjusting screw. Mounting: Two No. 6-32 tapped holes on 1 13/16" centers. Weight: Approximately 5 ozs. DC Coils only.



PW SERIES (In both voltage and current actuated models.) Sensitivity: 40 mw for current actuated models, 180 mw for voltage actuated models. Precision, light weight, hermetically sealed relay for aircraft and missile applications. Will withstand 10g vibration to 500 Hz. Mounting: Standard 7-pin miniature tube base. Weight: Approx. 1 oz.



RS SERIES (In both voltage and current actuated models.) 60 mw. sensitivity. Low-cost, small, light weight, sensitive relay for radio-sonde, light dimmer and model applications. Mounting: Two No. 4-40 tapped holes on diagonal 3/4" x 5/8" centers. Contacts: Bar palladium. Weight: 1 1/2 ozs.



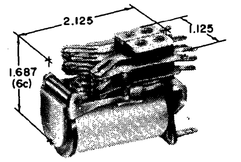
SENSITIVE RELAYS

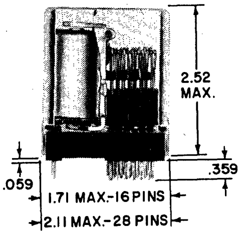
TYPE	COILS Input	COILS Resistance in Ohms	COILS Nominal Power	CONTACTS Arrangement	CONTACTS Amp Rating	SUGG. RE-SALE PRICE
LM5	6.3mA 4.5mA 3.2mA	2,500 5,000 10,000	100mW	SPDT	5	$4.55 4.80 5.15
LM11	9.0mA 6.3mA 4.5mA	2,500 5,000 10,000	200mW	DPDT	5	6.55 6.75 7.40
PW5DS†	6V 12V 24V	202 810 3,240	180mW	SPDT	2	12.45 12.45 12.45
PW5LS†	2.8mA 2.0mA	5,000 10,000	40mW	SPDT	2	12.90 13.35
RS5D	6V 12V 5mA 3.5mA 2.5mA	335 1,350 2,500 5,000 10,000	110mW 110mW 60mW 60mW 60mW	SPDT	2	3.05 3.20 3.30 3.60 4.20

TELEPHONE TYPE RELAYS

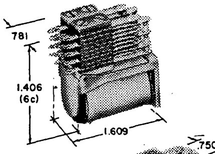
LS SERIES Short springs and light weight armature provide fast action without sacrificing reliability and long life. Stainless steel hinge bearing designed to give 100 million operations. Tinned, pierced solder terminals. Mounting: Two No. 6-32 tapped holes on 3/4" centers. Bifurcated contact arms with 1/16" dia. twin palladium contacts. Weight: Approximately 4 ozs.

The LSP version has identical specifications as the LS, except that it is enclosed in a high impact, clear plastic cover and is provided with a rectangular socket with combination taper tab or solder terminations. Enables plug-in like any other plug-in component. Two sizes of sockets and covers are available: 16-pin for 4 Form C (4PDT) or 28-pin for 6 Form C (6PDT). Dimensions: LSP17D: 1.71" x 1.39" x 2.52" seated; weight: 4 ozs. LSP23D: 2.11"x1.39"x2.52" seated; weight: 4 1/2 ozs.

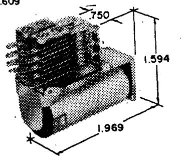




MH SERIES MINIATURE TYPE Ideal for applications where space and weight are factors. Mounting: Open model, MH11L, one No. 6-32 threaded stud 17/32" long plus locating boss. All other open models have four No. 3-48 holes on 3/8" x 3/8" centers. Sealed models, M enclosures, three 6-32 NC 2 threaded studs on 1 1/4" x 1/2" centers. D enclosures, three 6-32 threaded studs on 1 3/16" x 1 5/16" centers. All sealed models have hook end solder terminals. All models have 1/8" dia. gold-flashed silver contacts. Weight: Open models 2 1/2 oz. max. Sealed models 5 ozs. max.



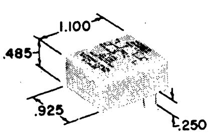
ML SERIES A small telephone type relay having excellent sensitivity and outstanding switching capabilities. Ideal for transistorized computer networks, telephone systems and battery powered communications equipment. Single contact arms have 1/8" dia. gold-flashed silver contacts rated at 3 amps for 100,000 operations. Pierced solder terminals. Mounting: Four 3-48 holes on 3/8" centers. Weight: 2.5 ozs.



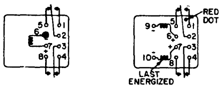
TYPE	COILS Input	COILS Resistance in Ohms	COILS Nominal Power	CONTACTS Arrangement	CONTACTS Amp Rating	SUGG. RE-SALE PRICE
LS17D	24V 48V 110V	300 1,300 8,000	1.9W 1.8W 1.5W	4PDT	4	6.50 6.70 6.95
LS23D	24V 110V	300 8,000	1.9W 1.5W	6PDT	4	7.85 8.30
LSP17D§	24V 48V 110V	300 1,300 8,000	1.9W 1.8W 1.5W	4PDT	4	8.45 8.55 8.85
LSP23D§	24V 48V 110V	300 1,300 8,000	1.9W 1.8W 1.5W	6PDT	4	10.50 10.60 10.90
MH11L	4.5mA	10,000	200mW	DPDT	3	6.90
MH11LM†	4.5mA	10,000	200mW	DPDT	3	11.70
MH17D	6V 12V 24V	23 96 365	1.6W	4PDT	5	6.95 6.95 6.95
MH17DM†	12V 24V	96 365	1.6W	4PDT	5	13.95 13.95
MH17AMR†	120V	6,200	2VA	4PDT	5	22.80
MH23D	6V 12V 24V 110V	13.3 62.3 245 5,000	2.5W	6PDT	5	8.70 8.70 8.70 9.25
MH23DD†	12V 24V	62.3 245	2.5W	6PDT	5	18.55 18.55
ML11D	4.0mA 2.83mA 2.0mA	2,500 5,000 10,000	40mW	DPDT	3	7.35 7.50 7.85
ML17D	5.65mA 4.0mA 2.83mA	2,500 5,000 10,000	80mW	4PDT	3	8.70 8.90 9.25
ML23D	6.93mA 3.4mA	2,500 10,000	120mW	6PDT	3	9.85 10.40

HIGH PERFORMANCE RELAYS

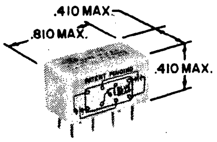
FC SERIES Conventional micro-miniature relay lies flat on printed circuit board. Withstands 150g shock, 400g linear acceleration, 30g vibration to 2000 Hz. Ambient temperature range: —65° to +125°C. Hermetically welded. Bifurcated contacts. Plugs in on .2" grid. Meets applicable sections of MIL-R-5757. and MSFC-SPEC-339. Weight: .75 oz.

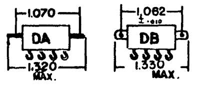


FL SERIES Dual-coil latching relay has same specs as above, except operates by pulsing each coil alternately (observing coil polarity); or connecting the coils in series from a reversing (polarized) source. Remains latched without coil power.



HC SERIES A micro-miniature, non-polarized, non-latching half-size crystal case relay for high reliability performance. Its high-torque motor structure and bifurcated, gold-plated silver DPDT contacts, rated dry circuit to 2 amps @ 28V DC resistive, provide positive performance in low level applications. Temperature range: —65°C to +125°C. Hermetically welded. HC11D has plug-in, plain case; HC11DA has hook-end solder terminals and shoulder brackets; HC11DB has hook-end solder terminals and flat mounting plate with 2 holes. The HC series meets or exceeds all applicable sections of MIL-R-5757 , and complies with MSFC-SPEC-339. Size: Plain case .8" x .4" x .4" (seated). Weight: 1/4 oz.





TYPE	COILS Input	COILS Resistance in Ohms	COILS Nominal Power	CONTACTS Arrangement	CONTACTS Amp Rating	SUGG. RE-SALE PRICE
FC11D	6V 12V 24V	.60 210 900	.65W	DPDT	3	19.40 19.40 19.40
FL11D	6V 12V 24V	67.5 230 1,000	.65W	DPDT	3	21.75 21.75 21.75

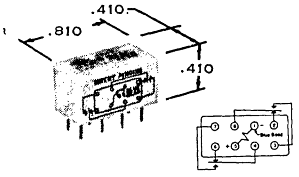
TELEPHONE TYPE RELAYS

TYPE	COILS Input	COILS Resistance in Ohms	COILS Nominal Power	CONTACTS Arrangement	CONTACTS Amp Rating	SUGG. RE-SALE PRICE
HC11D HC11DA HC11DB	24V	814	.72W	DPDT	2	$19.30 19.30 19.30

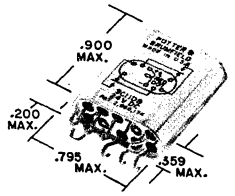
SPECIFY COIL VOLTAGE OR RESISTANCE WHEN ORDERING

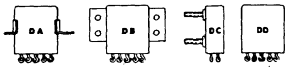
HIGH PERFORMANCE RELAYS (CONTINUED)

HCM SERIES Military version of miniature HC relay. Same rugged construction features. Hermetically sealed and vibration tested for use in demanding applications such as aircraft and ground support equipment. Meets or exceeds appropriate sections of MIL-R-5757. Straight pins or hook solder terminals. Shoulder bracket available. HCM has same mountings as HC Series on previous page. Weight: .5 ozs.



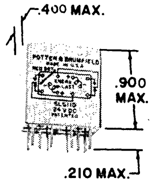
SC SERIES Micro-miniature permanent magnet relay for low power, high shock/vibration applications. 200g shock, 30g vibration to 2000 Hz with no contact openings. Ambient temperature range: −65°C to +125°C. Features single coil action and conforms to standard micro-miniature coil operation except polarized connections because of magnetic circuit. Positive terminal marked with red dot. Mounting: SC11D**, —DA, —DB, DC and DD correspond to similarly designed SL mountings. SCG11D has rectangular header with terminals on .2″ grid. Weight: ¾ oz.





**Armel No. HRK-1, 8-pin receptacles available from distributors for plug-in applications.

SL SERIES Dual coil micro-miniature magnetic latching relay with same shock/vibration, resistance and ambient temperature range as SC. Coils may be connected in series for polar operation. Mounting: SL11D* for plug-in applications: —DA has shoulder flanges with two .104″ x .136″ holes on a 1.062″ center; —DB has a welded bracket with four .125″ dia. holes on 1.062″ x .281″ centers; —DC has two No. 4-40 NC 2A threaded studs on .488″ x .220″ diagonal centers; —DD has plain case with hook end solder terminals. SLG11D has plug-in terminals on .2″ grid.



*Armel No. HRKB-1, 10-pin receptacles available from distributor for plug-in applications.

TELEPHONE TYPE RELAYS

TYPE	COILS			CONTACTS		SUGG. RESALE PRICE
	Input	Resistance in Ohms	Nominal Power	Arrangement	Amp Rating	
HCM11D HCM11DA HCM11DB	24V	814	.72W	DPDT	2	$12.90 12.90 12.90
SC11D	6V 12V 24V	35 135 550	1W	DPDT	2	19.60 19.60 19.60
SC11DA	12V 24V	135 550	1W	DPDT	2	19.60 19.60
SC11DB	6V 12V 24V	35 135 550	1W	DPDT	2	19.60 19.60 19.60
SC11DC	24V	550	1W	DPDT	2	19.60
SC11DD	24V	550	1W	DPDT	2	19.60
SCG11D	24V	550	1W	DPDT	2	19.60
SC7141	26.5V	MIL-R-1575E/10C-141 or RY4NA3B3L01				19.75
SL11D	6V 12V 24V	40 160 630	1W	DPDT	2	21.45 21.45 21.45
SCL11DA	6V 12V 24V	40 160 630	1W	DPDT	2	21.45 21.45 21.45
SL11DB	6V 12V 24V	40 160 630	1W	DPDT	2	21.45 21.45 21.45
SL11DC	24V	630	1W	DPDT	2	21.45
SL11DD	24V	630	1W	DPDT	2	21.45
SLG11D	24V	630	1W	DPDT	2	21.45

VOLTAGE SENSORS

CS SERIES Two types of accurate, low cost solid state voltage sensors are available. First, an adjustable pick-up and drop-out series for 24V DC and 120V AC voltage sources. Second, a series with factory-fixed pick-up and adjustable drop-out, also for 24V DC and 120V AC voltage sources. All are provided with standard octal plugs for socket mounting and are enclosed in a nylon dust cover. Please see the tables for ranges of voltage adjustments.

SPECIFICATIONS

Sensing Current Drain: Maximum of 3 ma.

Maximum Current Drain: After sensing: 30 ma.

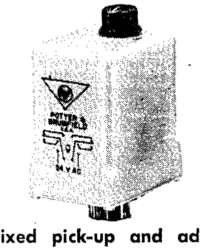
Accuracy of Set Point: 1% after initial setting.

Reverse Polarity Protection: Yes, on DC types.

Operating Temperature: −40°C to +55°C.

Load Switching Relay Contacts: 2 Form C (DPDT). Rating: 3 amps 28V DC resistive; 120V AC resistive.

Expected Life:
Mechanical: 10 million operations.
Electrical: 100,000 operations minimum @ rated load.



Fixed pick-up and adjustable drop-out. One knob for setting drop-out value.

Adjustable pick-up and drop-out. Two knobs for setting desired values.

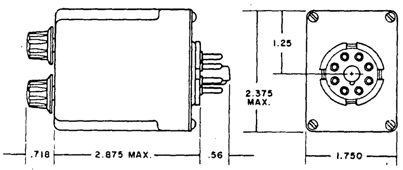
ADJUSTABLE PICK-UP AND DROP-OUT

TYPE	PICK-UP RANGE (VOLTS)	DROP-OUT RANGE (VOLTS)	TYPE OF VOLTAGE	SUGG. RESALE PRICE
CSJ38-30010	20-30	18-28	AC (50/60 Hz)	$30.20
CSJ38-70010	92-140	90-138	AC (50/60 Hz)	32.95
CSL38-30010	20-30	18-28	DC	26.20

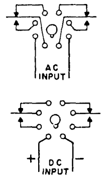
FIXED PICK-UP AND ADJUSTABLE DROP-OUT

TYPE	PICK-UP RANGE (VOLTS)	DROP-OUT RANGE (VOLTS)	TYPE OF VOLTAGE	SUGG. RESALE PRICE
CSJ38-71010	105	90-103	AC (50/60 Hz)	$29.20
CSL38-31010	22	16-20	DC	23.15

OUTLINE DIMENSIONS



SCHEMATICS



AMF | POTTER & BRUMFIELD
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

DRY REED RELAYS

JR (STANDARD) SERIES
JRA LOW COST SERIES

TWO TYPES OF CAPSULES The JRA Series is available only in a Form A (SPST-NO) contact arrangement. Both JR and JRM relays have reed switches with either Form A (SPST-NO) or Form C (SPDT) contact configuration. Biasing with a permanent magnet changes Form A to a Form B (SPST-NC). This arrangement requires that coil polarity be observed. Combining one Form A with one Form B results in a single Form C (SPDT) break-before-make. A "true" Form C (SPDT) uses a reed switch with two stationary and one movable contact. The movable contact is normally closed until the coil is energized.

JRM (MINIATURE) SERIES Fast response, reliable performance, high sensitivity, and long life make JR standard and JRM miniature series relays especially suited for data processing applications, computer equipment, logic circuitry and various other sophisticated control circuits.

JDT DUAL THIN-LINE The low profile (only 0.275" max. height) JDT Dual Thin-Line reed relays are ideal for high density packaging applications. Hermetically sealed glass capsules are epoxy encapsulated in 4 pole (4100 Series) or 8 pole (8100 Series) configurations. Dual in-line terminals on .100" centers for p.c. board mounting are featured. Operate time is 3.5 milliseconds including bounce. Release time is 3.5 milliseconds maximum. Weight: JDT 4100, ½ oz.; JDT 8100, ¾ oz.

TWO TYPES OF BASIC CAPSULES Both JR and JRM relays employ dry reed glass capsules with two basic types of contact arrangements, Form A (SPST-NO) or Form C (SPDT). Biasing with a permanent magnet changes Form A to a Form B (SPST-NC). This arrangement requires that coil polarity be observed. It uses a two-cavity bobbin. Combining one Form A with one Form B results in a single Form C (SPDT) break-before-make; this uses a three-cavity bobbin. A "true" Form C (SPDT) uses a reed switch with two stationary and one movable contact. The movable contact is normally closed until the coil is energized, causing a "true" Form C (SPDT) break-before-make; it uses a single-cavity bobbin.

SPECIFICATIONS

Pick-up: 75% of nominal @ 25°C.

Operate Time: At nom. voltage @ 25°C: JR: 3ms. JRM: 1ms.

Release Time: At 25°C: JR: .5ms. JRM: .05ms.

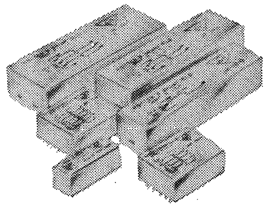
Coil Power: Based upon nom. voltage and resistance. JR: 1 capsule — 240 mw; 2 capsules — 360 mw; 3 capsules — 720 mw; 4 capsules — 960 mw; 5 capsules — 1.5 w.

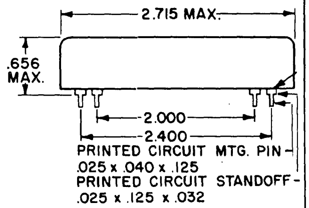
JRM: 1 capsule — 180 mw; 2 capsules — 275 mw; 3 capsules — 420 mw; 4 capsules — 540 mw; 5 capsules — 720 mw.

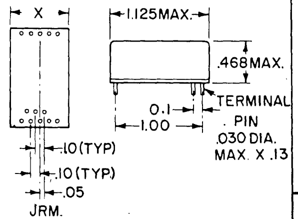
For additional specifications see columnar listings and drawings.

JR Standard Relays **Weights**
X = 1 Cavity = .687" max. — 1.50 ozs.
X = 2 Cavities = .890" max. — 2.00 ozs.
X = 3 Cavities = 1.094" max. — 2.50 ozs.
X = 4 Cavities = 1.297" max. — 3.00 ozs.
X = 5 Cavities = 1.516" max. — 3.50 ozs.

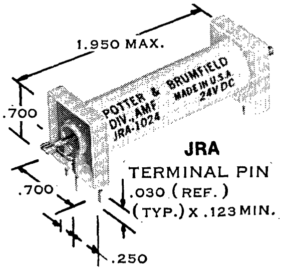
JRM Miniature Relays
X = 1 Cavity = .437" max. — .366 oz.
X = 2 Cavities = .562" max. — .395 oz.
X = 3 Cavities = .703" max. — .530 oz.
X = 4 Cavities = .813" max. — .620 oz.
X = 5 Cavities = .968" max. — .781 oz.



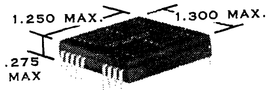


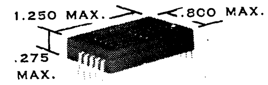


JRM.
3 CAVITIES



JRA





JRA LOW COST SERIES

TYPE	COILS					SUGG. RESALE PRICE
	Contact Arrangement	Number of Cavities	Sugg. Nominal Voltage	Resistance in Ohms	Reed Rating Watts	
JRA1006	1A	1	6	74	25VA	$1.50
JRA1012	1A	1	12	290	25VA	1.50
JRA1024	1A	1	24	1,200	25VA	1.50

JR STANDARD SERIES

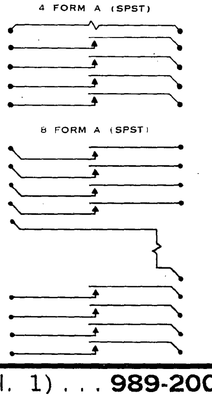
TYPE	Contact Arrangement	Number of Cavities	Sugg. Nominal Voltage	Resistance in Ohms	Reed Rating Watts	SUGG. RESALE PRICE
JR1000	1A	1	6	150	50	3.20
JR1001	2A	2	6	100	15	4.30
JR1020	1A	1	6	150	50	4.50
JR1040	1C*	1	6	150	10	8.05
JR1041	2C*	2	6	100	10	8.80
JR1060	1B	2	6	100	15	4.30
JR1005	1A	1	12	600	15	3.20
JR1006	2A	2	12	400	15	4.30
JR1008	4A	4	12	150	15	6.00
JR1025	1A	1	12	600	50	4.50
JR1045	1C*	1	12	600	10	8.05
JR1046	2C*	2	12	400	10	8.80
JR1063	1B	2	12	400	15	4.30
JR1086	1A + 1B	3	12	200	15	5.30
JR1010	1A	1	24	2,400	15	3.75
JR1011	2A	2	24	1,600	15	4.55
JR1013	4A	4	24	600	15	6.30
JR1030	1A	1	24	2,400	50	4.85
JR1031	2A	2	24	1,600	50	7.25
JR1050	1C*	1	24	2,400	10	8.40
JR1051	2C*	2	24	1,600	10	8.90
JR1066	1B	2	24	1,600	15	4.35
JR1088	1A + 1B	3	24	800	15	5.65
JR1089	2A + 2B	5	24	384	15	8.75

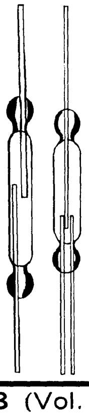
JDT DUAL THIN-LINE SERIES

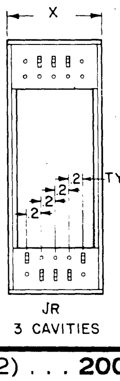
TYPE	Contact Arrangement	Number of Cavities	Sugg. Nominal Voltage	Resistance in Ohms	Reed Rating Watts	SUGG. RESALE PRICE
JDT4100	4A	4	6VDC	115	10	7.65
JDT4105	4A	4	12VDC	480	10	7.65
JDT4110	4A	4	24VDC	1,850	10	8.30
JDT8100	8A	8	6VDC	60	10	12.95
JDT8105	8A	8	12VDC	260	10	12.95
JDT8110	8A	8	24VDC	1,050	10	13.70

JRM MINIATURE SERIES

TYPE	Contact Arrangement	Number of Cavities	Sugg. Nominal Voltage	Resistance in Ohms	Reed Rating Watts	SUGG. RESALE PRICE
JRM1000	1A	1	6	200	10	3.45
JRM1001	2A	2	6	130	10	5.05
JRM1003	4A	4	6	67	10	8.05
JRM1036	1B	2	6	130	10	4.40
JRM1037	2B	3	6	86	10	5.90
JRM1048	1A + 1B	3	6	86	10	5.90
JRM1049	2A + 2B	5	6	50	10	9.05
JRM1006	1A	1	12	800	10	3.45
JRM1007	2A	2	12	520	10	5.05
JRM1009	4A	4	12	268	10	8.05
JRM1040	1B	2	12	520	10	4.40
JRM1041	2B	3	12	344	10	5.90
JRM1050	1A + 1B	3	12	344	10	5.90
JRM1051	2A + 2B	5	12	200	10	9.05
JRM1012	1A	1	24	3,200	10	3.80
JRM1013	2A	2	24	2,080	10	5.20
JRM1015	4A	4	24	1,072	10	8.15
JRM1044	1B	2	24	2,080	10	4.50
JRM1045	2B	3	24	1,376	10	6.05
JRM1052	1A + 1B	3	24	1,376	10	6.05
JRM1053	2A + 2B	5	24	800	10	9.20

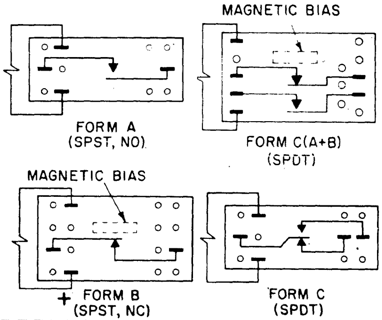






JR
3 CAVITIES

TYPICAL WIRING DIAGRAMS



FORM A (SPST, NO)

FORM C(A+B) (SPDT)

FORM B (SPST, NC)

FORM C (SPDT)

AMF | POTTER & BRUMFIELD
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

MERCURY-WETTED CONTACT RELAYS

JM SERIES Rare long life, high speed, and unvarying dependability—all are the result of the basic component of these relays: a hermetically sealed glass capsule. It contains the contact arrangement and a small reservoir of mercury sealed in a high pressure hydrogen atmosphere. A film of mercury is renewed for every operation—that's why you can think in terms of billions of operations without contact bounce, pits or welds.

TWO TYPES OF CAPSULES The capsules used in JMF and JMF2 (with 2 capsules) modules and JML relays has a SPDT, break-before-make (Form C), non-bridging contact arrangement. Each capsule used in JMP, and JM1 to JM4 relays has a SPDT, make-before-break (Form D), bridging contact arrangement. JMF, JMF2, JML and JMP series achieve a high rate of sensitivity by factory-adjusted magnet biasing.

MOUNTING POSITION: Upright mounting required, but deviation from upright up to 30° causes only minor deviation in operating characteristics.

CONTACT RATINGS

JMF, JMF2 and JML: 500V max., and 2 amps max., 100 VA max.*

JMP and JM1 to JM4: 500V max., and 5 amps max., 250 VA max.

*With contact protection unless in a low level circuit. Details of a simple protection circuit consisting of resistor and capacitor in series are packed with each relay.

TERMINATIONS

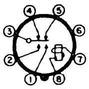


Figure 11

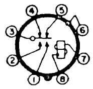


Figure 12

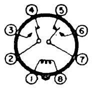


Figure 21

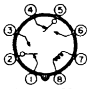


Figure 22

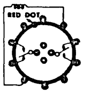


Figure 23
Hook Solder

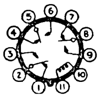


Figure 31

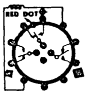


Figure 32
Hook Solder

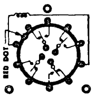


Figure 41
14 Pin Miniature Plug

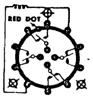


Figure 42
Hook Solder

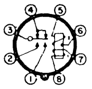


Figure 51

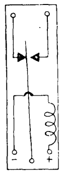


Fig. 61
FOR JMF MODULE

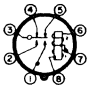


Figure 52

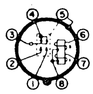


Figure 53

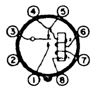


Figure 82

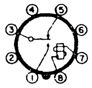
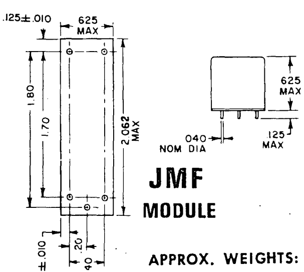
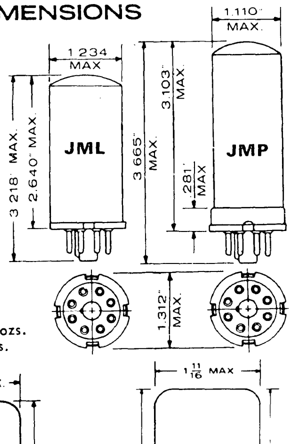


Figure 81

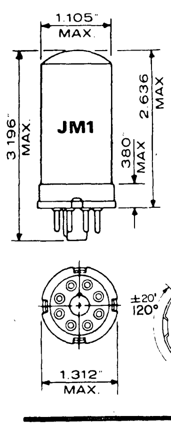
OUTLINE DIMENSIONS

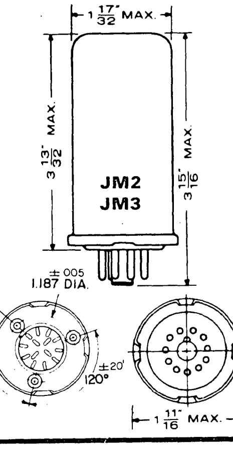


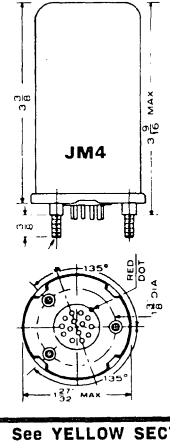


APPROX. WEIGHTS:

JMF—1.25 ozs.
JML—5.0 ozs.
JMP—4.5 ozs.
JM1—4.0 ozs.
JM2 & 3—8.0 ozs.
JM4—10.0 ozs.







JM MERCURY-WETTED CONTACT RELAY SERIES

TYPE	SERIES			COIL CHARACTERISTICS					SUGG. RESALE PRICE
	Capsule	Coil	Term.* Fig. No.	Resistance in Ohms ±10% @ 25°C	Sugg. Min. Operate mA DC	Soak † mA DC	Must Operate DC	Must Release DC	
JMF Printed Circuit Module Sensitive Form C Non-Bridg.	SINGLE-SIDE-STABLE								
	JMF	1070	61	450	16.13	—	12.9	2.1	$11.35
	JMF	1080	61	675	14.50	—	11.6	1.9	11.35
	JMF	1120	61	1,425	10.50	—	8.4	1.4	11.35
	JMF	1150	61	2,400	9.75	—	7.8	1.3	11.35
	JMF	1160	61	4,000	5.00	—	4.0	0.67	11.90
	BI-STABLE								
	JMF	5080	61	675	+6.75	—	±5.4	—	11.35
JMF2 Dual Capsule Form C Non-Bridg.	SINGLE-SIDE-STABLE								
	JMF2	1000	71	130	6VDC	—	3VDC	0.5VDC	21.75
	JMF2	1001	71	520	12VDC	—	6VDC	1.0VDC	21.75
	JMF2	1002	71	2,200	24VDC	—	12VDC	2.0VDC	22.30

JM MERCURY-WETTED CONTACT RELAY SERIES

TYPE	SERIES			COIL CHARACTERISTICS			SUGG. RESALE PRICE
	Capsule	Coil	Term.* Fig. No.	Resistance in Ohms ±10% @ 25°C	Must Operate mA DC	Max. Volts DC @ 25°C	
JMS Sensitive Form D Bridging	20 Milliwatts (per winding), Bi-Stable, Dual-Wound Coil.						
	JMS	5040	62	325/325	±7.0	24	$11.35
	JMS	5070	62	1250/1250	±3.6	47	11.90
	40 Milliwatts, Single-Side-Stable, Single-Wound Coil.						
	JMS	1070	61	34	32	7.7	11.35
	JMS	1130	61	620	7	33	11.35
	JMS	1160	61	2430	3.6	65	11.90
	JMS	1190	61	8600	2.0	122	11.90

JM MERCURY-WETTED CONTACT RELAY SERIES

TYPE	SERIES			COIL CHARACTERISTICS					SUGG. RESALE PRICE
	Capsule	Coil	Term.* Fig. No.	Resistance in Ohms ±10% @ 25°C	Sugg. Min. Operate mA DC	Soak † mA DC	Must Operate DC	Must Release DC	
JML Sensitive Form C Non-Bridg.	SINGLE-SIDE-STABLE								
	JML	1061	81	40	12.19	36.0	9.75	1.68	$14.00
	JML	1110	81	350	4.45	13.1	3.56	0.61	14.00
	JML	1160	81	1,000	2.76	8.1	2.21	0.38	14.00
	JML	1190	81	2,500	1.79	4.0	1.43	0.17	14.95
	JML	1200	81	4,000	1.56	3.4	1.25	0.25	14.95
	JML	1240	81	11,000	.90	2.6	0.72	0.12	14.95
	JML	1260	81	25,000	.65	1.9	0.52	0.09	14.95
	BI-STABLE								
	JML	5200	81	4,000(1)	+.66	—	±0.53	—	14.95
	JML	5430	82	1,100(2) 1,100	+2.20	—	±1.76	—	16.40
	CHOPPER						Voltage RMS 60 Hz		
	JML	8130	81	600	—	—	6.3V	—	14.60
JMP Polarized Form D Bridging	SINGLE-SIDE-STABLE								
	JMP	1160	11	1,000	7.0	16.2	5.60	0.40	18.40
	JMP	1200	11	4,000	3.70	8.55	2.96	0.24	19.70
	BI-STABLE								
	JMP	5200	11	4,000	+1.88	—	±1.5	—	19.70

TYPE	SERIES			COIL CHARACTERISTICS					SUGG. RESALE PRICE
						MUST OPERATE			
	Capsule	Coil	Term.* Fig. No.	Resistance in Ohms ±10%	Sugg. Min. Operate mA DC	Current mA DC	Voltage DC @ 25°C	Max. Voltage @ 25°C	
JM1 Form D Bridging 1 capsule SPDT	SPDT SINGLE COIL								
	JM1	106	12	40	83.70	67.7	2.98	9.0	$16.95
	JM1	109	12	130	47.50	38.8	5.55	16.1	16.95
	JM1	112	11	500	25.00	20.1	11.10	31.6	16.95
	JM1	114	11	700	25.00	20.0	15.40	37.4	16.95
	JM1	114	12	700	25.00	20.0	15.40	37.4	16.95
	JM1	118	11	2,500	12.50	10.1	27.80	70.7	17.25
	JM1	119	11	4,000	10.00	8.1	35.60	89.5	8.55
	JM1	120	11	7,000	10.00	6.0	46.20	117.0	17.85
	JM1	121	11	11,000	6.25	5.0	60.50	148.0	17.85
	JM1	123	11	25,000	4.50	3.6	99.00	224.0	17.85
JM2 Form D Bridging 2 capsules DPDT	DPDT SINGLE COIL								
	JM2	104	22	50	137.50	110.0	6.04	12.25	27.50
	JM2	106	21	140	81.25	66.5	10.00	20.5	27.50
	JM2	109	22	315	55.00	44.0	15.30	30.7	27.50
	JM2	110	22	500	42.25	34.8	19.20	38.7	27.50
	JM2	111	22	700	37.30	30.5	23.50	45.8	27.50
	JM2	112	22	1,250	27.50	22.1	30.40	61.2	27.50
	JM2	115	21	5,000	13.75	11.3	62.10	122.0	27.50
	JM2	115	22	5,000	13.75	11.3	62.10	122.0	27.50
JM3 Form D 3 capsules 3PDT	3PDT SINGLE COIL								
	JM3	109	31	315	55.00	44.0	15.30	30.7	35.60
	JM3	110	31	500	42.50	34.8	19.20	38.7	35.60
	JM3	111	31	700	37.30	30.5	23.50	45.8	35.60
	JM3	115	31	5,000	13.75	11.3	62.10	122.0	35.60
JM4 Form D Bridging 4 capsules 4PDT	4PDT SINGLE COIL								
	JM4	106	41	65	125.00	100.0	7.15	15.1	45.90
	JM4	110	41	390	52.50	42.0	18.00	37.0	45.90
	Octal style plugs, except Fig. 41 (14-pin miniature plug).								
JMD Form D Bridging Module 1 capsule SPDT	SPDT SINGLE COIL								
	JMD	1060	63	150	70.00	55.0	9.1	18	11.45
	JMD	1090	63	450	41.90	33.5	16.6	30	11.45
	JMD	1100	63	750	30.0	24.3	20.0	39	11.45

* See termination figures on this page.
† Current to be applied to the coil winding for at least 2 seconds just prior to current flow tests.

AMF | POTTER & BRUMFIELD
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

SOLID STATE TIME DELAY RELAYS

A wide selection of three separate series of solid state time delay controls are represented by Potter & Brumfield time delay relays, the CD series, the CH series, and the CU series. The differences between the three types consist in their degree of accuracy, the variety available in each series, and their cost.

BASIC TIMING CIRCUIT The basic timing circuit of all three series consists of a resistor in series with a capacitor. When the input voltage is applied to the resistor-capacitor circuit, the voltage across the capacitor slowly increases. When the firing level is reached a solid state trigger circuit acts to turn on a solid state output switch that energizes a switching relay or external electrical load. The solid state design eliminates cams, clutches and motors. Using no moving parts, the timing circuit can have no mechanical wear, an advantage that is especially desirable when accurate recycling is required.

CU SERIES An outstanding value in a solid state time delay relay at low cost, the CU series is designed for delay on operate applications in machine tool controls, copiers, office equipment, coin-operated machines, process controls and many others. It is available in two types: Fixed time delay that is set at the factory and cannot be modified. Second, adjustable with an external resistor. For minimum time two terminals, 2 and 5, must be shorted; for maximum time the listed external resistor between terminals 2 and 5 must be added. For intermediate times select a lesser value resistor, or a potentiometer. Either model can be furnished in two types of enclosures with the relay in the same enclosure as the solid state unit. The CU series is offered with delay on operate only.

CUA and CUC are fixed time delays. **CUF and CUH** are resistor adjustable delays. All with internal DPDT 10 amp contact relay.

CUA 41-70010
CUA 41-70120
CUC 41-30010
CUC 41-30120
CUA 41-30010
CUA 42-70010
CUA 42-70120
CUC 42-30010
CUC 42-30120
CUA 42-30010

CUF 41-70010
CUF 41-70120
CUH 41-30010
CUH 41-30120
CUF 41-30010
CUF 42-70010
CUF 42-70120
CUH 42-30010
CUH 42-30120
CUF 42-30010

CU-41 is a plain case relay, **CU-42** has a slotted flange case. Diagram A is for fixed delays, diagram B for resistor adjustable delays.

CH SERIES The CH series is intended for a wide range of industrial applications where economy is of greater interest than highly critical performance. It is available in two types: Knob-adjustable with the relay in the same enclosure as the solid state unit. The second type has a fixed time delay period that is set at the factory and cannot be modified; its case has no knob. The CH series is available for time delay on operate and on release.

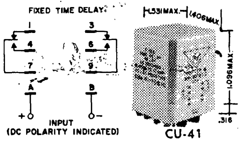
CH-38 and CD-38. Knob-adjustable delay "on operate" wtih internally mounted DP-DT relay. Contacts rated to 10 amps. Diagram A.

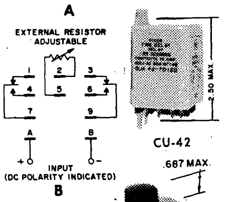
CHA-38-70001
CHB-38-30001
CHB-38-30003
CHB-38-70001
CHB-38-70003
CHB-38-80001
CHD-38-30001

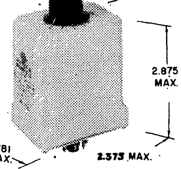
CHD-38-30003
CDB-38-70003
CDB-38-70004
CDB-38-70005
CDD-38-30003
CDD-38-30004
CDD-38-30005

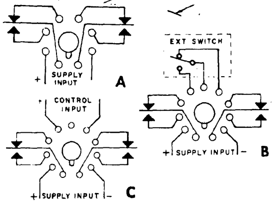
Delay "on release" CH requires auxiliary SPDT switch or relay contacts: CBH-38-70011, CHB-38-70013, CHD-38-30011, CHD-38-30013: Diagram B. CD "release" occurs when "Control" circuit is de-energized; supply circuit must be on continuously:

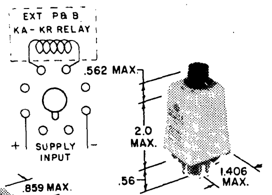
CDB-38-70012, CDD-38-30012: Diagram C.

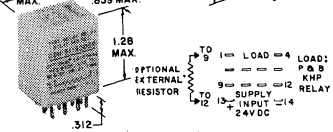


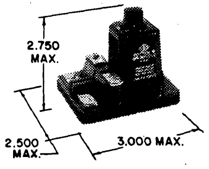


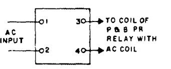












CD SERIES Remarkably dependable, accurate and flexible, the CD series offers an unusually wide selection of operational configurations, all with accurate time delay values, fast reset time and excellent repeatability. It is available in two types: Knob-adjustable in two versions, one with the relay in the same enclosure as the solid state unit, the other with an auxiliary relay. A second type is adjustable with an external resistor. The CD series is available for time delay on operate or on release.

CD-21. Knob-adjustable. Use with P&B KRP relays (see page 2) as listed under Note 2.

CDB-21-70003
CDB-21-70001

CDD-21-30003
CDD-21-30001

CD-31. Adjustable with external resistor (not furnished). Use with KHP relay (see page 2), Note 4.

CDH-31-30005

CD-45. Knob-adjustable. For heavy duty when used with PR power relay (see page 4) as listed under Note 6.

CDB-45-70002

TYPE	TIME DELAY IN SECONDS	INPUT VOLTAGE	NOTES	SUGG. RESALE PRICE
CUA41-70010	10	120VAC	1	$14.20
CUA41-70120	120	120VAC	1	15.75
CUC41-30010	10	24VDC	1	14.20
CUC41-30120	120	24VDC	1	15.75
CUA41-30010	10	24VAC	1	14.20
CUA42-70010	10	120VAC	1	14.20
CUA42-70120	120	120VAC	1	15.75
CUC42-30010	10	24VDC	1	14.20
CUC42-30120	120	24VDC	1	15.75
CUA42-30010	10	24VAC	1	14.20
CUF41-70010	1.0 - 10	120VAC	200K.*	15.00
CUF41-70120	1.0 - 120	120VAC	2.4 Meg.*	16.30
CUH41-30010	1.0 - 10	24VDC	160K.*	15.00
CUH41-30120	1.0 - 120	24VDC	2 Meg.*	16.30
CUF41-30010	1.0 - 10	24VAC	200K.*	15.00
CUF42-70010	1.0 - 10	120VAC	200K.*	15.00
CUF42-70120	1.0 - 120	120VAC	2.4 Meg.*	16.30
CUH42-30010	1.0 - 10	24VDC	160K.*	15.00
CUH42-30120	1.0 - 120	24VDC	2 Meg.*	16.30
CUF42-30010	1.0 - 10	24VAC	200K.*	15.00
CHA38-70001	10	120VAC	1	18.90
CHB38-30001	1.0 - 10	24VAC	1	19.95
CHB38-30003	1.0 - 180	24VAC	1	19.95
CHB38-70001	1.0 - 10	120VAC	1	19.95
CHB38-70003	1.0 - 180	120VAC	1	19.95
CHB38-80001	1.0 - 10	240VAC	1	20.95
CHD38-30001	1.0 - 10	24VDC	1	18.95
CHD38-30003	1.0 - 180	24VDC	1	18.95
CHB38-70011	1.0 - 10	120VAC	1 & 7	23.95
CHB38-70013	1.0 - 180	120VAC	1 & 7	23.95
CHD38-30011	1.0 - 10	24VDC	1 & 7	21.95
CHD38-30013	1.0 - 180	24VAC	1 & 7	21.95
CDB38-70003	0.1 - 10	120VAC	1	44.25
CDB38-70004	0.6 - 60	120VAC	1	44.25
CDB38-70005	1.8 - 180	120VAC	1	44.25
CDD38-30003	0.1 - 10	24VDC	1	42.00
CDD38-30004	0.6 - 60	24VDC	1	42.00
CDD38-30005	1.8 - 180	24VDC	1	42.00
CDB21-70003	0.1 - 10	120VAC	2	39.15
CDB21-70001	1.8 - 180	120VAC	2	39.15
CDD21-30003	0.1 - 10	24VDC	3	38.80
CDD21-30001	1.8 - 180	24VDC	3	38.80
CDH31-30005	180 Max.	24VDC	4 & 5	39.35
CDB45-70002	0.6 - 60	120VAC	6	37.50
CDB38-70012	0.6 - 60	120VAC	1 & 7	52.90
CDD38-30012	0.6 - 60	24VDC	1 & 7	49.95

*External resistor (not furnished) for maximum time.

NOTES

1. Has internal relay with DPDT contacts rated at 10 amperes, 120V AC.
2. Use with Potter & Brumfield relay KRP5AG-120V AC, KRP11AG— 120V or KRP14AG—120V AC or KRP14AG— 120V AC.
3. Use with Potter & Brumfield KRP5DG— 24V DC, KRP11DG— 24V DC or KRP-14DG— 24V DC relay.
4. Use with Potter & Brumfield KHP-17D11— 24V DC relay.
5. Supplied with 180 seconds delay; adjustable to 1.8 seconds with external resistor (not furnished).
6. Use with Potter & Brumfield PR11AY— 120V AC relay.
7. Provides delay on release; all others have delay on operate.

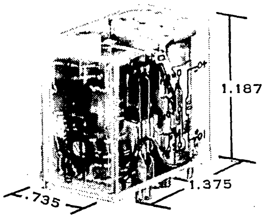
APPROX. WEIGHTS:

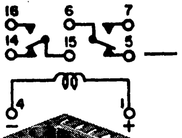
SERIES CD-31 2.00 ozs.
SERIES CD-21 4.25 ozs.
SERIES CH-38 4.00 ozs.
SERIES CD-45 6.00 ozs.
SERIES CD-38 8.25 ozs.
ALL SERIES CU 3.25 ozs.

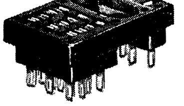
AMF | POTTER & BRUMFIELD
Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

TIME DELAY RELAYS

R12 SERIES The R12 Series time delay relays combine the field proven R10 Series basic relay with a high quality delay circuit. The time delay circuit uses silicon transistors throughout and the critical timing capacitor meets the specifications for military use. These small DC variable time delay relays do not false operate and will time as low as 0.1 second. Timing range of 0.1 to 120 seconds is spanned by three models: 0.1 to 2, 1.0 to 30 and 5.0 to 120 seconds. Each time range is varied with a high resolution 15-turn potentiometer. The internally mounted R10 Series relay is equipped with DPDT contacts rated 5 amperes. Solder terminals are provided and mounting may be accomplished by No. 3-48 stud or sockets offering solder or printed circuit board terminals.







R12. Variable time delay with high resolution 15-turn potentiometer. Calibrated timing capacitor meets specifications for military use. Fits sockets below. See notes 9 and 10.

9XR12-1 DPDT Solder terminal sockets and retainers.

Box of 10	**NET $9.00**

9XR12-2 DPDT Printed circuit terminal sockets and retainers.

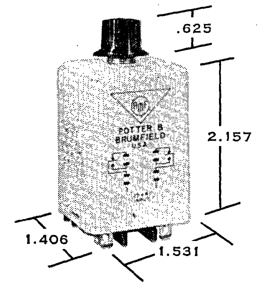
Box of 10	**NET $9.00**

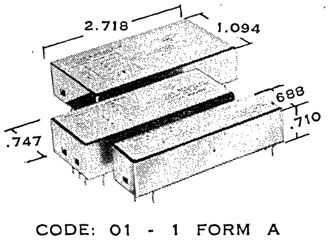
CL SERIES Designed for delay on operate, the CL Series is similar to the CU with the exception that they don't false operate† and will time to 0.1 second. These solid state time delays are ideal for AC or DC applications. A DPDT KU relay rated 10 amperes is mounted in the same enclosure, forming a compact assembly. CL relays are enclosed in yellow polycarbonate dust covers and are available in three types: fixed, resistor adjustable and knob adjustable. Plug-in/quick-connect terminals facilitate handling and hook-up.

CL-41. A plain case relay similar to the CU-41 with the exception that it doesn't false operate. See page 3 for mounting accessories (9KU).

CUB/CLB-51. Knob-adjustable versions of CU enclosed in slightly taller 51 style case. Same mounting accessories as CU-41. CLB does not false operate.

CJC SERIES. Fixed time delay that is factory set and cannot be modified.





CODE: 01 - 1 FORM A
02 - 1 FORM B
03 - 1 FORM C

TYPE	TIME DELAY IN SECONDS	INPUT VOLTAGE	NOTES	SUGG. RESALE PRICE
R12-2-12-X2-E1	0.1-2	12VDC	9 & 10	$18.10
R12-2-24-X2-E1	0.1-2	24VDC	9 & 10	18.10
R12-30-12-X2-E1	1.0-30	12VDC	9 & 10	18.60
R12-30-24-X2-E1	1.0-30	24VDC	9 & 10	18.60
R12-120-12-X2-E1	5.0-120	12VDC	9 & 10	20.10
R12-120-24-X2-E1	5.0-120	24VDC	9 & 10	20.10
CLA41-70010	10	120VAC	1 & 9	17.35
CLC41-30010	10	24VDC	1 & 9	17.35
CLF41-70010	0.1-10	120VAC	200K.*	18.85
CLH41-30010	0.1-10	24VDC	160K.*	18.85
CLB51-30010	0.1-10	24VAC	1 & 9	19.85
CLB51-70010	0.1-10	120VAC	1 & 9	19.85
CLB51-70120	1.2-120	120VAC	1 & 9	21.15
CJC01-20003	3	12VDC	8	19.30
CJC01-30003	3	24VDC	8	19.30
CJC02-20003	3	12VDC	8	19.95
CJC02-30003	3	24VDC	8	19.95
CJC03-20003	3	12VDC	8	21.20
CJC03-30003	3	24VDC	8	21.20

*External resistor (not furnished) for maximum time.

NOTES

1. Has internal relay with DPDT contacts rated at 10 amperes, 120V AC.
2. Use with Potter & Brumfield relay KRP5AG- 120V AC, KRP11AG- 120V or KRP14AG- 120V AC.
3. Use with Potter & Brumfield KRP5DG- 24V DC, KRP11DG- 24V DC or KRP14DG- 24V DC relay.
4. Use with Potter & Brumfield KHP17D11- 24V DC relay.
5. Supplied with 180 seconds delay; adjustable to 1.8 seconds with external resistor (not furnished).
6. Use with Potter & Brumfield PR11AY- 120V AC relay.
7. Provides delay on release; all others have delay on operate.
8. Internal relay contacts rated at 10 VA, other ratings available upon request.
9. Does not false operate.
10. Internal relay has 5 ampere rated contacts.

INDUSTRIAL SCREW TERMINAL SOCKETS

Molded of rugged Lexan forming compact unibody structure. All sockets are rated 10 amperes at 300 volts for use with relays and 600 volts for other industrial applications. Each #6-40 screw terminal is conveniently located for front wiring and will accept two #12 to #20 AWG wires under the saddle clamp. Formed bus connections are used between pin contacts and screw terminals — no soldered wires within the socket to come loose causing open circuits and/or shorting. Three types are available.

For KUP plain case, KUA and KUR relays; CU and CL time delays having .187″ quick-connect terminals. 11-terminal rectangular socket, 27E121. Two mounting slots for #6 screws. Weight: approx. 2½ ozs.

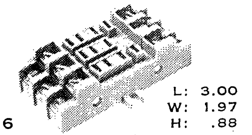
Box of 4 each, 9KU6	**Net $14.00**

For KRP, KAP, KBP, EBT and EBA relays; CD-21 and CD-38 time delays; and CS sensors. 8-pin screw terminal socket, 27E122. Rated 10 amperes; molded Lexan. Weight: approx. 1½ ozs.

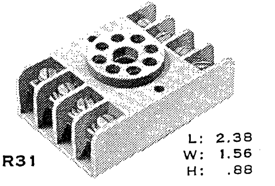
Box of 5 each, 9KR31	**Net $12.50**

For KRP, KAP and KBP17 relays; CD and CH time delays; and other relays having same plug-in base. 11-pin octal-type plug-in socket, 27E123, with screw terminals. Weight: approx. 2 ozs.

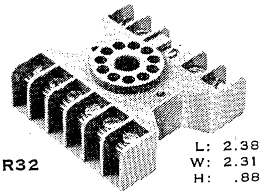
Box of 5 each, 9KR32	**Net $18.75**



9KU6



9KR31



9KR32

UNDERWRITERS' LABORATORIES, INC. — When any of these sockets is used with an associated relay that is recognized by U/L under the Component Program, then the socket is recognized as a "suitable mounting means" for that relay. None of these sockets alone has U/L recognition.

Various combinations of these sockets mounted close together on one panel provide front wiring convenience and design flexibility. All screw terminals are accessible from the front. These compact, rugged sockets allow broad relay control functions that include:

- 1 Form A to 3 Form C switching
- 5 or 10 amp load capability
- AC or DC operation
- Impulse switching
- Solid State time delay: fixed and variable (local or remote)
- Mechanical latching

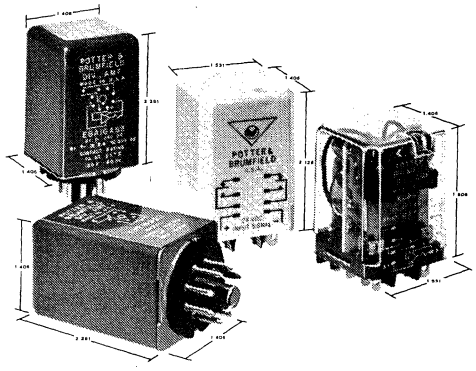
AMF | POTTER & BRUMFIELD

Princeton, Indiana 47570 812/385-5251 TWX: 812-291-4125

SOLID STATE HYBRID RELAYS

SOLID STATE HYBRID RELAYS SOLVE MANY CRITICAL SWITCHING PROBLEMS

Now, these new devices make it possible to interface semiconductor logic circuits with inductive loads such as motors, solenoids, or relays. Inputs as low as 60 microwatts switch 7 ampere loads. And they install conventionally, too! Look at tomorrow's switching devices today....



EBT SERIES combines input/output isolation of reed relay with inrush switching capabilities, long life of solid state switch. Switches 7 amps, 60 Hz @ 25°C ambient with nominal load voltage of 120V. Rated 5 amps rms 60 Hz @ 55°C ambient. Minimum operating current: 200 mA, 60 Hz. Expected life greater than 10 million operations. Bounce free. Operate time: 2 msec. maximum. Release time: 10 msec. maximum. Typical "Closed contact" voltage drop is 1.1V. Octal terminals fit standard 8-pin socket on page 11. Weight 5.5 ozs. approx.

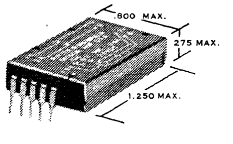
EBA SERIES has output switching characteristics, package, mounting of EBT, plus control signal amplifier. Operates from current sourcing output mode of DTL, TTL logic circuits, 60 microwatt signal switches 7A load. Must Operate voltage: 2.4V DC @ approx. 25 μamp at 24V DC supply. Maximum input is 30V DC or 1 mA. Release occurs at 0.5V DC or less. Rate of control voltage change: 1V/msec. min. Polarity protection provided. Operate Time: 2 msec. max. @ Must Operate control voltage; Release time: 10 msec. max. @ Must Release control voltage; both rated at nominal supply voltage.

KUA SERIES Amplifier-driven KUP relay, offers standard input sensitivity of 60 microwatts. Operates from low power signals associated with integrated circuits: DTL and TTL logic outputs in the current sourcing mode. Control signal of 2.4V DC @ approx. 25 μA operates relay at specified supply voltage. Maximum control signal: 30V DC or 1 ma. Must Release control voltage: 0.5V DC @ specified supply voltage. Polarity protection provided. Gold-flashed fine silver contacts switch 5A @ 28V DC res. or 120V 60 Hz, 80% P.F. Terminals: .187" q.c./solder fit standard KU sockets on page 3. Clear polycarbonate case. Weight: 3.5 ozs. approx.

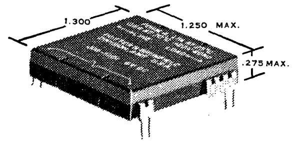
KUR SERIES Alternate direct-action, impulse relay employs permanent magnet latching relay plus flip-flop circuit that switches on leading edge of applied pulse. Recommended for pulse operation or alternate energizing of two loads, has permanent memory, alternate action features. Transfers DPDT contacts when specified input pulse (25 msec. min. duration and 1200 PPM max.) is received. Holds mode with or without power. Controlled from single DC source. Contacts gold-flashed fine silver rated 5A @ 28V DC, or 120V AC, 80% P.F. Terminals: .187" q.c./solder fit standard KU sockets on page 3. Has yellow plastic dust cover. Weight: 3.5 ozs. approx.

JDA SERIES Sensitive, amplifier-driven reed relay features same 0.275" low profile, Dual Thin-Line design as JDT reed relay series. Control signal is amplified by solid state driver circuit with sensitivity of 100 microwatts. Designed to operate from output of DTL and TTL logic circuits in current sourcing mode. Control signals between 2.4 and 30 volts DC will operate the JDA relay when specified supply voltage is applied. Release occurs when control signal is reduced to 0.5V DC, or less. Nominal supply power requirement approximately 490 mW in the activated state. Relay is designed for control voltage change to exceed the rate of 1V msec. Contacts are 2 Form A (DPDT-NO) rated 10 watts maximum resistive (50V DC or 0.5 amp max. switching) per contact. Terminals are spaced on 0.1" grid centers for printed circuit board mounting. Approximate weight: 0.4 oz.

JDA7GB1



JDB SERIES Solid state hybrid relay designed especially for interfacing from solid state circuits providing DC signals intended to control 120V 60 Hz loads, such as fractional HP motors, solenoids, and contactors. Expected life exceeds 10 million operations for any specified load current and ambient temperature combination. The SPST normally open solid state "contact" is designed to carry maximum load of 1.7 amps rms, 60 Hz @ 25°C ambient, or 1.0 amp rms, 60 Hz @ 55°C ambient. Internal RC network provides dv/dt suppression, yet results in less than 1 mA leakage current at 120V rms, 60 Hz. Operate time is 1 ms maximum @ nominal coil voltage @ 25°C. Release time is 10 ms maximum. Dual Thin-Line package design has terminals on 0.1" grid centers for mounting capability on pc boards with other electronic components. Approximate weight: 0.6 oz.



JDB1DD22

HYBRID RELAYS

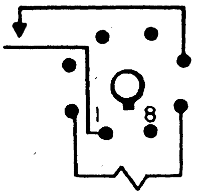
TYPE	COILS			CONTACTS		SUGG. RESALE PRICE
	Input	Res. In Ohms	Nom. Power	Arrange.	Amp Rating	
EBT1DA52§	6V 12V 24V	125 500 2000	290mW	SPST-NO	7	$16.60 16.60 16.60
KUR11D11§	24V	350	1.2W	DPDT	5	15.00

TYPE	INPUT				CONTACTS		SUGG. RE-SALE PRICE
	Control		Supply				
	DC Volt.	Nom. Power	DC Volt.	Nom. Power	Arrange.	Amp Rat-ing	
EBA1GA52§	2.4V	60μW	24V	390mW	SPST-NO	7	$23.40
KUA5G11§	2.4V	60μW	24V	1.2W	SPDT	5	13.70
KUA11G11§	2.4V	60μW	24V	1.2W	DPDT	5	14.15

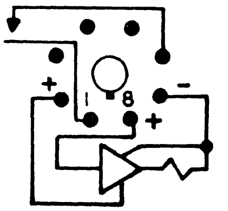
§Enclosed Relay

SCHEMATICS

EBT

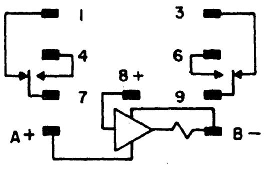


EBA



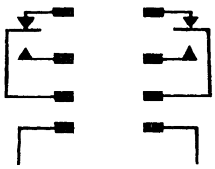
Control: Pins 8+ 7−
Supply: Pins 2+ 7−

KUA



Control: 8+ B−
Supply: A+ B−

KUR



24V DC
Input Signal

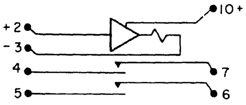
HYBRID RELAYS (continued)

TYPE	INPUT				CONTACTS		SUGG. RE-SALE PRICE
	Control		Supply				
	DC Volt.	Nom. Power	DC Volt.	Nom. Power	Arrange.	Amp Rat-ing	
JDA7GB1	2.4V	100μW	24V	490mW	DPST-NO	10W (0.5A Max.)	$15.25

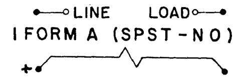
TYPE	COILS			CONTACTS		SUGG. RESALE PRICE
	Input	Res. In Ohms	Nom. Power	Arrange.	Amp Rating	
JDB1DD22	6V 12V 24V	125 500 2000	290mW	SPST-NO	1.7	$13.80 13.80 14.40

SCHEMATICS

Control: Pins 2+ 3−
Supply: Pins 10+ 3−



JDA7GB1



JDB1DD22

RELAYS, NOT DELAYS.

The most fantastic relay in the world, even at a ridiculously low price, isn't worth a nickel if it arrives a week late. So, besides concentrating on excellent products, we also concentrate on excellent service. From Reed, to IC Comparator, to Crystal Can relays. Call Kratos. You'll get relays, not delays.

Reed Relays Dry reed or mercury wetted, we've got a complete line-up of reed relays all set to travel. In Open Frame, Printed Circuit or Axial Lead configurations. Our new PS-100 series allows up to 150 dry reed relays to be mounted on a 4" x 6" PC board. That's "easy reeding." Kratos Reed Relays are available in A, B, and C contact configurations or in any combination of these configurations. Contact ratings run from 3 watts DC up to 50 watts DC. High voltage units are also on hand.

Our popular commercial "T" series provdes high quality at a low price. Only 40¢ each in quantities over 100,000. And, they're available now.

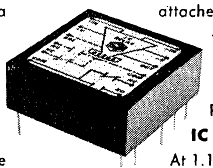
Relays, not delays.

Crystal Can Relays These extremely sensitive units are half-size Crystal Can Relays meeting the requirements of MIL-R-5757! Available in 100 or 300 milliwatt versions, these units are also offered with coaxial leads enabling the relays to switch "RF" signals.

"Adjust-a-Weld" is more than a nice name. It's a patented feature that means added reliability and performance in every Kratos (formerly Welch) Crystal Can relay.

We assemble the relay and then completely weld it to the frame all at one time. Coil armature, frame, blades and contacts are all positioned with micrometer precision resulting in extremely efficient magnetic structures, firmly attached to their rugged frame. Our name says Precision Products. And we mean it.

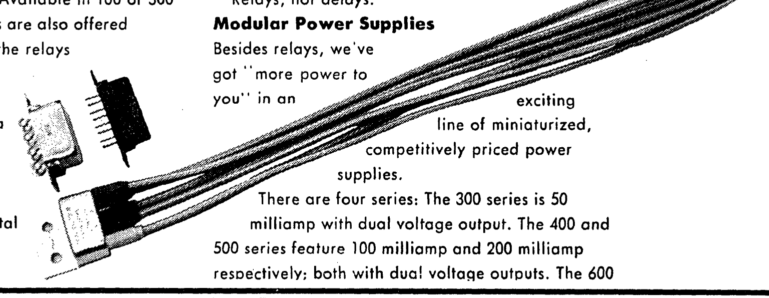
Relays, not delays.



IC Comparator Relays At 1.13" x 1.13" x .45", these high quality relays are space saving work horses. Each unit consists of an IC operational amplifier, a relay driver and a Reed Relay or mercury wetted relay output. The units operate on a standard DC voltage of ± 15 volts. Contact configurations available are 1A, 2A, 1B, 2B, 1C or 2C. The entire unit is encapsulated and designed for mounting on a PC board.

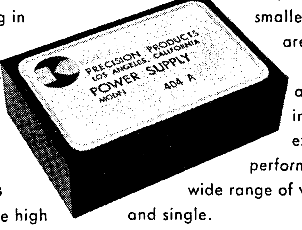
And, the entire line is ready for delivery.

Relays, not delays.



Modular Power Supplies Besides relays, we've got "more power to you" in an exciting line of miniaturized, competitively priced power supplies.

There are four series: The 300 series is 50 milliamp with dual voltage output. The 400 and 500 series feature 100 milliamp and 200 milliamp respectively; both with dual voltage outputs. The 600 series is a 5-volt single output of 500 milliamps.



These powerhouses are about the smallest available . . . and so are their prices.

Options include magnetic and/or isolation shielding, internal trim pots, two extra pins for customer-performed trimming, and a wide range of voltages – both dual and single.

These modular power units provide extremely tight regulation of as low as ±.02%. And, all units are short circuit protected.

That helps in the long run.

There it is. A brief look at our line. For more details just call. Or write. We'll get back to you in a hurry.

Relays (and power supplies), not delays.

Precision Products
Division of Kratos
11161 West Pico Blvd.
Los Angeles, Calif. 90064
Phone (213) 478-0635

PRECISION PRODUCTS
A DIVISION OF
KRATOS

(Formerly Phipps and Welch)

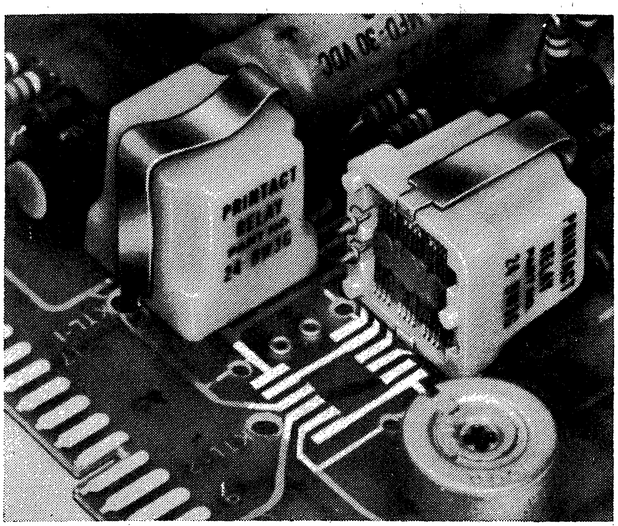
NO SOCKETS • NO SOLDERING • NO WIRING NO SPRINGS • NO MECHANICAL LINKAGE

NEW

Printact®

LATCHING AND NON-LATCHING MAGNETIC RELAYS

Plugs into your PC board . . . mates with plated conductors



The Printact relay, which combines printed circuit board technology with advanced electromagnetic design, offers custom features and economies.

Unlike conventional relays adapted for PC board use with terminal pins or sockets for solder mounting, the Printact relay plugs directly into the PC board, reducing costs and production time. The plated pads on the board become the fixed contacts. They mate with the shorting-bar contacts on the pivoting armature assembly, which is the single moving part in the relay. Held by a permanent magnet, this assembly eliminates return springs, pigtails, electrical and mechanical interconnections, which are prone to breakdown and wear, assuring reliable performance for millions of cycles.

The shorting-bar swinger contacts provide for isolated switching between break (NC) and make (NO) pads. Thus, each blade can perform a two-pole function equivalent to one SPSTNC and one SPSTNO. Common switching SPDT (form C) is achieved by bridging one NC pad to one NO pad.

Illustrated above is a Printact 3 blade relay which has its conductor pattern printed to perform a four-pole function consisting of 1A-1B-2C.

CATALOG NUMBERS

Volts	Coil Res.	2 Blades	3 Blades	4 Blades
Series "G" Standard Non-Latching — Gold Contacts				
6VDC	75Ω	6-BW2-G	6-BW3-G	6-BW4-G
12VDC	300Ω	12-BW2-G	12-BW3-G	12-BW4-G
24VDC	1200Ω	24-BW2-G	24-BW3-G	24-BW4-G
Series "LD" Dual Coil Magnetic Latch — Gold Contacts				
6/6VDC	30/30 Ω	6-BW2-LD	6-BW3-LD	6-BW4-LD
12/12VDC	150/150Ω	12-BW2-LD	12-BW3-LD	12-BW4-LD
24/24VDC	550/550Ω	24-BW2-LD	24-BW3-LD	24-BW4-LD

For Palladium Contacts Substitute BP for BW

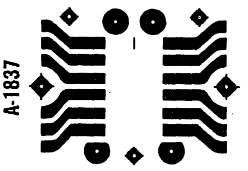
SPECIFICATIONS AT 25°C

Coil Power — 0.5 watt "G" Series, 1.0 watt "LD" Series.

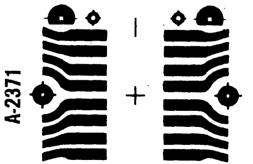
Contact Rating — dry circuit or low level with gold contacts; up to 2 amps 24v d-c res. with palladium contacts.

Cont. Res. — .050 ohm initial	**Dielectric** — 1000 Vrms
Insulation — 1000 megohms	**Temp.** −30°C to +80°C
Operate Time — 10 ms or less	**Release Time** — 5ms or less
Pick-up max. — 75% of rated	**Drop-out min.** — 10% of rated
Mech. Life — 100x10⁶ cycles	**Thermal EMF** — 10 microvolts
45db Isolation at 220 Mhz	**Size** — ⅞ x ⅞ x 1" h
60db Isolation at 40 Mhz	**Weight** — 0.8 ounces

SEND FOR PC BOARD DESIGN AIDS



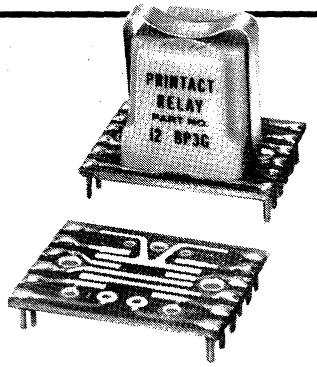
A-1837



A-2371

The above patterns, available in 2:1 and 4:1 size, when positioned on the layout, provide the artwork for the contact pads and also locate the coil clamp and relay positioning holes. Thus no layout to dimensions is required. These patterns, when used in conjunction with the PC board fabrication and area plating procedures, detailed in Tech-Notes PR-262D, assure accurate mating of the Printact swinger blades to the conductor pattern.

Design aids, complete catalog and sample with wired test board available upon request.



GENERAL PURPOSE MODULES AVAILABLE

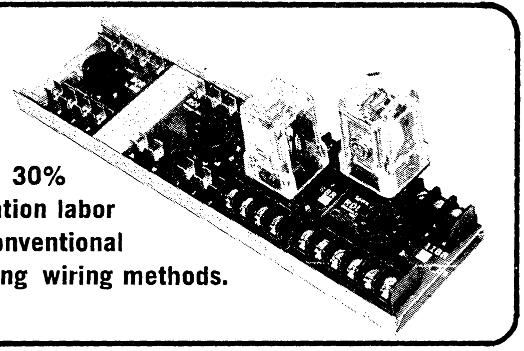
Where a custom board is not planned, send for catalog illustrating a variety of general purpose PC boards with etched and plated switching patterns to accommodate single or multiple relays. Can be chassis mounted with standoff bushings. Solder pads for point-to-point wiring or edge-connector terminals are available.

Printact Relay Division
Executone, Inc.
P.O. Box 1430EM • Long Island City, N. Y. 11101 • (212) EX 2-4800

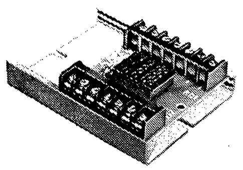
RDI SNAPTRACK™ MOUNTING SYSTEM

The **SNAPTRACK**™ mounting system provides a low cost convenient method for installing plug-in relays, timers and tubes in control equipment. Socket assemblies snap into position along continuous sections of SNAPTRACK, an extruded PVC, non-conductive mounting track, $3\frac{5}{32}$″ wide. The track may be installed with rivets or screws. Socket assemblies consist of a socket mounted to a G-10 epoxy glass P.C. board with choice of specially designed U.L. grade P.P. barrier type screw terminal blocks or ¼″ quick-connect tabs. The assembly is then wave soldered for circuit reliability. Terminal points are clearly numbered with epoxy ink. Screws are in the raised position and feature captive wire clamps which eliminate need for bending of, or attaching hook or ring terminals to wires. Wired-in 120V. or 240V. lamp option to indicate power available at coil terminals.

SAVES 30% installation labor over conventional mounting wiring methods.



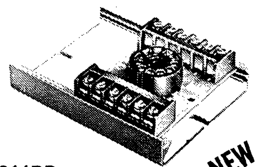
MINIATURE 4PDT RELAY



214BS

Use to mount Struthers-Dunn 281XDX, Potter & Brumfield KHP, Clare GP-1, Sigma 67, Guardian 1300 and others. No. 4-40 pan head screws accept 2 No. 14, 2 No. 16 or 4 No. 18 wires. Neon lamp option (214BS1). Size*: 2½″ W. x $1\frac{1}{16}$″ H. Rated 10A/150V.

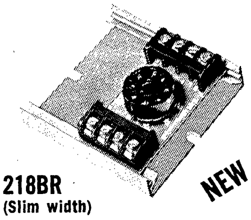
3PDT 11 PIN SOCKET



211BR NEW

Use to mount Struthers-Dunn 214 & 314, Potter & Brumfield KAP & KRP, Sigma 50 & 42, Magnecraft 88, Amperite thermal delay. No. 4-40 pan head screws accept 2 No. 14, 2 No. 16 or 4 No. 18 wires. Neon lamp option (211BR1). Size*: 2⅛″ W. x 1⅛″ H. Rated 10A/150V.

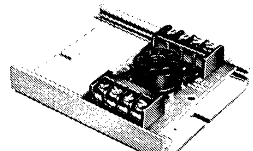
2PDT OCTAL SOCKET



218BR NEW
(Slim width)

Use to mount all standard octal plug-in relays, especially high density mounting of mercury wetted relays with octal base. No. 4-40 pan head screws accept 2 No. 14, 2 No. 16 or 4 No. 18 wires. Size*: 1½″ W. x 1⅛″ H. Rated 10A/150V.

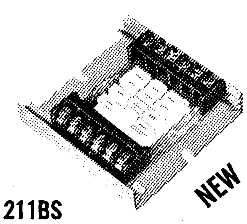
2PDT OCTAL SOCKET



208BR NEW

Use to mount all standard octal plug-in relays and 2″ square timers. No. 4-40 pan head screws accept 2 No. 14, 2 No. 16 or 4 No. 18 wires. Neon lamp option (208BR1). Size*: 2″ W. x 1⅛″ H. Rated 10A/150V.

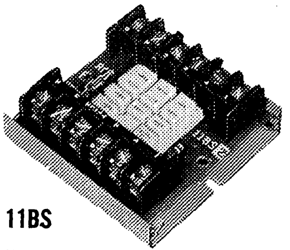
3PDT KUP STYLE RELAY



211BS NEW

Use to mount P&B's KUP, Struthers-Dunn 283, Sigma 68R3, Clare GP2 & GP3, CDE 20, Midtex 157 and others. No. 4-40 screws accept 2 No. 14 or 16 or 4 No. 18 wires. Neon lamp option (211BS1). Size*: 2⅛″ W. x 1⅛″ H. Rated 10A/ 150V.

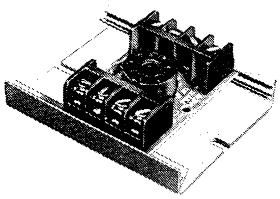
3PDT KUP STYLE RELAY



11BS

Use to mount P&B's KUP, Struthers-Dunn 283, Sigma 68R3, Clare GP2 & GP3, CDE 20, Midtex 157 and others. No. 8-32 screws accept up to 12 AWG wire. Neon lamp option (11BS1). Size*: 3″ W. x 1¼″ H. Rated 10A/ 300V.

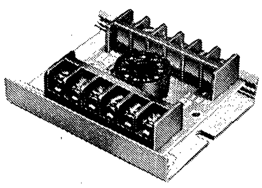
2PDT OCTAL SOCKET



8BR

Use to mount all standard octal plug-in relays, timers and tubes. No. 8-32 screws accept up to 12 AWG wire. Neon lamp option (8BR1). Size*: 2″ W. x 1¼″ H. Rated 10A/300V.

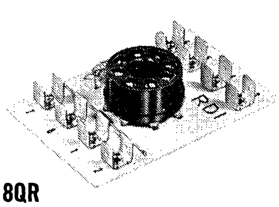
3PDT 11-PIN SOCKET



11BR

Use to mount all standard 11-pin plug-in relays, timers and tubes. No. 8-32 screws accept up to 12 AWG wire. Neon lamp option (11BR1). Size*: 3″ W. x 1¼″ H. Rated 10A/ 300V.

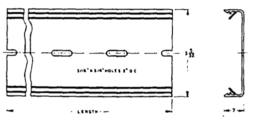
2 & 3PDT QUICK-CONNECT TABS



8QR
11QR

Use to mount all standard octal (8QR) and 11-pin (11QR) plug-in relays, timers and tubes. Quick-connect terminals are double ¼″ tabs. Neon lamp option (8QR1 and 11QR1). Size*: 2″ (8QR), 3″ (11QR) W. x 1⅛″ H. Rated 10A/300V.

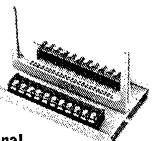
MOUNTING TRACK



TK2

SNAPTRACK™ mounting track is designed for maximum utility of both socket mounting and as a non-conductive rigid PVC chassis for custom circuits, or for breadboarding new circuits. Standard lengths of 6, 12, 24 and 48″. Accepts 3″ nominal card.

P.C. BOARD EDGE CONNECTOR ASSEMBLY



22PCB
with optional "Kluge" pcb NEW

Solve single and two card termination problems. Converts 22 pin card guided edge connector to screw terminal wiring. Also available is optional 22-pin pcb "Kluge" board for prototyping circuits. Holes drilled for DIP devices. Terminal size*: 5″ W. 1¼″ H. top of terminal block. PCB size*: 4.5″ W. x 5″ H. max. suggested. (Guide depth 2½″)

P.C. BOARD TERMINAL BLOCKS

PCV-4
(No. 8 Screws)

2PCV-6
(No. 4 Screws)

Designed for direct insertion into P.C. boards, PCV blocks can be hand or wave soldered.

Cat. No.	No. Terms.	Length (inches)
2PCV-4	4	1.400
2PCV-6	6	2.050
2PCV-7	7	2.375
2PCV-8	8	2.700
2PCV-11	11	3.675
PCV-3	3	1.400
PCV-4	4	1.820
PCV-6	6	2.700

*Socket assembly mounted in $3\frac{5}{32}$″ wide **SNAPTRACK.**

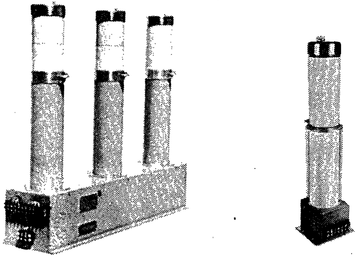
REED DEVICES INC. *21W183 Hill Avenue, Glen Ellyn, Illinois 60137 • 312/858-2050*

ROSS
ENGINEERING
CORPORATION

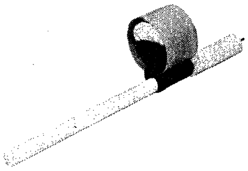
HIGH VOLTAGE DEVICES

SWITCHES, RELAYS, MEASUREMENT, CONTROL, ENERGY STORAGE SYSTEMS, SAFETY, AND ACCESSORIES.

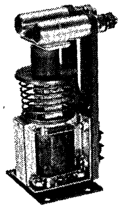
DC, 60 CYCLES, RF, PULSE,
FOR ELECTRONIC AND POWER.
1,000 VOLTS TO 600,000 VOLTS.



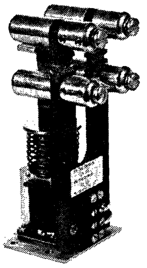
VACUUM POWER INTERRUPTING CONTACTORS AND CIRCUIT BREAKERS
5 to 38 KV RMS operate
50 to 1200 amps continuous
2,000 to 12,000 amps interrupt
10,000 to 40,000 amps momentary



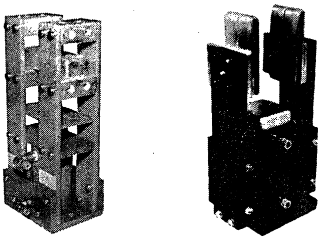
Hi-Z TM HIGH VOLTAGE VOLTMETER
High Impedance
Portable
Instrumentation
.001V to 120 KV



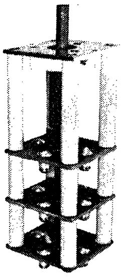
HV RELAYS
E SERIES
Open style
50 to 100 amps
12 to 300 KV PK



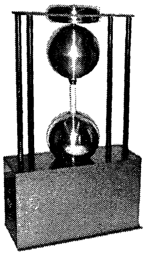
SPDT RELAYS
E SERIES
Economical
Open Style
12 to 70 KV
50 to 100 amps



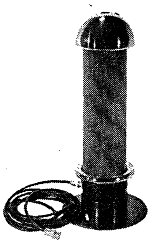
HIGH CURRENT SWITCH
G SERIES
100 to 4,000 amps
Continuous
Small size
to 100 KV, PK test
Air solenoid operated



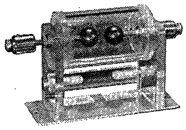
HV ROTARY SWITCHES
R SERIES
To 100 KV PK
10 to 100 amps
Multi-Pole
Multi-Position



GROUNDING RELAYS LOW CORONA
D SERIES
Spring or Gravity operated
to 600 KV, 100 amps



VOLTAGE DIVIDERS
VD SERIES
Compensated
DC to RF
to 450 KV, PK



SPHERE GAPS
SG SERIES
Enclosed
Adjustable
to 600 KV, PK

HV SAFETY GROUNDING INTERLOCKS, SAFETY DEVICES, SPECIALTIES. Models pictured are examples of a related series. Currents are RMS continuous ratings. Voltages listed are Peak 60 Cycle Test values. Operating values are generally 1/3 to 2/3 that of peak test values. Spark-over is generally 10% to 30% higher than peak test listed. Let us quote on specific items since most models are available NO, NC, SPDT, and latching, with 115 AC actuators. Many items are not listed and prices and models can change without notice.

WRITE FOR CATALOG EM71

ROSS ENGINEERING CORPORATION:

559 WESTCHESTER DRIVE, CAMPBELL, CALIF. 95008
PHONE (408) 377-4621
PHONE AFTER HOURS (408) 253-1572

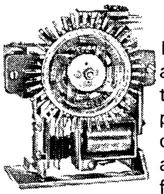
2/71

SCHRACK RELAYS

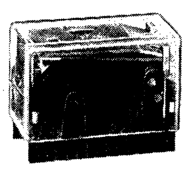
low cost • immediate delivery • highest quality

STEPPING SWITCHES

NEW



RT—A compact, versatile stepping switch which allows the user to create a 1 pole 40 or 48 position, 2 pole 20 or 24 position, or 4 pole 10 or 12 position switch depending upon application. 2 C off-normal and 1 C interrupter contacts are standard. Coil voltage from 6–110 VDC. Pierced .110 faston terminals for soldering or quick connect-disconnect. A die-cast metal frame. Bank contacts and bifurcated wipers. Enclosed in dust cover.

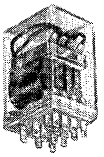


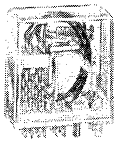
RTM—A miniature plug-in, high speed stepping switch ideal for use where economy of space and price is important. 2 pole 10 or 2 pole 12 position, gold plated contacts mate with socket which terminates on printed circuit spacing. Coil voltage from 12 to 110 VDC. Enclosed in dust cover. Dimensions: 1-41/64" L x 13/16" W x 15/16" H.

MINIATURE RELAYS

NEW

RA—A 4 PDT, U.L. recognized, miniature general purpose relay with gold flashed 3 amp contacts. Coil voltage from 6–220 VAC and 6–110 VDC. Available as plug-in unit to any one of 3 different socket types, with solder lugs or standard P.C. terminals. Enclosed in dust cover. Various contact materials available.

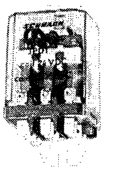


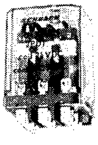


RE—A miniature relay having 6 form C contacts rated at 2 amps. Coil voltage from 6–115 VAC and 6–60 VDC. Mounts as a plug-in, with solder lugs or mates with socket which is on P.C. spacings. Enclosed in dust cover.

NEW

GENERAL PURPOSE RELAYS — INDUSTRIAL

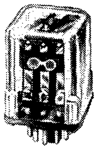




CA—A dependable, robust unit, similar to CAD series except open frame. Supplied with pierced .110 faston terminals for soldering or quick connect-disconnect. P.C. terminals optional. Coil voltage from 6–230 VAC, 50/60 cycle, 6–110 VDC. Recognized by U.L. under File E38891.

CAD—A compact, plug-in relay with dust cover. Available with 1, 2, or 3 PDT contacts rated at 5 or 10 amps. The 8 or 11 pin base mates with any standard tube socket. Coil voltage from 6–230 VAC, 50/60 cycle, and 6–110 VDC.

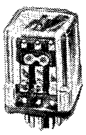
CA



CAD

RM—A small, low cost relay supplied with pierced .187 faston terminals for plug-in, soldering, or quick connect-disconnect application. Dust cover, plain style, for socket applications, or with slotted flanges on both ends of dust cover to permit bracket mounting directly to chassis. Neon lamps, external test button also available. 10 amp contacts. Sockets available. Recognized by U.L. under File E38891.

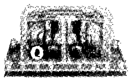
SENSITIVE RELAYS



CSD/CMD—Mechanical construction similar to CA or CAD types but with sensitivity ranging from 40–300 MW and 250 MVA. Max. 3 PDT. Coil voltage from 5–200 VAC and 4.9–100 VDC.

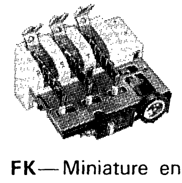
MECHANICAL LATCHING

CBT—A dual coil mechanical relay with dust cover which may be operated continuously up to 1000 cycles per hour. Screw terminals for all contact and coil connections. 4 PDT and 6 PDT contacts rated at 10 amps. Voltage from 6–220 VAC and 6–110 VDC.



CBF—Plug-in unit as above. Mates with 2 sockets (RD78700).

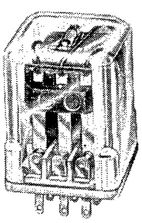
OVERLOAD RELAYS



FA—An overload relay which prevents single phasing in a 3 phase circuit. Open frame design with 3 poles rated from .35 amps to 100 amps. Equipped with reset button for manual or automatic operation.

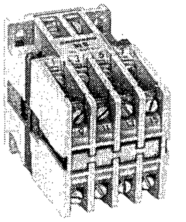
FK—Miniature enclosed version of the above, which is easily mounted on screw terminals of contactors. Contacts rated from .12 to 9.0 amps.

MAGNETIC LATCHING



CRD/CRF—A single coil magnetic latching relay similar in base design to the CAD or CAF series. CRD has octal or 11 pin base. CRF pierced .110 faston terminals for soldering or quick connect-disconnect applications. P.C. terminals can be furnished. Since no parts are subject to wear or friction, longer life is obtainable than with the mechanical latching relay. DPDT and 3PDT available at 10 amps. Enclosed in dust cover; aluminum dust cover optional with CRF type.

RR—Miniature version of the above, but furnished as 4 PDT with 3 amp contact rating. Same physical size as RA relay. Enclosed in dust cover.



CONTACTORS

Open frame, 2-1/16" wide, convertible contacts rated from 10–15 amps, continuous current. Coil voltage from 110–500 VAC and 48–440 VDC. 4 and 8 pole types available.

A complete variety of relay dust covers, plugs and sockets.

Write for catalogs and discount schedules.

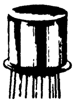
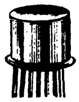
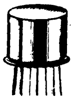
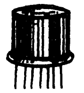
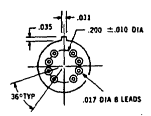
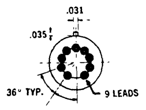
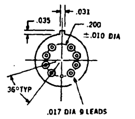
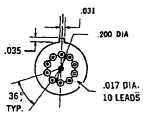
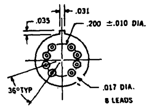
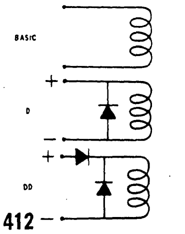
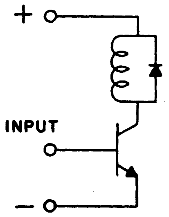
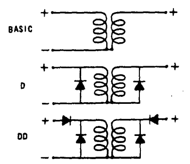
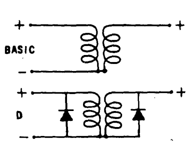
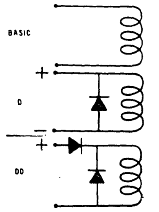
SCHRACK ELECTRICAL SALES CORPORATION **1140 BROADWAY, NEW YORK, N.Y. 10001**

TELEDYNE TRANSISTOR CASE RELAYS

All welded construction
TO-5 transistor type enclosure
Contacts — gold plated for dry circuit requirements
Hermetically sealed
Excellent for high isolation and RF switching
Capable of withstanding high shock and vibration

Insulation Resistance — 10,000 megohms min between mutually insulated terminals
Terminal Strength — Each terminal will withstand a 1 lb. pull in any direction
Temperature Range — -65 C to +125 C (200 C units available)
Enclosure All welded. Hermetically sealed.
Applicable Specification — Meets or exceeds MIL-R5757E
Rated Duty Continuous
Contact Resistance 0.1 ohm max before life 0.2 ohm max after life at max rated current

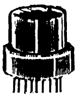
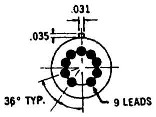
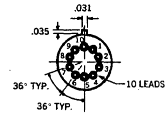
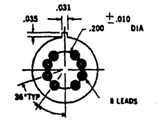
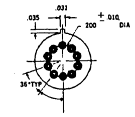
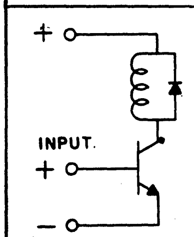
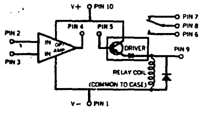
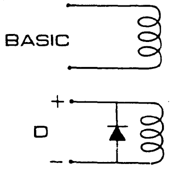
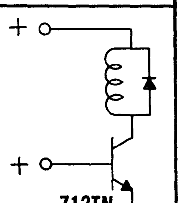
SPDT configurations available for all DPDT models shown

	 **412 412D 412DD DPDT**	 **412T DPDT**	 **420/422 420D/422D 420DD/ 422DD MAG-LATCH DPDT**	 **424A 424AD MAG-LATCH 4PST**	**432 432D 432DD SENSITIVE DPDT**
CONTACT RATING (OPERATIONS)	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^5 at 0.5 amp	10^7 at low level 10^5 at 0.5 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp
CONTACT BOUNCE	1.5 MS Max.	1.5 MS Max.	2.0 MS Max.	3.0 MS Max.	1.5 MS Max.
OPERATE POWER (TURN ON)	130 MW at 25°C	.15 to 90 MW at 25°C	100 MW at 25°C	125 MW at 25°C	60 MW at 25°C
OPERATE TIME	2.0 MS Max. at 25°C	2.0 MS Max. at 25°C	1.5 MS Max. at 25°C	1.5 MS Max.	4.0 MS Max. at 25°C
RELEASE TIME	412 1.5 MS Max. 412D 4 MS at 412DD 25°C	7.5 MS Max. at 25°C	————	————	432 2 MS Max. 432D 7.5 MS at 432DD 25°C
OVERLOAD	2 amp at 28V DC	2 amp at 28V DC	1 amp at 28V DC	1 amp at 28V DC	2 amp at 28V DC
VIBRATION	30 G's to 3,000 cps	30 G's to 3,000 cps	30 G's to 3,000 cps	30 G's to 3,000 cps	30 G's to 3,000 cps
SHOCK	80 G's 11 MS	80 G's, 11 MS	80 G's, 11 MS	100 G's, 11 MS	80 G's, 11 MS
DIELECTRIC STRENGTH	500 VRMS 125 VRMS at 1.3" Hg	500 VRMS 125 VRMS at 1.3" Hg	500 VRMS 125 VRMS at 1.3" Hg	350 VRMS 125 VRMS at 1.3" Hg	500 VRMS 350 VRMS NC-NO 125 VRMS at 1.3" Hg
NOM. COIL DATA (V DC)	5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5, 36, 48
RESISTANCE — OHMS ±10% at 25°C	412 & 412D — 50, 98, 220, 390, 880, 1560 412DD — 50, 98, 280, 500, 1130, 2000	50, 98, 220, 390, 880, 1560	420/422 & 420D/422D — 61, 120, 280, 500, 1130, 2000 420DD/422DD — 48, 97, 280, 500, 1130, 2000	61, 120, 280, 500, 1130, 2000	16 to 11K
H (HEIGHT OF CAN)	.265 Max.	.265 Max.	.275 Max.	.325 Max.	.375 Max.
X (NUMBER OF LEADS)	8 Leads	9 Leads	420 — 9 Leads, 422 — 10 Leads	10 Leads	8 Leads
LEAD LOCATION	 .031 .035 .200 ±.010 DIA 36°TYP .017 DIA 8 LEADS		 .031 .035 .200 ±.010 DIA 36°TYP .017 DIA 9 LEADS		 .031 .035 .200 ±.010 DIA. 36°TYP .017 DIA. 8 LEADS
SCHEMATIC	 **412 – 412D 412DD DPDT**	 **412T DPDT**	 **420/422 420DD 420D/422D 422DD MAG-LATCH DPDT**	 **424A 424AD MAG-LATCH 4PST**	 **432 432D 432DD SENSITIVE DPDT**

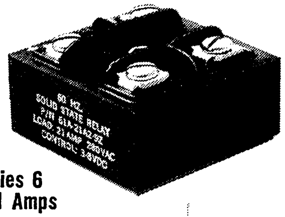
TELEDYNE RELAYS

3155 WEST EL SEGUNDO BLVD.
HAWTHORNE, CALIF. 90250
TELEPHONE (213) 679-2205

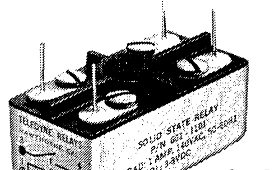
Teledyne is currently providing for space flight applications
Screened Relays which meet or exceed the following NASA
Screening Specifications:
Marshall Space Flight Center — SPEC.
MSFC — SPEC — 339
MSFC — SPEC — 339A
MSFC — SPEC — 40M37496
Goddard Space Flight Center — SPEC.
GSFC — SPEC — 601.100, change 2 Paragraph 3.8
Jet Propulsion Laboratory — SPEC.
JPL — SPEC — ZZP — 2073

432T SENSITIVE DPDT	**501-1 OP-AMP**	**712 712D INDUSTRIAL DPDT**	 **712TN INDUSTRIAL DPDT**
10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp	10^7 at low level 10^6 at 0.5 amp 10^5 at 1.0 amp
1.5 MS Max.	1.5 MS Max.	————	————
.07 to .45 MW at 25°C	————	185 MW at 25°C	.2 to 1.0 MW at 25°C
4.0 MS Max. at 25°C	2.0 MS Max.	4.0 MS Max. at 25°C	4.0 MS Max.
7.5 MS Max. at 25°C	4.0 MS Max.	712 — 3 MS Max. 712D — 6 MS Max.	6.0 MS Max.
2 amp at 28V DC	2 amp at 28V DC	2 amp at 28V DC	2 amp at 28V DC
30 G's to 3,000 cps	30 G's to 3,000 cps	10 G's to 500 cps	10 G's to 500 cps
80 G's, 11 MS	80 G's, 11 MS	30 G's, 11 MS	30 G's
500 VRMS 350 VRMS NC-NO 125 VRMS at 1.3" Hg	500 VRMS 300 VRMS	350 VRMS	350 VRMS
5, 6, 9, 12, 18, 26.5		5, 6, 9, 12, 18, 26.5	5, 6, 9, 12, 18, 26.5
100, 200, 400, 850, 1600, 3300	2K	50, 100, 220, 390, 880, 1560	50, 100, 220, 390, 880, 1560
.375 Max.	.375 Max.	.275 Max.	.275 Max.
9 Leads	10 Leads	8 Leads	10 Leads
 .031 .035 36° TYP. 9 LEADS	 .031 .035 36° TYP. 36° TYP. 10 LEADS	 .031 .035 ±.010 DIA .200 36°TYP 8 LEADS	 .031 .035 ±.010 DIA 200 36°TYP
 432T DPDT SENSITIVE	 V+ PIN 10 PIN 2 PIN 3 PIN 4 PIN 5 IN IN OP AMP DRIVER PIN 7 PIN 8 PIN 6 PIN 9 RELAY COIL (COMMON TO CASE) V— PIN 1 501-1 OP-AMP	 712 712D INDUSTRIAL DPDT	 712TN INDUSTRIAL DPDT

TELEDYNE SOLID STATE RELAYS



Series 6
14-21 Amps

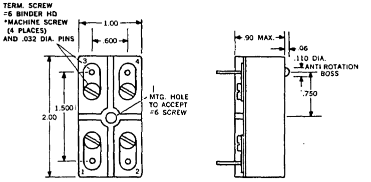


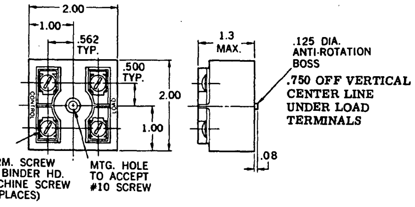
Series 600
1-10 Amps

Solid state relays that meet or exceed all categories of MIL-R-28750 and MIL-STD-704A. Transient protected on input and output. Features include an ultra-sensitive "coil" (compactible with 5 volt logic systems, such as TTL), and a zero-voltage switching option to minimize RFI. They can switch up to 5 KW, resistive or inductive loads.

Extremely high reliability and maintenance-free operation make them ideal for aircraft control and power system applications. Three input "coil" ranges are available, 3-8 VDC, 7-85 VDC, and 90-230 VAC. Features include low "contact resistance" and "contacts" capable of withstanding overloads 1000% above ratings. Lack of moving contacts prevent arcing, permitting switching in explosive atmospheres, controlling motors, solenoid valves, actuators, transformers, etc.

FIG. 7


TERM. SCREW
=6 BINDER HD
*MACHINE SCREW
(4 PLACES)
AND .032 DIA. PINS
1.00
.600
1.500
2.00
3
4
1
2
MTG. HOLE TO ACCEPT =6 SCREW
.90 MAX.
.06
.110 DIA.
ANTI ROTATION BOSS
.750


2.00
1.00
.562 TYP.
.500 TYP.
2.00
1.00
CONTROL
LOAD
TERM. SCREW #8 BINDER HD. MACHINE SCREW (4 PLACES)
MTG. HOLE TO ACCEPT #10 SCREW
1.3 MAX.
.125 DIA. ANTI-ROTATION BOSS
.750 OFF VERTICAL CENTER LINE UNDER LOAD TERMINALS
.08

TELEDYNE RELAYS

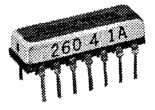
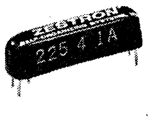
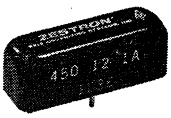
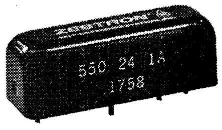
3155 WEST EL SEGUNDO BLVD.
HAWTHORNE, CALIF. 90250
TELEPHONE (213) 679-2205

ZESTRON* REED RELAYS

ZESTRON reed relays feature a patented epoxy-encapsulation technique to insure best possible dynamic characteristics. Magnetic shielding is standard with electrostatic shielding available on many units. Circuit pins are welded to reed leads. A rigid testing program includes the optional "Million-Operation Run-in and Evaluation" (MORE) test.

Brief specifications are listed below.
FOR DETAILED SPECIFICATIONS OR A COPY OF OUR COMPLETE CATALOG, PLEASE WRITE OR CALL.

SELF-ORGANIZING SYSTEMS, INC.
P.O. BOX 9918 • DALLAS, TEX., 75214 • (214) 276-9487

MAGNETICALLY SHIELDED VACUUM ENCAPSULATED ALL WELDED LEADS ZESTRON* REED RELAYS		SERIES NUMBER	CONTACT CONFIGURATION	NOM. OPERATE VOLTS (V)	COIL RESISTANCE (Ω) ± 10% @ $T_A = 25°C$	MAX. CURRENT, RESISTIVE LOAD	MAX. DC VOLTS (VDC)	MAX. VOLT-AMPERES (VA)	OPERATE TIME INC. BOUNCE (MS)	LIFE EXPECTANCY RATED LOAD (OPER)
DUAL IN-LINE PACKAGE TTL/DTL COMPATIBLE ☐ Economy DIP — 260 ☐ Diode Suppression — 262, 267 ☐ Electrostatic Shield — 265, 267 ☐ Sensitive Coils — 260, 262 ☐ Other contact configurations available.	 .2″ × .28″ × .78″	260 262	1A	4.5 12	500 1K	100 mA	28	3	0.3	$>3 \times 10^6$
		265 267		4.5 12	300 600					
ULTRA-MINIATURE. SMALLER THAN DIP FOR PC MOUNT ☐ 1 msec. operate — 225 ☐ 0.5 msec. operate — 226 ☐ Electrostatic and magnetic shielding standard.	 .21″ × .21″ × .81″	225	1A	4.5 6 12	150 170 680	250 mA	50	4	1	$>3 \times 10^6$
		226		4.5 12	230 1.5K	125 mA	28	3	0.5	
PROVEN RELIABILITY ECONOMY AND VALUE ☐ Optimum performance per dollar — 360 ☐ Electrostatic Shielding for RF and Video Applications — 365	.26″ × .26″ × 1.41″	360 365	1A 2A	4.5 6 12	110 to 880	500 mA	50	10	1	$>20 \times 10^6$
MINIATURE FORM C MINIATURE MERCURY WETTED ☐ 24 Volt coils ☐ Smallest available form C — 450 ☐ Smallest available mercury wet — 451	 .39″ × .39″ × 1.08″	450	1A	4.5 12 24	110 to 3.2K	250 mA	50	4	1	$>3 \times 10^6$
			1C			125 mA	28	3	2	
		451	1A			1A	28	28	3	$>20 \times 10^6$
LOW THERMAL EMF MULTIPLE CONTACT CONFIGURATIONS ☐ $<3\mu V$ Thermal EMF — 545 ☐ Package compatibility in forms A, B and C, 1 to 4 poles — 550	 .50″ × .50″ × 1.42″	545	1A, 2A 3A	4.5 12	160 to 3K	10 mA	12	0.1	2	$>100 \times 10^6$
		550	1A, 2A, 3A, 4A 1B, 2B	6 12 24	90 to 4K	500 mA	50	10	1	$>10 \times 10^6$
			1C, 2C 3C, 4C		45 to 2K	125 mA	28	3	2	
		551	1A, 2A 3A, 4A 1B			1A		28	3	$>20 \times 10^6$
HIGHEST POWER. DRY REED OR MERCURY WETTED ☐ 1 Amp dry reed — 650 ☐ 3 Amp mercury wet — 651 ☐ Up to 50 VA.	.62″ × .62″ × 2.64″	650	1A 2A 4A	6 12 24	45 to 3.4K	1A	250	15	3	$>20 \times 10^6$
			1C 2C 4C			500 mA		10	7	$>10 \times 10^6$
		651	1A 2A 4A			3A	400	50	3	$>100 \times 10^6$

*TRADEMARK *ZESTRON Reed Relays are manufactured by:*

SELF-ORGANIZING SYSTEMS, INC. P.O. BOX 9918/DALLAS, TEX., 75214/(214) 276-9487/PLANT: 3121 BENTON/GARLAND, TEX., 75040

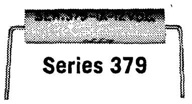
Wheelock
DATA SWITCH
Wheelock Signals Inc

THE Wheelock FAMILY OF RELAYS

ULTRA-MINIATURE REED RELAYS

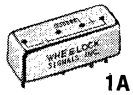
WHEELOCK SIGNALS INC.

Series 372



Series 379

- Occupies only 0.02 cu. in.
- Operates on only 50 mw of power
- Operate time 300 microseconds (typical)
- Insulation resistance as high as $1 \times 10^{14}\Omega$
- Contacts rated at a full 7 watts


WHEELOCK SIGNALS INC.
1A

Series 442

- Smallest Multi-Pole Relays in Industry
- Occupies 0.055 cu. in. per pole
- Operates on 90 mw
- P.C. board mount
- Contacts rated at full 7 watts

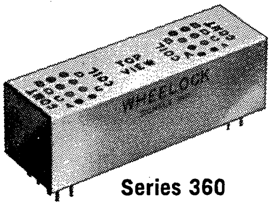
MICRO-MINIATURE REED RELAYS

- Contact rating: 10W, 500 ma
- Coil voltages: 6, 12 or 24 VDC
- Insulation resistance: $5 \times 10^{10}\Omega$

PRINTED CIRCUIT BOARD MODEL

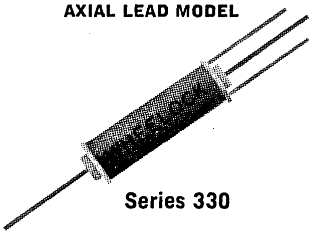
Series 3421

HIGH DENSITY MODEL



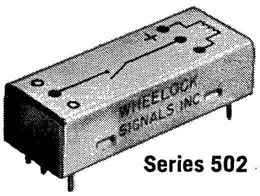
Series 360

AXIAL LEAD MODEL



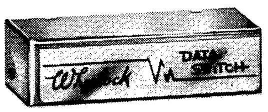
Series 330

MINIATURE REED RELAYS


WHEELOCK SIGNALS INC

Series 502

- All contact configurations available
- Coil voltages: 6-48 VDC
- Contact rating: 10 watts
- Standard 1″ grid spacing


Wheelock
DATA SWITCH

Series 262

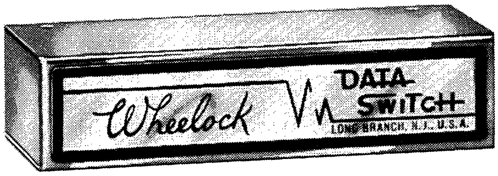
- Contact arrangements, single pole to 6 pole models
- Coil voltages: 6 to 48 VDC
- Coil ratings: 125 to 600 mw
- Contact rating: 10W

STANDARD REED RELAYS

- Coil ratings: 200 to 1500 mw
- Contact ratings to 50W
- Operating time: 2.5 ms (typical)
- Coil voltages: 6 to 120 VDC

MERCURY WETTED REED RELAYS

- Contacts: 1 to 5 pole
- Coil ratings: 200 mw for 1 pole, to 1500 mw for 5 poles
- Coil voltages: 6 to 120 VDC
- Contact rating: 3 amp up to 50W


Wheelock
DATA SWITCH
LONG BRANCH, N.J., U.S.A.

Series 3002 & Series 3002 Hg

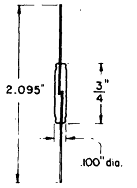
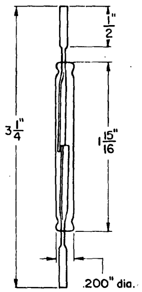
Wheelock

For complete details on how Wheelock can help solve problems involving space, weight and environmental limitations, write for the NEW Wheelock Reed Relay Catalog. It features the latest test data on reed relay life and reliability, dynamic characteristics and static characteristics.

SIGNALS INC. • 273 BRANCHPORT AVENUE • LONG BRANCH, NEW JERSEY 07740 • (201) 222-6880

NPE Controls Relay Manufacture Relay—For Greater Reliability—

REED SWITCHES

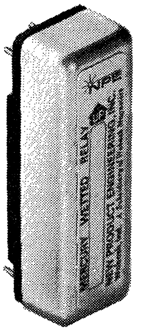
	SUBMINIATURE DRY REED SWITCH **69-2421** 	STANDARD DRY REED SWITCH **69-4321** 
Physical Characteristics		
Contact arrangement	Form A (SPSTNO)	Form A (SPSTNO)
Contact material	Rhodium	Rhodium
Atmosphere	Dry inert gas	Dry inert gas
Termination	Solderable or weldable	Solderable or weldable
Contact Ratings (max.)		
Voltage	100 v D.C., 150 v A.C.	150 v D.C., 250 v A.C.
Current (switch)	.5 amp	1.5 amps
Current (carry)	3 amps	6 amps
Power (D.C.)	15 watts	25 watts
Power (A.C. suppressed)	25 volt-amperes	40 volt-amperes
Resistance (initial)	200 milliohms	50 milliohms
Peak breakdown voltage	300 volts	500 volts
Operating Parameters		
Pull-in (specify range)	17.5 to 62.5 ampere turns	40 to 150 ampere turns
Drop-out (specify range)	approx. ½ of pull-in	approx. ½ of pull-in
Operate speed	1 msec (incl. bounce)	2.5 msec (incl. bounce)
Release speed	.1 msec	1.0 msec
Closure rate (maximum)	2000 hertz	400 hertz
Temperature range	−55°C to +150°C	−55°C to +155°C
Insulation resistance	10^{12} ohms min.	10^{12} ohms min.
Capacitance	.5 picofarad	1.5 picofarads
Shock	200G max., 11 ±1 msec	100G max., 11 ±1 msec
Vibration	30G max. @ 0 to 1700 hertz	30G max. @ 0 to 600 hertz
Life and Reliability (End-of-Life criteria: contact loss of 500 MV max. for Rated and Intermediate Loads, 100 MV max. for Low Level Load, 50 ohms max. for Dry Circuit Loads.)		
Rated Power Load — Life	20 x 10^6	20 x 10^6
Intermediate Load — Life	100 x 10^6	100 x 10^6
Low Level Load — Life	100 x 10^6	100 x 10^6
Dry Circuit Load — Life	500 x 10^6	500 x 10^6

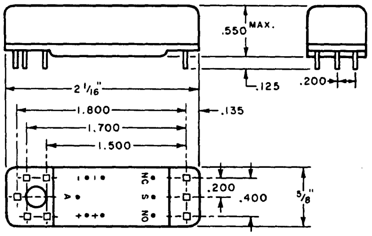
wabash

WRITE FOR DETAILS AND DESIGN ASSISTANCE

MERCURY-WETTED RELAYS

P/C MOUNT





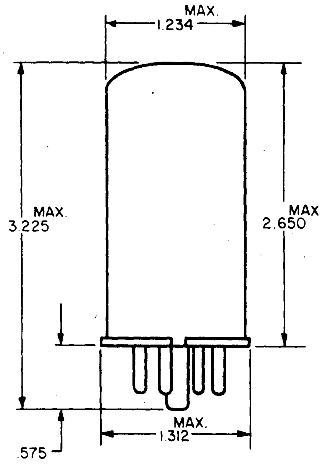
DATA SHEET P/C MOUNT

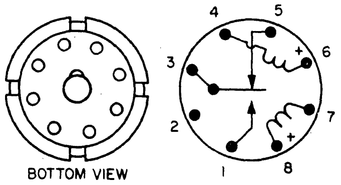
Coil Resistance Ohms	Must Operate Voltage	Must Release Voltage	Maximum Voltage	Part Number Form C	Part Number Form D
SINGLE-SIDE-STABLE, SINGLE WOUND					
385	4.35	.79	27.8	5507-110-0435	5107-110-0435
1540	8.70	1.5	55.5	5507-110-0870	5107-110-0870
5900	17.3	3.2	109.	5507-110-1730	5107-110-1730
SINGLE-SIDE-STABLE, DOUBLE WOUND					
190/190	4.35	.79	19.6	5507-210-0435	5107-210-0435
780/780	8.70	1.5	39.	5507-210-0870	5107-210-0870
2950/2950	17.3	3.2	77.	5507-210-1730	5107-210-1730
BI-STABLE, DOUBLE WOUND					
190/190	±1.71	± .61	19.6	5507-220-0171	5107-220-0171
780/780	±3.45	±1.20	39.	5507-220-0345	5107-220-0345
2950/2950	±6.90	±2.46	77.	5507-220-0690	5107-220-0690

Other standard relays are shown in the complete catalog.
Special relays available upon request.

PLUG-IN MOUNT

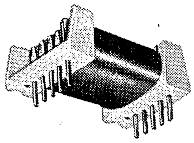
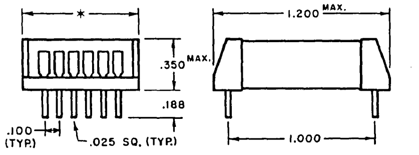
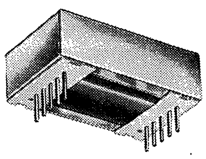
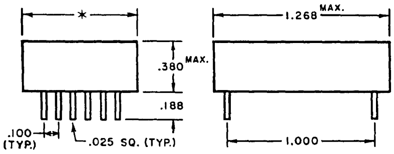
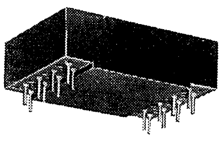
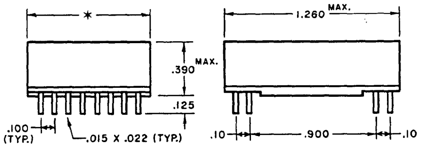
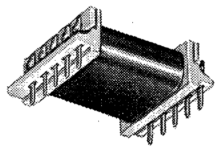
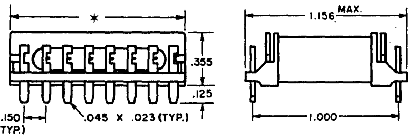
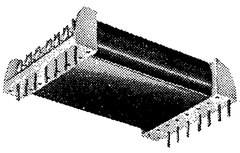
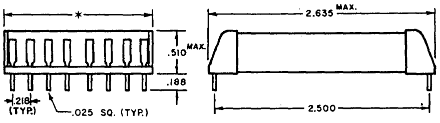
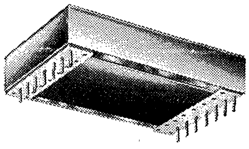
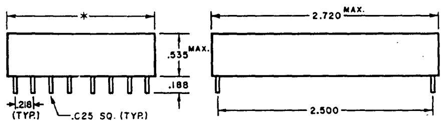
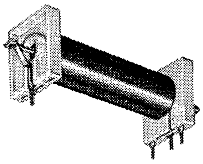
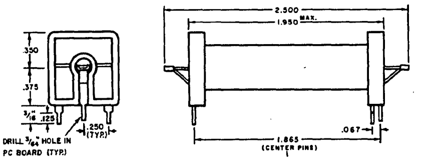
NPE
MERCURY WETTED RELAY





from Switch to Finished Better Performance

REED RELAYS

SERIES		END (TYP.) AND SIDE VIEWS	AVAILABLE CONTACT FORMS
822† MINIATURE		 * 1.200 MAX. .350 MAX. .188 .100 (TYP.) .025 SQ. (TYP.) 1.000	1A 2A 3A 4A 5A 1B 2B 1A1B 1A2B 1A1C(2A1B) 2A1B 2A2B 1B1C(1A2B) 1C 2C 3C 1A(mag.latch) 2A(mag.latch)
823† MINIATURE		 * 1.268 MAX. .380 MAX. .188 .100 (TYP.) .025 SQ. (TYP.) 1.000	1A 2A 3A 4A 5A 1B 2B 1A1B 1A2B 1A1C(2A1B) 2A1B 2A2B 1B1C(1A2B) 1C 2C 3C 1A(mag.latch) 2A(mag.latch)
824 MINIATURE		 * 1.260 MAX. .390 MAX. .125 .100 (TYP.) .015 X .022 (TYP.) .10 .900 .10	1A 2A 3A 4A 5A 6A 1B 2B 1A1B 1A2B 1A1C(2A1B) 2A1B 3A1B 3A2B 4A1B 1B1C(1A2B) 1C 2C 3C 4C 1A(mag.latch) 2A(mag.latch)
832 MINIATURE		 * 1.156 MAX. .355 .125 .150 (TYP.) .045 X .023 (TYP.) 1.000	1A 2A 3A 4A 5A 6A 1B 2B 1A1B 1A2B 1A1C(2A1B) 2A1B 2A2B 3A1B 3A2B 4A1B 4A2B 1B1C(1A2B) 1C 2C 3C 4C 1A(mag.latch) 2A(mag.latch)
842† STANDARD		 * 2.635 MAX. .510 MAX. .188 .218 (TYP.) .025 SQ. (TYP.) 2.500	1A 2A 3A 4A 5A 6A 8A 1B 2B 1A1B 1A2B 1A1C(2A1B) 2A1B 2A2B 3A1B 3A2B 4A1B 5A2B 1B1C(1A2B) 1C 2C 1A(mag.latch) 2A(mag.latch)
843 STANDARD		 * 2.720 MAX. .535 MAX. .188 .218 (TYP.) .025 SQ. (TYP.) 2.500	1A 2A 3A 4A 5A 6A 8A 1B 2B 1A1B 1A2B 1A1C(2A1B) 2A1B 2A2B 3A1B 3A2B 4A1B 5A2B 1B1C(1A2B) 1C 2C 1A(mag.latch) 2A(mag.latch)
852 STANDARD		 2.500 1.950 MAX. .350 .375 3/16 .125 .250 (TYP.) DRILL 3/64 HOLE IN PC BOARD (TYP.) .067 1.865 (CENTER PINS)	1A

† UL Listed Series

*Variable dimension depending on series and contact configuration. (Range: 832 Series: .445 to 1.20; 822 Series: .405 to .810; 823 Series: .465 to .875; 824 Series: .382 to .882; 842 Series: .645 to 2.170; 843 Series: .700 to 2.216 inches.)

CONTACT RATINGS For miniatures, see preceding page reed switch part number 69-2421; for standards see reed switch part number 69-4321.

LIFE AND RELIABILITY For miniatures see preceding page reed switch part number 69-2421; for standards see reed switch part number 69-4321.

OPERATING PARAMETERS	**MINIATURE**	**STANDARD**
Temperature:	−55°C to +105°C	−55°C to +105°C
Shock:	200G max., 11± 1 msec	100G max., 11± 1 msec
Vibration:	30G max. @ 0 to 1700 hertz	30G max. @ 0 to 600 hertz
Insulation resistance:	10^{12} ohms min.	10^{12} ohms min.
Capacitance:	.5 picofarad	1.5 picofarads

NEW PRODUCT ENGINEERING, INC. *A Subsidiary of Wabash Magnetics, Inc.* **wabash**
First and Webster Streets, Wabash, Indiana 46992 Telephone (219) 563-2191 TWX 810-290-2722

astrodyne, inc.

HEAT TRANSFER AND DISSIPATION DEVICES

OVER 75 BASIC HEAT SINK DESIGNS . . . PLUS CUSTOM DESIGNS.

ENGINEERING & DESIGN CAPABILITIES which will deliver the most appropriate cooling solution for every requirement are available with rapid response. *For design assistance, quotations or complete catalog information, call*
(617) 272-3850

FORCED CONVECTION

MODULAR design permits custom assembly of compact packages containing from 4 to 16 individual heat sinks, serviced by a single, standard compact blower. Side panels provide space for terminal boards or mounting associated components. UP TO 40 SINKS MOUNTED TO A SINGLE FAN—insulated electrically and separated physically with direct access to each mounted component — are provided by the 2601 Series.

(Bulletins FC-404/FC-601)

NATURAL CONVECTION

UP TO 20% MORE COOLING area per inch of length is provided by the patented T-fin construction. Units at right are illustrative of more than 70 natural convection models. Maximum dissipation in minimum space is provided with or without forced cooling.

(Catalog NC-2500)

MODULAR HEAT SINK

Model 2520 permits custom assembly of natural convection packages with all components and wiring on one side and cooling surfaces on the other. Units may be epoxy bonded or permanently brazed.

(Bulletin NC-520)

HIGH POWER COMPONENTS

Wide shelf of Model 2507 permits easy mounting of high power components including SCRs.

(Bulletin NC-507)

TRANSISTOR HEAT SINKS

2700 Series provide easy, secure mounting for computer, circuit board and other applications.
2800 Series for low power transistors provide large surface contact with chassis or other mounting surface. Both 2700 and 2800 Series accommodate TO-5 and TO-9 cases.

(Bulletin NC-701)

"GEAR" Type, Model 2201, provides increased surface area with angled fins for optimum natural convection cooling of low power devices.

(Bulletin NC-201)

CIRCUIT BOARD TYPES

2300 Series flush-mount, natural convection units permit high packing density and free circulation of air from any direction regardless of mounting position. Four models have common 1.81″ square base.

(Bulletin NC-300)

ULTRA-HIGH POWER "HOCKEY-PUCK" HEAT SINKS

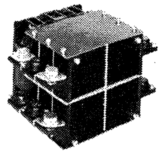
Five models provide high compression mounting for SCRs. Unique combination electrical terminal (600 amps) and spring-loaded mounting clamp allow easy replacement of rectifier/heat-sink assembly. CLAMPS for mounting with pressures to 2,000 lbs.

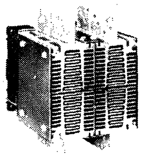
(Catalog HP-500)

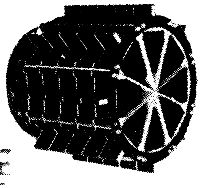
COMPACT HEAT EXCHANGERS

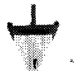
Six all-copper models, available from stock, provide high heat exchange efficiency with low pressure drops. Supplied with or without fans.

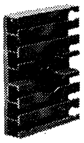
(Heat Exchanger Bulletin)

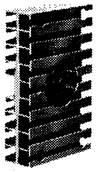

2401-12B

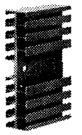

2404-12B


2601-40B

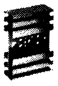


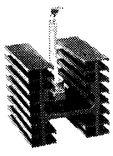

2501

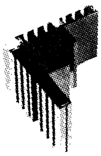

2503

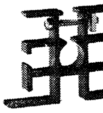

2506

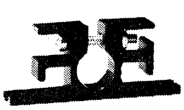
2513

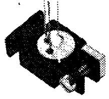

2515

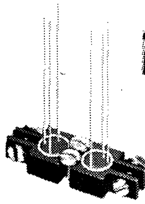

2507

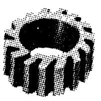

2520

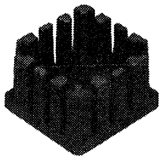

2703

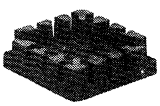

2701

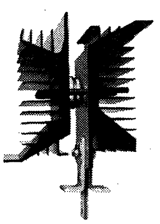

2801

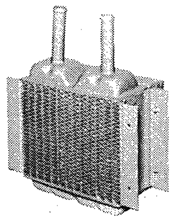

2802


2201


2300-010


2300-005


2554


100

astrodyne, inc.
SUBSIDIARY OF ROANWELL CORPORATION
353 MIDDLESEX AVENUE • WILMINGTON, MASS. 01887
(617) 272-3850 TWX: 710-347-0704

CARTER'S

POPULAR TRANSISTOR LINE

METAL CAN TRANSISTORS

2N497
2N498
2N656
2N657
2N696
2N697
2N698
2N699
2N699A
2N699B
2N706
2N706A
2N706B
2N706C
2N708
2N718
2N718A
2N719
2N720
2N720A
2N721
2N722
2N730
2N731
2N743
2N743A
2N744
2N744A
2N760
2N760A
2N783
2N784
2N784A
2N834
2N834A
2N835
2N870
2N871
2N910
2N911
2N912
2N915
2N916
2N917
2N917A
2N918
2N929
2N929A
2N930
2N930A
2N930B
2N956
2N957
2N1131
2N1132
2N1420
2N1507
2N1613
2N1613A
2N1613B
2N1711
2N1711A
2N1711B
2N1889
2N1890
2N1893
2N1893A
2N1990
2N2102
2N2102A
2N2192
2N2192A
2N2192B
2N2193
2N2193A
2N2193B
2N2194
2N2194A
2N2194B
2N2195
2N2195A
2N2195B
2N2205
2N2217
2N2218
2N2218A
2N2219
2N2219A
2N2220
2N2221
2N2221A
2N2222
2N2222A
2N2236
2N2237
2N2243
2N2243A
2N2270
2N2297
2N2303
2N2309
2N2310
2N2311
2N2312
2N2313
2N2314
2N2315
2N2316
2N2317
2N2350
2N2350A
2N2351
2N2351A
2N2352
2N2352A
2N2353
2N2353A
2N2364
2N2364A
2N2368
2N2369
2N2369A
2N2380
2N2380A
2N2405
2N2479
2N2481
2N2483
2N2484
2N2484A
2N2509
2N2510
2N2511
2N2586
2N2604
2N2605
2N2645
2N2695
2N2696
2N2703
2N2800
2N2801
2N2837
2N2838
2N2861
2N2862
2N2865
2N2868
2N2895
2N2896
2N2897
2N2898
2N2899
2N2900
2N2904
2N2904A
2N2905
2N2905A
2N2906
2N2906A
2N2907
2N2907A
2N2958
2N2959
2N2960
2N2961
2N3010
2N3011
2N3019
2N3020
2N3036
2N3056
2N3056A
2N3057
2N3057A
2N3072
2N3073
2N3081
2N3107
2N3108
2N3109
2N3110
2N3115
2N3116
2N3117
2N3120
2N3121
2N3122
2N3133
2N3134
2N3135
2N3136
2N3210
2N3227
2N3250
2N3250A
2N3251
2N3251A
2N3299
2N3300
2N3301
2N3302
2N3326
2N3388
2N3485
2N3485A
2N3486
2N3486A
2N3502
2N3503
2N3504
2N3505
2N3671
2N3672
2N3673
2N3700
2N3701
2N3725
2N3725A
2N3838
2N4080
2N4137

EPOXY TRANSISTORS

2N3563
2N3565
2N3566
2N3567
2N3568
2N3569
2N3638
2N3638A
2N3641
2N3642
2N3643
2N3644
2N3645
2N3646
2N3688
2N3689
2N3690
2N3691
2N3692
2N3693
2N3694
2N4121
2N4122
2N4140
2N4141
2N4142
2N4143
2N4248
2N4249
2N4250
2N4274
2N4275
2N4354
2N4436
2N4437
2N4917
2N4944
2N4945
2N4946
2N4964
2N4965
2N4967
2N4968
2N4969
2N4970
2N4971
2N4972
2N5126
2N5127
2N5128
2N5129
2N5130
2N5131
2N5132
2N5133
2N5134
2N5135
2N5136
2N5137
2N5138
2N5139
2N5141
2N5142
2N5143
CEN697
CEN706
CEN708
CEN718A
CEN722
CEN744
CEN870
CEN871
CEN914
CEN915
CEN916
CEN918
CEN930
CEN956
CEN1132
CEN613
CEN1711
CEN2219
CEN2222
CEN2369A
CEN2484
CEN2905
CEN2907
CEN3502
CEN3504
CEN3962
CSE1001
CSE1002
CSE2001
CSE2002
CSE3001
CSE3002
CSE4001
CSE4010
CSE5001
CSE5002
CSE5003
CSE5006
CSE5020
CSE5021
CSE5022
CSE5023
CSE5024
CSE5050
CSE5051
CSE6001
CSE6002
CSE6010
CSE7001
CSE8020
CSE8021
CSE8521

CARTER SEMICONDUCTOR INC.

374 BAYVIEW AVENUE • AMITYVILLE, L.I., NEW YORK 11707
Telephone: (516) 598-0660
TWX: 510-224-6691
Midwest Tel.: (312) 498-4260
West Tel.: (415) 941-7066

CENTRALAB SEMICONDUCTOR
Division • GLOBE-UNION INC.

PRIME′ SEMICONDUCTOR DEVICES Microglass Regulators and Rectifiers and Temperature Compensated Reference Diodes

PRIME′ MICROGLASS REGULATORS

400mW Microglass Regulators (DO-35 Case)

Type Number	Zener Breakdown Voltage V_Z @ I_{ZT}	Test Current I_{ZT}	Maximum Dynamic Resistance Z_{ZT} @ I_{ZT}	Maximum Dynamic Knee Resistance Z_{ZK} @ I_{ZK}		Microminiature Replacement for JEDEC Type
	Volts	mA	Ohms	Ohms	mA	
HM 6.8	6.8	18.5	4.5	700.0	1.0	1N957
HM 7.5	7.5	16.5	5.5	700.0	0.5	1N958
HM 8.2	8.2	15.0	6.5	700.0	0.5	1N959
HM 9.1	9.1	14.0	7.5	700.0	0.5	1N960
HM 10	10.0	12.5	8.5	700.0	0.25	1N961
HM 11	11.0	11.5	9.5	700.0	0.25	1N962
HM 12	12.0	10.5	11.5	700.0	0.25	1N963
HM 13	13.0	9.5	13.0	700.0	0.25	1N964
HM 15	15.0	8.5	16.0	700.0	0.25	1N965
HM 16	16.0	7.8	17.0	700.0	0.25	1N966
HM 18	18.0	7.0	21.0	750.0	0.25	1N967
HM 20	20.0	6.2	25.0	750.0	0.25	1N968
HM 22	22.0	5.6	29.0	750.0	0.25	1N969
HM 24	24.0	5.2	33.0	750.0	0.25	1N970
HM 27	27.0	4.6	41.0	750.0	0.25	1N971
HM 30	30.0	4.2	49.0	1000.0	0.25	1N972
HM 33	33.0	3.8	58.0	1000.0	0.25	1N973
HM 36	36.0	3.4	70.0	1000.0	0.25	1N974
HM 39	39.0	3.2	80.0	1000.0	0.25	1N975
HM 43	43.0	3.0	93.0	1500.0	0.25	1N976
HM 47	47.0	2.7	105.0	1500.0	0.25	1N977
HM 51	51.0	2.5	125.0	1500.0	0.25	1N978
HM 56	56.0	2.2	150.0	2000.0	0.25	1N979
HM 62	62.0	2.0	185.0	2000.0	0.25	1N980
HM 68	68.0	1.8	230.0	2000.0	0.25	1N981
HM 75	75.0	1.7	270.0	2000.0	0.25	1N982
HM 82	82.0	1.5	330.0	3000.0	0.25	1N983
HM 91	91.0	1.4	400.0	3000.0	0.25	1N984
HM 100	100.0	1.3	500.0	3000.0	0.25	1N985
HM 110	110.0	1.1	750.0	4000.0	0.25	1N986
HM 120	120.0	1.0	900.0	4500.0	0.25	1N987
HM 130	130.0	0.95	1100.0	5000.0	0.25	1N988
HM 150	150.0	0.85	1500.0	6000.0	0.25	1N989
HM 160	160.0	0.80	1700.0	6500.0	0.25	1N990
HM 180	180.0	0.68	2200.0	7000.0	0.25	1N991
HM 200	200.0	0.65	2500.0	8000.0	0.25	1N992

1 Watt Microglass Regulators (Case Type 6)

Type Number	Zener Breakdown Voltage V_Z @ I_{ZT}	Test Current I_{ZT}	Maximum Dynamic Resistance Z_{ZT} @ I_{ZT}	Maximum Dynamic Knee Resistance Z_{ZK} @ I_{ZK}		Microminiature Replacement for JEDEC Type
	Volts	mA	Ohms	Ohms	mA	
HW 6.8	6.8	37.0	3.5	700.0	1.0	1N3016
HW 7.5	7.5	34.0	4.0	700.0	0.5	1N3017
HW 8.2	8.2	31.0	4.5	700.0	0.5	1N3018
HW 9.1	9.1	28.0	5.0	700.0	0.5	1N3019
HW 10	10	25.0	7.0	700.0	0.25	1N3020
HW 11	11	23.0	8.0	700.0	0.25	1N3021
HW 12	12	21.0	9.0	700.0	0.25	1N3022
HW 13	13	19.0	10.0	700.0	0.25	1N3023
HW 15	15	17.0	14.0	700.0	0.25	1N3024
HW 16	16	15.5	16.0	700.0	0.25	1N3025
HW 18	18	14.0	20.0	750.0	0.25	1N3026
HW 20	20	12.5	22.0	750.0	0.25	1N3027
HW 22	22	11.5	23.0	750.0	0.25	1N3028
HW 24	24	10.5	25.0	750.0	0.25	1N3029
HW 27	27	9.5	35.0	750.0	0.25	1N3030
HW 30	30	8.5	40.0	1000.0	0.25	1N3031
HW 33	33	7.5	45.0	1000.0	0.25	1N3032
HW 36	36	7.0	50.0	1000.0	0.25	1N3033
HW 39	39	6.5	60.0	1000.0	0.25	1N3034
HW 43	43	6.0	70.0	1500.0	0.25	1N3035
HW 47	47	5.5	80.0	1500.0	0.25	1N3036
HW 51	51	5.0	95.0	1500.0	0.25	1N3037
HW 56	56	4.5	110.0	2000.0	0.25	1N3038
HW 62	62	4.0	125.0	2000.0	0.25	1N3039
HW 68	68	3.7	150.0	2000.0	0.25	1N3040
HW 75	75	3.3	175.0	2000.0	0.25	1N3041
HW 82	82	3.0	200.0	3000.0	0.25	1N3042
HW 91	91	2.8	250.0	3000.0	0.25	1N3043
HW 100	100	2.5	350.0	3000.0	0.25	1N3044
HW 110	110	2.3	450.0	4000.0	0.25	1N3045
HW 120	120	2.0	550.0	4500.0	0.25	1N3046
HW 130	130	1.9	700.0	5000.0	0.25	1N3047
HW 150	150	1.7	1000.0	6000.0	0.25	1N3048
HW 160	160	1.6	1100.0	6500.0	0.25	1N3049
HW 180	180	1.4	1200.0	7000.0	0.25	1N3050
HW 200	200	1.2	1500.0	8000.0	0.25	1N3051

PRIME′ Centralab semiconductor products are available at four levels of reliability — at realistic prices to meet individual requirements.

PRIME′ grades are:

- **PRIME′ 1** — For critical applications requiring maximum reliability. 100% conditioning, testing and data profiling — in excess of JAN-TX requirements.
- **PRIME′ 2** — For military and industrial applications requiring JAN-TX or equivalent reliability.
- **PRIME′ 3** — For applications requiring JAN or equivalent performance.
- **PRIME′ 4** — Commercial and industrial grade devices.

You pay only for the grade you need.

A detailed PRIME′ program brochure is available upon request.

1 Watt Microglass Regulators (Case Type 6)

Type Number	Zener Breakdown Voltage V_Z @ I_{ZT}	Test Current I_{ZT}	Maximum Dynamic Resistance Z_{ZT} @ I_{ZT}	Maximum Dynamic Knee Resistance Z_{ZK} @ I_{ZK} (2)		Maximum Reverse Current I_R @ V_R	
	Volts	mA	Ohms	Ohms	mA	μA	Volts
1N4736	6.8	37	3.5	700	1.0	10	4.0
1N4737	7.5	34	4.0	700	0.5	10	5.0
1N4738	8.2	31	4.5	700	0.5	10	6.0
1N4739	9.1	28	5.0	700	0.5	10	7.0
1N4740	10	25	7.0	700	0.25	10	7.6
1N4741	11	23	8.0	700	0.25	5	8.4
1N4742	12	21	9.0	700	0.25	5	9.1
1N4743	13	19	10	700	0.25	5	9.9
1N4744	15	17	14	700	0.25	5	11.4
1N4745	16	15.5	16	700	0.25	5	12.2
1N4746	18	14	20	750	0.25	5	13.7
1N4747	20	12.5	22	750	0.25	5	15.2
1N4748	22	11.5	23	750	0.25	5	16.7
1N4749	24	10.5	25	750	0.25	5	18.2
1N4750	27	9.5	35	750	0.25	5	20.6
1N4751	30	8.5	40	1000	0.25	5	22.8
1N4752	33	7.5	45	1000	0.25	5	25.1
1N4753	36	7.0	50	1000	0.25	5	27.4
1N4754	39	6.5	60	1000	0.25	5	29.7
1N4755	43	6.0	70	1500	0.25	5	32.7
1N4756	47	5.5	80	1500	0.25	5	35.8
1N4757	51	5.0	95	1500	0.25	5	38.8
1N4758	56	4.5	110	2000	0.25	5	42.6
1N4759	62	4.0	125	2000	0.25	5	47.1
1N4760	68	3.7	150	2000	0.25	5	51.7
1N4761	75	3.3	175	2000	0.25	5	56.0
1N4762	82	3.0	200	3000	0.25	5	62.2
1N4763	91	2.8	250	3000	0.25	5	69.2
1N4764	100	2.5	350	3000	0.25	5	76.0

1½ Watt Microglass Regulators (Case Type 6)

Type Number	Zener Breakdown Voltage V_Z @ I_{ZT}	Test Current I_{ZT}	Maximum Dynamic Resistance Z_{ZT} @ I_{ZT}	Maximum Dynamic Knee Resistance Z_{ZK} @ I_{ZK}		Maximum Reverse Current I_R @ V_R		Maximum Voltage Regulation $\triangle V_Z$
	Volts ±5%	mA	Ohms	Ohms	mA	μA	Volts	Volts
1N4460	6.2	40.0	4.0	200.0	1.0	20.0	3.72	0.35
1N4461	6.8	37.0	2.5	200.0	1.0	5.0	4.08	0.30
1N4462	7.5	34.0	2.5	400.0	0.5	1.0	4.50	0.35
1N4463	8.2	31.0	3.0	400.0	0.5	0.5	4.92	0.40
1N4464	9.1	28.0	4.0	500.0	0.5	0.3	5.46	0.45
1N4465	10.0	25.0	5.0	500.0	0.25	0.5	8.0	0.50
1N4466	11.0	23.0	6.0	550.0	0.25	0.3	8.8	0.55
1N4467	12.0	21.0	7.0	550.0	0.25	0.2	9.6	0.60
1N4468	13.0	19.0	8.0	550.0	0.25	0.1	10.4	0.65
1N4469	15.0	17.0	9.0	600.0	0.25	0.05	12.0	0.75
1N4470	16.0	15.5	10.0	600.0	0.25	0.05	12.8	0.80
1N4471	18.0	14.0	11.0	650.0	0.25	0.05	14.4	0.83
1N4472	20.0	12.5	12.0	650.0	0.25	0.05	16.0	0.95
1N4473	22.0	11.5	14.0	650.0	0.25	0.05	17.6	1.0
1N4474	24.0	10.5	16.0	700.0	0.25	0.05	19.2	1.1
1N4475	27.0	9.5	18.0	700.0	0.25	0.05	21.6	1.3
1N4476	30.0	8.5	20.0	750.0	0.25	0.05	24.0	1.4
1N4477	33.0	7.5	25.0	800.0	0.25	0.05	26.4	1.5
1N4478	36.0	7.0	27.0	850.0	0.25	0.05	28.8	1.7
1N4479	39.0	6.5	30.0	900.0	0.25	0.05	31.2	1.8
1N4480	43.0	6.0	40.0	950.0	0.25	0.05	34.4	1.9
1N4481	47.0	5.5	50.0	1000.0	0.25	0.05	37.6	2.1
1N4482	51.0	5.0	60.0	1100.0	0.25	0.05	40.8	2.3
1N4483	56.0	4.5	70.0	1300.0	0.25	0.05	44.8	2.5
1N4484	62.0	4.0	80.0	1500.0	0.25	0.05	49.6	2.7
1N4485	68.0	3.7	100.0	1700.0	0.25	0.05	54.4	3.0
1N4486	75.0	3.3	130.0	2000.0	0.25	0.05	60.0	3.3
1N4487	82.0	3.0	160.0	2500.0	0.25	0.05	65.6	3.6
1N4488	91.0	2.8	200.0	3000.0	0.25	0.05	72.8	4.0
1N4489	100.0	2.5	250.0	3100.0	0.25	0.05	80.0	4.4
1N4490	110.0	2.3	300.0	4000.0	0.25	0.05	88.0	5.0
1N4491	120.0	2.0	400.0	4500.0	0.25	0.05	96.0	5.5
1N4492	130.0	1.9	500.0	5000.0	0.25	0.05	104.0	6.0
1N4493	150.0	1.7	700.0	6000.0	0.25	0.05	120.0	7.0
1N4494	160.0	1.6	1000.0	6500.0	0.25	0.05	128.0	8.0
1N4495	180.0	1.4	1300.0	7000.0	0.25	0.05	144.0	10.0
1N4496	200.0	1.2	1500.0	8000.0	0.25	0.05	160.0	12.0

CENTRALAB SEMICONDUCTOR
Division • GLOBE-UNION INC.

4501 NORTH ARDEN DRIVE • EL MONTE, CALIFORNIA 91734
(213) 579-0700

3 Watt Microglass Regulators (Case Type 30)

Type Number	Zener Breakdown Voltage V_Z @ I_{ZT}	Test Current I_{ZT}	Maximum Dynamic Resistance Z_{ZT} @ I_{ZT}	Maximum Reverse Current I_R @ V_R		Maximum Voltage Regulation $\triangle V_Z$	Maximum Surge Current I_S
	Volts	mA	Ohms	μA	Volts	Volts	Amps
1N5063	6.8	75	2	50	5.2	0.7	10
1N5064	7.5	75	2	30	5.7	0.7	8
1N5065	8.2	75	3	15	6.2	0.7	7
1N5066	9.1	75	3	3	6.9	0.7	6
1N5067	10	75	4	1.5	7.6	0.7	5
1N5068	11	70	5	1	8.4	0.7	4.5
1N5069	13	50	6	1	9.9	0.7	4
1N5070	14	50	6	1	10.7	0.7	4
1N5071	15	50	6	1	11.4	0.8	3
1N5072	16	50	7	1	12.2	0.9	3
1N5073	18	40	8	1	13.7	1.0	2
1N5074	22	30	10	1	16.7	1.8	2
1N5075	24	30	10	1	18.2	2.0	1.5
1N5076	27	25	12	1	20.6	2.0	1.5
1N5077	30	25	15	1	22.8	2.5	1.5
1N5078	33	20	21	1	25.1	2.8	1.2
1N5079	36	20	21	1	27.4	3.0	1
1N5080	39	20	27	1	29.7	3.0	1
1N5081	40	20	27	1	30.4	3.0	1
1N5082	43	15	35	1	32.7	3.3	0.8
1N5083	45	15	37	1	34.2	3.5	0.8
1N5084	47	15	43	1	35.8	3.5	0.8
1N5085	50	15	50	1	38.0	3.6	0.8
1N5086	51	15	50	1	38.8	3.8	0.80
1N5087	56	10	70	1	42.6	4.0	0.70
1N5088	60	10	70	1	45.6	4.8	0.60
1N5089	62	10	75	1	47.1	4.8	0.60
1N5090	68	10	85	1	51.7	5.7	0.60
1N5091	70	10	90	1	53.3	5.8	0.60
1N5092	75	10	100	1	56.0	6.8	0.50
1N5093	80	10	115	1	60.9	7.7	0.40
1N5094	82	10	120	1	62.2	7.8	0.40
1N5095	91	8	155	1	69.2	8.0	0.40
1N5096	110	5	250	1	83.6	9.0	0.30
1N5097	120	5	325	1	91.2	11	0.20
1N5098	130	5	375	1	98.8	14	0.20
1N5099	140	5	550	1	106.4	14	0.20
1N5100	160	4	700	1	121.6	16	0.15
1N5101	170	4	750	1	129.2	16	0.15
1N5102	180	4	850	1	136.8	17	0.10
1N5103	190	4	900	1	144.7	17	0.10
1N5104	200	4	950	1	152.0	17	0.10
1N4883	12	65	5	1	9.1	0.7	4
1N4881	20	40	9	1	14.4		2
1N4097	100	8	175	1	76.0		0.30
1N4098	150	5	600	1	114.0	15	0.20

5 Watt Microglass Regulators (Case Type 20)

Type Number	Zener Breakdown Voltage V_Z @ I_{ZT}	Test Current I_{ZT}	Maximum Dynamic Resistance Z_{ZT} @ I_{ZT}	Maximum Dynamic Knee Resistance Z_{ZK} @ I_{ZK}	Maximum Reverse Current I_R	I_R Test Voltage V_R	I_R Test Voltage V_R	Maximum Voltage Regulation $\triangle V_Z$	Maximum Surge Current I_S
	Volts	mA	Ohms	Ohms	μA	Volts	Volts	Volts	Amps
1N5342	6.8	175	1	200	10	4.9	5.2	.15	11.5
1N5343	7.5	175	1.5	200	10	5.4	5.7	.15	10.7
1N5344	8.2	150	1.5	200	10	5.9	6.2	.20	10.0
1N5345	8.7	150	2	200	10	6.25	6.6	.20	9.5
1N5346	9.1	150	2	150	7.5	6.6	6.9	.22	9.2
1N5347	10	125	2	125	5.0	7.2	7.6	.22	8.6
1N5348	11	125	2.5	125	5.0	8	8.4	.25	8.0
1N5349	12	100	2.5	125	2.0	8.6	9.1	.25	7.5
1N5350	13	100	2.5	100	1.0	9.4	9.9	.25	7.0
1N5351	14	100	2.5	75	1.0	10.1	10.6	.25	6.7
1N5352	15	75	2.5	75	1.0	10.8	11.5	.25	6.3
1N5353	16	75	2.5	75	1.0	11.5	12.2	.30	6.0
1N5354	17	70	2.5	75	0.5	12.2	12.9	.35	5.8
1N5355	18	65	2.5	75	0.5	13	13.7	.40	5.5
1N5356	19	65	3.0	75	0.5	13.7	14.4	.40	5.3
1N5357	20	65	3.0	75	0.5	14.4	15.2	.40	5.1
1N5358	22	50	3.5	75	0.5	15.8	16.7	.45	4.7
1N5359	24	50	3.5	100	0.5	17.3	18.2	.55	4.4
1N5360	25	50	4.0	110	0.5	18	19	.55	4.3
1N5361	27	50	5.0	120	0.5	19.4	20.6	.60	4.1
1N5362	28	50	6.0	130	0.5	20.1	21.2	.60	3.9
1N5363	30	40	8	140	0.5	21.6	22.8	.60	3.7
1N5364	33	40	10	150	0.5	23.8	25.1	.60	3.5
1N5365	36	30	11	160	0.5	25.9	27.4	.65	3.3
1N5366	39	30	14	170	0.5	28.1	29.7	.65	3.1
1N5367	43	30	20	190	0.5	31	32.7	.70	2.8
1N5368	47	25	25	210	0.5	33.8	35.8	.80	2.7
1N5369	51	25	27	230	0.5	36.7	38.8	.90	2.5
1N5370	56	20	35	280	0.5	40.3	42.6	1.00	2.3
1N5371	60	20	40	350	0.5	43	45.5	1.20	2.2
1N5372	62	20	42	400	0.5	44.6	47.1	1.35	2.1
1N5373	68	20	44	500	0.5	49	51.7	1.50	2.0
1N5374	75	20	45	620	0.5	54	56	1.60	1.9
1N5375	82	15	65	720	0.5	59	62.2	1.80	1.8
1N5376	87	15	75	760	0.5	63	66	2.00	1.7
1N5377	91	15	75	760	0.5	65.5	69.2	2.20	1.6
1N5378	100	12	90	800	0.5	72	76	2.50	1.5
1N5379	110	12	125	1000	0.5	79.2	83.6	2.50	1.4
1N5380	120	10	170	1150	0.5	86.4	91.2	2.50	1.3
1N5381	130	10	190	1250	0.5	93.6	98.8	2.50	1.2
1N5382	140	8	230	1500	0.5	101	106	2.50	1.2
1N5383	150	8	330	1500	0.5	108	114	3.00	1.1
1N5384	160	8	350	1650	0.5	115	122	3.00	1.1
1N5385	170	8	380	1750	0.5	122	129	3.00	1.0
1N5386	180	5	430	1750	0.5	130	137	4.00	1.0
1N5387	190	5	450	1850	0.5	137	144	5.00	0.9
1N5388	200	5	480	1850	0.5	144	152	5.00	0.9

PRIME′ MICROGLASS RECTIFIERS — General Purpose (Case Type 30)

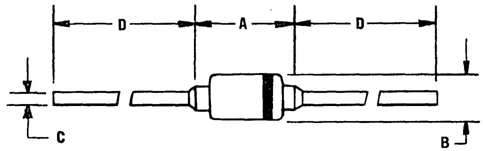
Type Number	Maximum Ratings			Electrical Characteristics	
	Working Peak Reverse Voltage $V_{RM(wkg)}$	Average Rectified Forward Current I_O	Peak Surge Current I_{FM}	Forward Voltage Drop V_F @ 1 Amp	Maximum Reverse Current I_R @ V_{RM}
	Volts	Amps	Amps	Volts	μA
HGR-5	50	1.0 @ $T_A = 75°C$	30 (1 Cycle) 10 (Repetitive)	1.1 Max. @ $T_A = 25°C$	10 @ $T_A = 25°C$ 50 @ $T_A = 100°C$
HGR-10	100				
HGR-20	200				
HGR-30	300				
HGR-40	400				
HGR-60	600				
1N3611 (7)	200	1.0 @ $T_A = 100°C$ 0.3 @ $T_A = 150°C$	10 (1 Cycle)	.6 to 1.2 @ $T_A = 100°C$	5 @ $T_A = 25°C$ 300 @ $T_A = 100°C$
1N3612 (7)	400				
1N3613 (7)	600				
1N4001	50	1.0 @ $T_A = 75°C$	30 (1 Cycle)	1.1 Max. @ $T_J = 25°C$	10 @ $T_J = 25°C$ 50 @ $T_J = 100°C$
1N4002	100				
1N4003	200				
1N4004	400				
1N4005	600				
1N4245	200	1.0 @ $T_A = 55°C$ 0.1 @ $T_A = 160°C$	25 (1 Cycle) 10 (Repetitive)	1.2 Max. @ $T_A = 55°C$	1.0 @ $T_A = 25°C$ 25 @ $T_A = 125°C$
1N4246	400				
1N4247	600				

(7) Electrical specifications per MIL-S-19500/228

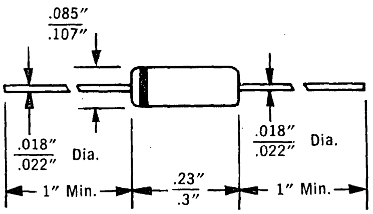
PRIME′ TEMPERATURE COMPENSATED REFERENCE DIODES (DO-7 Case)

Type Number	Nominal Zener Voltage @ I_{ZT} $V_Z \pm 5\%$	Test Current I_{ZT}	Maximum Dynamic Resistance Z_{ZT}	Maximum Voltage Change $\triangle V_Z$	Maximum Temperature Coefficient	Test Temperature
	Volts	mA	Ohms	mV	%/°C	°C
1N821	6.2	7.5	15	96	.01	−55, +25, +100
1N822(3)				96	.01	
1N823				48	.005	
1N824(3)				48	.005	
1N825				19	.002	
1N827				9.6	.001	
1N829				4.8	.0005	
1N821A	6.2	7.5	10	96	.01	−55, +25, +100
1N823A				48	.005	
1N825A				19	.002	
1N827A				9.6	.001	
1N829A				4.8	.0005	
1N935	9.0	7.5	20	67	.01	0, +75
1N936				33	.005	
1N937				13	.002	
1N938				6.7	.001	
1N939				3.3	.0005	
1N935A	9.0	7.5	20	139	.01	−55, +100
1N936A				69	.005	
1N937A				27	.002	
1N938A				13	.001	
1N939A				7	.0005	
1N935B	9.0	7.5	20	184	.01	−55, +150
1N936B				92	.005	
1N937B				37	.002	
1N938B				18	.001	
1N939B				9	.0005	
1N3154	8.4	10.0	15	130	.01	−55, +100
1N3155				65	.005	
1N3156				26	.002	
1N3157				13	.001	
1N3154A	8.4	10.0	15	172	.01	−55, +150
1N3155A				86	.005	
1N3156A				34	.002	
1N3157A				17	.001	

MICROGLASS DEVICES



DIMENSIONS (INCHES)					
CASE TYPE	WATTAGE	A (MAX)	B (MAX)	C (±.002)	D (MIN)
D035	4	.16	.085	.02	1
6	1	.16	.085	.03	1
30	3	.16	.100	.03	1
20	5	.16	.140	.04	1



D0-7

CENTRALAB SEMICONDUCTOR
Division • GLOBE-UNION INC.

4501 NORTH ARDEN DRIVE • EL MONTE, CALIFORNIA 91734
(213) 579-0700

CENTRALAB SEMICONDUCTOR
Division • GLOBE-UNION INC.
4501 NORTH ARDEN DRIVE • EL MONTE, CALIFORNIA 91734

Opto-Hybrid Readers

Type Number	Supply Voltage	Current Requirement (Max per channel)	Threshold (Radiometric)		Maximum Matching Ratio H Max/Min	Maximum Shape Factor F	Min. Output High (Light) I_{OH} = 0.2mA	Max. Output Low (Dark) I_{OL} = −10mA	Max. Propagation Delay t_{pd}	Max. Rise Time t_r	Max. Fall Time t_f
			H_{th} Min	H_{th} Max							
	Vdc	mA	mw/cm²	mw/cm²			Vdc	Vdc	μsec	μsec	μsec
OH100	5 ± .25	6	2.5	10.0	—	1.10	4.5	0.4	1.0	1.0	1.0
OH102			1.0	3.0	—						
OH106			—	0.2	—						
OH106A			.03	0.1	—						
OH900			—	10.0	2.0						
OH900A			—	10.0	1.2						
OH1200			—	10.0	2.0						
OH1200A			—	10.0	1.2						

Light Emitting Diodes

Device Type	Case Type	Minimum P_O @ I_F	Maximum V_F @ I_F	I_F	Typical λ_p	Typical $\Delta\lambda$	Minimum BV_R I_R @ 10μA	I Maximum T_A = 25°C
		mW	Volts	mA	nm	nm	Volts	mA
CL100	TO-18(L)	1.0	1.50	100	930	36	—	100
CL110	TO-18(E)	0.25	1.60	50	900	50	—	70
CL110A	TO-18(E)	0.50	1.50	50	900	50	3	70
CL110B	TO-18(E)	0.60	1.50	50	900	50	5	70
CL150	DO-31	0.27	1.50	50	930	36	6	120

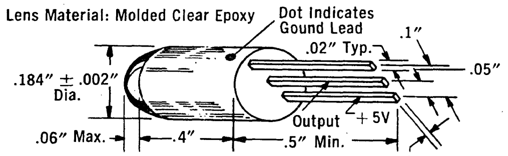
TO-18(L): Glass lens TO-18(E): Epoxy lens

Photo Diodes

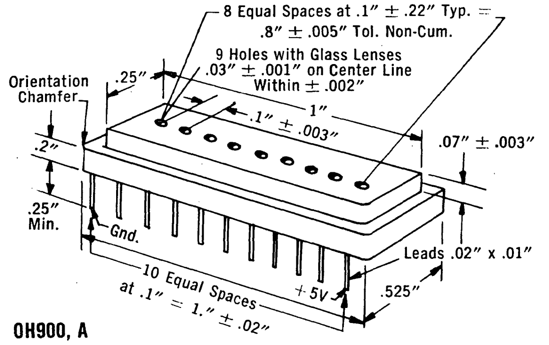
Type Number	Case Type	Light Current H = 20mW/cm² 2800°K Tungsten V_R = −5V, T_A = 25°C		Dark Current H = 0 I_R @ V_R			Effective Active Area	Typical Junction Capacitance @ V_R = −5V	P_o (max.) T_A = 125°C
		Min.	Max.	25°C	100°C	V_R			
		μA	μA	nA	nA	volts	cm²	pf	mW
CPD 110	TO-18(W)	10	20	20	150	5	.008	8	50
CPD 110A	TO-18(W)	10	20	20	150	20	.008	8	50

TO-18(W): Glass window

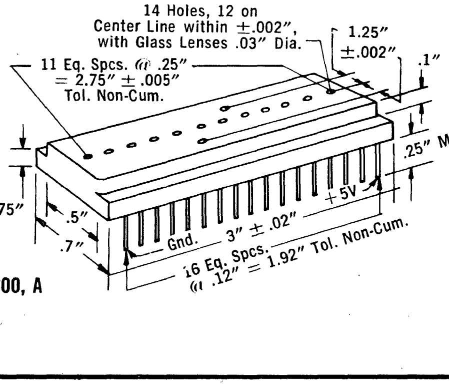
Centralab Opto-Electronic Devices


Lens Material: Molded Clear Epoxy
Dot Indicates Gound Lead
.1″
.02″ Typ.
.05″
.184″ ± .002″ Dia.
Output
+5V
.06″ Max.
.4″
.5″ Min.
.01″

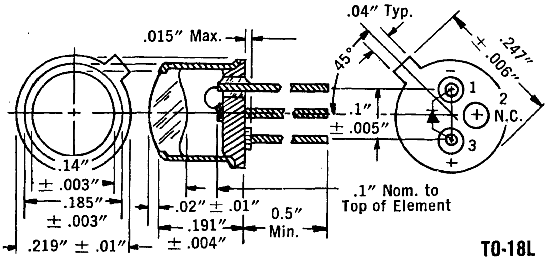
OH100, OH102, OH106, A


8 Equal Spaces at .1″ ± .22″ Typ. = .8″ ± .005″ Tol. Non-Cum.
9 Holes with Glass Lenses .03″ ± .001″ on Center Line Within ± .002″
Orientation Chamfer
.25″
1″
.1″ ± .003″
.07″ ± .003″
.2″
.25″ Min.
Gnd.
Leads .02″ x .01″
10 Equal Spaces at .1″ = 1.″ ± .02″
+5V
.525″

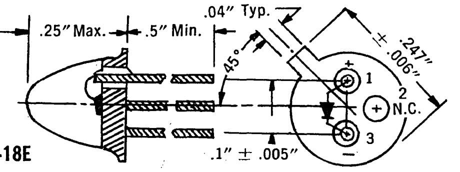
OH900, A


14 Holes, 12 on Center Line within ±.002″, with Glass Lenses .03″ Dia.
1.25″ ±.002″
.1″
11 Eq. Spcs. @ .25″ = 2.75″ ± .005″ Tol. Non-Cum.
.25″ Min.
+5V
.175″
.5″
.7″
Gnd.
3″ ± .02″
16 Eq. Spcs. @ .12″ = 1.92″ Tol. Non-Cum.

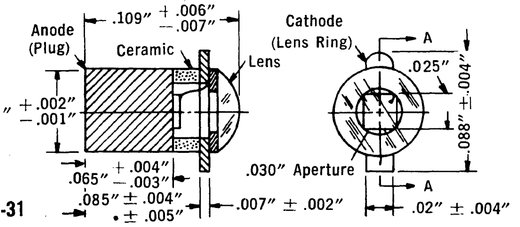
OH1200, A


.04″ Typ.
.015″ Max.
45°
.247″ ± .006″
1
2
N.C.
3
.1″ ± .005″
.14″ ± .003″
.185″ ± .003″
.02″ ± .01″
.191″ ± .004″
0.5″ Min.
.1″ Nom. to Top of Element
.219″ ± .01″

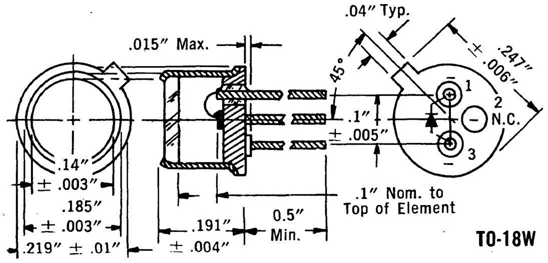
TO-18L


.04″ Typ.
.25″ Max.
.5″ Min.
45°
.247″ ± .006″
1
2
N.C.
3
.1″ ± .005″

TO-18E


Anode (Plug)
.109″ +.006″ −.007″
Ceramic
Lens
Cathode (Lens Ring)
A
.025″
.088″ ± .004″
.16″ +.002″ −.001″
.065″ +.004″ −.003″
.085″ ± .004″
± .005″
.030″ Aperture
.007″ ± .002″
A
.02″ ± .004″

DO-31


.04″ Typ.
.015″ Max.
45°
.247″ ± .006″
1
2
N.C.
3
.1″ ± .005″
.14″ ± .003″
.185″ ± .003″
.191″ ± .004″
0.5″ Min.
.1″ Nom. to Top of Element
.219″ ± .01″

TO-18W

Centralab is the world's leading developer and producer of silicon photo sensitive devices. We have been in the field since the inception of the U.S. Space Program, steadily improving cell efficiency while producing most of the solar cells used on space vehicles. We've applied the same technology to developing a broad line of photo-voltaic and photo sensitive products for uses ranging from untended terrestrial power sources to sensors for computer peripherals and industrial controls. These include Opto-Hybrid™ readers, LEDs, photo diodes, punched tape and card sensors, null indicators, solar panels and general purpose solar cells.

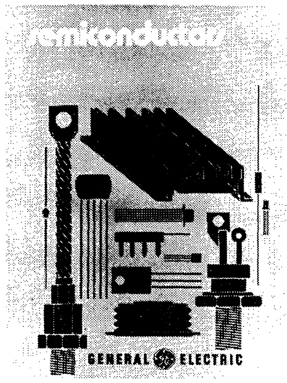
Contact us for complete data on these devices or for assistance from our opto-electronic engineers with your particular application.

A comprehensive condensed catalog of all Centralab PRIME′ semiconductor products is available upon request.

CENTRALAB SEMICONDUCTOR
Division • GLOBE-UNION INC.
4501 NORTH ARDEN DRIVE • EL MONTE, CALIFORNIA 91734
(213) 579-0700

General Electric has all kinds of Semiconductors ...for every kind of application, BIG or small!

WE CAN SAVE YOU TIME!
We could list page after page of products, but semiconductors is still a fast moving industry where new products or developments may solve your needs better, and more economically. Pick up the phone and call your local sales office or authorized GE distributor handling electronic components. Look for the monogram in the telephone "Yellow Pages" under Electronic Equipment & Supplies.



WE HAVE INSTANT INFORMATION!
Would you rather just get information first? Start out with our Full Line Catalog, Publication 451.80. Call your local distributor. He has a supply. Price and availability information is also yours for the asking.

AIM

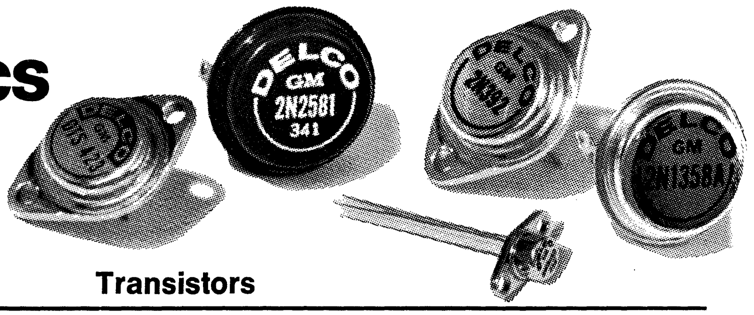
WE ARE LOADED WITH EXPERTISE!
Perhaps you want primarily some application assistance, the kind that only semiconductor professionals can supply. GE's OPERATION AIM can Assist In Matching GE semiconductors to your requirements. On all semiconductor applications we have experience and practical know-how . . . *Ask your GE electronic components salesman or local semiconductor distributor.*

Do we make everything? Of course not. Who does? But one thing for sure, we can assist in solving your circuit problems. And as you can see from the list of product areas shown here, we make all kinds. Remember, we handle an awful lot of semiconductor business, small and big.

OPTOELECTRONICS POWER TRANSISTORS
SILICON RECTIFIERS UNIJUNCTIONS
SCR'S SIGNAL ASSEMBLIES INTEGRATED CIRCUITS
TRIGGERS TRANSISTORS SWITCHES
MIL TYPES SIGNAL DIODES HI-REL TYPES

GENERAL ELECTRIC

Delco Electronics power semiconductors



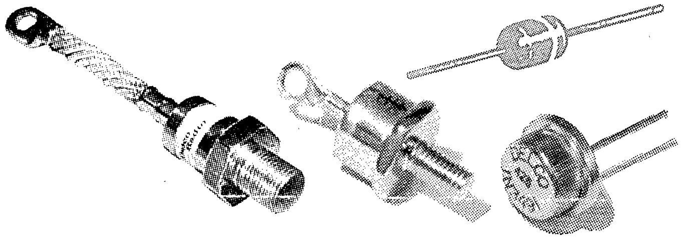
Transistors

Type	I_C Amps	V_{CBO} Volts	V_{CEO} Volts	h_{FE} @	I_C Amps	V_{CE} (sat) Volts	@ I_C Amps
NPN SILICON TO-36, HIGH VOLTAGE							
2N2580	10	400	400	10/40 4 min	5 10	0.7	5.0
2N2580M†	10	400	400	10/40	5	0.7	5.0
2N2581	10	400	400	25/65 10 min	5 10	1.0	10.0
2N2582	10	500	500	10/40 4 min	5 10	0.7	5.0
2N2583	10	500	500	25/65 10 min	5 10	1.0	10.0
2N3079	10	200	200	10/50	5	0.7	5.0
2N3080	10	300	300	10/50	5	0.7	5.0
NPN SILICON TO-3 HIGH VOLTAGE							
DTS-103	15	80⑥	60	20/55	5.0	1.8	10
DTS-104	15	80⑥	60	50/120	5.0	1.5	10
DTS-105	15	100⑥	80	20/55	5.0	1.8	10
DTS-106	15	110⑥	90	20/55	5.0	1.8	10
DTS-107	15	120⑥	100	20/55	5.0	1.8	10
DTS-108	15	180⑥	100	50/120	5.0	1.5	10
DTS-401	2.0	400	400	20/100	0.5	.8	1.0
DTS-402	3.5	400	400			.8	1.0
DTS-403	3.5	400	400	—	—	2.0	3.5
DTS-410	3.5	200	200	30/90	1.0	0.8	1.0
DTS-411	3.5	300	300	30/90	1.0	0.8	1.0
DTS-413	2.0	400	400	20/80	0.5	0.8	0.5
DTS-423	3.5	400	400	30/90	1.0	0.8	1.0
DTS-423M†	3.5	400	400	30/90	1.0	0.8	1.0
DTS-424	3.5	500	500	30/90	1.0	.8	1.0
DTS-425	3.5	500	500	30/90	1.0	.8	1.0
DTS-430	5	400	400	15/45	2.5	0.9	2.5
DTS-431	5	400	400	15/35	2.5	0.7	2.5
DTS-431M†	5	400	400	15/35	2.5	0.7	2.5
DTS-701	1	—	800	20/	.15	—	—
DTS-702	3	1200⑥	1000	2.5/	2.0	—	—
DTS-704	3	1400⑥	1000	2.5/	2.0	—	—
DTS-721	3	1000⑥	1000	20/60	.15	—	—
DTS-723	3	1200⑥	1000	10/	.5	.8	1.0
DTS-801	2	1000	800	20/	0.2	—	—
DTS-802	5	1200⑥	1000	2.2/	3.5	—	—
DTS-804	5	1400⑥	1000	2.2/	3.5	—	—
2N3902	3.5	400	400	30/90	1.0	.8	1.0
JAN 2N3902 Δ	3.5	700⑥	400	30/90	1.0	.8	1.0
2N5157	3.5	700⑥	500	30/90	1.0	.8	1.0
JAN2N5157 Δ	3.5	700⑥	500	30/90	1.0	.8	1.0
2N5241	5	400	400	15/35	2.5	0.7	2.5
2N5970	15	80⑥	60	20/60	5.0	2.0	10
2N5971	15	80⑥	60	50/150	5.0	1.5	10
2N5972	15	100⑥	80	25/75	5.0	1.8	10
2N5973	15	120⑥	100	25/75	5.0	1.8	10
PNP GERMANIUM TO-41 NU-BASE							
2N1073	10	40②	40②	20/60	5.0	0.6	5.0
2N1073A	10	80②	80②	20/60	5.0	0.6	5.0
2N1073B	10	120②	120②	20/60	5.0	0.6	5.0
PNP GERMANIUM TO-3 NU-BASE							
2N5155	25	140⑥	120⑦	25/100	8.0	0.9	25.0
DTG-110A	25	110⑥	70	50/300	1.0	0.5	5.0
DTG-110B	25	90⑥	40⑦	65/300	1.0	0.5	5.0
DTG-600	25	90⑥	50⑦	50/115⑤	5.0	0.75	25
DTG-601	25	90⑥	60⑦	50/115⑤	5.0	0.75	25
DTG-602	25	100⑥	70⑦	50/115⑤	5.0	0.75	25
DTG-603	25	90⑥	80⑦	50/	5.0	0.75	25.0
DTG-603M†	25	90⑥	80⑦	50/	5.0	0.75	25.0
DTG-1200	15		120⑦	27.5	8.0	0.5	12
DTG-1010	15	325⑥	110⑦	100⑤	8.0	0.5	12
DTG-1110	15	200⑥	80⑦			0.5	10
DTG-2000	25	60⑥	30⑦	25/	8.0	0.9	25
DTG-2100	25	80⑥	60⑦	25/	8.0	0.9	25
DTG-2200	25	100⑥	80⑦	25/	8.0	0.9	25
DTG-2300	25	120⑥	100⑦	25/	8.0	0.9	25
DTG-2400	25	140⑥	120⑦	25/	8.0	0.9	25
DTG-2400M†	25	140⑥	120	25/125	10.0	0.9	25
DTG-5000	50	100⑥	80	60/180	10	1.0	50
DTG-5100	50	120⑥	100	60/180	10	1.0	50
DTG-5200	50	80⑥	60	80/240	10	1.0	50
DTG-5300	50	80⑥	50	40/120	10	2.0	50

Transistors

Type	I_C Amps	V_{CBO} Volts	V_{CEO} Volts	h_{FE} @	I_C Amps	V_{CE} (sat) Volts	@ I_C Amps
PNP GERMANIUM TO-37 NU-BASE							
2N3212	5	100⑥	80	30/90	3.0	0.5	5.0
2N3213	5	80⑥	60	30/90	3.0	0.5	5.0
2N3214	5	60⑥	40	30/90	3.0	0.5	5.0
2N3215	5	40⑥	30	25/100	3.0	0.5	5.0
PNP GERMANIUM TO-36 ALLOY BASE							
2N173	15	60	45	35/70	5.0	1.0	12.0
2N174	15	80	55	25/50	5.0	0.9	12.0
JAN 2N174A	15	80	40	40/80	1.2	0.7	12.0
2N277	15	40	25	35/70	5.0	0.3②	12.0
2N278	15	50	30	35/70	5.0	1.0	12.0
2N441	15	40	25	20/40	5.0	0.3②	12.0
2N442	15	50	30	20/40	5.0	0.3②	12.0
2N443	15	60	45	20/40	5.0	1.0	12.0
2N1099	15	80	55	35/70	5.0	0.7	12.0
2N1100	15	100	65	25/50	5.0	0.7	12.0
2N1358	15	80	40	40/80	1.2	0.7	12.0
2N1358A	15	100	60	25/50	5.0	0.7	12.0
JAN 2N1358	15	80	40	25/50	5.0	0.7	12.0
2N1412	15	100	65	25/50	5.0	0.7	12.0
JAN 2N1412A	15	100	70	25/50	5.0	0.6	12.0
2N1518	25	50	40	15/60	15	0.7	25
2N1519	25	80	60	15/60	15	0.7	25
2N1520	35	50	40	17/68	15	0.6	35
2N1521	35	80	60	17/68	15	0.6	35
2N1522	50	50	40	25/100	15	0.5	50
2N1523	50	80	60	25/100	15	0.5	50
2N1970	15	100	50	17/40	5.0	1.0	12.0
2N2075	15	80	65	20/40	5.0	0.7	12.0
2N2076	15	70	55	20/40	5.0	0.7	12.0
2N2077	15	50	45	20/40	5.0	0.9	12.0
2N2078	15	40	25	20/40	5.0	0.9	12.0
2N2079	15	80	65	35/70	5.0	0.7	12.0
2N2080	15	70	55	35/70	5.0	0.7	12.0
2N2081	15	50	45	35/70	5.0	0.9	12.0
2N2082	15	40	25	35/70	5.0	0.9	12.0
JAN 2N2210				use JAN 2N1412A			
2N2490	15	70	50	20/40	5.0	0.7	12.0
2N2491	15	60	40	35/70	5.0	0.7	12.0
2N2492	15	80	65	25/50	5.0	0.5	12.0
2N2493	15	100	75	25/50	5.0	0.5	12.0
PNP GERMANIUM TO-3 ALLOY BASE							
2N255A	5	15	15②	25③	.450		
2N301	3	40	32	62.5	.700		
2N301A	3	60	32	62.5	.700		
2N379	7	80⑨	40	20/90	2.0	1.0	2.0
2N380	7	60⑨	30	20/90	2.0	1.0	2.0
2N392	5	60	45	60/150	3.0	0.5	3.0
2N456A	7	40	20	30/90	5.0	0.5	5.0
2N456B	7	40	30	30/90	5.0	0.5	5.0
2N457A	7	60	30	30/90	5.0	0.5	5.0
2N457B	7	60	40	30/90	5.0	0.5	5.0
2N458A	7	80	40	30/90	5.0	0.5	5.0
2N458B	7	80	45	30/90	5.0	0.5	5.0
2N554	5	15	30	30	1.0		
2N669	3	30⑧	30①	250④	.500	0.4⑤	3.0
2N1011	5	80	40	30/75	3.0	1.5	3.0
2N1021	7	100	50	30/90	5.0	0.5	5.0
2N1021A	7	100	50	30/90	5.0	0.5	5.0
2N1022	7	120	50	30/90	5.0	0.5	5.0
2N1022A	7	120	55	30/90	5.0	0.5	5.0
2N1159	5	80	60	30/75	3.0	1.0	3.0
2N1160	7	80	60	20/50	5.0	1.0	5.0
2N1168	5	50	30	60⑤	3.0	.25⑤	3.0
2N1534	5	40	20	35/70	3.0	1.2	3.0
2N1535	5	60	30	35/70	3.0	1.2	3.0
2N1536	5	80	40	35/75	3.0	1.2	3.0
2N1539	5	25	20	50/100	3.0	0.3	.300
2N1540	5	40	30	50/100	3.0	0.3	.300
2N1541	5	55	40	50/100	3.0	0.3	.300
2N1542	5	65	50	50/100	3.0	0.3	.300
2N1543	5	80	60	50/100	3.0	0.3	.300
2N1544	5	25	20	75/150	3.0	0.2	.300
2N1545	5	40	30	75/150	3.0	0.2	.300
2N1546	5	55	40	75/150	3.0	0.2	.300
2N1547	5	65	50	75/150	3.0	0.2	.300
2N5156	10	100	60⑦	25/60	5.0	1.0	10
DTG-110	7	40	40②	74/250	1.0	5.0	2.0

① V_{CES} ② V_{CER} ③ Power gain db ④ Max. ⑤ Typical ⑥ V_{CEX} ⑦ V_{CE} Sus ⑧ @ 90° C-R_{EB} = 100 ohm ⑨ V_{CBX} †Military Type Spec. Δ JANTX Type Available



Silicon Rectifiers

TYPE	MAXIMUM FORWARD CURRENT	PEAK REVERSE VOLTAGE	PEAK TRANSIENT REVERSE VOLTAGE	REVERSE CURRENT	FORWARD VOLTAGE DROP	REPETITIVE PEAK FORWARD CURRENT
1.5 AMPERE-AXIAL LEAD						
DRS102	1.5A	200V	—	10 μA	0.9V	10A
DRS104	1.5A	400V	—	10 μA	0.9V	10A
DRS106	1.5A	600V	—	10 μA	0.9V	10A
DRS108	1.5A	800V	—	10 μA	0.9V	10A
DRS110	1.5A	1000V	—	10 μA	0.9V	10A
DRS112	1.5A	1200V	—	10 μA	0.9V	10A
DRS114	1.5A	1400V	—	10 μA	0.9V	10A
15 AMPERE STUD MOUNT						
1N3208	15A	50V	—	10 mA	1.5V	70A
1N3209	15A	100V	—	10 mA	1.5V	70A
1N3210	15A	200V	—	10 mA	1.5V	70A
18 AMPERE PRESS FIT						
1N3491	25A	50V	—	10 mA	0.7V	110A
1N3492	25A	100V	—	10 mA	0.7V	110A
1N3493	25A	200V	—	8 mA	0.7V	110A
160 AMPERE STUD BASE						
DRS163	160A	300V	400V	15 mA	1.45V	2500A⑳
DRS164	160A	400V	525V	15 mA	1.45V	2500A⑳
DRS165	160A	500V	650V	15 mA	1.45V	2500A⑳
DRS166	160A	600V	800V	12 mA	1.45V	2500A⑳
DRS167	160A	700V	925V	12 mA	1.45V	2500A⑳
DRS168	160A	800V	1050V	10 mA	1.45V	2500A⑳
DRS169	160A	900V	1200V	10 mA	1.45V	2500A⑳
200 AMPERE STUD BASE						
DRS203	200A	300V	400V	15 mA	1.4V	3500A⑳
DRS204	200A	400V	525V	15 mA	1.4V	3500A⑳
DRS205	200A	500V	650V	15 mA	1.4V	3500A⑳
DRS206	200A	600V	800V	12 mA	1.4V	3500A⑳
DRS207	200A	700V	925V	12 mA	1.4V	3500A⑳
DRS208	200A	800V	1050V	10 mA	1.4V	3500A⑳
DRS209	200A	900V	1200V	10 mA	1.4V	3500A⑳

Silicon Rectifiers and Zener Diodes

TYPE	MAXIMUM FORWARD CURRENT	PEAK REVERSE VOLTAGE	PEAK TRANSIENT REVERSE VOLTAGE	REVERSE CURRENT	FORWARD VOLTAGE DROP	REPETITIVE PEAK FORWARD CURRENT
250 AMPERE STUD BASE						
DRS243	250A	300V	400V	15 mA	1.4V	4500A⑳
DRS244	250A	400V	525V	15 mA	1.4V	4500A⑳
DRS245	250A	500V	650V	15 mA	1.4V	4500A⑳
DRS246	250A	600V	800V	12 mA	1.4V	4500A⑳
DRS247	250A	700V	925V	12 mA	1.4V	4500A⑳
DRS248	250A	800V	1050V	10 mA	1.4V	4500A⑳
DRS249	250A	900V	1200V	10 mA	1.4V	4500A⑳
DRS250	250A	800V	1050V	10 mA	1.55V	4500A⑳
DRS251	250A	1000V	1300V	10 mA	1.55V	4500A⑳
DRS252	250A	1200V	1600V	10 mA	1.55V	4500A⑳
DRS253	250A	1400V	2000V	10 mA	1.55V	4500A⑳
DRS254	250A	1600V	2400V	10 mA	1.55V	4500A⑳

TYPE	MIN. ZENER VOLTAGE Vz @ 0.25 Adc	MAX. ZENER VOLTAGE PULSE WIDTH=1ms	MAXIMUM CLAMPING FACTOR	MAXIMUM REVERSE CURRENT I_R(mA)
30 KW POWER ZENERS—DO-9 CASE				
DPZ30-30R	30	43 Vdc @ 700 A	1.4	5.0
DPZ30-33R	33	47 Vdc @ 640 A	1.4	5.0
DPZ30-36R	36	52 Vdc @ 580 A	1.4	5.0
DPZ30-39R	39	56 Vdc @ 535 A	1.4	5.0
DPZ30-43R	43	62 Vdc @ 485 A	1.4	5.0
DPZ30-45R	45	65 Vdc @ 460 A	1.4	5.0
DPZ30-47R	47	68 Vdc @ 440 A	1.4	5.0
DPZ30-50R	50	72 Vdc @ 420 A	1.4	5.0

⑳ ½ Cycle non-repetitive

Delco Electronics

GENERAL MOTORS CORPORATION, KOKOMO, INDIANA

Regional Headquarters

Union, New Jersey* 07083,
Box 1018 Chestnut Station,
(201)-687-3770

El Segundo, Calif. 90245,
354 Coral Circle,
(213)-772-5181

Chicago, Illinois* 60656,
5151 N. Harlem Avenue,
(312)-775-5411

Kokomo, Ind. 46901,
700 E. Firmin,
(317)-459-2175 Home Office

GM
MARK OF EXCELLENCE

*Office includes field lab and resident engineer for application assistance.

Semiconductor Distributors

ALA., BIRMINGHAM, Forbes Distributing Co., Inc. (205)-251-4104
ARIZ., PHOENIX, Cramer/Arizona (602)-263-1112
Sterling Electronics (602)-258-4531
CAL., LOS ANGELES, Kierulff Electronics, Inc. (213)-685-5511
Radio Products Sales, Inc. (213)-748-1271
CAL., PALO ALTO, Kierulff Electronics, Inc. (415)-968-6292
CAL., SAN DIEGO, Milo of California, Inc. (714)-232-8951
COLO., COLORADO SPRINGS, Walker Electronics (303)-636-1661
COLO., DENVER, Cramer/Denver (303)-758-2100
Denver Walker Electronics (305)-935-2406
FLA., MIAMI, Mountain Electronics
Subsidiary of Avnet, Inc. (305)-634-4556
FLA., WEST PALM BEACH, Mountain Electronics,
Subsidiary of Avnet, Inc. (305)-833-5701
ILL., ROSEMONT (Chicago), Kierulff/F-J-R (312)-678-8560
ILL., SKOKIE (Chicago), Merquip Electronics (312)-282-5400
IND., INDIANAPOLIS, Graham Electronics Supply, Inc. (317)-634-8486
MD., BALTIMORE, Radio Electric Service Co. (301)-823-0070
MASS., NEWTON, The Greene-Shaw Co., Inc. (617)-969-8900
MICH., ROMULUS, Harvey/Detroit (313)-729-5500
MINN., MINNEAPOLIS, Stark Electronics Supply Co. (612)-332-1325
MO., KANSAS CITY, Walters Radio Supply, Inc. (816)-531-7015
MO., NO. KANSAS CITY, ECI Semiconductors, Inc. (816)-221-2400
MO., ST. LOUIS, Electronic Components for
Industry Co. (314)-647-5505
N.J., CLIFTON, Eastern Radio Corporation (201)-471-6600
N.M., ALBUQUERQUE, Cramer/New Mexico (505)-265-5767
Sterling Electronics (505)-247-2486
N.Y., BINGHAMTON, Harvey/Federal (607)-748-8211
N.Y., NEW YORK, Harvey/New York (212)-582-2590
N.Y., WOODBURY, Harvey/New York (516)-921-8700
OHIO, CINCINNATI, United Radio, Inc. (513)-761-4030
OHIO, CLEVELAND, Pattison Supply (216)-441-3000
OHIO, DAYTON, Kierulff/F-J-R (513)-278-9411
OKLA., OKLAHOMA CITY, Radio, Inc. (405)-235-1551
OKLA., TULSA, Radio, Inc. (918)-587-9123
PENN., PHILADELPHIA, Almo Electronics (215)-676-6000
PENN., PITTSBURGH, RPC Electronics (412)-782-3770
S.C., COLUMBIA, Dixie Radio Supply Co., Inc. (803)-253-5333
TEXAS, DALLAS, Adleta Electronics Company (214)-742-8257
TEXAS, FORT WORTH, Adleta Electronics Co. (817)-336-7446
TEXAS, HOUSTON, Harrison Equipment Co., Inc. (713)-224-9131
UTAH, SALT LAKE CITY, Cramer/Utah (801)-487-3681
VA., RICHMOND, Meridian Electronics, Inc.,
a Sterling Electronics Company (703)-353-6648
WASH., SEATTLE, Kierulff Electronics, Inc. (206)-763-1550
WASH., TACOMA, C & G Electronics Co. (206)-272-3181
CANADA, ONT., SCARBOROUGH, Lake Engineering
Co., Ltd. (416)-751-5980
ALL OVERSEAS INQUIRIES:
General Motors Overseas Operations, Power and Industrial Products Dept., 767 Fifth Avenue, New York, N.Y. 10022. Phone: (212)-486-3723.

SINGLE PHASE BRIDGES
1½ Amp to 25 Amp...
50 to 1000 PIV

EDI offers the most complete line of packaged bridges ranging from the encapsulated printed circuit type with current ratings to 5 amperes to the metal case, beam lead power bridges with ratings up to 25 amperes.

The printed circuit types are designed to provide the most compact packaging and are transfer molded epoxy eliminating voids, providing corona protection and the maximum electrical, mechanical, and thermal reliability.

The metal case MINIBRIDGE series has been designed to replace larger bridges and eliminate 4 stud rectifiers in power supplies, converters, inverters, motor control circuits and DC motor starters. Their unique beam lead construction, used instead of discrete rectifiers, allows better heat transfer from junction to case and lower junction operating temperatures. Universal three way terminals (snap on, wrap around or solder) make connections simple and the insulated metal case provides maximum thermal conductivity.

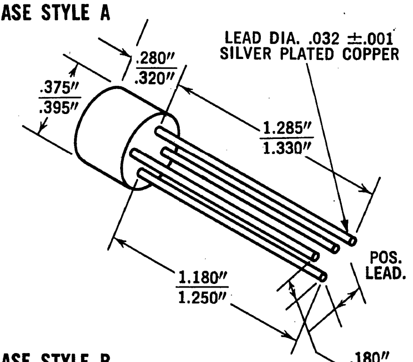
Diffused silicon junctions displaying avalanche characteristics are used and these bridges display high surge capability and low leakage.

Type Number	Avg. Rect. Current	Peak Voltage Inverse	Recurrent Peak Forward	One Cycle Surge	Fwd. Drop Per Leg	DC Reverse Per Leg	Case Style
PF05	1.5A	50V	4.5A	50A	1.0V	5μA	A
PF10	1.5A	100V	4.5A	50A	1.0V	5μA	A
PF20	1.5A	200V	4.5A	50A	1.0V	5μA	A
PF40	1.5A	400V	4.5A	50A	1.0V	5μA	A
PF60	1.5A	600V	4.5A	50A	1.0V	5μA	A
PD05	2.0A	50V	6.0A	50A	1.0V	5μA	B
PD10	2.0A	100V	6.0A	50A	1.0V	5μA	B
PD20	2.0A	200V	6.0A	50A	1.0V	5μA	B
PD40	2.0A	400V	6.0A	50A	1.0V	5μA	B
PD60	2.0A	600V	6.0A	50A	1.0V	5μA	B
PD80	2.0A	800V	6.0A	50A	1.0V	5μA	B
PD100	2.0A	1000V	6.0A	50A	1.0V	5μA	B
PE05	5.0A	50V	15A	100A	1.0V	5μA	B
PE10	5.0A	100V	15A	100A	1.0V	5μA	B
PE20	5.0A	200V	15A	100A	1.0V	5μA	B
PE40	5.0A	400V	15A	100A	1.0V	5μA	B
PE60	5.0A	600V	15A	100A	1.0V	5μA	B
PE80	5.0A	800V	15A	100A	1.0V	5μA	B
PE100	5.0A	1000V	15A	100A	1.0V	5μA	B
PA05	8.0A	50V	20A	150A	1.0V	10μA	C
PA10	8.0A	100V	20A	150A	1.0V	10μA	C
PA20	8.0A	200V	20A	150A	1.0V	10μA	C
PA40	8.0A	400V	20A	150A	1.0V	10μA	C
PA60	8.0A	600V	20A	150A	1.0V	10μA	C
PA80	8.0A	800V	20A	150A	1.0V	10μA	C
PA100	8.0A	1000V	20A	150A	1.0V	10μA	C
PB05	25A	50V	75A	300A	1.0V	10μA	C
PB10	25A	100V	75A	300A	1.0V	10μA	C
PB20	25A	200V	75A	300A	1.0V	10μA	C
PB40	25A	400V	75A	300A	1.0V	10μA	C
PB60	25A	600V	75A	300A	1.0V	10μA	C
PB80	25A	800V	75A	300A	1.0V	10μA	C
PB100	25A	1000V	75A	300A	1.0V	10μA	C

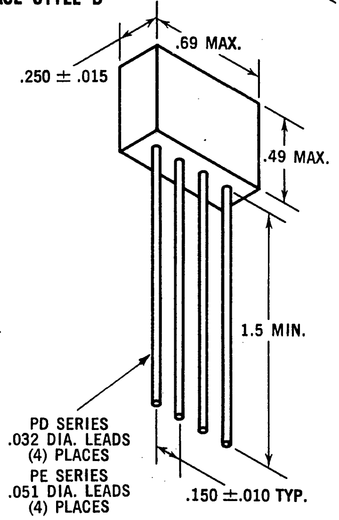
NOTES:

1 — PA & PB Series available in special case for underwriter applications. Contact factory for details.
2 — PA & PB Series available in other configurations; i.e. Center Tap, Doubler & Three Phase.

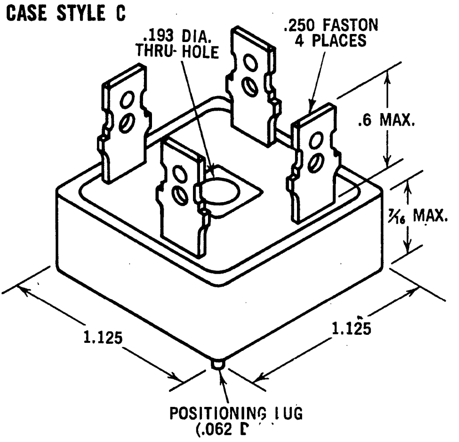
CASE STYLE A

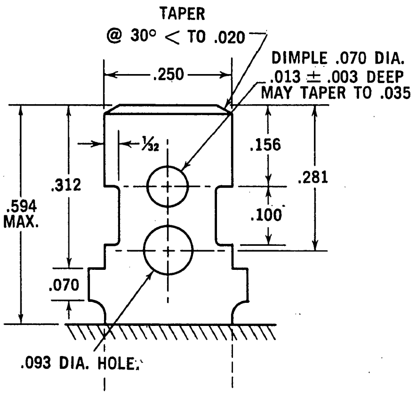

.280″
.320″
LEAD DIA. .032 ±.001
SILVER PLATED COPPER
.375″
.395″
1.285″
1.330″
POS. LEAD.
1.180″
1.250″
.180″
.220″

CASE STYLE B


.69 MAX.
.250 ± .015
.49 MAX.
1.5 MIN.
PD SERIES
.032 DIA. LEADS
(4) PLACES
PE SERIES
.051 DIA. LEADS
(4) PLACES
.150 ±.010 TYP.

CASE STYLE C


.193 DIA.
THRU- HOLE
.250 FASTON
4 PLACES
.6 MAX.
7/16 MAX.
1.125
1.125
POSITIONING LUG
(.062 D


TAPER
@ 30° < TO .020
DIMPLE .070 DIA.
.013 ± .003 DEEP
MAY TAPER TO .035
.250
1/32
.156
.281
.312
.594
MAX.
.100
.070
.093 DIA. HOLE

HIGH VOLTAGE AXIAL LEAD SILICON RECTIFIER CARTRIDGES

EDI's high voltage, axial lead cartridges offer peak inverse voltages to 50,000 volts and forward current ratings to 100 mA. Constructed with diffused junctions displaying avalanche characteristics, these assemblies display high surge capability and low leakage. Applications include CRT display, oscilliscope, TWT power supplies, electrostatic applications and low power radar. Fast recovery versions are available for high frequency and pulse inputs.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

STANDARD RECOVERY

Series	Avg. Rect. Current	Recurrent Peak Forward	One Cycle Surge	DC Reverse	Case Style
LFD	20mA	60mA	2A	2μA	A
LCD	20mA	60mA	2A	2μA	B
LHC25 †	25mA	75mA	3A	1μA	C
BCD	100mA	3.0A	10A	2μA	B

† Also available in 10mA and 5mA as LHC10 and LHC5.

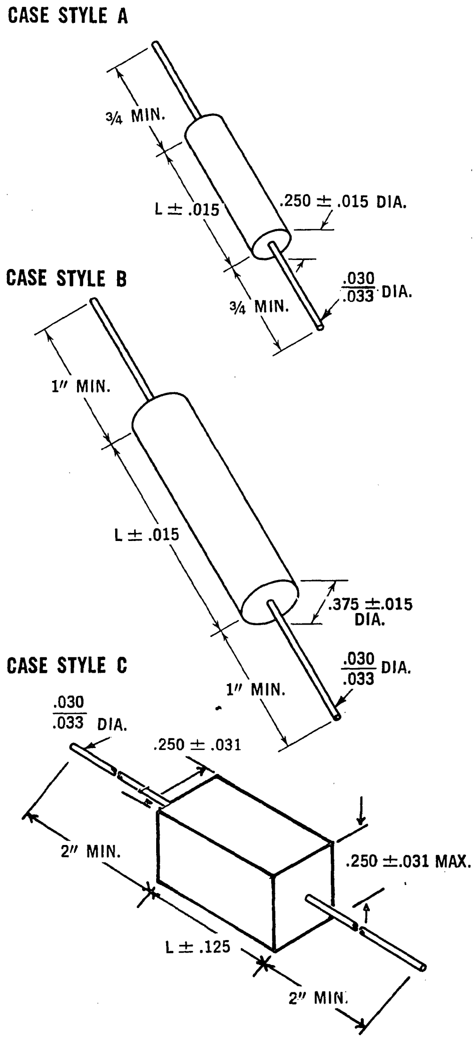
FAST RECOVERY

Series	Avg. Rect. Current	Recurrent Peak Forward	One Cycle Surge	DC Reverse	Reverse Recovery *	Case Style
RFD	20mA	60mA	1.0A	2μA	300nSec	A
RCD	20mA	60mA	1.0A	2μA	300nSec	B
RHC25 †	25mA	75mA	3A	2μA	250nSec	C
RTD	100mA	3.0A	10A	2μA	200nSec	B

* Faster recovery available. Contact factory for information.

† Also available in 10mA and 5mA as RHC10 and RHC5.

CASE STYLES



Peak Inverse Voltage	LFD-LCD — RFD-RCD SERIES Type Number	Fwd. Drop	Type Number	Fwd. Drop	Dimension "L"	BCD — RTD SERIES Type Number	Fwd. Drop	Type Number	Fwd. Drop	Dimension "L"	LHC25 — RHC25 SERIES Type Number	Fwd. Drop	Type Number	Fwd. Drop	Dimension "L"
8,000	LFD8	14V	RFD8	20V	1.000	BCD08	13V	RTD08	20V	1.000	LHC25-8	18V	RHC25-8	30V	1.000
10,000	LFD10	14V	RFD10	20V	1.000	BCD10	13V	RTD10	20V	1.000	LHC25-10	18V	RHC25-10	30V	1.000
12,000	LCD12	24V	RCD12	30V	1.625	BCD12	20V	RTD12	24V	1.625	LHC25-12	18V	RHC25-12	30V	1.000
15,000	LCD15	24V	RCD15	30V	1.625	BCD15	20V	RTD15	30V	1.625	LHC25-15	35V	RHC25-15	60V	2.000
20,000	LCD20	36V	RCD20	45V	2.125	BCD20	26V	RTD20	40V	2.125	LHC25-20	35V	RHC25-20	60V	2.000
25,000	LCD25	48V	RCD25	50V	2.625	BCD25	33V	RTD25	50V	2.625	LHC25-25	35V	RHC25-25	60V	2.000
30,000	LCD30	48V	RCD30	60V	3.125	BCD30	40V	RTD30	60V	3.125	LHC25-30	50V	RHC25-30	90V	3.000
35,000	LCD35	60V	RCD35	60V	4.125	BCD35	46V	RTD35	70V	3.625	LHC25-35	50V	RHC25-35	90V	3.000
40,000	LCD40	60V	RCD40	80V	4.125	BCD40	53V	RTD40	80V	4.125	LHC25-40	50V	RHC25-40	90V	3.000
45,000	LCD45	72V	RCD45	90V	4.125	BCD45	60V	RTD45	90V	4.625					
50,000	LCD50	84V	RCD50	105V	5.125	BCD50	66V	RTD50	100V	5.125					

electronic devices, incorporated
21 GRAY OAKS AVENUE, YONKERS, NEW YORK 10710 • TEL: 914-965-4400 • TWX: 710-560-0021

HIGH VOLTAGE SILICON RECTIFIER PACKS

EDI's high voltage rectifier packs, offer peak inverse voltages to 50,000 volts and forward current ratings to 3 amperes. These assemblies are constructed with junctions displaying avalanche characteristics to provide proper voltage distribution and inverse power dissipation.

Applications for these field tested, performance proven units include radar and other pulse equipment, induction heating and forming equipment, laser power supplies, electron beam welders. Fast recovery versions are available for use with higher frequency inputs to reduce size of power sources and for circuits with fast rise and fall time pulses.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

STANDARD RECOVERY

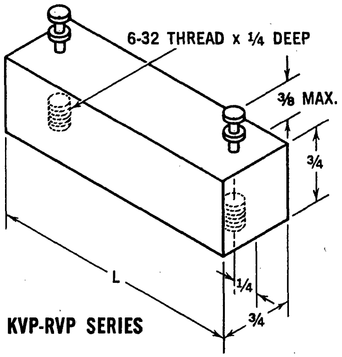
Series	Nominal Current	Recurrent Peak Fwd.	One Cycle Surge	DC Reverse
KVP	1 Amp	10 Amp	50 Amp	5 μAmp
KHP	3 Amp	30 Amp	300 Amp	5 μAmp

FAST RECOVERY

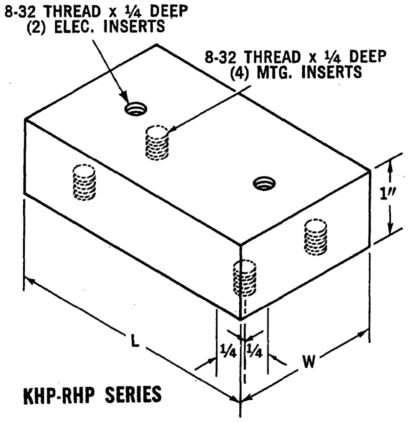
Series	Nominal Current	Recurrent Peak Fwd.	One Cycle Surge	DC Reverse	Reverse Recovery*
RVP	.80 Amp	8 Amp	25 Amp	5 μAmp	300 nSec
RHP	2.5 Amp	25 Amp	150 Amp	5 μAmp	300 nSec

*Faster recovery available. Contact factory for information.

CASE STYLES



KVP-RVP SERIES



KHP-RHP SERIES

Peak Inverse Voltage	KVP SERIES		RVP SERIES		KHP SERIES		RHP SERIES		DIMENSIONS		
									KVP-RVP	KHP-RHP	
	Avg. Rect. Current	Fwd. Drop	Avg. Rect. Current	Fwd. Drop	Avg. Rect. Current	Fwd. Drop	Avg. Rect. Current	Fwd. Drop	Dim. "L"	Dim. "L"	Dim. "W"
5,000	1.10A	8V	0.80A	10V	3.00A	8V	2.50A	10V	2.5	4.0	1.0
6,000	1.00A	9V	0.80A	11V	2.75A	9V	2.50A	11V	2.5	4.75	1.0
7,000	1.00A	10V	0.80A	12V	2.75A	10V	2.50A	12V	3.0	5.50	1.0
8,000	1.00A	11V	0.80A	13V	2.75A	11V	2.50A	13V	3.0	6.0	1.0
9,000	1.00A	14V	0.80A	16V	2.50A	14V	2.50A	16V	3.0	6.5	1.0
10,000	1.00A	15V	0.80A	17V	2.50A	15V	2.50A	17V	3.5	7.0	1.0
15,000	0.90A	21V	0.80A	25V	2.50A	21V	2.25A	25V	5.0	4.0	2.0
20,000	0.75A	28V	0.60A	33V	2.25A	28V	2.25A	33V	5.5	6.0	2.0
25,000	0.75A	36V	0.60A	42V	2.25A	36V	2.25A	42V	6.0	8.0	2.0
30,000	0.75A	42V	0.60A	50V	2.25A	42V	2.25A	50V	6.0	4.0	3.0
35,000	0.75A	49V	0.60A	58V	2.25A	49V	2.25A	58V	6.5	6.0	3.0
40,000	0.75A	55V	0.60A	65V	2.25A	55V	2.25A	65V	6.5	8.0	3.0
45,000	0.75A	63V	0.60A	75V	2.25A	63V	2.25A	75V	7.0	4.0	4.0
50,000	0.75A	70V	0.60A	82V	2.25A	70V	2.25A	82V	7.0	6.0	4.0

ORDERING INFORMATION

Use series number and add PIV expressed in kilovolts.

EXAMPLE: To order an 8 KV KVP 1 Amp Block, specify "KVP 8." To order a 25 KV, 3 Amp Block, specify "KHP 25."

electronic devices, incorporated
21 GRAY OAKS AVENUE, YONKERS, NEW YORK 10710 • TEL: 914-965-4400 • TWX: 710-560-0021

MINIATURE MOLDED EPOXY, AXIAL LEAD SILICON RECTIFIERS

EDI offers the most complete range of miniature silicon rectifiers ranging from the 50-1000 volt general purpose devices to miniature high voltage devices with 6000 volt inverse ratings. Both standard and fast recovery versions are available. The current range is from 50 mA to 3 amp dc. Primary features are the insulated body, diffused junctions, avalanche characteristics, high surge capabilities and low leakage.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

STANDARD RECOVERY

Series	Avg. Rect. Current	Peak Inverse Voltages	Recurrent Peak Forward	One Cycle Surge	Fwd. Drop	D.C. Reverse	Case Style
LK	.050A	1,000-6,000	.30A	2A	6.0V	2μA	B
EK	.150A	4,500-6,000	3.0A	15A	6.0V	2μA	B
EH	.250A	3,000-4,000	5.0A	25A	4.0V	2μA	B
BH	.250A	2,000-5,000	2.0A	20A	4.0V	10μA	B
EG	.350A	2,000-3,000	6.0A	30A	3.0V	2μA	B
EF	.500A	1,000-2,000	8.0A	35A	2.0V	2μA	B
1N4001-7	1.0A	50-1,000	10A	30A	1.1V	10μA	A
CB	1.0A	50-1,000	10A	50A	1.1V	2μA	A
*HAB	3.0A	50-1,000	25A	300A	1.1V	5μA	C
*HIB	3.0A	1,200	25A	300A	1.2V	5μA	D

*Also available as 1N4139 — 1N4146 Series.

FAST RECOVERY

Series	Avg. Rect. Current	Peak Inverse Voltages	Recurrent Peak Forward	One Cycle Surge	Fwd. Drop	DC Reverse	Reverse Recovery*	Case Style
RK-A	.150A	3,000-6,000	3.0A	10A	7.8V	2μA	200nSec	B
RK-B	.150A	3,000-6,000	3.0A	10A	7.8V	2μA	250nSec	B
RF-A	.500A	1,600-2,000	8.0A	25A	2.6V	2μA	200nSec	B
RF-B	.500A	1,600-2,000	8.0A	25A	2.6V	2μA	250nSec	B
CB-F	.750A	50-1,000	6.0A	25A	1.3V	5μA	250nSec	A
RL	1.0A	50-1,000	10A	30A	1.3V	2μA	250nSec	B
RAB	3.0A	50-600	30A	300A	1.3V	15μA	150nSec	C
RAB	3.0A	800-1,000	30A	300A	1.3V	15μA	250nSec	C

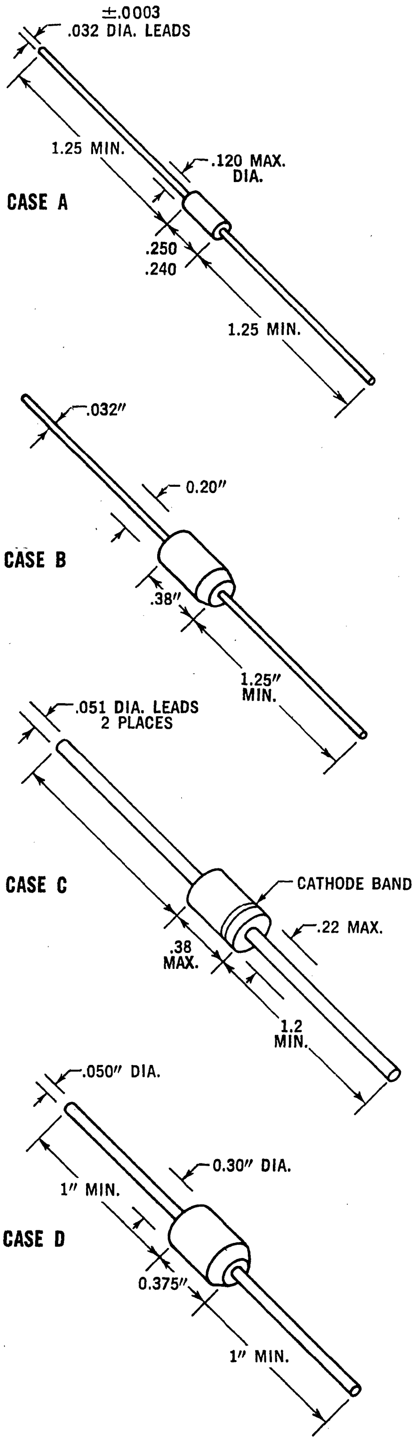
*Faster recovery available. Contact factory for information.

ORDERING INFORMATION

With exception of "1N" numbers use series number and insert PIV code which is PIV less the last zero.

EXAMPLE: To order a 50 PIV 1 amp rectifier, specify CB5, for 400 volt CB40. For a 6000 V, 150 mA, 200 nsec rectifier, specify RK600A.

CASE STYLES



electronic devices, incorporated
21 GRAY OAKS AVENUE, YONKERS, NEW YORK 10710 • TEL: 914-965-4400 • TWX: 710-560-0021

GALVANOMAGNETIC DEVICES

THE ADVANCED LINE OF HALL EFFECT DEVICES AND MAGNETORESISTORS FOR

DETECTION
MEASUREMENT
COMPUTATION
CONTROL
PROBES
MULTIPLIERS
MODULATORS
TAPE HEADS
CURRENT MEASURING RINGS
PICK-UPS
WATTMETERS
TRANSDUCERS

ISC MAGNETICS DIVISION products are the result of over fifteen years research, development and application engineering on Hall Effect components and magnetoresistors for a broad range of detection, measurement, computation and control applications.

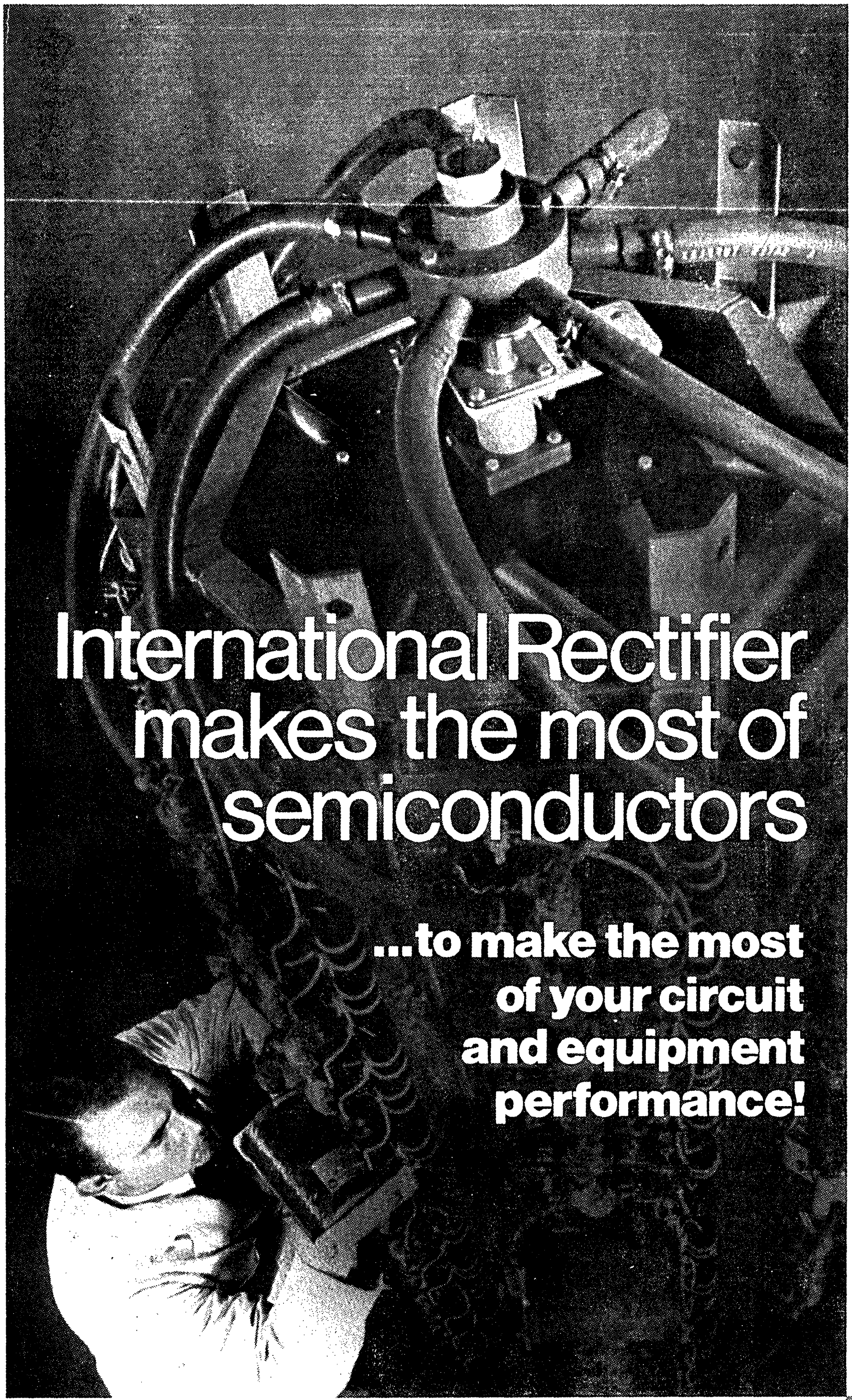
More than 30 different Hall generators and 15 different magnetoresistors, all in stock for immediate delivery, are available as standard catalog items.

Our applications engineering staff is at your disposal to discuss requirements for "black boxes" and complete systems involving processing, material handling, current regulation, and other automatic controls for military, space, and industrial applications.

COMPLETE GALVANOMAGNETIC DEVICE CATALOG AVAILABLE.

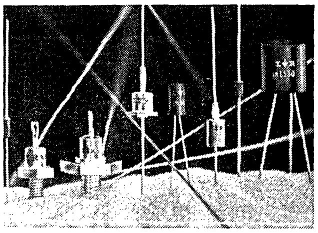
ISC ✱ MAGNETICS

Division of INSTRUMENT SYSTEMS CORPORATION
770 Park Avenue, Huntington, N. Y. 11743
Telephone: (516) 423-6200 / TWX: 510-226-6983 / Cable Address: INSSYSTHTGN

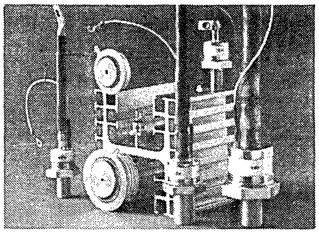


International Rectifier makes the most of semiconductors

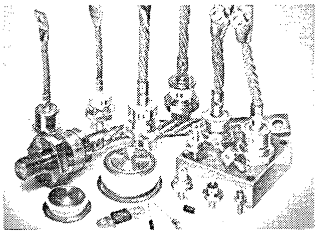
...to make the most of your circuit and equipment performance!



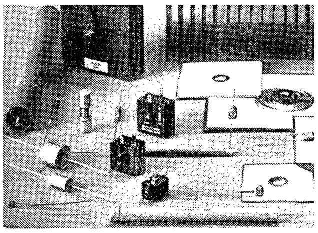
ZENER REGULATORS/REFERENCES
611 Reg. Types: 150mW-50W/2-200V/1%-20% Tol.
55 Ref. Types: 5.9-49.6V/0.015-0.0005%/°C Tol.



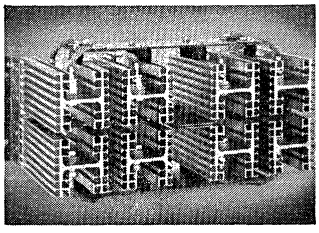
SCR'S/LOGIC-TRIACS
367 Std & Inv. Types: 4-740A RMS/25-1700V
12 Logic-Triac Types: 60-200A RMS/400-1000V



SILICON RECTIFIERS
441 Types: 400mA-800A(AV)/50-3000V
Cartridges, bridges, assemblies to 50KV

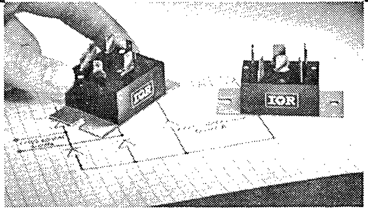


SELENIUM RECTIFIERS/SUPPRESSORS
Single to multicell power stacks, cartridges, voltage suppressors and contact protectors.



POWER CONTROL ASSEMBLIES
From simple to multi-circuit complexes, IR's single-source expertise provides optimized power assemblies.

From a discrete diode to a complex circuit function . . . from mini-to-macro power . . . where solid-state electronic and electrical power conversion and control are involved, we have an edge in experience. Since 1947, the year the semiconductor industry was born, we've chosen to specialize in those areas where our sophistication and high technology make a big difference. When we make a product, we make the most of it. The most in technology . . . the most in performance . . . the most in configurations . . . and the most in reliability. So check our areas of specialization, and keep us in mind when you begin your next design. **You, too, can make the most of it with IR semiconductors!**



. . . state-of-the-art innovations in power hybrid integration for DC drives, power supplies, solid-state relays, circuit breakers, heating controls, ad infinitum!

Semiconductor Division, 233 Kansas Street, El Segundo, California 90245, (213) 678-6281

INTERNATIONAL RECTIFIER

LOOKING FOR THOSE HARD-TO-GET SPECIAL AND DISCONTINUED TRANSISTORS... INCLUDING PHILCO TYPES?

TYPE
2N128
2N207
2N207A
2N207B
2N223
2N224
2N225
2N226
2N227
2N231
2N232
2N240
2N317A
2N344
2N345
2N346
2N352
2N353
2N355
2N386
2N387
2N393
2N395
2N396
2N396A
2N408
2N428
2N495
2N496
2N499
2N499A
2N501
2N501A
2N502
2N502A
2N502B
2N503
2N504
2N534
2N535
2N535A

TYPE
2N535B
2N536
2N588
2N589
2N597
2N598
2N599
2N600
2N601
2N670
2N671
2N672
2N673
2N674
2N675
2N696
2N697
2N698
2N699
2N699A
2N706
2N706A
2N706B
2N708
2N709
2N768
2N769
2N770
2N771
2N772
2N773
2N774
2N775
2N776
2N777
2N778
2N779
2N779A
2N779B
2N784A
2N794

TYPE
2N795
2N796
2N785
2N828
2N834
2N835
2N846
2N846A
2N846B
2N858
2N859
2N860
2N861
2N862
2N863
2N864
2N865
2N924
2N926
2N927
2N928
2N929
2N930
2N935
2N936
2N937
2N938
2N939
2N940
2N941
2N942
2N943
2N944
2N945
2N946
2N947
2N960
2N961
2N962
2N963
2N964

TYPE
2N965
2N966
2N967
2N976
2N977
2N979
2N980
2N982
2N983
2N984
2N1024
2N1025
2N1026
2N1027
2N1028
2N1034
2N1035
2N1036
2N1037
2N1118
2N1118A
2N1119
2N1122
2N1122A
2N1123
2N1124
2N1125
2N1128
2N1129
2N1130
2N1131
2N1132
2N1135
2N1135A
2N1158
2N1158A
2N1177
2N1178
2N1179
2N1199
2N1199A

TYPE
2N1200
2N1201
2N1204
2N1204A
2N1219
2N1220
2N1221
2N1222
2N1223
2N1267
2N1268
2N1269
2N1270
2N1271
2N1272
2N1300
2N1301
2N1411
2N1416
2N1427
2N1428
2N1429
2N1436
2N1467
2N1472
2N1478
2N1494
2N1494A
2N1495
2N1496
2N1499
2N1499A
2N1499B
2N1500
2N1606
2N1607
2N1608
2N1613
2N1623
2N1643
2N1654

TYPE
2N1655
2N1656
2N1663
2N1676
2N1677
2N1683
2N1711
2N1726
2N1727
2N1728
2N1742
2N1743
2N1744
2N1745
2N1746
2N1747
2N1748
2N1748A
2N1749
2N1750
2N1752
2N1753
2N1754
2N1785
2N1786
2N1787
2N1788
2N1789
2N1790
2N1864
2N1865
2N1866
2N1867
2N1868
2N1893
2N1905
2N1917
2N1918
2N1983
2N1984
2N1985

TYPE
2N1986
2N1987
2N1988
2N1989
2N1990
2N2048
2N2086
2N2087
2N2088
2N2147
2N2148
2N2162
2N2163
2N2164
2N2165
2N2166
2N2167
2N2168
2N2169
2N2170
2N2175
2N2176
2N2177
2N2178
2N2180
2N2181
2N2182
2N2183
2N2184
2N2185
2N2186
2N2187
2N2199
2N2200
2N2217
2N2218
2N2218A
2N2219
2N2219A
2N2220

TYPE
2N2221
2N2221A
2N2222
2N2222A
2N2274
2N2275
2N2276
2N2277
2N2278
2N2279
2N2280
2N2281
2N2282
2N2360
2N2361
2N2362
2N2368
2N2369
2N2369A
2N2374
2N2375
2N2376
2N2377
2N2378
2N2380
2N2380A
2N2398
2N2399
2N2400
2N2401
2N2402
2N2410
2N2451
2N2478
2N2479
2N2487
2N2488
2N2489
2N2537
2N2538

TYPE
2N2539
2N2540
2N2651
2N2699
2N2710
2N2795
2N2796
2N2904
2N2904A
2N2905
2N2905A
2N2906
2N2906A
2N2907
2N2907A
2N2954
2N2966

TYPE
2N2967
2N3011
2N3015
2N3133
2N3134
2N3135
2N3136
2N3317
2N3318
2N3319
2N3320
2N3321
2N3322
2N3342
2N3343
2N3344
2N3345
2N3346

SPECIALS

T1750
T1872
T1905
T1943
T2028
T2029
T2030
T2038

T2039
T2040
T2042
T2044
T2092
T2113
T2122
T2340

LINEAR INTEGRATED CIRCUITS

LTE 702C
LTE 709C

LTE 710C
LTE 711C

YOU JUST FOUND THEM!

ALL 100% TESTED . . . GUARANTEED AND AT THE INDUSTRY'S LOWEST PRICES.

. . . a dependable source for your transistor requirements. Write for new catalog and compare.

LTE LANSDALE
Transistor & Electronics, Inc.

19 JENKINS AVENUE o LANSDALE, PENNA. 19446 o (215) 855-9002

METROPOLITAN Supply Company
A DIVISION OF METROPOLITAN OVERSEAS SUPPLY CORPORATION
468 PARK AVENUE SOUTH, NEW YORK, N. Y. 10016
TELEX: 422509, CABLE ADDRESS "LECIMEX" NEW YORK
TELEPHONE: (212) 686-2120

SEMICONDUCTORS AND INTEGRATED CIRCUITS

Diodes

Type	Price
1N23C	.83
1N23E	2.76
1N23WE	3.16
1N34,A	.22
1N70A	.42
1N78	3.75
1N78A	4.35
1N82,A	.89
1N90	.24
1N91	.96
1N160	2.50
1N198,A	.23
1N270	.24
1N298A	1.10
1N359A thru 1N361A	.81
1N415B	.73
1N415E	2.70
1N456,A	.33
1N457,A	.37
1N530 thru 1N540	.40
1N625 thru 1N627	.32
1N645	.40
1N683	1.33
1N696	1.59
1N702 thru 1N769	.52
1N702A thru 1N769A	.57
1N830	2.47
1N830A	3.20
1N841	.60
1N845	1.10
1N914	.18
1N914A	.20
1N914B	.40
1N930 thru 1N933	.87
1N957 thru 1N984	.68
1N957A thru 1N984A	.77
1N957B thru 1N984B	.82
1N1028	5.00
1N1032	6.45
1N1085,A	1.20
1N1126,A	1.45
1N1128,A	1.88
1N1132	12.85
1N1141-42	5.15
1N1169,A	.41
1N1183,A	1.39
1N1184,A	1.50
1N1191,A	1.34
1N1201,A	1.15
1N1226,A	.99
1N1232,A	1.86
1N1313A thru 1N1327A	.288
1N1351 thru 1N1375	2.42
1N1396	5.85
1N1412	5.75
1N1425 thru 1N1431	2.76
1N1486	.64
1N1490	.47
1N1507 thru 1N1528	1.85
1N1540	1.32
1N1542	1.84
1N1586	2.38
1N1588A thru 1N1609A	3.15
1N1612,A	.90
1N1648	.59
1N1692	.34
1N1701	.50
1N1703	.71
1N1730A	2.20
1N1753	7.45
1N1763,A	.39
1N1765,A thru 1N1802,A	1.72
1N1803A thru 1N1836A	3.28
1N1875A thru 1N1888A	2.14
1N1891 thru 1N1904	4.75
1N1911	1.62
1N1914	2.50
1N1929,A thru 1N1943,A	1.39
1N1981,A thru 1N1997,A	2.34
1N2001,A thru 1N2012,A	3.20
1N2013 thru 1N2040	1.65
1N2041 thru 1N2049	3.10
1N2069,A	.27
1N2070,A	.29
1N2071,A	.31
1N2102	11.45
1N2103 thru 1N2108	.40
1N2132	2.80
1N2135	3.44
1N2147,A	2.76
1N2148	2.35
1N2163	2.85
1N2218	1.63
1N2220	2.27
1N2221	3.24
1N2223	4.28
1N2269	3.10
1N2286	9.90
1N2292,A	2.79
1N2378	2.25
1N2382	2.93
1N2384	4.85
1N2452	4.79
1N2491	1.12
1N2495	1.89
1N2520	3.46
1N2612	.48
1N2620	2.94
1N2623	6.25
1N2635	5.32
1N2765	3.45
1N2770	11.05
1N2804 thru 1N2838	4.62
1N2847	2.03
1N2860,A	.36
1N2864,A	.62
1N2878 thru 1N2891	5.90
1N3016 thru 1N3051	1.13
1N3060	21.00
1N3062	.93
1N3084	2.80
1N3092	26.40
1N3093 thru 1N3120	4.29
1N3126 thru 1N3153	4.29
1N3169	29.40
1N3171,A	50.25
1N3182	.59
1N3183 thru 1N3188	4.29
1N3190	.84
1N3202	8.46
1N3212	2.14
1N3214	3.26
1N3215 thru 1N3224	4.29
1N3229	1.10
1N3234	4.32
1N3237	1.54
1N3245	5.14
1N3251	4.96
1N3258	2.16
1N3270	22.95
1N3276	42.40
1N3289	9.15
1N3297 thru 1N3340	4.29
1N3341B thru 1N3350B	7.15
1N3492	.53
1N3495	1.36
1N3498	7.26
1N3503	17.45
1N3506 thru 1N3520	.97
1N3568	1.85
1N3574	2.56
1N3582A	6.35
1N3597	2.37
1N3601	1.00
1N3605	.52
1N3612	1.40
1N3614	2.80
1N3619	1.87
1N3624	6.50
1N3642	.69
1N3650	2.96
1N3657	1.59
1N3671,A	6.65
1N3703,A thru 1N3710,A	1.23
1N3749	.56
1N3761	1.77
1N3784	38.10
1N3785,A thru 1N3820,A	2.58
1N3821,A thru 1N3830,A	1.34
1N3831 thru 1N3845	4.10
1N3877	10.85
1N3891	5.95
1N3911	9.60
1N3981 thru 1N3990	3.29
1N3993 thru 1N4000	3.12
1N4001	.28
1N4002	.29
1N4003	.30
1N4004	.32
1N4005	.33
1N4007	.52
1N4010 thru 1N4042	2.61
1N4016A thru 1N4042A	3.24
1N4046	18.70
1N4052	44.65
1N4061	7.85
1N4067	12.95
1N4070	16.80
1N4072	19.55
1N4074	23.60
1N4076	26.75
1N4081	36.50
1N4099 thru 1N4135	2.64
1N4258 thru 1N4275	3.76
1N4276 thru 1N4293	4.28
1N4295	3.05
1N4298	10.70
1N4304	16.75
1N4309-12	2.64
1N4323A thru 1N4358A	1.17
1N4370,A thru 1N4372,A	.95
1N4385	.74
1N4460 thru 1N4496	2.97
1N4501	3.20
1N4508	7.94
1N4536	.39
1N4559 thru 1N4564	4.89
1N4572	8.85
1N4576,A	3.10
1N4581,A	3.10
1N4611-13	4.15
1N4614 thru 1N4627	2.34
1N4770	4.58
1N4782	11.15
1N4786,A thru 1N4800,A	2.87
1N4890	15.70
1N4892	20.65
1N5008 thru 1N5051	1.86
1N5059	.39
1N5060	.47
1N5063 thru 1N5089	3.52
1N5091 thru 1N5103	4.34
1N5104 thru 1N5117	5.00
1N5118 thru 1N5128	4.36
1N5129 thru 1N5134	5.67
1N5135 thru 1N5148	4.39
1N5221 thru 1N5281	.66
1N5283 thru 1N5314	3.29
1N5391	.27
1N5403	.51
1N5559,A thru 1N5594,A	1.23

Transistors

Type	Price
2N78,A	1.65
2N97	.89
2N109	.59
2N118,A	5.96
2N133	1.00
2N160	2.05
2N174	2.60
2N178	.82
2N187,A	.97
2N211	.86
2N216	.86
2N241,A	.72
2N270	.64
2N284	1.25
2N291	.81
2N301	.86
2N327A	1.59
2N328A	2.69
2N332,A thru 2N338,A	3.40
2N356,A	1.54
2N362	.54
2N376,A	1.35
2N381	.54
2N388	.74
2N396,A	.54
2N404	.37
2N404A	.45
2N428	.73
2N440,A	1.62
2N442	1.38
2N445,A	1.10
2N456,A	1.27
2N457,A	1.43
2N459,A	3.08
2N476	5.65
2N479,A	5.32
2N481-86	.45
2N490	6.75
2N492	7.87
2N501	4.77
2N512	4.20
2N526	.77
2N540	6.42
2N548	2.99
2N558	1.63
2N579	1.02
2N586	1.42
2N609-11	1.17
2N628	2.61
2N647	.86
2N651	.82
2N659	1.01
2N677	2.11
2N677C	5.42
2N696-97	.42
2N706	.35
2N706A	.42
2N711,A	.79
2N720,A	1.02
2N721,A	1.24
2N758	1.97
2N760,A	1.02
2N784	2.97
2N835	1.29
2N876	1.37
2N884	3.78
2N910	1.13
2N914	.89
2N917	1.18
2N923	4.46
2N935	2.10
2N940	7.97
2N948	5.18
2N956	.72
2N997	8.85
2N1012	1.50
2N1021,A	2.77
2N1026	3.21
2N1031	2.12
2N1032A	3.60
2N1036	3.51
2N1038	1.87
2N1039	2.16
2N1040	2.97
2N1042	2.48
2N1046	6.27
2N1048,A	14.45
2N1050,A	17.90
2N1086	.99
2N1091	.95
2N1092	3.60
2N1102	.62
2N1120	6.36
2N1130	1.27
2N1131	1.21
2N1132	1.29
2N1138	2.68
2N1140	1.23
2N1142	3.47
2N1143	2.96
2N1146A	2.70
2N1149-51	7.38
2N1167	6.17
2N1170	2.12
2N1176	.42
2N1183,A	1.57
2N1184,A	2.24
2N1191	.79
2N1193	.77
2N1202	5.08
2N1203	11.48
2N1208	15.45
2N1212	12.86
2N1226	1.32
2N1231	8.72
2N1247-48	11.90
2N1262	3.32
2N1273-74	.40
2N1281-82	1.35
2N1284	1.40
2N1292	8.95
2N1299	1.68
2N1302-03	.40
2N1308-09	.67
2N1316	1.35
2N1335	10.40
2N1346	.94
2N1350-51	.97
2N1358	3.60
2N1379	.77
2N1382	.77
2N1395	1.47
2N1396	1.58
2N1412	3.82
2N1420	.54
2N1440	4.37
2N1442	9.70
2N1452	1.30
2N1471	1.27
2N1480	2.03
2N1482	2.87
2N1484	3.12
2N1485	3.42
2N1486	5.12
2N1487	4.00
2N1488	5.73
2N1490	6.45
2N1491	1.65
2N1492	5.66
2N1501	1.82
2N1502	1.75
2N1519	4.19
2N1521	4.67
2N1529	1.18
2N1532	2.63
2N1538	4.37
2N1540	1.58
2N1541	1.65
2N1542	2.06
2N1547	2.46
2N1548	3.39
2N1552	4.05
2N1560	3.46
2N1590	4.44
2N1591	5.45
2N1592	6.39
2N1601	4.87
2N1613	.65
2N1620	28.65
2N1647	14.80
2N1651	4.07
2N1671A	2.69
2N1671B	3.03
2N1690	10.70
2N1693	16.45
2N1701	1.92
2N1706	.54
2N1711	.59
2N1720	6.50
2N1724	21.25
2N1745	1.64
2N1770	2.04
2N1771	2.37
2N1773	4.28
2N1774	4.88
2N1776	6.78
2N1801	54.50
2N1823	118.80
2N1840	3.57
2N1846	4.36
2N1849	6.12
2N1871	6.41
2N1890	3.28
2N1892	.67
2N1910	14.56
2N1914	22.50
2N1919	7.40
2N1948	11.05
2N1956	1.60
2N1972	1.98
2N1985	1.98
2N2011	2.60
2N2018	19.80
2N2024	20.10
2N2030	37.75
2N2048	1.58
2N2101	33.60
2N2102	.87
2N2106	1.78
2N2148	.97
2N2170	2.04
2N2195	1.03
2N2219	.69
2N2220	1.46
2N2222	.54
2N2223	2.78
2N2226	32.45
2N2270	.69
2N2291	2.40
2N2312	4.78
2N2324	3.06
2N2328	9.63
2N2332	3.28
2N2346	4.42
2N2352	2.19
2N2369A	1.38
2N2386	2.43
2N2412	4.05
2N2480	7.86
2N2491	2.18
2N2498	2.96
2N2510	2.53
2N2586	4.85
2N2597	7.10
2N2604	2.68
2N2619	17.60
2N2640	6.08
2N2658	24.70
2N2690	5.83
2N2711	.27
2N2712	.29
2N2741	54.25
2N2758	51.00
2N2770	65.00
2N2781	37.40
2N2791	4.89
2N2803	10.35
2N2812	56.20
2N2824	60.60
2N2847-48	4.30
2N2861	6.82
2N2869	1.36
2N2890	9.15
2N2892	15.45
2N2903	5.65
2N2904	1.16
2N2905	1.16
2N2918	4.06
2N2924	.27
2N2926	.26
2N2946	2.60
2N2968-69	25.40
2N2976	6.92
2N2990	9.35
2N3019	3.55
2N3046	29.90
2N3057,A	7.43
2N3070	3.12
2N3086	11.70
2N3116	1.15
2N3120	7.85
2N3121	7.95
2N3137	7.00
2N3249	3.80
2N3251	2.07
2N3301	.69
2N3342	3.65
2N3368	2.09
2N3391	.39
2N3396	.34
2N3419	9.45
2N3440	1.60
2N3458	2.17
2N3563	.40
2N3565	.34
2N3600	3.17
2N3615	1.40
2N3638	.32
2N3638A	.38
2N3640	.40
2N3645	.71
2N3646	.41
2N3671-72	3.87
2N3694	.39
2N3713	3.47
2N3744	15.80
2N3752	31.35
2N3802	12.95
2N3823-24	1.93
2N3845	.38
2N3891	203.00
2N3909	1.70
2N3921	15.10
2N3978	2.65
2N3998	15.15
2N4001	5.70
2N4006	3.57
2N4012	10.80
2N4022	17.70
2N4032	7.10
2N4084	13.86
2N4091	4.16
2N4122	.56
2N4210	49.75
2N4216	4.05
2N4220	1.87
2N4248	.23
2N4274	.39
2N4362	29.85
2N4367	206.30
2N4378	302.00
2N4393	2.92
2N4399	12.15
2N4416	2.70
2N4428	6.70
2N4852	1.10
2N4856	4.19
2N4862	9.45
2N4965-68	.67
2N4985	2.35
2N5010	7.86
2N5014	29.60
2N5016	39.60
2N5047	7.85
2N5060	.67
2N5127-33	.22
2N5134-43	.23
2N5197	15.40
2N5199	7.80
2N5416	4.70
3N70	18.50
3N76	7.83
3N90	10.10
3N92	4.05
3N94	11.48
3N120	15.95
3N123	3.05
3N140	1.60

Integrated Circuits

7400 Series

Type	Price
7400N	1.15
7401N	1.15
7402N	1.32
7403N	1.15
7404N	1.44
7405N	1.44
7410N	1.15
7420N	.98
7430N	.98
7440N	1.45
7441AN	6.40
7442N	5.87
7443N	5.87
7444N	5.87
7445N	8.95
7446N	7.37
7447N	6.80
7448N	5.87
7450N	1.15
7451N	1.15
7453N	1.15
7454N	1.15
7460N	.94
7470N	1.73
7472N	1.61
7473N	2.65
7474N	2.30
7475N	4.05
7476N	2.79
7480N	3.10
7481N	6.75
7482N	4.60
7483N	7.30
7484N	7.10
7486N	2.70
7490N	4.73
7491AN	6.41
7492N	4.73
7493N	4.73
7494N	5.07
7495N	5.07
7496N	6.08
7510L	4.40

800 Series

Type	Price
829G	1.56
830P	1.32
831G	5.77
831P	3.45
832G	4.45
832P	1.23
833G	4.95
833P	1.55
834P	2.30
835F	4.78
835P	2.30
836P	1.51
837F	4.78
837P	2.30
838P	8.30
839P	8.30
840F	4.78
840P	2.30
844G	4.45
844P	1.37
845P	1.37
846P	1.37
847P	1.61
848P	1.94
850G	11.40
850P	5.18
857F	7.20
857P	3.24
861P	1.97
862P	1.37
863P	1.94
864P	2.16
870P	3.19
875P	1.75
877P	4.37
879P	2.40
880P	4.37
883P	1.97
884P	1.85
885P	1.41
887P	2.40
890P	2.57
891P	2.81
892P	1.41
896P	4.39
898P	1.58
899G	2.07
899P	1.41

Prices are subject to change without notice.

micro

Microsemiconductor

a division of Standard Resources Corporation

Zener Diodes

Industry preferred series

Power Package Vz Volts	500mW "B"*	1.5W "A"	3.0W "A"	5.0W "E"
6.2	1N5234	1N4460†		
6.8	1N5235	1N4461†	1N5063	1N4954‡
7.5	1N5236	1N4462†	1N5064	1N4955‡
8.2	1N5237	1N4463†	1N5065	1N4956‡
9.1	1N5239	1N4464†	1N5066	1N4957‡
10	1N5240	1N4465†	1N5067	1N4958‡
11	1N5241	1N4466†	1N5068	1N4959‡
12	1N5242	1N4467†	1N4883	1N4960‡
13	1N5243	1N4468†	1N5069	1N4961‡
14	1N5244		1N5070	1N5118‡
15	1N5245	1N4469†	1N5071	1N4962‡
16	1N5246	1N4470†	1N5072	1N4963‡
17	1N5247			
18	1N5248	1N4471†	1N5073	1N4964‡
19	1N5249			
20	1N5250	1N4472†	1N4884	1N4965‡
22	1N5251	1N4473†	1N5074	1N4966‡
24	1N5252	1N4474†	1N5075	1N4967‡
25	1N5253			
27	1N5254	1N4475†	1N5076	1N4968‡
30	1N5256	1N4476†	1N5077	1N4969‡
33	1N5257	1N4477†	1N5078	1N4970
36	1N5258	1N4478	1N5079	1N4971
39	1N5259	1N4479	1N5080	1N4972
40			1N5081	1N5119
43	1N5260	1N4480	1N5082	1N4973
45			1N5083	1N5120
47	1N5261	1N4481	1N5084	1N4974
50			1N5085	1N5121
51	1N5262	1N4482	1N5086	1N4975
56	1N5263	1N4483	1N5087	1N4976
60	1N5264		1N5088	1N5122
62	1N5265	1N4484	1N5089	1N4977
68	1N5266	1N4485	1N5090	1N4978
70			1N5091	1N5123
75	1N5267	1N4486	1N5092	1N4979
80			1N5093	1N5124
82	1N5268	1N4487	1N5094	1N4980
87	1N5269			
90			1N4096	1N5125
91	1N5270	1N4488	1N5095	1N4981
100	1N5271	1N4489	1N4097	1N4982
110	1N5272	1N4490	1N5096	1N4983
120	1N5273	1N4491	1N5097	1N4984
130	1N5274	1N4492	1N5098	1N4985
140	1N5275		1N5099	1N5126
150	1N5276	1N4493	1N4098	1N4986
160	1N5277	1N4494	1N5100	1N4987
170	1N5278		1N5101	1N5127
180	1N5279	1N4495	1N5102	1N4988
190	1N5280		1N5103	1N5128
200	1N5281	1N4496	1N5104	1N4989

*To order Package B, add the suffix/Z to the part number, i.e.: 1N963/Z.

†JAN and JANTX units available per MIL-S-19500/400.

‡JAN and JANTX units available per MIL-S-19500/356.

Standard Temperature Compensated Zeners

Standard TC Zeners are sealed in a glass DO-7 package.
Other packages available on request.

Vz (Volts)	Iz (ma)	ZZT (ohms)	Average Temperature Coefficient (%/°C) .01	.005	.002	.001	.0005	Temperature Range
6.2	7.5	15, 10	1N821,A	1N823,A*	1N825,A	1N827,A	1N829,A	−55°C to +100°C
	7.5	15	1N3500	1N3496	1N3497	1N3498	1N3499	0°C to +75°C
6.3	7.5	15					1N3553	−55°C to +100°C
6.35	7.5	12				1N3501	1N3502	+25°C to +100°C
						1N3503		
						1N3504		
6.4	0.5	200	1N4565	1N4566	1N4567	1N4568	1N4569	No suffix types: 0°C to +75°C A types: −55°C to +100°C
	1.0	100	1N4570	1N4571	1N4572	1N4573	1N4574	
	2.0	50	1N4575	1N4576	1N4577	1N4578	1N4579	
	4.0	25	1N4580	1N4581	1N4582	1N4583	1N4584	
6.5	7.5	10	1N3779	1N3781	1N3782	1N3783	1N3784	−55°C to +100°C
			1N3780					
6.6	2.0	75		1N4611	1N4611A	1N4611B	1N4611C	−55°C to +100°C
	5.0	25		1N4612	1N4612A	1N4612B	1N4612C	
	10.0	15		1N4613	1N4613A	1N4613B	1N4613C	
8.4	10.0	15	1N3154,A	1N3155,A	1N3156,A	1N3157,A		A types: −55°C to +150°C No suffix types: −55°C to +100°C
8.5	.5	200	1N4775	1N4776	1N4777	1N4778	1N4779	No suffix types: +25°C to +100°C A types: −55°C to +100°C
	.5	200	1N4775A	1N4776A	1N4777A	1N4778A	1N4779A	
	1.0	100	1N4780	1N4781	1N4782	1N4783	1N4784	
	1.0	100	1N4780A	1N4781A	1N4782A	1N4783A	1N4784A	
9.0	7.5	20	1N935	1N936	1N937	1N938	1N939	No suffix types: 0°C to +75°C A types: −55°C to +100°C B types: −55°C to +150°C
11.7	7.5	30	1N941	1N942	1N943	1N944	1N945	No suffix types: 0°C to +75°C A types: −55°C to +100°C B types: −55°C to +150°C

JAN and JANTX Qualified: 1N821 — 1N829 1N3154 — 1N3157 1N935B — 1N938B.

*Measurements at −55°C, 0°C, +25°C, +75°C, +100°C, +150°C per spec.

All readings are at 25°C, unless otherwise noted.

Other industry preferred Zener diode series available from MICRO:

250mW

1N709 thru 1N745	Package DO-7 or "B"
1N763 thru 1N769	Package DO-7 or "B"

400mW

1N753 thru 1N759	Package DO-7 or "B"
1N957 thru 1N992	Package DO-7 or "B"
1N3513 thru 1N3534	Package DO-7 or "B"

500mW

1N5234 thru 1N5281	Package DO-7 or "B"

1.0W

1N3675 thru 1N3710	Package "A"
1N1521 thru 1N1528	Package "A"
1N1766 thru 1N1802	Package "A"
1N3828 thru 1N3830	Package "A"
1N1875 thru 1N1888	Package "A"
1N2387	Package "A"
1N3016 thru 1N3051	Package "A"
1N3098 thru 1N3100	Package "A"
1N4158 thru 1N4193	Package "A"
1N4323 thru 1N4358	Package "A"
1N4656 thru 1N4677	Package "A"
1N4735 thru 1N4764	Package "A"

1.2W

1N4831 thru 1N4860	Package "A"

2.5W

1N5015 thru 1N5051	Package "A"

Microsemiconductor

a division of Standard Resources Corporation

Rectifiers

4 Amp Series Rectifiers — Package E

Equivalent Type	PIV (Volts)	Maximum Average DC Output Current 25°C (Amps)	100°C (Amps)	Fan Cooled 250 LFM 25°C (Amps)	Minimum Forward Current at 1.0V 25°C (Amps)	Max. Reverse Current at PIV (μA) 25°C	100°C
MV2105	50	4.0	2.0	6.0	3	1	50
MV2106	100	4.0	2.0	6.0	3	1	50
MV2107	200	4.0	2.0	6.0	3	1	50
MV2108	400	4.0	2.0	6.0	3	1	50
MV2109	600	4.0	2.0	6.0	3	1	50
MV2110	800	4.0	2.0	6.0	3	1	50
MV2111	1000	4.0	2.0	6.0	3	1	50
MV2112	50	3.0	1.5	4.5	2	1	50
MV2113	100	3.0	1.5	4.5	2	1	50
MV2114	200	3.0	1.5	4.5	2	1	50
MV2115	400	3.0	1.5	4.5	2	1	50
MV2116	600	3.0	1.5	4.5	2	1	50
MV2117	800	3.0	1.5	4.5	2	1	50
MV2118	1000	3.0	1.5	4.5	2	1	50

Maximum Peak One Cycle Surge Sinusoidal 8.3msec: 100 amps @ 100°C and rated load.

2 Amp Series Low Leakage Rectifiers — Package A

MSC Type	PIV (Volts)	Average Rectified Current (Amps) 25°C	100°C	Minimum Forward Current (Amps) @ +1V	Maximum Reverse (DC Test) Current at PIV (μA) 25°C	100°C	Maximum Peak One Cycle Surge Sinusoidal (8.3msec) (Amps)
MB228	100	2.0	1.0	1	.025	5	25
MB229	200	2.0	1.0	1	.025	5	25
MB230	300	2.0	1.0	1	.025	5	25
MB231	400	2.0	1.0	1	.025	5	25
MB232	500	2.0	1.0	1	.025	5	25
MB233	600	2.0	1.0	1	.025	5	25
MB234	800	2.0	1.0	1	.025	5	25
MB235	1000	2.0	1.0	1	.050	10	25
MB236	100	1.5	.75	.800	.2	15	25
MB237	200	1.5	.75	.800	.2	15	25
MB238	300	1.5	.75	.800	.2	15	25
MB239	400	1.5	.75	.800	.2	15	25
MB240	500	1.5	.75	.800	.2	15	25
MB241	600	1.5	.75	.800	.2	15	25
MB242	800	1.5	.75	.800	.2	15	25
MB243	1000	1.5	.75	.800	.5	50	25

1 Amp Series Rectifiers, General Purpose — Package A

MSC Type	PIV (Volts)	Average Rectified Current (Amps) 25°C	100°C	Minimum Forward Current @ +1V @ 25°C (Amps)	Maximum Reverse (DC Test) Current at PIV (μA) 25°C	100°C	Maximum Peak One Cycle Surge Sinusoidal (8.3msec) (Amps)
MB244	100	1.0	.5	.600	1.0	75	20
MB245	200	1.0	.5	.600	1.0	75	20
MB246	300	1.0	.5	.600	1.0	75	20
MB247	400	1.0	.5	.600	1.0	75	20
MB248	500	1.0	.5	.600	1.0	75	20
MB249	600	1.0	.5	.600	1.0	75	20
MB250	800	1.0	.5	.600	1.0	75	20
MB251	1000	1.0	.5	.600	1.0	75	20

1 Amp @ 100°C Series Rectifiers, 50 Amp Surge — Package F

Type	PIV (Volts)	Breakdown Voltage @ 100μA (Volts)	Maximum Forward Voltage Drop @ 25°C V_F @ I_F (Volts)	(Amps)	Maximum Reverse Cur. @ 25°C, DC $I_{R\,max}$ @ V_R (μA)	(Volts)	Maximum Peak One Cycle Surge Sinusoidal 8.3 msec (Amps)
MF300	80	100	1.0	1.25	1	80	50
MF301	80	100	1.0	1.00	5	80	50
MF310	200	240	1.0	1.25	1	200	50
MF311	200	240	1.0	1.00	5	200	50
MF320	400	480	1.0	1.25	1	400	50
MF321	400	480	1.0	1.00	5	400	50
MF330	600	720	1.0	1.25	1	600	50
MF331	600	720	1.0	1.00	5	600	50
MF340	800	960	1.0	1.25	1	800	50
MF341	800	960	1.0	1.00	5	800	50
MF350	1000	1150	1.0	1.25	1	1000	50
MF351	1000	1150	1.0	1.00	5	1000	50

*Performed @ $T_A = 100°C$.

1 Amp Series Rectifiers** @ 100°C — Package A

Type	Peak Inverse Voltage (Volts)	Breakdown Voltage @ 100μA (Volts)	Average Rectified Current (Amps) 100°C	150°C	Maximum Reverse Current (DC Test) @ PIV (μA) 25°C	150°C
1N3611	200	240	1.0	.3	5.0	300
1N3612	400	450	1.0	.3	5.0	300
1N3613	600	720	1.0	.3	5.0	300
1N3614	800	920	1.0	.3	5.0	300
1N3957	1000	1120	1.0	.3	5.0	300

Maximum Forward Voltage Drop @ 1 Amp: 1.2 Volts.
Maximum Peak One Cycle Surge Sinusoidal (8.2msec): 30 Amps.
**JAN and JANTX types available per MIL-S-19500/228E.

1 Amp Series Rectifiers* @ 100°C — Package A

Type	Peak Inverse Voltage (Volts)	Breakdown Voltage @ 100μA (Volts)	Average Rectified Current (I_O) (Amps) 100°C	150°C	Maximum Forward Voltage @ 1 Amp 25°C (Volts)	Maximum Reverse Current @ PIV (μA) 25°C	150°C
1N4245	200	240	1.00	.333	1.0	1	150
1N4246	400	480	1.00	.333	1.0	1	150
1N4247	600	720	1.00	.333	1.0	1	150
1N4248	800	960	1.00	.333	1.0	1	150
1N4249	1000	1150	1.00	.333	1.0	1	150

Maximum Peak One Cycle Surge Sinusoidal (8.3msec): 30 Amps.
Maximum Reverse Recovery Time: 5.0μsec.
*JAN and JANTX types available per MIL-S-19500/286C.

4 Amp Series Fast Recovery Rectifiers — Package E

Equivalent Type	PIV (Volts)	Maximum Average DC Output Current (Amps) 25°C	100°C	Minimum Forward Current @ 1.1V 25°C (Amps)	Maximum Reverse Recovery Time* (nsec)	Maximum Junction Capacitance @ 25°C (pf) 0V	−10V	Max. Peak One Cycle Surge Sinusoidal 8.3msec (Amps)
MV7113	50	4.0	2.0	4	200	300	120	100
MV7114	100	4.0	2.0	4	200	275	110	100
MV7115	200	4.0	2.0	4	200	250	100	100
MV7116	400	4.0	2.0	4	350	200	80	100
MV7117	500	4.0	2.0	4	350	175	70	100
MV7118	600	4.0	2.0	4	350	175	70	100
MV7119	800	4.0	2.0	4	500	150	60	100
MV7120	1000	4.0	2.0	4	500	150	60	100
MV7121	50	3.0	1.5	3	200	300	120	80
MV7122	100	3.0	1.5	3	200	275	110	80
MV7123	200	3.0	1.5	3	200	250	100	80
MV7124	400	3.0	1.5	3	350	200	80	80
MV7125	500	3.0	1.5	3	350	175	70	80
MV7126	600	3.0	1.5	3	350	175	70	80
MV7127	800	3.0	1.5	3	500	150	60	80
MV7128	1000	3.0	1.5	3	500	150	60	80
MV7129	50	2.0	1.0	2	200	300	120	60
MV7130	100	2.0	1.0	2	200	275	110	60
MV7131	200	2.0	1.0	2	200	250	100	60
MV7132	400	2.0	1.0	2	350	200	80	60
MV7133	500	2.0	1.0	2	350	175	70	60
MV7134	600	2.0	1.0	2	350	175	70	60
MV7135	800	2.0	1.0	2	500	150	60	60
MV7136	1000	2.0	1.0	2	500	150	60	60

Maximum Reverse Current at PIV — 25°C: 5μA; 100°C: 100μA.
*Tested @ $I_F = I_R = 10mA$ Recovered to 5mA.

Microsemiconductor 11250 Playa Court, Culver City, Calif. 90230 ■ Phone: (213) 391-8271 or (213) 870-2974

micro

Microsemiconductor
a division of Standard Resources Corporation

Rectifiers

2 Amp Series
Fast Recovery Rectifiers — Package A

Type	(Volts)	Avalanche Voltage Breakdown @ 50μA (Volts) Min.	Max.	Maximum Average Rectified Current (Amps) 55°C	100°C	Forward Voltage @ 1 ADC (Volts) Max.	Typ.	Maximum Reverse Recovery Time (nsec.)
*1N4942	200	220	500	1.0	.75	1.2	1.0	150
1N4943	300	330	500	1.0	.75	1.2	1.0	150
*1N4944	400	440	600	1.0	.75	1.2	1.0	150
1N4945	500	550	700	1.0	.75	1.2	1.0	150
*1N4946	600	660	950	1.0	.75	1.2	1.0	150
*1N4947	800	880	1200	1.0	.75	1.2	1.0	250
*1N4948	1000	1100	1400	1.0	.75	1.2	1.0	500

Maximum Reverse Current @ PIV — 25°C: 1μA; 125°C: 100μA.
Maximum Junction Capacitance 12 VDC: 15 pt.
Maximum Peak One Cycle Surge Sinusoidal 8.3msec 40°C: 25 Amps.
*JAN and JANTX types available per MIL-S-19500/359A.

4 Amp Series
Ultra Fast Recovery Rectifiers — Package E

Equivalent Type	PIV (Volts)	Maximum Average Rectified Current (Amps) 25°C	100°C	Minimum Forward Current (Amps) @ 1.0V 25°C	Maximum Reverse Current @ PIV (μA) 25°C	100°C	Maximum Reverse Recovery Time* (nsec)	Max. Peak One Cycle Surge Sinusoidal 8.3msec (Amps)
MV7105	50	4.0	2.0	3.0	5	150	50	100
MV7106	100	4.0	2.0	3.0	5	150	50	100
MV7107	150	4.0	2.0	3.0	5	150	50	100
MV7108	200	4.0	2.0	3.0	5	150	50	100
MV7109	50	3.0	1.5	2.0	5	150	50	100
MV7110	100	3.0	1.5	2.0	5	150	50	100
MV7111	150	3.0	1.5	2.0	5	150	50	100
MV7112	200	3.0	1.5	2.0	5	150	50	100

*T_{rr} @ I_F = ½A, I_R = 1A Recovered to ¼ A.

2 Amp Series
Ultra Fast Recovery Rectifiers — Package A

MSC Type	PIV (Volts)	Minimum Forward Current @ 1 Volt (I_F) (Amps)	Average Rectified Current (Amps)	Reverse Leakage @ PIV (μA) 25°C	100°C	Reverse Recovery Time* (nsec)	Capacitance @ 0 Volts (pf)
MB388	50	1.0	2	3.0	50	75	25
MB389	100	1.0	2	3.0	50	75	25
MB390	150	1.0	2	3.0	50	75	25
MB391	200	1.0	2	3.0	50	75	25
MB392	250	1.0	2	3.0	50	75	25
MB393	50	0.5	1	3.0	50	75	25
MB394	100	0.5	1	3.0	50	75	25
MB395	150	0.5	1	3.0	50	75	25
MB396	200	0.5	1	3.0	50	75	25
MB397	250	0.5	1	3.0	50	75	25

*T_{rr} I_F = I_R = 10mA Recovered to 5mA.

Other Industry preferred 1 Amp Series rectifiers available from MICRO

Package	Avg. For. Cur. (Amps)	T_A (°C)	PIV (Volts) 50	100	200	400	600	800	1000	I Surge 1 Cycle @ 8.3ms
F	1.0	55			1N3866	1N3867	1N3868			60
F	.5	55							1N3869	30
A	1.0	100			1N4383	1N4384	1N4385			50
F	1.0	25						1N4585	1N4586	50
F	1.0	75			1N5059	1N5060	1N5061	1N5062		50
F	1.0	100			1N3981	1N3982	1N3983			30
A	1.0	75	1N4001	1N4002	1N4003	1N4004	1N4005	1N4006	1N4007	30

Mini-Micro Multiplier Rectifiers (1000 to 6000 volts) — Package A-1

MSC Type	PIV	Average Rectified Current @ 25°C (mA)	Reverse Current @ PIV (μA) 25°C	100°C	Forward Voltage @ 10mA (Volts)	Capacitance @ 0 Volts (pf)
MH400	1000	10	0.5	20.0	1.2	
MH401	1500	10	0.5	20.0	2.4	
MH402	2000	10	0.5	20.0	2.8	
MH403	2500	10	0.5	20.0	3.0	
MH404	3000	5	0.020	1.0	6.0	1
MH405	3000	10	0.5	20.0	3.2	
MH406	3500	5	0.020	1.0	6.0	1
MH407	3500	10	0.5	20.0	4.5	
MH408	4000	5	0.020	1.0	6.0	1
MH409	4000	10	0.5	20.0	4.5	

Pin Microwave Switching Diodes

FEATURES

- 20 Watt Dissipation
- 0.5 Pico-Farads Capacitance for Low Reverse Loss
- Breakdown Voltages to 1250 Volts
- 0.15 Ohms Series Resistance
- 30 MHz to 30 GHz Operating Range
- Choice of Five Package Configurations

Type Package H, 250mW	Package H1, 750mW	R_S (ohms) @ I_f	CAP @ 100V pf	I_r @ PIV micro-amps	PIV Volts	V_f @ I_f Volts
MN1015	MN2015	.75 @ 50mA*	0.7	1.0	150	0.85
MN1015A	MN2015A	.5 @ 50mA*				
MN1025	MN2025	1 @ 50mA*	0.7	1.0	250	0.85
MN1025A	MN2025A	.6 @ 50mA*				
MN1050	MN2050	1.5 @ 100mA*	0.65	1.0	500	0.9
MN1050A	MN2050A	.75 @ 100mA*				
MN1075	MN2075	1.5 @ 150mA*	0.6	1.0	750	0.95
MN1075A	MN2075A	.75 @ 150mA*				
MN1125	MN2125	1.5 @ 150mA*	0.55	1.0	1250	0.95
MN1125A	MN2125A	.75 @ 150mA*				

Package B, 5 Watts

MN3015	.5 @ 50mA†	1.5	1.0	150	0.85
MN3015A	.35 @ 50mA†				
MN3050	1.5 @ 50mA†	0.6	1.0	500	0.9
MN3050A	.75 @ 50mA†				

Package A, 10 Watts

MN4030	.3 @ 50mA	6.0	1.0	300	0.9
MN4050	.4 @ 100mA†	3.5	1.0	500	0.9
MN4050A	.2 @ 100mA†				
MN4100	.5 @ 200mA†	2.8	1.0	1000	0.9
MN4100A	.3 @ 200mA†				
MN4100B	.2 @ 200mA†				

Package E, 20 Watts

MN5060	.3 @ 150mA†	8.0	1.0	600	0.9
MN5060A	.15 @ 150mA†				
MN5100	.4 @ 300mA†	7.0	1.0	1000	0.9
MN5100A	.2 @ 300mA†				

NOTES: All Above are Guaranteed Maximums.
Operating Temperature Range from —65°C to 175°C.
†R_S Measured @ 500MHz.
*R_S Measured @ 1500GHz.

micro

Microsemiconductor
a division of Standard Resources Corporation

Rectifiers

High-Voltage Microdiodes — Package H

MSC Type	PIV (Volts)	Forward Current @ 1.0V @ 25°C (mA)	Reverse Current @ 25°C and Indicated Temperature (μA)		Max. Avg. Rectified Current (mA) 25°C
MC021	50	400	.2 @ PIV	15 @ PIV (150°C)	200
MC021A	50	400	.025 @ PIV	5 @ PIV (150°C)	200
MC022	100	400	.2 @ PIV	15 @ PIV (150°C)	200
MC022A	100	400	.025 @ PIV	5 @ PIV (150°C)	200
MC023	150	400	.2 @ PIV	15 @ PIV (150°C)	200
MC023A	150	400	.025 @ PIV	5 @ PIV (150°C)	200
MC020	200	400	.2 @ PIV	15 @ PIV (150°C)	200
MC020A	200	400	.025 @ PIV	5 @ PIV (150°C)	200
MC030	300	400	.2 @ PIV	15 @ PIV (150°C)	200
MC030A	300	400	.025 @ PIV	5 @ PIV (150°C	200
MC040	400	400	.2 @ PIV	15 @ PIV (150°C)	200
MC040A	400	400	.025 @ PIV	5 @ PIV (150°C)	200
MC050	500	400	.2 @ PIV	15 @ PIV (150°C)	200
MC050A	500	400	.025 @ PIV	5 @ PIV (150°C)	200
MC060	600	400	.2 @ PIV	25 @ PIV (150°C)	200
MC060A	600	400	.025 @ PIV	5 @ PIV (150°C)	200
MC080	800	200	.3 @ PIV	30 @ PIV (150°C)	200
MC080A	800	200	.050 @ PIV	10 @ PIV (150°C)	200
MC100	1000	200	.5 @ PIV	50 @ PIV (150°C)	200
MC100A	1000	200	.050 @ PIV	10 @ PIV (150°C)	200
MC110	1100	200	.2 @ PIV		200
MC110A	1100	200	.025 @ PIV		200
MC120	1200	200	.2 @ PIV		200
MC120A	1200	200	.025 @ PIV		200
MC130	1300	100	.3 @ PIV		100
MC130A	1300	100	.025 @ PIV		100
MC140	1400	100	.3 @ PIV		100
MC140A	1400	100	.025 @ PIV		100
MC150	1500	100	.5 @ PIV		100
MC150A	1500	100	.025 @ PIV		100
MC170	125	200	.001 @ 125V	3 @ 125V (150°C)	200

Ultra Fast Recovery Microdiodes — Package H

MSC Type	Saturation Voltage @ 100μA (Volts)	Forward Current @ +1.0V (mA)	Maximum Reverse Current @ 25°C and Indicated Temperature (μA)		Maximum Capacitance (pf)	Reverse Recovery (mμsec)
MC914	100	10	0.025 @ -20V	50.0 @ -20V (150°C)	4.0 @ 0V	4.0
MC914A	100	20	0.025 @ -20V	50.0 @ -20V (150°C)	4.0 @ 0V	4.0
MC916	100	10	0.025 @ -20V	50.0 @ -20V (150°C)	2.0 @ 0V	4.0
MC916A	100	20	0.025 @ -20V	50.0 @ -20V (150°C)	2.0 @ 0V	4.0
MC001	75	10	0.1 @ -50V	100.0 @ -50V (150°C)	2.0 @ 0V	2.0
MC001A	75	20	0.1 @ -50V	100.0 @ -50V (150°C)	2.0 @ 0V	2.0
MC002	200	100	0.1 @ -150V	100.0 @ -150V (150°C)	5.0 @ 0V	50.0
1N3064M	75 (@ 5μA)	10	0.1 @ -50V	100.0 @ -50V (150°C)	2.0 @ 0V	4.0
1N3069M	65 (@ 5μA)	50	0.1 @ -50V	100.0 @ -50V (150°C)	6.0 @ 0V	50.0
1N3206	100	10	0.025 @ -20V	50.0 @ -20V (150°C)	4.0 @ 0V	4.0
*JAN 1N3206	100	10 (5)	0.025 @ -20V 0.5 @ -80V	30.0 @ -20V (150°C)	2.0 @ 0V	4.0
**JAN 1N3207	60	150	0.05 @ -20V	.10.0 @ -20V (100°C)	15.0 @ 0V	6.0
1N3207	60	150	0.05 @ -20V	10.0 @ -20V (100°C)	6.0 @ 0V	6.0
1N3594	60 (@ 5μA)	50	0.1 @ -50V	100.0 @ -50V (150°C)	4.0 @ 0V	6.0
1N3722	60	20	0.1 @ -50V	100.0 @ -50V (150°C)	4.0 @ 0V	6.0

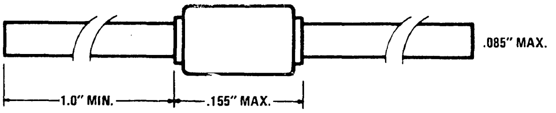
*Available Per MIL-S-19500/195C.
**Available Per MIL-S-19500/230C.

Fast Recovery Microdiodes — Package H

MSC Type	Saturation Voltage @ 100μA (Volts)	Forward Current @ +1.0V (mA)	Maximum Reverse Current @ 25°C and Indicated Temperature (μA)		Reverse Recovery
MC643	200	10	.025 @ -10V 1 @ -100V	5 @ -10V (100°C) 15 @ -100V (100°C)	200K Ω in .3μsec
MC643A	200	100	.025 @ -10V 1 @ -100V	5 @ -10V (100°C) 15 @ -100V (100°C)	200K Ω in .3μsec
MC658	120	100	.05 @ -50V	25 @ -50V (150°C)	80K Ω in .3μsec
MC658A	120	100	.025 @ -50V	5 @ -50V (150°C)	80K Ω in .3μsec
MC659	60	6	5 @ -50V	25 @ -50V (100°C)	400K Ω in .3μsec
MC659A	60	10	.025 @ -50V	5 @ -50V (150°C)	400K Ω in .3μsec
MC660	120	6	5 @ -100V	50 @ -100V (100°C)	400K Ω in .3μsec
MC660A	120	10	.025 @ -100V	5 @ -100V (150°C)	400K Ω in .3μsec
MC661	240	6	10 @ -200V	100 @ -200V (100°C)	400K Ω in .3μsec
MC661A	240	10	.025 @ -200V	5 @ -200V (150°C)	400K Ω in .3μsec
MC662	100	10	1 @ -10V 20 @ -50V	20 @ -10V (100°C) 100 @ -50V (100°C)	100K Ω in .5μsec
MC662A	100	100	1 @ -10V 20 @ -50V	20 @ -10V (100°C) 100 @ -50V (100°C)	100K Ω in .5μsec
MC663	100	100	5 @ -75V	50 @ -75V (100°C)	200K Ω in .5μsec
MC663A	100	100	.1 @ -75V	15 @ -75V (100°C)	200K Ω in .3μsec
1N897	50	5	.1 @ -40V .025 @ -10V	20 @ -40V (100°C) 10 @ -5V (100°C)	100K Ω in .1μsec
1N898	50	100	.1 @ -40V .025 @ -10V	20 @ -40V (100°C 10 @ -5V (100°C)	100K Ω in .3μsec
1N899	100	5	.1 @ -80V .025 @ -10V	20 @ -80V (100°C) 10 @ -5V (100°C)	100K Ω in .3μsec
1N900	100	50	.1 @ -80V .025 @ -10V	20 @ -80V (100°C) 10 @ -5V (100°C)	100K Ω in .3μsec
1N901	100	100	.1 @ -80V .025 @ -10V	20 @ -80V (100°C) 10 @ -5V (100°C)	100K Ω in .3μsec
1N902	200	10	1 @ -100V	15 @ 100V (100°C)	200K Ω in .3μsec

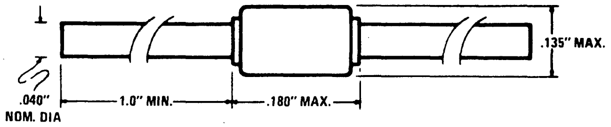
Package Outlines

A, A-1 & F

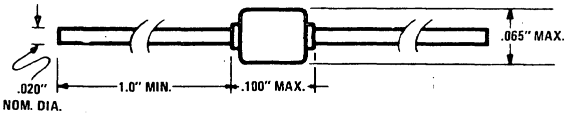


Lead Dia. (Nom.)		Body Dia. (Max.)	
A & F	A-1	A, A-1	F
0.028"	0.020"	0.085"	0.110"

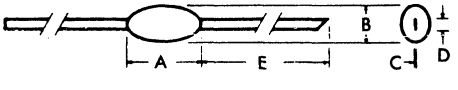
E



B



H & H-1



	A	B	C D	E
Package H	.100" Max.	.050" Max.	.0035" x .019"	.5" Min.
Package H-1	.150" Nom.	.060" Nom.	.0046" x .045"	.25" Min.

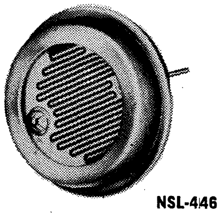
NATIONAL SEMICONDUCTORS LTD.

MANUFACTURERS OF PHOTOELECTRIC CELLS

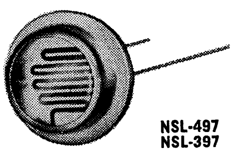
SUMMARY OF STANDARD PHOTOELECTRIC PRODUCTS

CdS & CdSe PHOTOCELLS

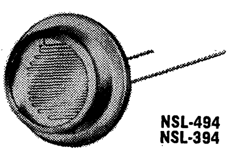
Cell Type No.	Typ. 1 Ftc Res. KΩ	Min. Dark Res. MΩ	Max. Peak Volt.	Max. Power MW -	Description
NSL-311	170	100	80	50	CdSe Photoconductive Cell in Hermetic Glass and Metal TO-18.
NSL-312	75	100	80	50	
NSL-313	30	100	80	50	
NSL-314	14	100	80	50	
NSL-315	550	1000	250	50	
NSL-316	260	1000	250	50	
NSL-317	110	1000	250	50	
NSL-318	50	500	120	50	
NSL-411	170	60	80	50	CdS Photoconductive Cell in Hermetic Glass and Metal TO-18.
NSL-412	75	10	80	50	
NSL-413	30	2.0	80	50	
NSL-414	14	0.2	80	50	
NSL-415	550	100	250	50	
NSL-416	260	100	250	50	
NSL-417	110	50	250	50	
NSL-418	50	5.0	120	50	
NSL-443	200	300	2000	1000	CdS Photoconductive Cell in Hermetic Glass and Metal 1.0″ Dia. Case.
NSL-444	120	100	2000	1000	
NSL-445	26.0	40	420	1000	
NSL-446	11.4	12	420	1000	
NSL-447	5.5	2.3	420	1000	
NSL-361	65	200	80	100	CdSe Photoconductive Cell in Hermetic Glass and Metal 0.250″ Dia. Case. (Similar CdS cells, NSL-461-467 available.)
NSL-362	28	200	80	100	
NSL-363	12	200	80	100	
NSL-364	5.2	200	80	100	
NSL-365	550	3000	250	100	
NSL-366	230	3000	250	100	
NSL-367	100	3000	250	100	
NSL-481	43.0	65	120	200	CdS Photoconductive Cell in Hermetic Glass and Metal TO-5. (Similar CdSe Cells, NSL-381-387 available.)
NSL-482	18.6	15	120	200	
NSL-483	8.0	1.8	120	200	
NSL-484	3.5	0.25	120	200	
NSL-485	330	300	250	200	
NSL-486	155	130	250	200	
NSL-487	66	100	250	200	
NSL-392	4.0	10	80	500	CdSe Photoconductive Cell in Hermetic Glass and Metal TO-8. (Similar CdS cells, NSL-491-497 available.)
NSL-393	1.7	10	80	500	
NSL-394	0.75	10	80	500	
NSL-395	40.0	100	320	500	
NSL-396	17.0	100	320	500	
NSL-397	7.5	100	320	500	
NSL-3921	4.0	2	100	200	CdSe Photoconductive Cell in Plastic Case; Glass Lens and Epoxy Coated "Open Pill" Versions also available.
NSL-3931	1.7	2	100	200	
NSL-3941	0.75	2	100	200	
NSL-3951	40.0	20	350	200	
NSL-3961	17.0	20	350	200	
NSL-3971	7.5	20	350	200	
NSL-4911	9.3	14	120	200	CdS Photoconductive Cell in Plastic Case; Glass Lens and Epoxy Coated "Open Pill" Versions also available.
NSL-4921	4.0	3.2	120	200	
NSL-4931	1.7	0.4	120	200	
NSL-4941	0.75	0.05	120	200	
NSL-4951	40.0	32	350	200	
NSL-4961	17.0	4.0	350	200	
NSL-4971	7.5	0.54	350	200	
NSL-3112	170	20	80	50	CdSe Epoxy Coated, "Open Pill," TO-18 dia. Photoconductive Cell.
NSL-3122	75	20	80	50	
NSL-3132	30	20	80	50	
NSL-3142	14	20	80	50	
NSL-3152	550	200	250	50	
NSL-3162	260	200	250	50	
NSL-3172	110	200	250	50	
NSL-3182	50	100	120	50	
NSL-4112	170	60	80	50	CdS Epoxy Coated, "Open Pill," TO-18 dia. Photoconductive Cell.
NSL-4122	75	10	80	50	
NSL-4132	30	2.0	80	50	
NSL-4142	14	0.2	80	50	
NSL-4152	550	160	250	50	
NSL-4162	260	20	250	50	
NSL-4172	110	4	250	50	
NSL-4182	50	2	120	50	
NSL-3812	43.0	20	100	100	CdSe Epoxy Coated, "Open Pill," TO-5 dia. Photoconductive Cell.
NSL-3822	18.6	20	100	100	
NSL-3832	8.0	20	100	100	
NSL-3842	3.5	20	100	100	
NSL-3852	330	200	320	100	
NSL-3862	155	200	320	100	
NSL-3872	66	200	320	100	
NSL-4812	43	65	120	200	CdS Epoxy Coated, "Open Pill," TO-5 dia. Photoconductive Cell.
NSL-4822	18.6	15	120	200	
NSL-4832	8.0	1.8	120	200	
NSL-4842	3.5	0.25	120	200	
NSL-4852	330	300	350	200	
NSL-4862	155	130	350	200	
NSL-4872	66	100	350	200	



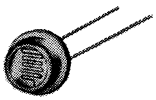
NSL-446



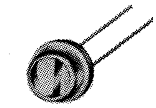
NSL-497
NSL-397



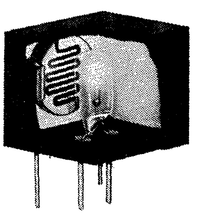
NSL-494
NSL-394



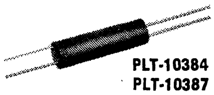
NSL-464
NSL-364



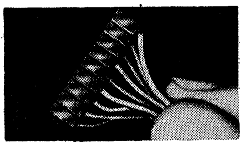
NSL-467
NSL-367



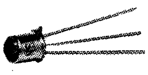
PL-1036-1



PLT-10384
PLT-10387



NSL-701-9A



NSL-610

PHOTODETECTOR LAMP ASSEMBLIES

CdSe Photodetector

Module Type No.	Emitter Volts	Emitter Current MA	Detector Max. ON Res. Ω	Detector Min. OFF Res. MΩ	Detector Max. Volts	Detector Max. Power	Description
PL-1033-1	10	15	100	10	80	250	Phenolic .75″x.75″x .625″ Pin Leads for P.C. Board Mounting. (Matched, Multi-Detector Configurations also Available)
PL-1036-1	10	15	400	100	320	250	
PL-2H33-1	120	2	100	10	80	250	
PL-2H36-1	120	2	400	100	320	250	
PL-3A33-1	100	2	150	10	80	250	
PL-3A36-1	100	2	500	100	320	250	
PL-5S33-1	1.6	20	500	10	80	100	
PL-5S36-1	1.6	20	2000	100	320	100	
PLT-10384	10	15	400	10	80	100	Standard Tube; Axial Leads.
PLT-10387	10	15	5000	100	250	100	
PLF-5S380	1.6	25	250	100	80	100	4 Leaded, Hermetic TO-5.
PLS-5S380	1.6	25	10,000	100	250	100	Small Tube, Axial Leads.
PLM-5S310	1.6	25	500	10	80	50	Miniature Tube Axial Leads.

Silicon Photodetector

Module Type No.	Emitter Volts	Emitter Current MA	Detector Min. BV_{CEO}	Detector Typ. Dark Curr. nA	Coupled Characteristics Current Trans. Ratio	Coupled Characteristics Rise Fall Time μsec	Description
PLF-6S610	1.5	50	30	1	30	3	4 Leaded, Hermetic TO-5 Isolation: 700v.
PLM-6S610	1.5	50	30	1	30	3	Miniature Tube, Axial Leads. Isolation: 2.5Kv
PLF-6S810	1.5	50	50	15	.1	1 (max.)	4 Leaded, Hermetic TO-5 Isolation: 700v.
PLM-6S810	1.5	50	50	15	.1	1 (max.)	Miniature Tube, Axial Leads. Isolation: 2.5Kv

SILICON PHOTODIODES

NSL Type No.	Minimum Short Ckt.* Curr. MA	Open Ckt.* Volt.	Dark Curr. μA @ 1V. @ 55°C	Reverse Voltage Recommended Maximum	Description
NSL-701-1	0.30	0.4	10	5	.1″x.2″ Chip Wire Leads
NSL-701-9	0.30	0.4	10	5	9 Element Cell, 0.1 Spacing.
NSL-702-1	0.65	0.4	20	5	.2″x2″ Chip Wire Leads
NSL-702-2	0.65	0.4	10	5	
NSL-703	1.5	0.4	50	5	.2″x.4″ Chip Wire Leads
NSL-707	3.75	0.4	100	5	.2″x.1″ Chip Wire Leads
NSL-708	1.85	0.4	50	5	.1″x.1″ Chip Wire Leads
NSL-710	0.125	0.4	2	5	TO-18 Package.
NSL-751	1.5	0.4	50	5	0.5″ dia. Epoxy Package.
NSL-781	0.28	0.4	10	5	Hermetic TO-5 Case.
NSL-881	0.28	0.3	5	15	
NSL-782	0.45	0.4	15	5	
NSL-791	0.65	0.4	20	5	Hermetic TO-8 Case.
NSL-792	1.2	0.4	40	5	

*At 500 Ftc (25 MW/Cm²) 2856°K Source.

SILICON PHOTOTRANSISTORS

NSL Type No.	‡I_{CEO}, MA @ 5V Min.	‡I_{CEO}, MA @ 5V Typ.	Dark I_{CEO} @ 15V 25°C — nA Typ.	Dark I_{CEO} @ 15V 25°C — nA Max.	Description
NSL-610-1	.2	1	1	50	TO-18 Encased NPN Silicon Phototransistor; Power Dissipation @ 25°C 175 mW, Minimum Breakdown Voltage BV_{CEO} 30 volts.
NSL-610-3	1	3	1	50	
NSL-610-6	4	6	1	50	
NSL-610-9	7	9	1	50	

‡At 200 Ftc (10 MW/Cm²) 2856°K Source.

NATIONAL SEMICONDUCTORS LTD.

331 Cornelia Street, Plattsburgh, N. Y. 12901 • Tel: (518) 561-3160
In Canada 2150 Ward Street, Montreal 378, Quebec • Tel: (514) 744-5507

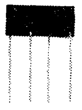
RECTIFIER COMPONENTS CORP.

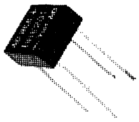
SPECIALIST IN QUALITY RECTIFIER ASSEMBLIES SILICON AND SELENIUM

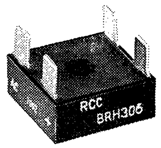
124 ALBANY AVE. / FREEPORT, N.Y. 11520 / TELEPHONE: (516) 868-0470

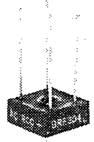
SILICON ASSEMBLIES — FEATURING STATE OF THE ART "GLASSIVATED," DIFFUSED, AVALANCHE DIODE CELLS AND WELDED CONSTRUCTION

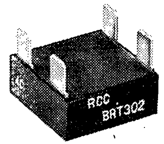
SILICON BRIDGE RECTIFIERS

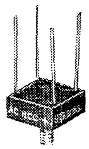

CASE 1

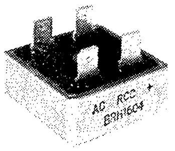

CASE 2


CASE 3


CASE 4


CASE 5
(Threaded Insert)

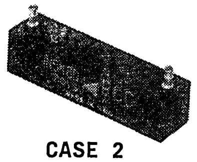

CASE 6

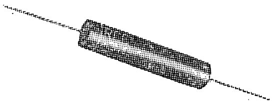

CASE 7

2 AMP/50°C 50 Apk SURGE		2 AMP/55°C 50 Apk SURGE		3 AMP/55°C 50 Apk SURGE		3 AMP/55°C 50 Apk SURGE		PEAK REVERSE VOLTAGE (PER ELEMENT)	6 AMP/55°C 50 Apk SURGE		6 AMP/55°C 50 Apk SURGE		6 AMP/55°C 125 Apk SURGE		16 AMP/65°C 125 Apk SURGE	
Type No.	Case	Type No.	Case	Type No.	Case	Type No.	Case	Volts Peak	Type No.	Case	Type No.	Case	Type No.	Case	Type No.	Case
501-363-05	1	BRE2005	2	—	—	BRH/T300.5	3/5	50	BRE600.5/S	4/6	BRV600.5/T	3/5	BRH/T600.5	3/5	BRH1600.5	7
501-363-1	1	BRE201	2	—	—	—	—	100	BRE601/S	4/6	—	—	BRH/T601	3/5	BRH1601	7
501-363-2	1	BRE202	2	BRE302	4	BRH/T302	3/5	200	BRE602/S	4/6	BRV602/T	3/5	BRH/T602	3/5	BRH1602	7
501-363-4	1	BRE204	2	BRE304	4	BRH/T304	3/5	400	BRE604/S	4/6	BRV604/T	3/5	BRH/T604	3/5	BRH1604	7
501-363-6	1	BRE206	2	BRE306	4	BRH/T306	3/5	600	BRE606/S	4/6	BRV606/T	3/5	BRH/T606	3/5	BRH1606	7
—	—	BRE208	2	BRE308	4	BRH/T308	3/5	800	BRE608/S	4/6	BRV608/T	3/5	BRH/T608	3/5	BRH1608	7
—	—	—	—	—	—	BRH/T310	3/5	1000	—	—	BRV610/T	3/5	—	—	—	—
—	—	—	—	—	—	BRH/T315	3/5	1500	—	—	BRV615/T	3/5	—	—	—	—

SILICON HIGH VOLTAGE RECTIFIERS

CASE 1

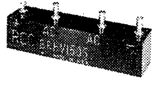

CASE 2


CASE 3

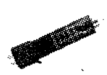
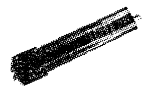
0.2 AMP/25°C 2.5Apk SURGE			0.5 AMP/25°C 50Apk SURGE			1.0 AMP/55°C 50Apk SURGE			1.0 AMP/55°C 80Apk SURGE			1.0 AMP/55°C 50Apk SURGE			1.0 AMP/25°C 80Apk SURGE		
Type No.	Case	PRV	Type No.	Case	PRV	Type No.	Case	PRV	Type No.	Case	PRV	Type No.	Case	PRV	Type No.	Case	PRV
IN1731	1	1500	RC1731	1	1500	RC5482	3	2000	IN5482	3	2000	RC5477	2	5000	IN5477	2	5000
IN1732	1	2000	RC1732	1	2000	RC5483	3	3000	IN5483	3	3000	RC5478	2	6000	IN5478	2	6000
IN1733	1	3000	RC1733	1	3000	RC5484	3	4000	IN5484	3	4000	RC5479	2	7000	IN5479	2	7000
IN1734	1	5000	RC1734	1	5000	RC5485	3	5000	IN5485	3	5000	RC5480	2	8000	IN5480	2	8000
—	—	—	—	—	—	—	—	—	—	—	—	RC5481	2	10,000	IN5481	2	10,000

SILICON H.V. BRIDGE RECTIFIERS 1.5 AMP/75°C — 50A SURGE

Type No.	PRV (Per) Element)
BRHV1502	2000
BRHV1503	3000
BRHV1504	4000
BRHV1505	5000
BRHV1506	6000



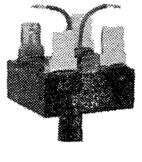
SILICON TUBE RETRO — FIT RECTIFIERS

HVK1109/866 0.5 AMP/55°C 50Apk Surge 10,000Vpk/PRV	HVK1110/872 1.25 AMP/55°C 60Apk Surge 10,000Vpk/PRV
	

SILICON INTEGRAL CONTROLLED BRIDGE RECTIFIERS

3 AMP/40°C
20Apk Surge

Type No.	PRV
BCS300.5	50
BCS301	100
BCS302	200
BCS304	400

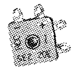


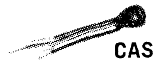
SELENIUM ASSEMBLIES — FEATURING "NON-BARRIER" / "NON-AGING" CELL STRUCTURES

SELENIUM H.V. RECTIFIERS

Type No.	PRV Vpk	Max. DC Output MAdc	Dimensions In Inches	
			Length	Dia.
303-248	6500	1.5	2 1/16	.200
303-351	7500	4.4	2 3/16	.225
303-352	10,000	4.0	2 13/16	.280
303-347	11,000	4.0	2 15/16	.225
303-355	12,000	4.0	4 11/32	.325
303-356	18,000	4.0	4 11/32	.225
303-399	20,000	4.0	4 1/16	.280

BRIDGE RECTIFIERS FOR SOLENOID, MOTOR, RELAY & BATTERY CHARGER APPLICATIONS

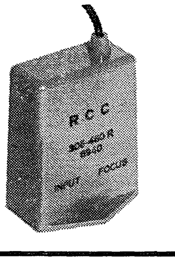
CASE 1



CASE 2

Type No.	Case	Max. AC Input Vrms	Max. DC Output MAdc	Approximate Dimensions (In Inches)
301-173	2	33	120	¼ x ¼ x ¼
301-267	2	33	160	⅜ x ¼ x ⅜
301-172	2	33	200	⅜ x ⅜ x ⅜
302-137	1	130	100	⅝ x ⅝ x 5/16
302-235	1	250	80	⅝ x ⅝ x 5/16

ASSEMBLIES FOR COLOR TV APPLICATIONS

VOLTAGE MULTIPLIERS



SEMTECH
CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 910-336-1264

"METOXILITE" SILICON RECTIFIERS – ALSO AVAILABLE TO NEW MSFC/NASA AND MILITARY SPECIFICATIONS (JAN & TX)

200 TO 1000 VOLTS
LOW REVERSE LEAKAGE
SOLID INTERNAL CONSTRUCTION
SUPERIOR THERMAL SHOCK RESISTANCE
FOR NEW PACKAGING DESIGN

A multi-purpose, high current axial lead silicon rectifier, ideally suited to maximize small electronic package designs. "Metoxilite" (fused metal oxides) is fused to the metallurgically bonded junction/tungsten-pin assembly forming a "tough" subminiature package. Hermetically sealed and designed to meet stringent temperature cycling, humidity and other environmental requirements per MIL-STD-750A. A general purpose rectifier for use in military, space, industrial and consumer product applications, such as: power supplies, AC to DC converters and control circuits.

Type No.	Peak Inverse Voltage	RMS Voltage	DC Blocking Voltage	Average Rectified Current		Max. Static Forward Volt @ 1A	Max. Static Reverse Current		Recurrent Surge	One Cycle Surge	Recovery Time ①	
				55°C	100°C	25°C	25°C	100°C			Max.	Typ.
	Volts	Volts	Volts	MA	MA	Volts	UA	UA	Amps	Amps	Usec	Usec

MEDIUM RECOVERY (t_rr) 2 MICROSECONDS

S2M	200	140	200	1000	750	1.2	1	25	10	50	2	1
S4M	400	280	400	1000	750	1.2	1	25	10	50	2	1
S6M	600	420	600	1000	750	1.2	1	25	10	50	2	1
S8M	800	560	800	1000	750	1.2	1	25	10	50	2	1
S0M	1000	770	1000	1000	750	1.2	1	25	10	50	2	1

TECHNICAL BULLETIN R69

FAST RECOVERY NANOSECOND REVERSE RECOVERY

S2F	200	140	200	1000	750	1.2	1	25	6	25	.150	100
S4F	400	280	400	1000	750	1.2	1	25	6	25	.150	100
S6F	600	420	600	1000	750	1.2	1	25	6	25	.250	175
S8F	800	560	800	1000	750	1.2	1	25	6	25	.300	200
S0F	1000	770	1000	1000	750	1.2	1	25	6	25	.500	250

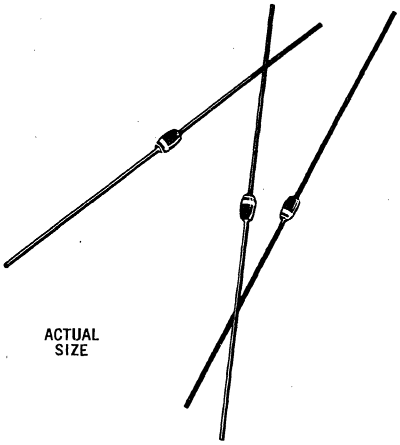
TECHNICAL BULLETIN R68

Operating and storage temperature −193.8°C to +200°C

① Recovery conditions: 0.5 amp forward current to 1.0 amp reverse current Recovery time measured when rectifier recovers to .25 amp.

For all types on this page: THERMAL RESISTANCE from junction to heat sink θJL = 38°C/W with (d) length of lead from body to heat sink .375 inches.

1 AMP 55°C/NO HEAT SINK
3 AMP/MIL STANDARD 750



ACTUAL SIZE

(1N) TYPE

Device Type ①	Reverse Voltage		Forward Current ② Free Air	Reverse Current (Max.) I_R		Instantaneous Forward Voltage V_F @ I_F=	Repetitive Surge Current	1 Cycle Surge Current tp=8.3m Sec.	Reverse Recovery Time ③ Trr		Thermal Impedance θJ—L	
	V_R	V_{RM}(wkg)	55°C	UAdc		1.0Adc		A(pk)	µSec		°C/Watt	
	Vdc	V(pk)	A	25°C	100°C	Vdc	A(pk)	I_F(surge)	Max.	Typ.	d=0	d=.37

MEDIUM RECOVERY (t_rr) 2 MICROSECONDS

1N5614	200	200	1.0	0.5	25	1.2	10	50	2	1	21	38
1N5616	400	400	1.0	0.5	25	1.2	10	50	2	1	21	38
1N5618	600	600	1.0	0.5	25	1.2	10	50	2	1	21	38
1N5620	800	800	1.0	0.5	25	1.2	10	50	2	1	21	38
1N5622	1000	1000	1.0	0.5	25	1.2	10	50	2	1	21	38

TECHNICAL BULLETIN R76

FAST RECOVERY NANOSECOND REVERSE RECOVERY

1N5615	200	200	1.0	0.5	25	1.2	6	25	.150	.100	21	38
1N5617	400	400	1.0	0.5	25	1.2	6	25	.150	.100	21	38
1N5619	600	600	1.0	0.5	25	1.2	6	25	.250	.175	21	38
1N5621	800	800	1.0	0.5	25	1.2	6	25	.300	.200	21	38
1N5623	1000	1000	1.0	0.5	25	1.2	6	25	.500	.250	21	38

TECHNICAL BULLETIN R77

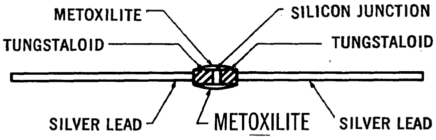
All temperatures are local ambient, 25°C unless otherwise specified.

NOTES: ① Types 1N5614, 16, 18, 20, 22 available in accordance with MIL-S-19500/427 (EL).
Types 1N5615, 17, 19, 21, 23 available in accordance with MIL-S-19500/429 (EL).

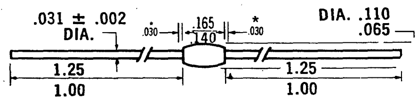
② The 1.0 amp rating @ 55°C requires no heat sinking, special mounting, or forced air across the body of the device.

③ Recovery conditions: 0.5 amp forward current to —1.0 amp reverse current recovery time measured when rectifier recovers to —.25 amp. See Semtech Applications note and test procedure for details.

Operating and Storage Temperature —193.8°C to +200°C



LEAD MATERIAL: 99.9% PURE SILVER
IN ACCORDANCE WITH MIL-S-13282A, GRADE A
THERMAL IMPEDANCE = 133°C/W/IN.



*LEAD DIAMETER UNCONTROLLED IN THIS AREA

Semtech reserves the right to change specifications without notice.

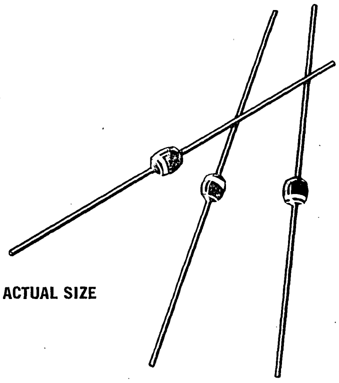
SEMTECH
CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 910-336-1264

"METOXILITE" SILICON RECTIFIERS CONTINUED

HIGH CURRENT AXIAL LEADS

3 AMP 55°C/NO HEAT SINK
6 AMP/MIL STANDARD 750

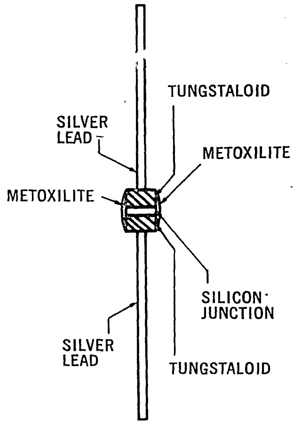
Type ①	Peak Inverse Voltage	RMS Voltage	DC Blocking Voltage	Average Rectified Current		Max. Static Forward Volt @ 3A	Max. Static Reverse Current		Recurrent Surge	One Cycle Surge	Recovery Time ③	
				55°C	100°C	25°C	25°C	100°C			Max.	Typ.
	Volts	Volts	Volts	Amps	Amps	Volts	μA	μA	Amps	Amps	μsec	μsec


ACTUAL SIZE

MEDIUM RECOVERY (t_{rr}) 2 MICROSECONDS

3SM2	200	140	200	3	2	1.0	1	25	25	150	2	1
3SM4	400	280	400	3	2	1.0	1	25	25	150	2	1
3SM6	600	420	600	3	2	1.0	1	25	25	150	2	1
3SM8	800	560	800	3	2	1.1	1	25	25	150	2	1
3SM0	1000	770	1000	3	2	1.1	1	25	25	150	2	1

TECHNICAL BULLETIN R67



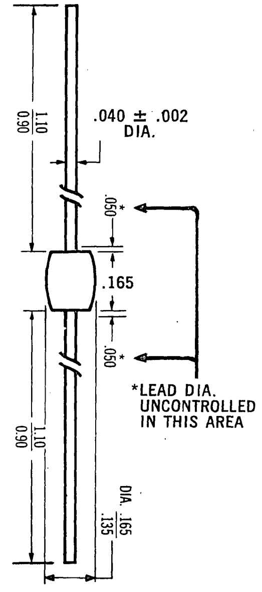
FAST RECOVERY NANOSECOND REVERSE RECOVERY

3SF1	100	70	100	3	2	1.1	1	25	25	150	.150	.100
3SF2	200	140	200	3	2	1.1	1	25	25	150	.150	.100
3SF4	400	280	400	3	2	1.1	1	25	25	150	.150	.100

TECHNICAL BULLETIN R66

For all types on this page: THERMAL RESISTANCE from junction to heat sink θJL = 20°C/W with (d) length of lead from body to heat sink .375 inches.

LEAD MATERIAL: 99.9% PURE SILVER
IN ACCORDANCE WITH MIL-S-13282A, GRADE A
THERMAL IMPEDANCE ≅ 80°C/W/IN.



(1N) TYPE

MEDIUM RECOVERY (t_{rr}) 2 MICROSECONDS

1N5550	200	140	200	3	2	1.0	1	20	25	150	2	1
1N5551	400	280	400	3	2	1.0	1	20	25	150	2	1
1N5552	600	420	600	3	2	1.0	1	20	25	150	2	1
1N5553	800	560	800	3	2	1.1	1	20	25	150	2	1
1N5554	1000	770	1000	3	2	1.1	1	20	25	150	2	1

TECHNICAL BULLETIN R78

FAST RECOVERY NANOSECOND REVERSE RECOVERY

1N5415	50	35	50	3	2	1.1	1	20	25	150	.150	.100
1N5416	100	70	100	3	2	1.1	1	20	25	150	.150	.100
1N5417	200	140	200	3	2	1.1	1	20	25	150	.150	.100
1N5418	400	280	400	3	2	1.1	1	20	25	150	.150	.100
1N5419	500	350	500	3	2	1.1	1	20	25	150	.250	.200

All temperatures are local ambient, 25°C unless otherwise specified.

TECHNICAL BULLETIN R79

NOTES:
① Types 1N5550-54 available in accordance with MIL-S-19500/420 (USAF).
Types 1N5415-19 available in accordance with MIL-S-19500/411 (EL).
② The 3 amp rating @ 55°C requires no heat sinking, special mounting, or forced air across the body of the device.
③ Recovery conditions: 0.5 amp forward current to 1.0 amp reverse current.
Recovery time measured when rectifier recovers to .25 amp.

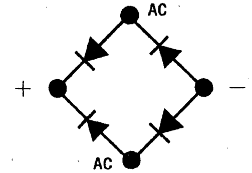
Operating and storage temperature −193.8°C to +200°C.

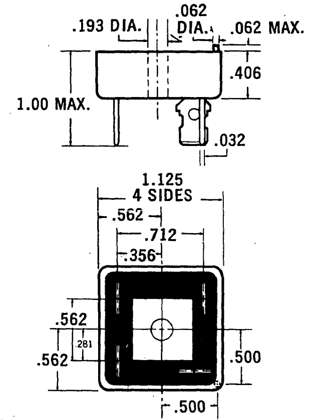
Semtech reserves the right to change specifications without notice.

SEMTECH
CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 910-336-1264

“ALPAC”® SILICON BRIDGE RECTIFIERS

Semtech Corporation introduces “ALPAC” a complete line of Single Phase Silicon Bridge Rectifier circuits. Designed in Aluminum Cases to provide maximum thermal conductivity and simple installation. “ALPAC” universal terminals, insulated from case, provide a 3 way electrical connection: fast disconnect, wire wrap around and hole wire insert for soldering. Internally the device utilizes the Semtech high performance solid double heat sink junctions welded together for mechanical strength, eliminating the use of solders for improved reliability. The bridges are designed for utilization in power supplies, AC to DC converters and motor control circuits.



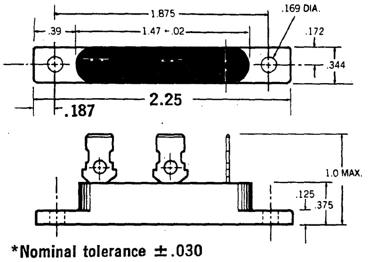


Tolerance ±.030

Type No.	PIV Per Leg	Sine Wave RMS Input Voltage Max.	Average DC Output Amps TC=Case Temp. (°C)			Average DC Output/Leg TA=Ambinet Temp. (No Heat Sink) (°C)			Peak 1 Cycle Fwd. Surge	Peak Recurrent Fwd.	VF Max. Per Leg @ 3A DC	Reverse Current (IR Max. @ PIV) (°C)		Data Sheet No.
			55	100	125	25	55	100			25°C	25	100	
	Volts	Volts	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Volts	µA	µA	
SCBA05	50	35	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB3
SCBA1	100	70	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB3
SCBA2	200	140	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB3
SCBA3	300	210	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB3
SCBA4	400	280	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB3
SCBA6	600	420	25	18.5	12.5	6.0	5.0	3.0	150	75	1.0	5	100	MB3

Maximum thermal impedance junction to mounting surface 1.5°C/Watt.
Maximum operating and storage temperature —55°C to +150°C.

ALSO AVAILABLE IN FAST RECOVERY



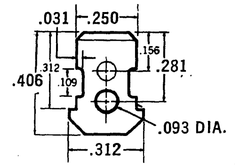
*Nominal tolerance ±.030

“ALPAC”® DOUBLERS AND CENTER TAPS AVAILABLE IN FAST RECOVERY

Semtech Corporation introduces “Alpac,” a series of Doublers and Center taps, Rectifier circuits. Designed in Aluminum Cases to provide maximum thermal conductivity and simple installation. “Alpac” terminals are insulated from case. The Universal Terminals provide a 3 way electrical connection: fast disconnect, wire wrap around and hole wire insert for soldering. Internally the device utilizes the Semtech high performance solid double heat sink junctions.

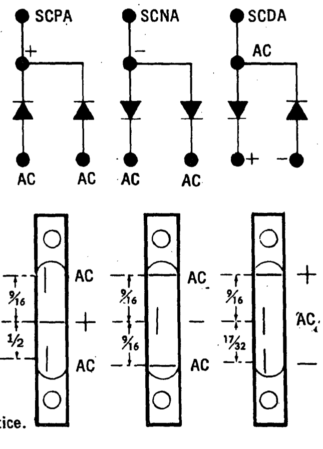
The devices are designed to replace stud rectifiers and provide simple, economical and reliable packaging.

TERMINAL DETAIL



(ALL DIMS. FOR REF. ONLY)

TERMINAL ORIENTATION

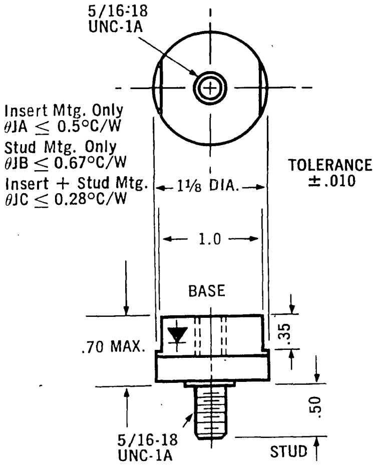


Type No.	PIV Per Leg DC or Recurrent	Sine Wave RMS Input Voltage Max.	Average DC Output/Leg TC=Case Temp. (°C)			Average DC Output Amps TA=Ambient Temp. (No Heat Sink) (°C)			Peak 1 Cycle Fwd. Surge	Peak Recurrent Fwd.	VF Max. Per Leg @ 3A DC	IR Max. Per Leg @ PIV (°C)		Data Sheet No.
			55	100	125	25	55	100			25°C	25	100	
	Volts	Volts	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Volts	µA	µA	
SCDA05	50	35	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCPA05	50	35	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCNA05	50	35	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCDA1	100	70	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCPA1	100	70	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCNA1	100	70	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCDA2	200	140	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCPA2	200	140	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCNA2	200	140	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCDA3	300	210	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCPA3	300	210	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCNA3	300	210	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCDA4	400	280	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCPA4	400	280	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCNA4	400	280	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCDA6	600	420	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCPA6	600	420	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4
SCNA6	600	420	15	10	5	5	4	2.5	150	75	1.0	5	100	MB4

Maximum thermal impedance junction to mounting surface 1.5°C/Watt.
Maximum operating and storage temperature —55°C to +150°C. Semtech reserves the right to change specifications without notice.

SEMTECH
CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 910-336-1264

"CUPAC" 150 SILICON POWER RECTIFIERS



Semtech Corporation introduces "CuPac" 150, a new series of high current silicon rectifiers with fast recovery characteristics. OFHC** insert base and stud allow the internal "Metoxilite" rectifiers to be heat sunk from cathode, anode or both. The secondary Diallyl Phthalate case provides a long external leakage path necessary for P.I.V. to 600 volts.

FAST RECOVERY (t_{rr}) 200 NANOSECONDS
(600 VOLTS, trr 400 ns)

Type No.	Peak Inverse Voltage	Max. Static V_F @ 100A	Max. Static Rev. Current @ PIV	
		T_J=100°C	25°C	100°C
	Volts	Volts	µA	MA
SCSF05*	50	1.2	25	1
SCSF1 *	100	1.2	25	1
SCSF2 *	200	1.2	25	1
SCSF4 *	400	1.2	25	1
SCSF6 *	600	1.2	25	1

MEDIUM RECOVERY (t_{rr}) 2 MICROSECONDS

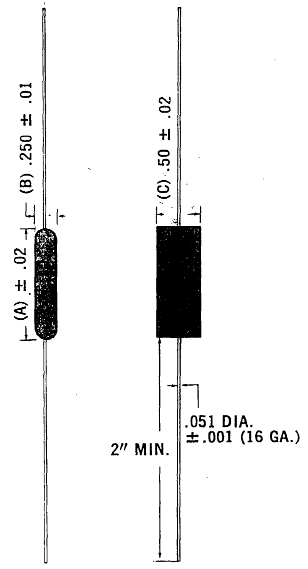
Type No.	Peak Inverse Voltage	Max. Static V_F @ 100A	Max. Static Rev. Current @ PIV	
		T_J=100°C	25°C	100°C
	Volts	Volts	µA	MA
SCSM05*	50	1.1	25	1
SCSM1 *	100	1.1	25	1
SCSM2 *	200	1.1	25	1
SCSM4 *	400	1.1	25	1
SCSM6 *	600	1.1	25	1

*For Reverse Polarity, Add "R" After Type No.

TECHNICAL BULLETIN R75

"CUPAC" also available in DOUBLERS and CENTER TAPS, 3-PHASE ½ WAVE BRIDGE

"SLIMPAC"® HIGH VOLTAGE - HIGH CURRENT SILICON RECTIFIERS



The Semtech's "Slimpac" is a new high density high voltage high current silicon rectifier for use in industrial and military applications which require small, lightweight rectifiers without compromise on the required high reliability criteria. Designed and tooled to be efficiently mass produced, "Slimpac" can be used economically in existing applications. The rectifier can be utilized in all standard, single and polyphase rectifier circuits. Designed to be corona free, the unit is capable of meeting stringent electrical, mechanical, and environmental specifications.

Type No.	Peak Inverse Voltage	① Average Rectified Current		One Cycle Surge Current		Reverse Current @ PIV		Max. Forward Voltage	Max. Case Size	Data Sheet No.
		55°C	100°C	25°C	100°C	25°C	100°C	25°C	(A)	
	Volts	Amps	Amps	Amps	Amps	µA	µA	500 MA	Inches	
SCH5000	5000	.5	.33	50	25	0.1	15	7	1.125	H46
SCH7500	7500	.5	.33	50	25	0.1	15	10	1.625	H46
SCH10000	10000	.5	.33	50	25	0.1	15	14	2.000	H46
SCH12500	12500	.5	.33	50	25	0.1	15	17	2.375	H46
SCH15000	15000	.5	.33	50	25	0.1	15	20	2.750	H46
SCH20000	20000	.5	.33	50	25	0.1	15	27	3.500	H46
SCH25000	25000	.5	.33	50	25	0.1	15	33	4.250	H46

MEDIUM RECOVERY **(t_{rr}) 1 MICROSECOND

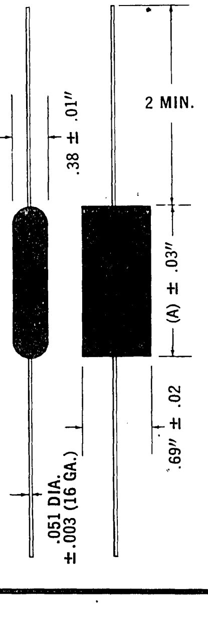
SCH5000	5000	.5	.33	50	25	0.1	15	7	1.125	H47
SCHF7500	7500	.5	.33	50	25	0.1	15	10	1.625	H47
SCHF10000	10000	.5	.33	50	25	0.1	15	14	2.000	H47
SCHF12500	12500	.5	.33	50	25	0.1	15	17	2.375	H47
SCHF15000	15000	.5	.33	50	25	0.1	15	20	2.750	H47
SCHF20000	20000	.5	.33	50	25	0.1	15	27	3.500	H47
SCHF25000	25000	.5	.33	50	25	0.1	15	33	4.250	H47

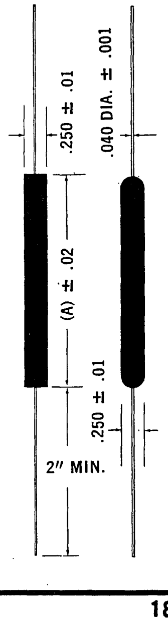
FAST RECOVERY **(t_{rr}) 150 NANOSECONDS

SCF2500	2500	.5	.33	25	12.5	0.1	15	6	1.125	H47
SCF5000	5000	.5	.33	25	12.5	0.1	15	12	2.000	H47
SCF7500	7500	.5	.33	25	12.5	0.1	15	18	2.750	H47
SCF10000	10000	.5	.33	25	12.5	0.1	15	24	3.500	H47
SCF12500	12500	.5	.33	25	12.5	0.1	15	30	4.250	H47

**T_{RR} Reverse Recovery is measured on each junction prior to manufacture of assembly.
0.5 Amp forward current to 1.0 Amp reverse current. Recovery time measured when rectifier recovers to .25 Amp.
Operating and storage temperature —55°C to +150°C

① Multiply by 2 when used in oil.





"SLIMPAC SR."

ALSO AVAILABLE IN FAST RECOVERY

Type No.	Peak Inverse Voltage	Average Rectified Current		One Cycle Surge Current		Reverse Current @ PIV		Max. Forward Voltage	Case Size	Data Sheet No.
		55°C	100°C	25°C	100°C	25°C	100°C	25°C	Inches	
	Volts	Amps	Amps	Amps	Amps	µA	µA	@ 1 Amp	A	
SCHS2500	2500	2	1.2	150		10	120	5	1.5	H48
SCHS5000	5000	2	1.2	150		10	120	10	2.5	H48
SCHS7500	7500	2	1.2	150		10	120	15	3.5	H48
SCHS10000	10000	2	1.2	150		10	120	20	4.5	H48
SCHS12500	12500	2	1.2	150		10	120	25	5.5	H48
SCHS15000	15000	2	1.2	150		10	120	30	6.5	H48

Operating and storage temperature —55°C to +150°C

"SLIMPAC JR."

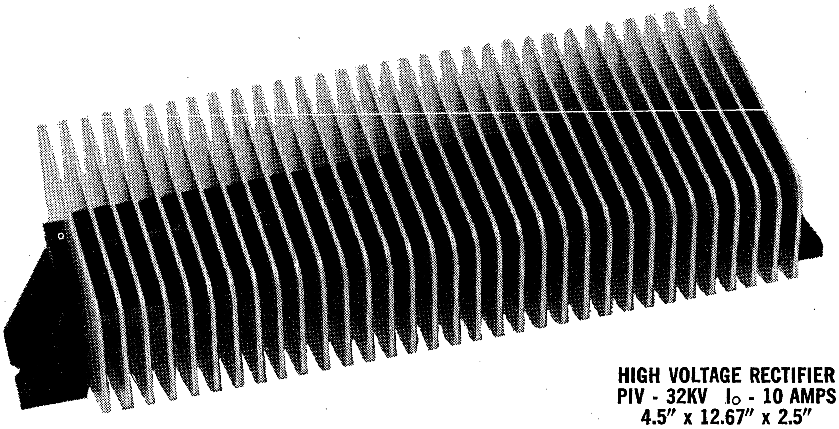
SCHJ15K	15000	.050	.030	4	2	0.1	25	20	1.5	H49
SCHJ22.5K	22500	.050	.030	4	2	0.1	25	30	2	H49
SCHJ30K	30000	.050	.030	4	2	0.1	25	40	2.5	H49
SCHJ37.5K	37500	.050	.030	4	2	0.1	25	50	3	H49
SCHJ45K	45000	.050	.030	4	2	0.1	25	60	3.5	H49

Operating and storage temperature —55°C to +150°C

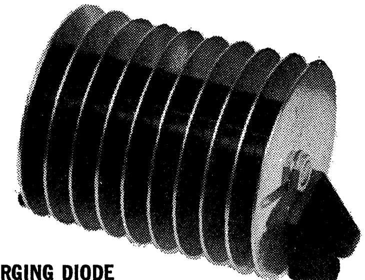
SEMTECH
CORPORATION 652 Mitchell Road, Newbury Park, California 91320 (805) 498-2111, (213) 628-5392 / TWX: 910-336-1264

SPECIAL "STACPAC" HIGH POWER SILICON RECTIFIERS

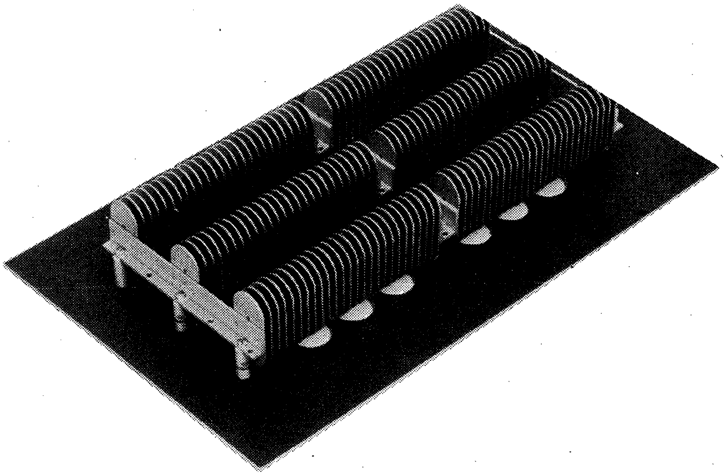
"STACPAC", a new concept in power rectifier stacks for use in high voltage, high current applications. Unique in design, "STACPAC" completely eliminates all the external component parts and solder joints usually found in devices of this type. All components are encapsulated and connected to aluminum discs, that in turn, serve as compensation, cooling fins and corona protection. Internally, "STACPAC" utilizes the Semtech "METOXILITE" Silicon Rectifiers. "STACPAC" was designed specifically to streamline packaging, replace multiple stud rectifiers and auxiliary compensation in high voltage, high current applications. Semtech has immediate capability to produce special high current — high voltage assemblies up to and exceeding 500K volts. Please contact our representatives for further details.



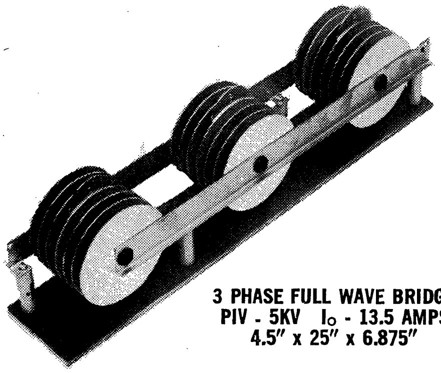
HIGH VOLTAGE RECTIFIER
PIV - 32KV I_O - 10 AMPS
4.5" x 12.67" x 2.5"



CHARGING DIODE
PIV - 7KV I_O - 10 AMPS
4.5" DIA. 7.25" LONG



3 PHASE FULL WAVE BRIDGE
PIV - 25KV I_O - 9 AMPS
14" x 23.18" x 3.75"



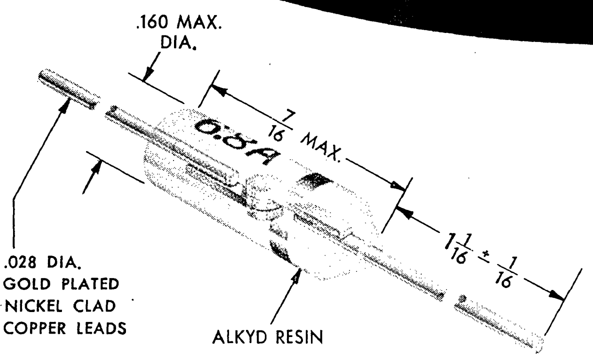
3 PHASE FULL WAVE BRIDGE
PIV - 5KV I_O - 13.5 AMPS
4.5" x 25" x 6.875"

UNSURPASSED!

The Reliable SCHAUER® 1-Watt Zener

LOW PRICES! IMMEDIATE SHIPMENT!

ANY VOLTAGE
2.0 to 18.0



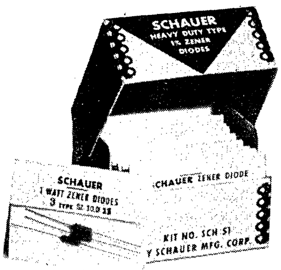
- No fragile nail heads.
- Silicon junction aligned between two parallel, offset tantalum heat sinks . . . great lead tension strength.
- All welded and brazed assembly.
- High pressure molded package.
- Banded and tapered cathode.

Schauer Type Note 1	Nominal V_{ZT} Volts	Typical Z_{ZT} Ohms at $I_{ZT} = 20$ ma $T_a = 25$°C	Temp. Coeff. % per °C
SZ2.4	2.4	14	−.054
SZ2.7	2.7	16	−.055
SZ3.0	3.0	17	−.055
SZ3.3	3.3	17	−.054
SZ3.6	3.6	17	−.050
SZ3.9	3.9	17	−.045
SZ4.3	4.3	17	−.037
SZ4.7	4.7	12	−.029
SZ5.1	5.1	10	−.019
SZ5.6	5.6	6.0	−.009
SZ6.2	6.2	2.0	+.018
SZ6.8	6.8	1.5	+.035
SZ7.5	7.5	1.5	+.044
SZ8.2	8.2	2.0	+.049
SZ9.1	9.1	4.0	+.053
SZ10.0	10.0	5.0	+.055
SZ11.0	11.0	6.0	+.057
SZ12.0	12.0	7.0	+.059
SZ13.0	13.0	7.0	+.061
SZ15.0	15.0	8.0	+.065
SZ16.0	16.0	8.0	+.066
SZ17.0	17.0	10.0	+.068
SZ18.0	18.0	10.0	+.068

PRICES—Mixed types receive total quantity price break.

	1-99	100-499	500-999	1000-4999	5000 up
10% TOLERANCE	.49	.38	.33	.29	.27
OTHER TOLERANCES Note 1					
5%	.59	.47	.41	.37	.34
2%	.89	.81	.76	.72	.69
1%	1.07	.97	.91	.86	.82

Note 1: Type shown are 10% tolerances, add suffix "A" for 5% and suffix 20%, 2%, 1% for other tolerances. For intermediate voltages, insert voltage and tolerances, i.e.: SZ6.3 (1%).



SCHAUER 1% tolerance zener diode kit #SCH51. A $54.57 value for only $24.50!

A 51-piece assortment of 1% tolerance, 1 watt reliable Schauer zener diodes covering the voltage range of 2.7 to 16.0. Three diodes of each voltage are contained in re-usable poly bags which are stored in a handy kit. Data sheet included.

May be used over and over in laboratory prototypes as well as in precision test equipment. Close tolerances mean fixed impedances and temperature coefficients and permit voltage range tests for optimum design.

SCHAUER silicon varistors

Consists of two matched silicon junctions connected in parallel and oppositely poled. The junctions are molded into one small package with axial gold plated nickel leads. Surge: 25 amps peak ½ cycle; dissipation: ¾ watt at 25°C.; TC of 2mv/°C. All have closely controlled forward conductance with log current characteristics.

Schauer Type	Uses	Forward Voltage Both Directions		PRICES 1-99	100-499	500-999	1000-4999	5000 Up
SV1	General purpose limiters, regulates above 100ua	.20 - .50 @ 10ua	.78 - .90 @ 100ma	.41	.35	.29	.24	.20
SV1-LR	Log I extended down to 5ua osc. control, limiters	.35 - .50 @ 10ua	.78 - .90 @ 100ma	.43	.37	.31	.26	.22
V64	Protection of 150-300mv meter movements. Max. surge, min. shunt error	.10 - .25 @ 0.1ua	.78 - .90 @ 100ma	.45	.39	.33	.28	.24

SCHAUER stabistor forward reference diodes

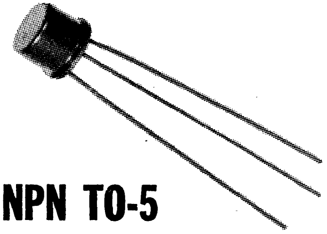
One and two junction diodes with closely controlled forward conductance for low voltage regulation, non-linear bias, limiter and DC coupling applications. Surge: 20 amps peak ½ cycle; dissipation: ¾ watt at 25°C.

Schauer Type	Forward Voltage Drop 10ua	10ma	100ma	Minimum Rev. Voltage @ 10ua	PRICES 1-99	100-499	500-999	1000-4999	5000 Up
SS1	.2 - .5	.64- .72	.90 max.	3.0	.23	.18	.16	.14	.12
SS1-2	.70-1.0	1.30-1.40	1.75 max.	20.0	.50	.39	.35	.32	.29

Semiconductor Division

SCHAUER MANUFACTURING CORP.
4516 Alpine Ave., Cincinnati, Ohio 45242
Telephone (513) 791-3030

silicon power transistors



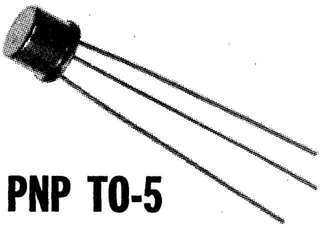
NPN TO-5

$I_{C(MAX)} = 1.0$ to 3.5A $V_{CEO(SUS)} = 40$ to 900V $f_T = 1.0$ to 40 MHz

Type #	PNP Complement	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	C_{ob} (pf)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N1479		40	20-60@.2/4	1.4@.2/.02	3@.2/.02	5.0	35	150	1.5			**2N1482 Family.** 115 x 115 Mil Chip. Single Diffused Process. Clip Leads. Case 100	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1480		55	20-60@.2/4	1.4@.2/.02	3@.2/.02	5.0	35	150	1.5				
2N1481		40	35-100@.2/4	1.4@.2/.01	3@.2/.02	5.0	35	150	1.5				
2N1482		55	35-100@.2/4	1.4@.2/.01	3@.2/.02	5.0	35	150	1.5				
2N5784		65	20-100@1/2	2@3.2/.8	1.5@1/2	10	17.5						
2N5785		50	20-100@1.2/2	2@3.2/.8	1.5@1.2/2	10	17.5						
2N5786		40	20-100@1.6/2	2@3.2/.8	1.5@1.6/2	10	17.5						
STC40347		40	25-100@.45/4	1@.45/.045	1.5@.45/4	8.75	20						
STC40348		65	30-100@.3/4	.75@.3/.03	1.3@.3/4	8.75	20						
Typical Values		**60**	**20-100@1/2**	**1@1/.1**	**1.2@1/2**	**10**	**17.5**	**150**	**1.5**	**3@1/.1**	**6@1/.1**		
2N2911		125	20-60@1/2	.3@1/.1	1.2[3]@1/.1	8.75	20		1.0			**STC40349 Family.** 115 x 115 Mil Chip. Single Diffused Process. Clip Leads. Case 100	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
STC40349		140	25-100@.15/4	.5@.15/.015	1.1@.15/4	8.75	20						
Typical Values		**150**	**20-100@.5/4**	**1@.5/.05**	**1.5@.5/4**	**10**	**17.5**	**175**	**1.0**	**3@1/.1**	**6@1/.1**		
2N3439	2N5416	350	40-160@.02/10	.5@.05/.004	1.3[3]@.05/.004	10	17.5	10	15			**2N3439 Family.** 55 x 55 Mil Chip. Triple Diffused Mesa Process. Case 101	High Voltage Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N3440	2N5415	250	40-160@.02/10	.5@.05/.004	1.3[3]@.05/.004	10	17.5	10	15				
STC40346		175(V_{CER})	>25@.01/10	.5@.01/.001	1@.01/10	10	17.5		10				
STC40321		300(V_{CER})	25-200@.02/10		2@.05/10	5	30						
STC40327		300(V_{CER})	40-250@.02/10		2@.05/10	5	30						
STC40412		250(V_{CER})	>40@.03/20			10	17.5	10	10				
Typical Values		**300**	**30-200@.02/10**	**.5@.05/.004**	**1.1[3]@.05/.004**	**10**	**17.5**	**10**	**15**				
SRS1004M	SRSP1004	100(V_{CER})	30-200@.01/15	1.4@.015/.005	1[3]@.015/.005	4	37.5	8	40			**SRS1004M Family.** 55 x 55 Mil Chip. Double Diffused Mesa Process. Case 101	High Voltage Switch and Amplifier. Consumer, Industrial, and Military Usage.
SRS2004M	SRSP2004	200(V_{CER})	30-200@.01/15	1.5@.015/.005	1[3]@.015/.005	4	37.5	8	40				
SRS3004M	SRSP3014	300(V_{CER})	30-200@.01/15	1.6@.015/.005	1[3]@.015/.005	4	37.5	8	40				
SRS4004M	SRSP4014	400(V_{CER})	30-200@.01/15	1.6@.015/.005	1[3]@.015/.005	4	37.5	8	40				
SRS5004M	SRSP5014	500(V_{CER})	30-200@.01/10	1.6@.01/.003	1[3]@.01/.003	4	37.5	8	40				
SRS6004M		600(V_{CER})	30-200@.01/10	1.6@.01/.003	1[3]@.01/.003	4	37.5	8	40				
SRS7004M		700(V_{CER})	30-200@.01/10	1.8@.01/.003	1[3]@.01/.003	4	37.5	8	40				
Typical Values		**500(V_{CER})**	**30-200@.01/10**	**1.2@.01/.003**	**.08[3]@.01/.003**	**7.5**	**20**	**8**	**40**	**.6@.01/.003**	**2@.02/.003**		
SRS1004		100(V_{CER})	30-250@.05/10	1.4@.05/.006	1[3]@.05/.006	4	37.5	25	30			**SRS1004 Family.** 80 x 80 Mil Chip. Double Diffused Mesa Process. Case 101	High Voltage Switch and Amplifier. Consumer, Industrial, and Military Usage.
SRS2004		200(V_{CER})	30-250@.05/10	1.4@.05/.006	1[3]@.05/.006	4	37.5	25	30				
SRS3014		300(V_{CER})	30-250@.05/10	1.4@.05/.006	1[3]@.05/.006	4	37.5	25	30				
SRS4014		400(V_{CER})	30-250@.045/10	1.4@.045/.005	1[3]@.045/.005	4	37.5	25	30				
SRS5014		500(V_{CER})	30-250@.025/10	1.5@.025/.005	1[3]@.025/.005	4	37.5	25	30				
SRS6014		600(V_{CER})	30-250@.025/10	1.5@.025/.005	1[3]@.025/.005	4	37.5	25	30				
SRS7014		700(V_{CER})	30-250@.025/10	1.5@.025/.005	1[3]@.025/.005	4	37.5	25	30				
SRS8014		800(V_{CER})	30-250@.02/10	1.6@.02/.005	1[3]@.02/.005	4	37.5	25	30				
SRS9014		900(V_{CER})	30-250@.02/10	1.6@.02/.005	1[3]@.02/.005	4	37.5	25	30				
Typical Values		**600(V_{CER})**	**30-300@.025/10**	**1.2@.025/.005**	**.8[3]@.025/.005**	**7.5**	**20**	**25**	**30**	**1@.025/.005**	**2.5@.025/.005**		

NOTES:

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)



PNP TO-5

$I_{C(MAX)} = 1.0$A $V_{CEO(SUS)} = 100$ to 500V $f_T = 15$ to 30 MHz

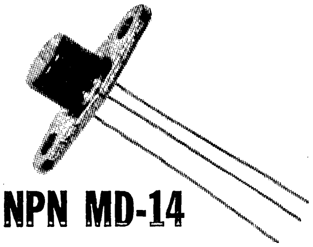
Type #	PNP Complement	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	C_{ob} (pf)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{CFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N5415	2N3440	200	30-150@.05/10	2.5@.05/.005	1.5@.05/10	10	17.5	15	15			**2N5415 Family.** 55 x 55 Mil Chip. Double Diffused Mesa Process Case 101	High Voltage Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N5416	2N3439	300	30-200@.05/10	2@.05/.005	1.5@.05/10	10	17.5	15	15				
SRSP1004	SRS1004M	100(V_{CER})	30-200@.02/10	1.8@.02/.005	1.2[3]@.02/.005	4	37.5	10	30				
SRSP2004	SRS2004M	200(V_{CER})	30-200@.02/10	1.8@.02/.005	1.2[3]@.02/.005	4	37.5	10	30				
SRSP3014	SRS3004M	300(V_{CER})	30-200@.02/10	1.8@.02/.005	1.2[3]@.02/.005	4	37.5	10	30				
SRSP4014	SRS4004M	400(V_{CER})	30-200@.02/10	2@.02/.005	1.2[3]@.02/.005	4	37.5	10	30				
SRSP5014	SRS5004M	500(V_{CER})	25-200@.02/10	2@.02/.005	1.2[3]@.02/.005	4	37.5	10	30				
Typical Values		**300**	**20-200@.05/10**	**1.8@.05/.005**	**1.2@.05/10**	**10**	**17.5**	**10**	**30**	**.6@.01/.003**	**2@.01/.443**		

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

silicon power transistors



NPN MD-14

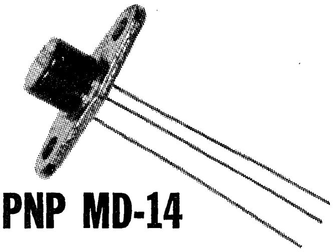
$I_{C(MAX)} = 1.0$ to 3.0A $V_{CEO(SUS)} = 40$ to 350V $f_T = 1.0$ to 15 MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	C_{ob} (pf)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
STC40347V2	40	25-100@.45/4	1@.45/.045	1.5@.45/4	.001[1]@30	11.7	15					**STC40347V2 Family.** 115 x 115 Mil Chip. Single Diffused Process. Clip Leads. Case 211	General Purpose Power Switch and Amplifier. Industrial and Military Usage.
STC40348V2	65	30-100@.3/4	.75@.3/.03	1.3@.3/4	.001[1]@30	11.7	15						
Typical Values	**75**	**20-100@.3/4**	**.6@.3/.03**	**1.2@.3/4**	**.001@30**	**11.7**	**15**	**150**	**1.0**				
STC40349V2	140	25-100@.15/4	.5@.15/.015	1.1@.15/4	.001[1]@90	11.7	15					**STC40349V2 Family.** 115 x 115 Mil Chip. Single Diffused Process. Clip Leads. Case 211	General Purpose Power Switch and Amplifier. Industrial and Military Usage.
Typical Values	**150**	**20-100@.15/4**	**.4@.15/.015**	**1.0@.15/4**	**.001@70**	**11.7**	**15**	**150**	**1.0**				
2N4063	350	40-160@.02/10	.5@.05/.004	1.3[3]@.05/.004	.5@450	10	17.5	10	15			**2N4063 Family.** 55 x 55 Mil Chip. Triple Diffused Mesa Process. Case 212	High Voltage, General Purpose Switch and Amplifier, Consumer, Industrial and Military Usage.
2N4064	250	40-160@.02/10	.5@.05/.004	1.3[3]@.05/.004	.5@300	10	17.5	10	15				
STC40346V2	175(V_{CER})	>25@.01/10	.5@.01/.001	1.0@.01/10	.01@200	10	17.5		10				
STC40412V2	250(V_{CER})	>40@.03/10			1.0[1]@100	10	17.5	10	10				
Typical Values	**300**	**30-200@.02/10**	**.5@.05/.004**	**1.1[3]@.05/.004**	**.05@300**	**10**	**17.5**	**10**	**15**	**.6@.01/.003**	**2@.01/.003**		

NOTES:

[1] I_{CER} @ V_{CE} (mA @ V)

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

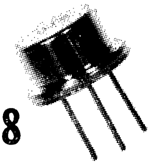


PNP MD-14

$I_{C(MAX)} = 1.0$ to 3.0A $V_{CEO(SUS)} = 40$ to 350V $f_T = 1.0$ to 15 MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	C_{ob} (pf)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
SRS1005	350	40-160@.02/10	.5@.05/.004	1.3[3]@.05/.004	.5@450	10	17.5	10	15			PNP Complement To 2N4063 Family. 55 x 55 Mil Chip. Triple Diffused Mesa Process. Case 212	H.V. GPA and Switch. Consumer, Industrial and Military Usage.
SRS2005	250	40-160@.02/10	.5@.05/.004	1.3[3]@.05/.004	.5@300	10	17.5	10	15				
SRS3005	175(V_{CER})	>25@.01/10	.5@.01/.001	1.0@.01/10	.01@200	10	17.5		10				
SRS4005	250(V_{CER})	>40@.03/10			1.0@100	10	17.5	10	10				
Typical Values	**300**	**30-200@.02/10**	**.5@.05/.004**	1.1[3]@.05/.004	**.05@300**	**10**	**17.5**	**10**	**15**	**.6@.01/.003**	**2@.01/.003**		

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)



NPN TO-8

$I_{C(MAX)} = 1.0$ to 3.0A $V_{CEO(SUS)} = 40$ to 55V $f_T = 1.25$ MHz

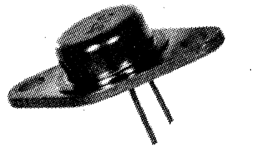
Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	C_{ob} (pf)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N1483	40	20-60@.75/4	2@.75/.075	3.5@.75/4	.015[2]@30	25	7.0	175	1.25			**2N1486 Family.** 115 x 115 Mil Chip. Single Diffused Clip Leads. Case 180	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1484	55	20-60@.75/4	2@.75/.075	3.5@.75/4	.015[2]@30	25	7.0	175	1.25				
2N1485	40	35-100@.75/4	.75@.75/.04	2.5@.75/4	.015[2]@30	25	7.0	175	1.25				
2N1486	55	35-100@.75/4	.75@.75/.04	2.5@.75/4	.015[2]@30	25	7.0	175	1.25				
2N1701	40	20-80@.3/4	1.5@.3/.03	3@.3/4	.75[2]@60	25	7.0		0.35				
Typical Values	**60**	**20-100@.75/4**	**.6@.75/.04**	**2@.75/4**	**.01[2]@30**	**25**	**7.0**	**150**	**1.25**	**3@1/.1**	**6@1/.1**		

[2] I_{CBO} @ V_{CB} (mA @ V)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

silicon power transistors



NPN TO-66

$I_{C(MAX)}$ = 1.0 to 7.0A $V_{CEO(SUS)}$ = 35 to 350V f_T = 0.75 to 60 MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (µs @ A/A)	t_{OFF} @ I_C/I_B (µs @ A/A)	Generic Product	General Information
2N3054	55	20-100@.5/4	1@.5/.05	1.7@.5/4	1.0@90	29	6.0					**2N3054 Family.** 115 x 115 Mil Chip. Single Diffused Process. Clip Leads. Case 620	General Purpose Power Switch and Amplifier. Consumer and Industrial Usage.
STC40250	40	25-100@1.5/4	1.5@1.5/.15	2.2@1.5/4	1^1@30	29	6.0						
STC40310	35	20-120@1/2		1.4@1/2	.01^1@15	29	6.0		.75				
STC40312	60(V_{CER})	20-120@1/2		1.4@1/2	.01^1@15	29	6.0		.75				
STC40316	40(V_{CER})	20-120@1/2		1.4@1/2	.01^1@15	29	6.0		.75				
STC40324	35	20-120@1/2		1.4@1/2	.01^1@15	29	6.0		.75				
Typical Values	**60**	**20-120@1/2**	**1@1.5/.15**	**1.2@1/2**	**.01^1@15**	**29**	**6.0**	**.6@48**	**1.0**	**3@1/.1**	**6@1/.1**		
2N3441	140	20-80@.5/4	1@.5/.05	1.7@.5/4	1@140	25	7.0	**.24@120**				**2N3441 Family.** 115 x 115 Mil Chip. Single Diffused Process. Clip Leads. Case 620	General Purpose Power Switch and Amplifier. Consumer and Industrial Usage.
Typical Values	**150**	**20-120@.5/4**	**1@.5/.05**	**1.5@.5/4**	**1@140**	**29**	**6.0**	**.24@120**	**1.0**	**3@1/.1**	**6@1/.1**		
STA3878	50	40-200@.5/2	2@4/.4	2.5@4/2	25@120	35	5.0	.75@40	40			**STA3878 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultra-sonically Bonded Leads. Case 621	High Speed Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
STA3879	75	12-100@4/2	1.2@4/.4	2^3@4/.4	25@120	35	5.0	.5@40	40	.5@4/.4	1.2@4/.4		
STA5202	50	10-100@4/1.2	1.2@4/.4	2^3@4/.4	10@100	35	5.0	.4@40	60	.4@4/.8	1.6@4/.8		
STA5427	80	30-120@2/2	1.2@7/.7	1.2^3@2/.2	.01@75	40	4.37	5@8	30	.2@2/.2	2.2@2/.2		
STA5428	80	60-240@2/2	1.2@7/.7	1.2^3@2/.2	.01@75	40	4.37	5@8	30	.2@2/.2	2.2@2/.2		
STA5429	100	30-120@2/2	1.2@7/.7	1,2^3@2/.2	.01@90	40	4.37	5@8	30	.2@2/.2	2.2@2/.2		
STA5430	100	60-240@2/2	1.2@7/.7	1,2^3@2/.2	.01@90	40	4.37	5@8	30	.2@2/.2	2.2@2/.2		
STA40364	60(V_{CER})	35-175@.5/5	2@2.5/.25	1.8@2.5/5	.5^1@50	35	5.0	.75@40	15				
STA8250	140	20-200@2/2	1.2@4/.4	1.8@4/2	4@140	40	4.37	.75@40	30	.2@2/.2	1.0@2/.2		
STA5050	125	25-100@.75/5	1@.75/.1	1.2@.75/5	.5@125	40	3.75	2@20	10	.3@.75/.1	4.7@.75/1		
STA5051	150	25-100@.75/5	1@.75/.1	1.2@.75/5	.5@150	40	3.75	2@20	10	.3@.75/.1	4.7@.75/1		
Typical Values	**120**	**20-200@2/2**	**1@4/.4**	**1.7@4/2**	**4@120**	**40**	**4.37**	**2@20**	**40**	**.2@2/.2**	**.6@2/.2**		
STA3583	175	40-200@.5/10	5@1/.125	1.4@1.0/10	1.0@225	35	5.0	.35@100	10			**STA3583 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultra-sonically Bonded Leads. Case 621	High Voltage, High Speed Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
STA3584	250	8-140@1/2	.75@1.0/.125	1.4^3@1/.1	1.0@300	35	5.0	.35@100	10	3@1.0/.1	7@1.0/.1		
STA3585	300	8-140@1/2	.75@1.0/.125	1.4^3@1/.1	1.0@400	35	5.0	.35@100	10	3@1.0/.1	7@1.0/.1		
STA4240	300	6-240@.75/2	1@.75/.075	1.8^3@.75/.075	2@400	35	5.0	.35@100	15	.5@.75/.075	9@.75/.075		
STA5052	200	25-100@.75/5	1.0@.75/1	1.2@.75/5	.5@200	40	3.75	2@20	10	.3@.75/.1	4.7@.75/.1		
STA9250	350	10-200@1/2	1@1/.175	1.8^3@1/.1	1.0@400	35	5.0	.35@100	30	.5@1/.1	2.5@1/.1		
STA40313	300(V_{CER})	>40@.5/10		1.5@.1/10	10@300	35	5.0	.15@150					
STA40316	300(V_{CER})	>50@.5/10		1.5@.5/10	5@150	35	5.0	.10@150					
STA40322	300(V_{CER})	>75@.5/10			10@150	35	5.0	.10@150					
STA40328	300(V_{CER})	>20@1/10		1.5@1/10	10@150	35	5.0	.10@150					
Typical Values	**250**	**10-200@1/2**	**.6@1/.125**	**1.2^3@1/.125**	**.5@275**	**35**	**5.0**	**.1@150**	**35**	**.5@1/.1**	**2@1/.1**		

NOTE: This product is developmental.

NOTES:
[1] I_{CER} @ V_{CE} (mA @ V)
[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

NPN TO-53

$I_{C(MAX)}$ = 3.0A $V_{CEO(SUS)}$ = 60 to 80V f_T = 1.0 MHz

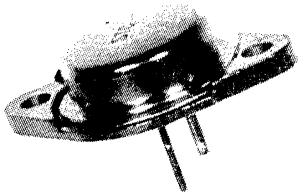
Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	Generic Product	General Information
2N389	60(V_{CER})	12-60@1/15	5@1/.2	8@1.5/15	10@60	85	2.2		1.0	**2N389 Family.** 140 x 140 Mil Chip. Single Diffused Process. Clip Leads. Case 330	General Purpose Power Switch and Amplifier. Industrial and Military Usage.
2N389A	60(V_{CER})	12-60@1/4	.75@1/.2	2.5@1.5/4	10^4@60	85	2.06		1.0		
2N424	80(V_{CER})	12-60@1/15	10@1/.2	8@.75/15	10@60	85	2.2		1.0		
2N424A	80(V_{CER})	12-60@1/4	.75@1/.2	2.5@1.5/4	10@60	85	2.06		1.0		
Typical Values	**70**	**15-100@1/4**	**.6@1/.2**	**1.8@1.5/4**	**5@60**	**85**	**2.2**	**4.25@20**	**1.0**		

[4] Available with gold plated leads on special request.

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

silicon power transistors



NPN TO-3

$I_{C(MAX)} = 3.0$ to 30A $V_{CEO(SUS)} = 35$ to 350V $f_T = 0.7$ to 60 MHz

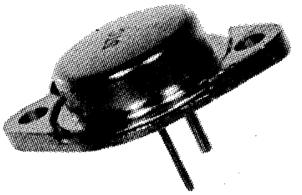
Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N1487	40	15-45@1.5/4	3.0@1.5/.3	3.5@1.5/4	.025[2]@30	75	2.33		1.0			**2N1490 Family.** 115 x 115 Mil Chip. Single Diffused Process. Clip Leads. Case 280	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1488	55	15-45@1.5/4	3.0@1.5/.3	3.5@1.5/4	.025[2]@30	75	2.33		1.0				
2N1489	40	25-75@1.5/4	1@1.5/.1	2.5@1.5/4	.025[2]@30	75	2.33		1.0				
2N1490	55	25-75@1.5/4	1@1.5/.1	2.5@1.5/4	.025[2]@30	75	2.33		1.0				
Typical Values	**60**	**15-100@1.5/4**	**.8@1.5/.1**	**1.7@1.5/4**	**.02[2]@30**	**75**	**2.33**	**3.75@20**	**1.0**	**3@1/.1**	**6@1/.1**		
2N3055	60	20-70@4/4	1.1@4/.4	1.8@4/4	5@100	117	1.5	**1.95@80**				**2N3055 Family.** 170 x 170 Mil Chip. Single Diffused Process. Clip Leads. Case 280	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N3232	60	18-55@3/10	2.5@3/.2	3.5@3/10	1@60	117	1.5		1.0				
2N3235	55	20-70@4/4	1.1@4/.4	1.8@4/4	5@90	117	1.5		1.0				
STC40251	40	15-60@8/4	1.5@8/.8	2.2@8/4	2@40	117	1.5	**3.0@39**					
STC40325	35	12-60@8/4	1.5@8/.8	2.0@8/4	5[2]@30	117	1.5						
STC40363	70(V_{CER})	20-70@4/4	1.1@4/.4	1.8@4/4	.5[1]@60	117	1.5		0.7				
STC40636	95(V_{CER})	20-70@4/4	1.0@4/.4	1.4@4/4	.5[1]@85	117	1.5						
Typical Values	**75**	**20-100@4/4**	**.8@4/.4**	**1.6@4/4**	**.5@60**	**117**	**1.5**	**1.95@60**	**1.0**	**4@1/.1**	**6@1/.1**		
2N3233	100	18-55@3/10	2.5@3/.2	3.5@3/10	1@100	117	1.5		1.0			**2N3442 Family.** 170 x 170 Mil Chip. Single Diffused Process. Clip Leads. Case 280	General Purpose High Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N3234	160	18-55@3/10	2.5@3/.2	3.5@3/10	1@160	117	1.5		1.0				
2N3442	140	20-70@3/4	1.0@3/.3	1.7@3/4	5@140	117	1.5	**1.5@78**					
2N4347	120	15-60@2/4	1.0@2/.2	2.0@2/4	2@125	100	1.5	**1.5@67**					
Typical Values	**130**	**20-70@3/4**	**.8@3/.3**	**1.5@3/4**	**1@130**	**117**	**1.5**	**1.5@78**	**1.0**	**4@1/.1**	**6@1/.1**		
2N3236	90	17-60@5/4	1.1@5/.5	1.8@5/4	2@90	150	1.17		1.0			**2N3772 Family.** 240 x 240 Mil Chip. Single Diffused Process. Clip Leads. Case 281	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N3237	75	12-36@10/8	2.0@10/1.35	3@10/8	5@75	200	1.0		1.0				
2N3238	80	8.5-25@10/12	3@10/1.33	4@10/12	5@80	150	1.17		1.0				
2N3239	80	8.5-25@10/10	1.0@10/1.33	2@10/10	5@80	150	1.17		1.0				
2N3771	40	15-60@15/4	2.0@15/1.5	2.7@15/4	2@50	150	1.17	**3.75@40**	0.8				
2N3772	60	15-60@10/4	1.4@10/1.0	2.2@10/4	5@100	150	1.17	**2.5@60**	0.8				
STC40411	(90(V_{CER})	35-100@4/4	.8@4/.4	1.2@4/4	5[1]@80	150	1.17	**5@40**	0.8				
Typical Values	**60**	**15-100@10/4**	**1.0@10/1**	**1.7@10/4**	**1@60**	**150**	**1.17**	**3@50**	**1.0**	**5@1/.1**	**10@1/.1**		
2N3240	160	8.5-25@10/10	1.0@10/1.33	2@10/10	5@160	150	1.17		1.0			**2N3773 Family.** 240 x 240 Mil Chip. Single Diffused Process. Clip Leads. Case 281	General Purpose High Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N3773	140	15-60@8/4	1.4@8/.8	2.2@8/4	2@140	150	1.17	**1.5@100**	0.8				
2N4348	120	15-60@5/4	1.0@5/.5	2@5/4	2@125	120	1.46	**1.5@80**					
Typical Values	**140**	**15-100@8/4**	**1.1@8/.8**	**1.8@8/4**	**1@140**	**150**	**1.17**	**1.5@100**	**0.8**	**6@1/.1**	**10@1/.1**		
STA3445	60	20-60@3/5	1.5@3/.3	1.5@3/5	.1@60	115	1.5	7.5@15.3	10	.35@5/.5	2.4@5/.5	**STA3445 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 282	High Speed, Power Amplifier and Switch. Industrial and Military Usage.
STA3446	80	20-60@3/5	1.5@3/.3	1.5@3/5	.1@80	115	1.5	7.5@15.3	10	.35@5/.5	2.4@5/.5		
STA3447	60	40-120@5/5	1.5@5/.5	1.4@5/5	.1@60	115	1.5	7.5@15.3	10	.35@5/.5	2.4@5/.5		
STA3448	80	40-120@5/5	1.5@5/.5	1.4@5/5	.1@80	115	1.5	7.5@15.3	10	.35@5/.5	2.4@5/.5		
STA8350	100	20-200@4/3	1.5@4/.4	2@4/3	1.0@100	115	1.5	7.5@15.3	40	.35@4/.4	1@4/.4		
STA8351	140	20-200@3/3	1.5@3/.3	2@3/3	1.0@140	115	1.5	7.5@15.3	40	.35@3/.3	1@3/.3		
Typical Values	**120**	**20-200@3/5**	**1@3/.3**	**1.4@3/5**	**.1@100**	**115**	**1.5**	**7.5@15.3**	**40**	**.35@5/.5**	**1@5/.5**		

[1] I_{CER} @ V_{CE} (mA @ V) [2] I_{CBO} @ V_{CB} (mA @ V)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

silicon power transistors



NPN TO-3 (cont'd)

$I_{C(MAX)}$ = 3.0 to 30A $V_{CEO(SUS)}$ = 35 to 350V f_T = 0.7 to 60 MHz

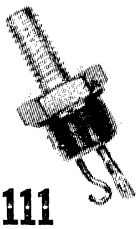
Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
STA5038	90	20-100@12/5	2.5@20/5	3.3[3]@20/5	50@140	140	1.25	5@28	60	.5@12/1.2	2@12/1.2	**STA5038 Family.** 200 x 200 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 282	High Speed, Power Amplifier and Switch. Industrial and Military Usage.
STA5039	75	20-100@10/5	2.5@20/5	3.3[3]@20/5	50@110	140	1.25	5@28	60	.5@10/1.0	2@10/1.0		
STA5671	90	20-100@15/2	.75@15/1.2	1.5[3]@15/1.2	12@110	140	1.25	7@20	50	.5@15/1.2	2@15/1.2		
STA5672	120	20-100@15/2	.75@15/1.2	1.5[3]@15/1.2	10@135	140	1.25	7@20	50	.5@15/1.2	2@15/1.2		
STA8360	140	20-200@12/3	1.5@12/1.2	1.8[3]@12/1.2	5@140	140	1.25	7@20	40	.5@12/1.2	1@12/1.2		
Typical Values	**120**	**20-200@10/5**	**.6@15/1.2**	**1.4[3]@15/1.2**	**1@120**	**140**	**1.25**	**7@20**	**50**	**.3@15/1.2**	**1@15/1.2**		
STA5929	80	20-100@10/4	2@10/.66	2[3]@10/.66	5@90	175	1.0	7.6@23	30	.5@10/.66	.8@10/.66	**STA5929 Family.** 200 x 200 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 283	High Speed, Power Amplifier and Switch. Industrial and Military Usage.
STA5930	120	20-100@10/4	2@10/.66	2[3]@10/.66	5@130	175	1.0	7.6@23	30	.5@10/.66	.8@10/.66		
STA5931	160	20-100@10/4	2@10/.66	2[3]@10/.66	5@170	175	1.0	7.6@23	30	.5@10/.66	.8@10/.66		
STA5932	60	20-100@20/4	2@20/1.33	2[3]@20/1.33	5@70	175	1.0	7.6@23	30	.6@20/1.33	.9@20/1.33		
STA5933	100	20-100@20/4	2@20/1.33	2[3]@20/1.33	5@110	175	1.0	7.6@23	30	.6@20/1.33	.9@20/1.33		
Typical Values	**120**	**20-200@10/4**	**1@10/.66**	**1.7[3]@10/.66**	**1@120**	**175**	**1.0**	**7.6@23**	**30**	**.4@10/.66**	**.7@10/.66**		
STA5934	140	20-100@20/4	2@20/1.33	2[3]@20/1.33	5@150	175	1.0	7.6@23	30	.6@20/1.33	.9@20/1.33	**STA5932 Family.** 250 x 250 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 285	High Speed, Power Amplifier and Switch. Industrial and Military Usage.
STA5935	80	20-100@30/4	2@30/2	2.4[3]@30/2	5@90	175	1.0	7.6@23	30	.7@30/2	1.0@30/2		
STA5936	120	20-100@30/4	2@30/2	2.4[3]@30/2	5@130	175	1.0	7.6@23	30	.7@30/2	1.0@30/2		
STA5937	160	20-100@30/4	2@30/2	2.4[3]@30/2	5@170	175	1.0	7.6@23	30	.7@30/2	1.0@30/2		
Typical Values	**120**	**20-200@20/4**	**1@20/1.33**	**1.8[3]@20/1.33**	**1@120**	**175**	**1.0**	**7.6@23**	**30**	**.5@20/1.33**	**.9@20/1.33**		
NOTE: This product is developmental.													
STA5239	225	20-80@2/10	5@4.5/1.125	3@2/10	4@300	100	1.75	.67@150	5.0			**STA5239 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 282	High Voltage, High Speed Power Amplifier and Switch. Industrial and Military Usage.
STA5240	300	20-80@2/10	5@4.5/1.125	3@2/10	2@375	100	1.75	.67@150	5.0				
STA5838	250	8-40@3/2	1@3/.375	2[3]@3/.375	5@265	100	1.75	2.5@40	5.0	1.5@3/.375	4.5@3/.375		
STA5839	275	10-50@2/3	1.5@2/.2	2[3]@2/.2	2@290	100	1.75	2.5@40	5.0	1.5@2/.2	5.25@2/.2		
STA5840*	350	10-50@2/3	1.5@2/.2	2[3]@2/.2	2@360	100	1.75	2.5@40	5.0	1.75@2/.2	4.5@2/.2		
Typical Values	**275**	**10-100@2/10**	**1@2/.2**	**1.8[3]@2/.2**	**1@300**	**100**	**1.75**	**2.5@40**	**25**	**.7@2/.2**	**2@2/.2**		
STA5804	225	10-100@5/4	2@5/.5	2[3]@5/.5	.5@225	110	1.6	2.2@50	15	.5@5/.5	5.5@5/.5	**STA5804 Family.** 200 x 200 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 283	High Voltage, High Current, High Speed Power Amplifier and Switch. Industrial and Military Usage.
STA5805	300	10-100@5/4	2@5/.5	2[3]@5/.5	1.0@300	110	1.6	2.2@50	15	.5@5/.5	5.5@5/.5		
STA9360*	350	10-200@5/4	2@5/.5	2.5[3]@5/.5	1.0@350	110	1.6	2.2@50	20	.5@5/.5	3@5/.5		
STA9361	225	10-200@10/4	2@10/1.0	2.5[3]@10/1	1.0@225	110	1.6	2.75@40	20	.5@10/1	3@10/1		
STA9362	300	10-200@8/4	2@8/.8	2.5[3]@8/.8	1.0@300	110	1.6	2.75@40	20	.5@8/.8	3@8/.8		
Typical Values	**275**	**10-200@5/4**	**1@5/.5**	**1.8[3]@5/.5**	**1@300**	**110**	**1.6**	**2.75@40**	**20**	**.5@5/.5**	**2.5@5/.5**		
STA9370	225	10-200@20/4	2@20/2	2.5[3]@20/2	.5@225	125	1.4	5@25	20	.6@20/2	3@20/2	**STA9370 Family.** 250 x 250 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 285	High Voltage, High Current, High Speed Power Amplifier and Switch. Industrial and Military Usage.
STA9371	300	10-200@15/4	2@15/1.5	2.5[3]@15/1.5	1.0@300	125	1.4	5@25	20	.6@15/1.5	3@15/1.5		
STA9372*	350	10-200@12/4	2@12/1.2	2.5[3]@12/1.2	1.0@350	125	1.4	5@25	20	.6@12/1.2	3@12/1.2		
*NOTE: This product developmental. Contact factory.													
Typical Values	**250**	**10-200@12/4**	**1@12/1.2**	**1.8[3]@12/1.2**	**1@275**	**125**	**1.4**	**5@25**	**20**	**.5@12/1.2**	**2.5@12/1.2**		

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

silicon power transistors



NPN TO-111

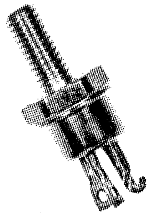
$I_{C(MAX)} = 5$ to 10A $V_{CEO(SUS)} = 50$ to 350V $f_T = 30$ to 50 MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N2877	50	20-60@1/2	2@5/.5	1.2@1/2	.01@80	30	3.33	2.5@12	30			**2N2880 Family.** 75 x 100 Mil Chip. Double Diffused Planar Epitaxial Process. Ultrasonicly Bonded Leads. Case 710	High Speed, Power Amplifier and Switch. Military Usage.
2N2878	50	40-120@1/2	2@5/.5	1.2@1/2	.01@80	30	3.33	2.5@12	50				
2N2879	70	20-60@1/2	2@5/.5	1.2@1/2	.01@100	30	3.33	2.5@12	30				
2N2880	70	40-120@1/2	2@5/.5	1.2@1/2	.01@100	30	3.33	2.5@12	50				
Typical Values	**60**	**20-120@1/2**	**1.6@5/.5**	**1@1/2**	**.01@80**	**30**	**3.33**	**2.5@12**	**50**	**1@1/.1**	**2@1/.1**		
STA8450	60	20-200@5/3	1.5@5/.5	2[3]@5/.5	.5@60	33	3.0	1.65@20	40	.4@5/.5	1.0@5/.5	**STA8450 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 711	High Voltage, High Speed Power Amplifier and Switch. Military Usage.
STA8451	100	20-200@4/3	1.5@4/.4	2[3]@4/.4	1.0@100	33	3.0	1.65@20	40	.4@4/.4	1.0@4/.4		
STA8452	140	20-200@3/3	1.5@3/.3	2[3]@3/.3	1.0@140	33	3.0	1.65@20	40	.4@3/.3	1.0@3/.3		
Typical Values	**120**	**20-200@3/3**	**1@3/.3**	**1.7[3]@3/.3**	**1@120**	**33**	**3.0**	**1.65@20**	**40**	**.3@5/.5**	**1@5/.5**		
STA9450	225	20-200@2.5/4	2@2.5/.25	2.5[3]@2.5/.25	.5@225	30	3.3	1.5@20	30	.9@2.5/.25	2.5@2.5/.25	**STA9450 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 711	High Speed Power Switch and Amplifier. Military Usage.
STA9451	300	20-200@2/4	2@2/.2	2.5[3]@2/.2	1.0@300	30	3.3	1.5@20	30	.8@2/.2	2.5@2/.2		
STA9452*	350	20-200@1.5/4	2@1.5/.15	2.5[3]@1.5/.15	1.0@350	30	3.3	1.5@20	30	.8@1.5/.15	2.5@1.5/.15		
Typical Values	**275**	**20-200@2/4**	**1@2/.2**	**.8[3]@2/.2**	**1@275**	**30**	**3.3**	**1.5@20**	**30**	**.7@2/.2**	**2@2/.2**		

*NOTE: This product is developmental. Contact factory.

NOTES:

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)



NPN TO-111 (isolated collector)

$I_{C(MAX)} = 5$ to 10A $V_{CEO(SUS)} = 60$ to 350V $f_T = 30$ to 40 MHz

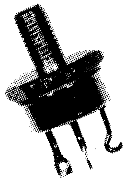
Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
STA8550	60	20-200@5/3	1.5@5/.5	2[3]@5/.5	.5@60	33	3.0	1.65@20	40	.5@5/.5	1@5/.5	**STA8550 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 700	High Speed Power Amplifier and Switch. Military Usage.
STA8551	100	20-200@4/3	1.5@4/.4	2[3]@4/.4	1.0@100	33	3.0	1.65@20	40	.5@4/.4	1@4/.4		
STA8552	140	20-200@3/3	1.5@3/.3	2[3]@3/.3	1.0@140	33	3.0	1.65@20	40	.4@3/.3	1@3/.3		
Typical Values	**120**	**20-200@3/3**	**1@3/.3**	**1.8[3]@3/.3**	**1@120**	**33**	**3.0**	**1.65@20**	**40**	**.3@5/.5**	**1@5/.5**		
STA9550	225	20-200@2.5/4	2@2.5/.25	2.5[3]@2.5/.25	.5@225	30	3.3	1.5@20	30	.8@2.5/.25	2.5@2.5/.25	**STA9550 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 700	High Voltage, High Speed Power Amplifier and Switch. Military Usage.
STA9551	300	20-200@2/4	2@2/.2	2.5[3]@2/.2	1.0@300	30	3.3	1.5@20	30	.7@2/.2	2.5@2/.2		
STA9552	350	20-200@1.5/4	2@1.5/.15	2.5[3]@1.5/.15	1.0@350	30	3.3	1.5@20	30	.7@1.5/.15	2.5@1.5/.15		
Typical Values	**275**	**20-200@2/4**	**1@2/.2**	**1.8[3]@2/.2**	**1@275**	**30**	**3.3**	**1.5@20**	**30**	**.7@2/.2**	**2@2/.2**		

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

silicon power transistors



NPN TO-61

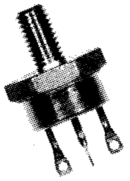
$I_{C(MAX)} = 5$ to 20A $V_{CEO(SUS)} = 60$ to 350V $f_T = 20$ to 40 MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N1616	60	15-75@2/12	2@2/.25	3@2/12	1@60	30	2.5					**2N1616 Family.** 170 x 170 Mil Chip. Single Diffused Process. Clip Leads. Case 350	High Power Switch and Amplifier. Military Usage.
2N1616A	60	20-60@2/4	1@2/.2	2@2/4	.2@60	48	2.08						
2N1617	70	15-75@2/12	2@2/.25	3@2/12	1@80	30	2.5						
2N1617A	70	20-60@2/4	1@2/.2	2@2/4	.2@80	48	2.08						
2N1618	80	15-75@2/12	2@2/.25	3@2/12	1@100	30	2.5						
2N1618A	80	20-60@2/4	1@2/.2	2@2/4	.2@100	48	2.08						
Typical Values	**80**	**20-100@2/4**	**.8@2/.2**	**1.8@2/4**	**.1@80**	**48**	**2.08**	**1@48**	**1.0**	**4@1/.1**	**6@1/.1**		
STA8650	60	20-200@5/3	1.5@5/.5	2[3]@5/.5	.5@60	50	2.0	2.5@20	40	.4@5/.5	1@5/.5	**STA8650 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 351	High Speed Power Switch and Amplifier. Military Usage.
STA8651	100	20-200@4/3	1.5@4/.4	2[3]@4/.4	1.0@100	50	2.0	2.5@20	40	.4@4/.4	1@4/.4		
STA8652	140	20-200@3/3	1.5@3/.3	2[3]@3/.3	1.0@140	50	2.0	2.5@20	40	.4@3/.3	1@3/.3		
Typical Values	**120**	**20-200@3/3**	**1@3/.3**	**1.8[3]@3/.3**	**1@120**	**50**	**2.0**	**2.5@20**	**40**	**.35@5/.5**	**1@5/.5**		
STA9650	225	20-200@2.5/4	2@2.5/.25	2.5[3]@2.5/.25	.5@60	50	2.0	2.5@20	30	.9@2.5/.25	2.5@2.5/.25	**STA9650 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 351	High Voltage, High Speed Power Switch and Amplifier. Military Usage.
STA9651	300	20-200@2/4	2@2/.2	2.5[3]@2/.2	1.0@100	50	2.0	2.5@20	30	.8@2/.2	2.5@2/.2		
STA9652	350	20-200@1.5/4	2@1.5/.15	2.5[3]@1.5/.15	1.0@140	50	2.0	2.5@20	30	.8@1.5/.15	2.5@1.5/.15		
Typical Values	**275**	**20-200@2/4**	**1@2/.2**	**1.8[3]@2/.2**	**1@275**	**50**	**2.0**	**2.5@20**	**30**	**.7@2/.2**	**2@2/.2**		
STA9660	225	10-200@10/4	2@10/1	2.5[3]@10/1	.5@225	57	1.75	2.85@20	20	.6@10/1	3@10/1	**STA9660 Family.** 200 x 200 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 351	High Voltage, High Current, High Speed Power Switch and Amplifier. Military Usage.
STA9661	300	10-200@8/4	2@8/.8	2.5[3]@8/.8	1.0@300	57	1.75	2.85@20	20	.6@8/.8	3@8/.8		
STA9662	350	10-200@5/4	2@5/.5	2.5[3]@5/.5	1.0@350	57	1.75	2.85@20	20	.5@5/.5	3@5/.5		
Typical Values	**275**	**10-200@5/4**	**1@5/.5**	**1.8[3]@5/.5**	**1@275**	**57**	**1.75**	**2.85@20**	**20**	**.5@5/.5**	**2.5@5/.5**		

NOTE: This product is developmental.

NOTES:

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)



NPN TO-61 (isolated collector)

$I_{C(MAX)} = 5$ to 20A $V_{CEO(SUS)} = 60$ to 350V $f_T = 20$ to 40 MHz

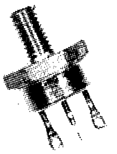
Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
STA8750	60	20-200@5/3	1.5@5/.5	2[3]@5/.5	.5@60	50	2.0	2.5@20	40	.4@5/.5	1@5/.5	**STA8750 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 352	High Speed Power Switch and Amplifier. Military Usage.
STA8751	100	20-200@4/3	1.5@4/.4	2[3]@4/.4	1.0@100	50	2.0	2.5@20	40	.4@4/.4	1@4/.4		
STA8752	140	20-200@3/3	1.5@3/.3	2[3]@3/.3	1.0@140	50	2.0	2.5@20	40	.4@3/.3	1@3/.3		
Typical Values	**120**	**20-200@3/3**	**1@3/.3**	**1.8@3/.3**	**1@120**	**50**	**2.0**	**2.5@20**	**40**	**.35@5/.5**	**1@5/.5**		
STA9750	225	20-200@2.5/4	2@2.5/.25	2.5[3]@2.5/.25	.5@60	50	2.0	2.5@20	30	.9@2.5/.25	2.5@2.5/.25	**STA9750 Family.** 140 x 140 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 352	High Voltage, High Speed Power Switch and Amplifier. Military Usage.
STA9751	300	20-200@2/4	2@2/.2	2.5[3]@2/.2	1.0@100	50	2.0	2.5@20	30	.8@2/.2	2.5@2/.2		
STA9752	350	20-200@1.5/4	2@1.5/.15	2.5[3]@1.5/.15	1.0@140	50	2.0	2.5@20	30	.8@1.5/.15	2.5@1.5/.15		
Typical Values	**275**	**20-200@2/4**	**1@2/.2**	**1.8[3]@2/.2**	**1@275**	**50**	**2.0**	**2.5@20**	**30**	**.7@2/.2**	**2@2/.2**		

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

silicon power transistors



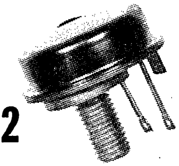
NPN TO-61 (isolated collector) (cont'd)

$I_{C(MAX)} = 5$ to 20A $V_{CEO(SUS)} = 60$ to 350V $f_T = 20$ to 40 MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = .1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
STA9760	225	10-200@10/4	2@10/1	2.5[3]@10/1	.5@225	57	1.75	2.85@20	20	.6@10/1	3@10/1	**STA9760 Family.** 200 x 200 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 352	High Voltage, High Current, High Speed Power Switch and Amplifier. Military Usage.
STA9761	300	10-200@8/4	2@8/.8	2.5[3]@8/.8	1.0@300	57	1.75	2.85@20	20	.6@8/.8	3@8/.8		
STA 9762	350	10-200@5/4	2@5/.5	2.5[3]@5/.5	1.0@350	57	1.75	2.85@20	20	.5@5/.5	3@5/.5		
Typical Values	**275**	**10-200@5/4**	**1@5/.5**	**1.8[3]@5/.5**	**1@275**	**57**	**1.75**	**2.85@20**	**20**	**.5@5/.5**	**2.5@5/.5**		
NOTE: This product is developmental.													

NOTES:

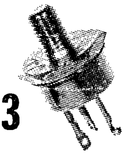
[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)



NPN TO-82

$I_{C(MAX)} = 7.5$ to 10A $V_{CEO(SUS)} = 30$ to 250V $f_T = 0.5$ MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEY} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N1015	30	>10@2/4	1.5@2/.3	2@2/4	20@30	71.5	0.7					**2N1016 Family.** 200 x 200 Mil Chip. Single Diffused Process. Clip Leads. Case 540	High Power Switch and Amplifier. Military Usage.
2N1015A	60	>10@2/4	1.5@2/.3	2@2/4	20@60	71.5	0.7						
2N1015B	100	>10@2/4	1.5@2/.3	2@2/4	20@100	71.5	0.7						
2N1015C	150	>10@2/4	1.5@2/.3	2@2/4	20@150	71.5	0.7						
2N1015D	200	>10@2/4	1.5@2/.3	2@2/4	20@200	71.5	0.7						
2N1015E	250	>10@2/4	1.5@2/.3	2@2/4	20@250	71.5	0.7						
2N1016	30	>10@5/4	2.5@5/.75	2@5/4	20@30	71.5	0.7						
2N1016A	60	>10@5/4	2.5@5/.75	2@5/4	20@60	71.5	0.7						
2N1016B	100	>10@5/4	2.5@5/.75	2@5/4	20@100	71.5	0.7						
2N1016C	150	>10@5/4	2.5@5/.75	2@5/4	20@150	71.5	0.7						
2N1016D	200	>10@5/4	2.5@5/.75	2@5/4	20@200	71.5	0.7						
2N1016E	250	>10@5/4	2.5@5/.75	2@5/4	20@250	71.5	0.7						
Typical Values	**175**	**10-100@5/4**	**1.5@5/.75**	**1.8@5/4**	**5@175**	**71.5**	**0.7**	**3@50**	**0.8**	**.6@5/1**	**13@5/1**		
2N2226	50	100-500@9/6	3.5@9/.15	4@9/6	20@50	100	0.5					**2N2226 Family.** 2 - 170 x 170 Mil Chips in Darlington Configuration. Single Diffused Process. Clip Leads. Case 540	High Gain, High Power Amplifier and Switch. Military Usage.
2N2227	100	100-500@9/6	3.5@9/.15	4@9/6	20@100	100	0.5						
2N2228	150	100-500@9/6	3.5@9/.15	4@9/6	20@150	100	0.5						
2N2229	200	100-500@9/6	3.5@9/.15	4@9/6	20@200	100	0.5						
2N2230	50	>350@8/6	3.5@9/.15	4@9/6	20@50	100	0.5						
2N2231	100	>350@8/6	3.5@9/.15	4@9/6	20@100	100	0.5						
2N2232	150	>350@8/6	3.5@9/.15	4@9/6	20@150	100	0.5						
2N2233	200	>350@8/6	3.5@9/.15	4@9/6	20@200	100	0.5						
Typical Values	**100**	**100-2000@9/6**	**3@9/.15**	**3.5@9/6**	**5@100**	**100**	**0.5**	**3@40**	**0.8**				



NPN TO-63

$I_{C(MAX)} = 10$ to 30A $V_{CEO(SUS)} = 60$ to 350V $f_T = 0.6$ to 30 MHz

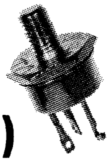
Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N2815	80	10-50@10/3	1.5@10/1.5	2.5[3]@10/1.5	2@80	100	1.0		0.6	3.5@10/1.5	12@10/1.5	**2N2815 Family.** 325 x 325 Mil Chip. Single Diffused Process. Clip Leads. Case 530	Hign Current, High Power Switch and Amplifier. Military Usage.
2N2816	100	10-50@10/3	1.5@10/1.5	2.5[3]@10/1.5	2@100	100	1.0		0.6	3.5@10/1.5	12@10/1.5		
2N2817	150	10-50@10/3	1.5@10/1.5	2.5[3]@10/1.5	2@150	100	1.0		0.6	3.5@10/1.5	12@10/1.5		
2N2818	200	10-50@10/3	1.5@10/1.5	2.5[3]@10/1.5	2@200	100	1.0		0.6	3.5@10/1.5	12@10/1.5		
2N2819	80	10-50@15/3	1.5@15/2.2	2.5[3]@15/2.2	2@80	100	1.0		0.6	3.5@15/2.2	12@15/2.2		
2N2820	100	10-50@15/3	1.5@15/2.2	2.5[3]@15/2.2	2@100	100	1.0		0.6	3.5@15/2.2	12@15/2.2		
2N2821	150	10-50@15/3	1.5@15/2.2	2.5[3]@15/2.2	2@150	100	1.0		0.6	3.5@15/2.2	12@15/2.2		
2N2822	200	10-50@15/3	1.5@15/2.2	2.5[3]@15/2.2	2@200	100	1.0		0.6	3.5@15/2.2	12@15/2.2		
2N2823	80	10-40@20/2	1.1@20/3	2.1[3]@20/3	2@80	100	1.0		0.6	3.5@20/3	12@20/3		
2N2824	100	10-40@20/2	1.1@20/3	2.1[3]@20/3	2@100	100	1.0		0.6	3.5@20/3	12@20/3		
2N2825	150	10-40@20/2	1.1@20/3	2.1[3]@20/3	2@150	100	1.0		0.6	3.5@20/3	12@20/3		
Typical Values	**125**	**10-100@15/3**	**1.2@15/2.2**	**1.9[3]@15/2.2**	**1@125**	**100**	**1.0**	**3@50**	**0.6**	**3@15/2.2**	**10@15/2.2**		
STA3265	90	25-55@15/2	1@20/2	1.8[3]@20/2	20@150	100	1.0	.35@75	20	.5@15/1.2	2@15/1.2	**STA3265 Family.** 200 x 200 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 531	High Current, High Speed Power Switch and Amplifier. Military Usage.
STA3266	60	20-80@15/3	1.6@20/2	2.2[3]@20/2	20@120	100	1.0	.70@50	20	.5@15/1.2	2@15/1.2		
STA8860	140	20-200@12/3	1.5@12/1.2	1.8[3]@12/1.2	5@140	100	1.0		30	.5@12/1.2	1@12/1.2		
Typical Values	**120**	**20-200@12/5**	**.8@12/1.2**	**1.5[3]@12/1.2**	**1@120**	**100**	**1.0**	**.7@50**	**30**	**.4@12/1.2**	**1@12/1.2**		

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

silicon power transistors



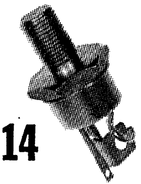
NPN TO-63 (cont'd)

$I_{C(MAX)}$ = 10 to 30A $V_{CEO(SUS)}$ = 60 to 350V f_T = 0.6 to 30 MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
STA6046	60	20-100@20/4	2@20/1.33	2[3]@20/1.33	5@70	114	.875	5.2@22	30	.6@20/1.33	.9@20/1.33	**STA6046 Family.** 250 x 250 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 531	High Current, High Speed Power Switch and Amplifier. Military Usage.
STA6047	100	20-100@20/4	2@20/1.33	2[3]@20/1.33	5@110	114	.875	5.2@22	30	.6@20/1.33	.9@20/1.33		
STA6048	140	20-100@20/4	2@20/1.33	2[3]@20/1.33	5@150	114	.875	5.2@22	30	.6@20/1.33	.9@20/1.33		
Typical Values	**110**	**20-200@20/4**	**1@20/1.33**	**1.8[3]@20/1.33**	**1@110**	**114**	**.875**	**5.2@22**	**30**	**.5@20/1.33**	**.9@20/1.33**		
STA9860	225	10-200@10/4	2@10/1	2.5@10/4	5@225	100	1.0	5@20	20	.6@10/1	3@10/1	**STA9860 Family.** 200 x 200 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 531	High Voltage, High Speed Power Switch and Amplifier. Military Usage.
STA9861	300	10-200@8/4	2@8/.8	2.5@8/4	1.0@300	100	1.0	5@20	20	.6@8/.8	3@8/.8		
STA9862	350	10-200@5/4	2@5/.5	2.5@5/4	1.0@350	100	1.0	5@20	20	.5@5/.5	3@5/.5		
STA9863	225	10-200@5/4	2@5/.5	2.5@5/4	5@225	100	1.0	5@20	20	.5@5/.5	3@5/.5		
STA9864	300	10-200@5/4	2@5/.5	2.5@5/4	1.0@300	100	1.0	5@20	20	.5@5/.5	3@5/.5		
Typical Values	**275**	**10-200@5/4**	**1@5/.5**	**1.8@5/4**	**1@275**	**100**	**1.0**	**5@20**	**20**	**.5@5/.5**	**2.5@5/.5**		
STA9870	225	10-200@20/4	2@20/2	2.5@20/4	5@225	114	.875	2.5@22	20	.6@20/2	3@20/2	**STA9870 Family.** 250 x 250 Mil Chip. Double Epitaxial Process. Ultrasonicly Bonded Leads. Case 531	High Voltage, High Current, High Speed Power Switch and Amplifier. Military Usage.
STA9871	300	10-200@15/4	2@15/1.5	2.5@15/4	1.0@300	114	.875	5.2@22	20	.6@15/1.5	3@15/1.5		
STA9872	350	10-200@12/4	2@12/1.2	2.5@12/4	1.0@350	114	.875	5.2@22	20.	.5@12/1.2	3@12/1.2		
Typical Values	**250**	**10-200@12/4**	**1@12/1.2**	**1.8[3]@12/1.2**	**1@250**	**114**	**.875**	**5.2@22**	**20.**	**.5@12/1.2**	**2.5@12/1.2**		

NOTE: This product is developmental.

NOTES:
[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)



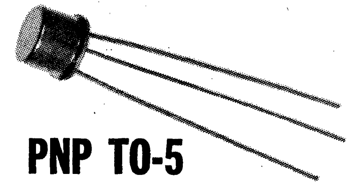
NPN TO-114

$I_{C(MAX)}$ = 70A $V_{CEO(SUS)}$ = 80 to 150V f_T = 0.1 MHz

Type #	$V_{CEO(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$I_{S/b}$ @ V_{CE} t = 1sec (A @ V)	f_T (MHz)	t_{ON} @ I_C/I_B (μs @ A/A)	t_{OFF} @ I_C/I_B (μs @ A/A)	Generic Product	General Information
2N3149	80	>10@50/3	1.5@50/10	2.5[3]@50/10	2@80	200	0.5		0.1	10@50/10	20@50/10	**2N3149 Family.** 476 Mil Diameter Chip. Single Diffused Process Clip Leads. Case 600	High Current, High Power Amplifier and Switch. Military Usage.
2N3150	100	>10@50/3	1.5@50/10	2.5[3]@50/10	2@100	200	0.5		0.1	10@50/10	20@50/10		
2N3151	150	>10@50/3	1.5@50/10	2.5[3]@50/10	2@150	200	0.5		0.1	10@50/10	20@50/10		
Typical Values	**110**	**8-60@50/3**	**1.2@50/10**	**2[3]@50/10**	**1@110**	**200**	**0.5**	**4@50**	**0.5**	**9@50/10**	**17@50/10**		

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

germanium power transistors



PNP TO-5

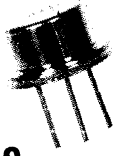
$I_{C(MAX)}$ = 3A $V_{CEO(SUS)}$ = 30 to 60V

Type #	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	f_T (KHz)	Generic Product	General Information
2N1038	30	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@40	20	3.75	100	225	**2N1038 Family.** 3 Amp PNP Germanium Alloy Power Transistors. Case 102	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1039	40	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@60	20	3.75	100	225		
2N1040	50	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@80	20	3.75	100	225		
2N1041	60	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@100	20	3.75	100	225		
2N2564	30	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@40	20	3.75	100	250		
2N2565	40	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@60	20	3.75	100	250		
2N2566	50	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@80	20	3.75	100	250		
2N2567	60	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@100	20	3.75	100	250		
2N2659	30	20	30-90@.5/.5	.2@.5/.05	.6@.5/.5	.6@50	15	5.0	100	280		
2N2660	40	20	30-90@.5/.5	.2@.5/.05	.6@.5/.5	.6@70	15	5.0	100	280		
2N2661	50	20	30-90@.5/.5	.2@.5/.05	.6@.5/.5	.6@90	15	5.0	100	280		
2N2665	30	20	50-150@.5/.5	.25@.5/.025	.6@.5/.5	.6@50	15	5.0	100	300		
2N2666	40	20	50-150@.5/.5	.25@.5/.025	.6@.5/.5	.6@70	15	5.0	100	300		
2N2667	50	20	50-150@.5/.5	.25@.5/.025	.6@.5/.5	.6@90	15	5.0	100	300		

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

germanium power transistors



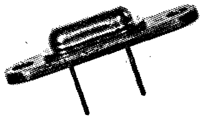
PNP TO-8

$I_{C(MAX)}$ = 3A $V_{CEO(SUS)}$ = 30 to 100V

Type #	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	f_T (KHz)	Generic Product	General Information
2N1183	20	20	20-60@.4/2	.3@.4/.04	1.5@.4/2	.25[2]@45	7.5	10	100	350	**2N1183 Family.**	General Purpose Power
2N1183A	30	20	20-60@.4/2	.5@.4/.04	1.5@.4/2	.25[2]@60	7.5	10	100	500	3 Amp PNP Germanium	Switch and Amplifier.
2N1183B	40	20	20-60@.4/2	.5@.4/.04	1.5@.4/2	.25[2]@80	7.5	10	100	500	Alloy Power	Consumer, Industrial,
2N1184	20	20	40-120@.4/2	.3@.4/.04	1.5@.4/2	.25[2]@45	7.5	10	100	350	Transistors.	and Military Usage.
2N1184A	30	20	40-120@.4/2	.5@.4/.04	1.5@.4/2	.25[2]@60	7.5	10	100	500	Case 101	
2N1184B	40	20	40-120@.4/2	.5@.4/.04	1.5@.4/2	.25[2]@80	7.5	10	100	500		

NOTES:

[2] I_{CBO} @ V_{CB} (mA @ V)



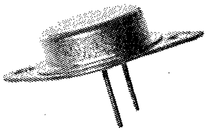
PNP MS7 (spacesaver)

$I_{C(MAX)}$ = 3A $V_{CEO(SUS)}$ = 25 to 65V

Type #	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	Generic Product	General Information
2N1755	25	30	30-75@.5/2	.7@3/.3	1[3]@3/.3	3[2]@40	28	2.5	95	**2N1755 Family.**	General Purpose Power
2N1756	40	30	30-75@.5/2	.7@3/.3	1[3]@3/.3	3[2]@60	28	2.5	95	3 Amp PNP Germanium	Switch and Amplifier.
2N1757	55	30	30-75@.5/2	.7@3/.3	1[3]@3/.3	3[2]@80	28	2.5	95	Alloy Power	Consumer, Industrial,
2N1758	65	30	30-75@.5/2	.7@3/.3	1[3]@3/.3	3[2]@100	28	2.5	95	Transistors.	and Military Usage.
2N1759	25	30	60-150@.5/2	.5@3/.3	.8[3]@3/.3	3[2]@40	28	2.5	95	Case 630	
2N1760	40	30	60-150@.5/2	.5@3/.3	.8[3]@3/.3	3[2]@60	28	2.5	95		
2N1761	55	30	60-150@.5/2	.5@3/.3	.8[3]@3/.3	3[2]@80	28	2.5	95		
2N1762	65	30	60-150@.5/2	.5@3/.3	.8[3]@3/.3	3[2]@100	28	2.5	95		
2N2067	25	20	20-100@.5/14	.7@1/.1	.7@.5/14	3[2]@40	28	2.5	95		
2N2068	55	40	20-100@.5/14	.7@1/.1	.7@.5/14	3[2]@80	28	2.5	95		

[2] I_{CBO} @ V_{CB} (mA @ V)

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)



PNP TO-3

$I_{C(MAX)}$ = 3 to 25A $V_{CEO(SUS)}$ = 20 to 100V

Type #	NPN Complement	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ T_C = 25°C (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	f_T (KHz)	Generic Product	General Information
2N176		30(V_{CER})	10	>25@.5/2	.4@3/.3		3[2]@30	90	0.8	100		**2N301 Family.**	General Purpose Power
2N297A		40	40	40-100@.5/2	1@2/.2	1.5@2/2	3[2]@60	85	1.0	110		3 Amp PNP Germanium	Switch and Amplifier.
2N301		50	10	50-165@1/2	.75@5/.5	.5@1/2	.5[2]@30	50	1.5	100	200	Alloy Power	Consumer, Industrial,
2N301A		50	10	50-165@1/2	.5@5/.5	.5@1/2	.5[2]@30	50	1.5	100	200	Transistors.	and Military Usage.
2N1291	2N1292	30(V_{CES})	15	>40@.5/2	1@1/.1	.9@.5/2	1.5[2]@35	20	3.0	85		Case 280	
2N1293	2N1294	60(V_{CES})	15	>40@.5/2	1@1/.1	1.1@.5/2	1.5[2]@60	20	3.0	85			
2N1295	2N1296	80(V_{CES})	15	>40@.5/2	1@1/.1	1.2@.5/2	1.5[2]@80	20	3.0	85			
2N1297	2N1298	100(V_{CES})	15	>40@.5/2	1@1/.1	1.2@.5/2	1.5[2]@100	20	3.0	85			
2N2137[5]		20	15	30-60@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@30	62.5	1.2	100			
2N2138[5]		30	25	30-60@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@45	62.5	1.2	100			
2N2139[5]		45	30	30-60@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@60	62.5	1.2	100			
2N2140[5]		60	40	30-60@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@75	62.5	1.2	100			
2N2141[5]		65	45	30-60@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@90	62.5	1.2	100			
2N2142[5]		20	15	50-100@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@30	62.5	1.2	100			
2N2143[5]		30	25	50-100@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@45	62.5	1.2	100			
2N2144[5]		45	30	50-100@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@60	62.5	1.2	100			
2N2145[5]		60	40	50-100@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@75	62.5	1.2	100			
2N2146[5]		65	45	50-100@.5/2	.5@2/.2	1.2[3]@2/.2	2[2]@90	62.5	1.2	100			
2N665		40	40	40-80@.5/2	.9@3/.2	1.5@2/2	10[2]@80		2.0	95		**2N1529 Family.**	General Purpose Power
2N1529[5]		20	20	20-40@3/2	1.5@3/.3	1.7[3]@3/.3	20[2]@40		0.8	100		5 Amp PNP Germanium	Switch and Amplifier.
2N1530[5]		30	30	20-40@3/2	1.5@3/.3	1.7[3]@3/.3	20[2]@60		0.8	100		Alloy Power	Consumer, Industrial,
2N1531[5]		40	40	20-40@3/2	1.5@3/.3	1.7[3]@3/.3	20[2]@80		0.8	100		Transistors.	and Military Usage.
2N1532[5]		50	50	20-40@3/2	1.5@3/.3	1.7[3]@3/.3	20[2]@100		0.8	100		Case 280	
2N1533[5]		60	60	20-40@3/2	1.5@3/.3	1.7[3]@3/.3	20[2]@120		0.8	100			
2N1534[5]		20	20	35-70@3/2	1.2@3/.3	1.5[3]@3/.3	20[2]@40		0.8	100			
2N1535[5]		30	30	35-70@3/2	1.2@3/.3	1.5[3]@3/.3	20[2]@60		0.8	100			
2N1536[5]		40	40	35-70@3/2	1.2@3/.3	1.5[3]@3/.3	20[2]@80		0.8	100			
2N1537[5]		50	50	35-70@3/2	1.2@3/.3	1.5[3]@3/.3	20[2]@100		0.8	100			
2N1538[5]		60	60	35-70@3/2	1.2@3/.3	1.5[3]@3/.3	20[2]@120		0.8	100			
2N1539[5]		20	20	50-100/3/2	.3@3/.3	.7[3]@3/.3	20[2]@40		0.8	100			
2N1540[5]		30	30	50-100/3/2	.3@3/.3	.7[3]@3/.3	20[2]@60		0.8	100			
2N1541[5]		40	40	50-100/3/2	.3@3/.3	.7[3]@3/.3	20[2]@80		0.8	100			
2N1542[5]		50	50	50-100/3/2	.3@3/.3	.7[3]@3/.3	20[2]@100		0.8	100			
2N1543[5]		60	60	50-100/3/2	.3@3/.3	.7[3]@3/.3	20[2]@120		0.8	100			
2N1544[5]		20	20	75-150/3/2	.5@3/.3	.5[3]@3/.3	20[2]@40		0.8	100			
2N1545[5]		30	30	75-150/3/2	.5@3/.3	.5[3]@3/.3	20[2]@60		0.8	100			
2N1546[5]		40	40	75-150/3/2	.5@3/.3	.5[3]@3/.3	20[2]@80		0.8	100			
2N1547[5]		50	50	75-150/3/2	.5@3/.3	.5[3]@3/.3	20[2]@100		0.8	100			
2N1548[5]		60	60	75-150/3/2	.5@3/.3	.5[3]@3/.3	20[2]@120		0.8	100			

[2] I_{CBO} @ V_{CB} (mA @ V)

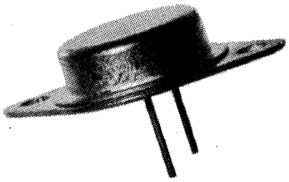
[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

[5] The "A-Version" (e.g. 2N1529A) is also readily available. It's a high-reliability version of the "non-A Version."

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

germanium power transistors



PNP TO-3 (cont'd)

$I_{C(MAX)} = 3$ to 25A $V_{CEO(SUS)} = 20$ to 100V

Type #	NPN Complement	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	f_T (KHz)	Generic Product	General Information
2N456A		20	20	30-90@5/1.5	.5@5/.5	1.5@5/1.5	2[2]@40	50	1.5	100	200	**2N456A Family.** 7 Amp PNP Germanium Alloy Power Transistors. Case 280	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N456B		30	30	30-90@5/1.5	.5@5/.5	1.5@5/1.5	2[2]@40	150	0.5	100	200		
2N457A		30	20	30-90@5/1.5	.5@5/.5	1.5@5/1.5	2[2]@60	50	1.5	100	200		
2N457B		40	30	30-90@5/1.5	.5@5/.5	1.5@5/1.5	2[2]@60	150	0.5	100	200		
2N458A		40	20	30-90@5/1.5	.5@5/.5	1.5@5/1.5	2[2]@80	50	1.5	100	200		
2N458B		45	30	30-90@5/1.5	.5@5/.5	1.5@5/1.5	2[2]@80	150	0.5	100	200		
2N1021A		50	30	30-90@5/1.5	.5@5/.5	1.5@5/1.5	2[2]@100	150	0.5	100	200		
2N1022A		55	30	30-90@5/1.5	.5@5/.5	1.5@5/1.5	2[2]@120	150	0.5	100	200		
2N627		30(V_{CES})	20	10-30@10/2	1@10/1		20[2]@40	94	0.8	100		**2N627 Family.** 10 Amp PNP Germanium Alloy Power Transistors. Case 280	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N628		45(V_{CES})	30	10-30@10/2	1@10/1		20[2]@60	94	0.8	100			
2N629		60(V_{CES})	40	10-30@10/2	1@10/1		20[2]@80	94	0.8	100			
2N1549[5]		20	20	10-30@10/2	1@10/1	1.3[3]@10/1	20[2]@40	94	0.8	100		**2N1549 Family.** 15 Amp PNP Germanium Alloy Power Transistors. Case 280	High Current General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1550[5]		30	30	10-30@10/2	1@10/1	1.3[3]@10/1	20[2]@60	94	0.8	100			
2N1551[5]		40	40	10-30@10/2	1@10/1	1.3[3]@10/1	20[2]@80	94	0.8	100			
2N1552[5]		50	50	10-30@10/2	1@10/1	1.3[3]@10/1	20[2]@100	94	0.8	100			
2N1553[5]		20	20	30-60@10/2	.7@10/1	1[3]@10/1	20[2]@40	94	0.8	100			
2N1554[5]		30	30	30-60@10/2	.7@10/1	1[3]@10/1	20[2]@60	94	0.8	100			
2N1555[5]		40	40	30-60@10/2	.7@10/1	1[3]@10/1	20[2]@80	94	0.8	100			
2N1556[5]		50	50	30-60@10/2	.7@10/1	1[3]@10/1	20[2]@100	94	0.8	100			
2N1557[5]		20	20	50-100@10/2	.5@10/1	.7[3]@10/1	20[2]@40	94	0.8	100			
2N1558[5]		30	30	50-100@10/2	.5@10/1	.7[3]@10/1	20[2]@60	94	0.8	100			
2N1559[5]		40	40	50-100@10/2	.5@10/1	.7[3]@10/1	20[2]@80	94	0.8	100			
2N1560[5]		50	50	50-100@10/2	.5@10/1	.7[3]@10/1	20[2]@100	94	0.8	100			
2N1162		25	20	15-65@25/1	1@25/1.6	1.7[3]@25/1.6	15[2]@50	94	0.8	100		**2N1162 Family.** 25 Amp PNP Germanium Alloy Power Transistors. Case 280	High Current General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1162A		25	25	15-65@25/1	1@25/1.6	1.7[3]@25/1.6	15[2]@50	94	0.8	100			
2N1164		35	25	15-65@25/1	1@25/1.6	1.7[3]@25/1.6	15[2]@80	94	0.8	100			
2N1164A		40	40	15-65@25/1	1@25/1.6	1.7[3]@25/1.6	15[2]@80	94	0.8	100			
2N1166		45	30	15-65@25/1	1@25/1.6	1.7[3]@25/1.6	15[2]@100	94	0.8	100			
2N2266A		50	50	15-65@25/1	1@25/1.6	1.7[3]@25/1.6	15[2]@100	94	0.8	100			
2N2288		30	0.75	20-60@5/2	1@5/.5	1[3]@5/.5	5[2]@40	60	1.2	110	450	**2N2288 Family.** 10 Amp PNP Diffused-Alloy Power Transistors. Case 280	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N2289		50	0.75	20-60@5/2	1@5/.5	1[3]@5/.5	5[2]@80	60	1.2	110	450		
2N2290		70	0.75	20-60@5/2	1@5/.5	1[3]@5/.5	5[2]@120	60	1.2	110	450		
2N2291		30	1.5	50-120@5/2	1@5/.5	1[3]@5/.5	5[2]@40	60	1.2	110	450		
2N2292		50	1.5	50-120@5/2	1@5/.5	1[3]@5/.5	5[2]@80	60	1.2	110	450		
2N2293		70	1.5	50-120@5/2	1@5/.5	1[3]@5/.5	5[2]@120	60	1.2	110	450		
2N1751		60	2.5	30-90@20/1.5	.5@20/2.5		5[2]@80	100	0.8	110		**2N2285 Family.** 25 Amp PNP Diffused-Alloy Power Transistors. Case 280	High Current General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N2285		30	1.5	35-140@10/2	.65@25/2.5	1.5[3]@25/2.5	5[2]@60	100	0.8	110	600		
2N2286		60	1.5	35-140@10/2	.65@25/2.5	1.5[3]@25/2.5	5[2]@100	100	0.8	110	600		
2N2287		80	1.5	35-140@10/2	.65@25/2.5	1.5[3]@25/2.5	5[2]@120	100	0.8	110	600		
2N5155		120	1.5	25-100@8/2	.9@25/2.5	1.4[3]@25/2.5	10@140	60	1.42	110	100		

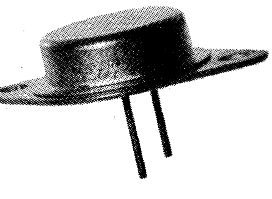
NOTE: This product is developmental.

NOTES:

[2] I_{CBO} @ V_{CB} (mA @ V)

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

[5] The "A-Version" (e.g. 2N1529A) is also readily available. It's a high-reliability version of the "non-A Version."



NPN TO-3

$I_{C(MAX)} = 3A$ $V_{CEO(SUS)} = 20$ to 80V

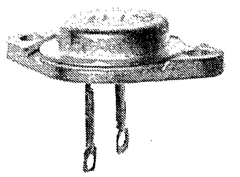
Type #	PNP Complement	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	Generic Product	General Information
2N1218		20	15	30-120@1/1.5	1@1/.05	.5-1.5@1/1.5	1@30	20	3.75	100	**2N1292 Family.** 3 Amp NPN Germanium Alloy Power Transistors. Case 280	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1292	2N1291	30(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	1[2]@35	25	3.0	100		
2N1294	2N1293	45(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	2[2]@60	25	3.0	100		
2N1296	2N1295	60(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	3[2]@80	25	3.0	100		
2N1298	2N1297	80(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	4[2]@100	25	3.0	100		

[2] I_{CBO} @ V_{CB} (mA @ V)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

germanium power transistors



PNP TO-41

$I_{C(MAX)}$ = 10 to 50A $V_{CEO(SUS)}$ = 20 to 100V

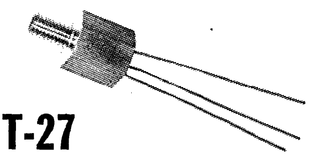
Type #	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	f_T (KHz)	Generic Product	General Information
2N1163	25	20	15-65@25/1	1@25/1.6	1.7^3@25/1.6	15^2@50	94	0.8	100		**2N1163 Family.** 25 Amp PNP Germanium Alloy Power Transistors. Case 296	High Current General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1163A	25	25	15-65@25/1	1@25/1.6	1.7^3@25/1.6	15^2@50	94	0.8	100			
2N1165	35	25	15-65@25/1	1@25/1.6	1.7^3@25/1.6	15^2@80	94	0.8	100			
2N1165A	40	40	15-65@25/1	1@25/1.6	1.7^3@25/1.6	15^2@80	94	0.8	100			
2N1167	45	30	15-65@25/1	1@25/1.6	1.7^3@25/1.6	15^2@100	94	0.8	100			
2N1167A	50	50	15-65@25/1	1@25/1.6	1.7^3@25/1.6	15^2@100	94	0.8	100			
2N1430	100	1.5	30-90@5/2	.4@10/1	$.9^3$@10/1	5@120	70	1.2	110	600	**2N2212 Family.** 10 Amp PNP Germanium Diffused-Alloy Power Transistors. Case 296	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N2212	60	1.5	50-120@5/2	1@5/.5	1@5/2	2^2@100	70	1.2	110	900		
2N2294	30	1.5	50-120@5/2	1@5/.5	1^3@5/.5	15^2@40	70	1.2	110	450		
2N2295	50	1.5	50-120@5/2	1@5/.5	1^3@5/.5	15^2@80	70	1.2	110	450		
2N2296	70	1.5	50-120@5/2	1@5/.5	1^3@5/.5	15^2@120	70	1.2	110	450		
2N1651	30	1.5	35-140@10/2	.65@25/2.5	$.9^3$@25/2.5	5^2@40	100	0.8	110	600	**2N1651 Family.** 25 Amp PNP Germanium Diffused-Alloy Power Transistors. Case 296	High Current General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1652	60	1.5	35-140@10/2	.65@25/2.5	$.9^3$@25/2.5	5^2@80	100	0.8	110	600		
2N1653	80	1.5	35-140@10/2	.65@25/2.5	$.9^3$@25/2.5	5^2@100	100	0.8	110	600		
2N2636	60	1.5	20-80@25/2	.65@25/2.5	$.9^3$@25/2.5	10^2@100	100	0.8	110	600		
2N2637	60	1.5	20-80@25/2	.65@25/2.5	$.9^3$@25/2.5	10^2@100	100	0.8	110	600		
2N2638	60	1.5	20-80@25/2	.65@25/2.5	$.9^3$@25/2.5	10^2@100	100	0.8	110	600		
2N2691	80	1.5	30-100@20/1.5	.65@20/2	$.9^3$@20/2	5^2@100	100	0.8	110	600		
2N2691A	80	5.0	50-100@20/1.5	.65@20/2	$.9^3$@20/2	5^2@120	170	0.5	110	600		
2N2357	30	1.5	30-90@20/1.5	.9@50/5	1.5^3@50/5	50^2@60	170	0.5	110	600	**2N2357 Family.** 50 Amp PNP Germanium Diffused-Alloy Power Transistors. Case 296	High Current General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N2358	60	1.5	30-90@20/1.5	.9@50/5	1.5^3@50/5	50^2@100	170	0.5	110	600		
2N2359	80	1.5	30-90@20/1.5	.9@50/5	1.5^3@50/5	50^2@120	170	0.5	110	600		

NOTE: This product is developmental.

NOTES:

[2] I_{CBO} @ V_{CB} (mA @ V)

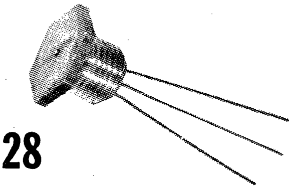
[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)



PNP MT-27

$I_{C(MAX)}$ = 3A $V_{CEO(SUS)}$ = 30 to 60V

Type #	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	f_T (KHz)	Generic Product	General Information
2N2552	30	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@40	20	3.75	100	225	**2N2552 Family.** 3 Amp PNP Germanium Alloy Power Transistors. Case 240	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N2553	40	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@60	20	3.75	100	225		
2N2554	50	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@80	20	3.75	100	225		
2N2555	60	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@100	20	3.75	100	225		
2N2560	30	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@40	20	3.75	100	250		
2N2561	40	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@60	20	3.75	100	250		
2N2562	50	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@80	20	3.75	100	250		
2N2563	60	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@100	20	3.75	100	250		
2N2662	30	20	30-90@.5/.5	.2@.5/.05	.6@.5/.5	.6@50	15	5.0	100	280		
2N2663	40	20	30-90@.5/.5	.2@.5/.05	.6@.5/.5	.6@70	15	5.0	100	280		
2N2664	50	20	30-90@.5/.5	.2@.5/.05	.6@.5/.5	.6@90	15	5.0	100	280		
2N2668	30	20	50-150@.5/.5	.25@.5/.025	.6@.5/.5	.6@50	15	5.0	100	300		
2N2669	40	20	50-150@.5/.5	.25@.5/.025	.6@.5/.5	.6@70	15	5.0	100	300		
2N2670	50	20	50-150@.5/.5	.25@.5/.025	.6@.5/.5	.6@90	15	5.0	100	300		



PNP MT-28

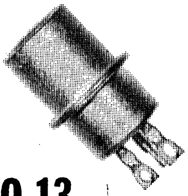
$I_{C(MAX)}$ = 3A $V_{CEO(SUS)}$ = 30 to 60V

Type #	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	f_T (KHz)	General Information	Generic Product
2N1042	30	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@40	20	3.75	100	250	**2N1042 Family.** 3 Amp PNP Germanium Alloy Power Transistors. Case 250	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1043	40	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@60	20	3.75	100	250		
2N1044	50	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@80	20	3.75	100	250		
2N1045	60	20	20-60@3/1	.75@3/.3	1.5@3/1	.65@100	20	3.75	100	250		
2N2556	30	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@40	20	3.75	100	225		
2N2557	40	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@60	20	3.75	100	225		
2N2558	50	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@80	20	3.75	100	225		
2N2559	60	20	20-60@1/.5	.25@1/.1	1@1/.5	.65@100	20	3.75	100	225		

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

germanium power transistors



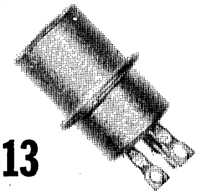
PNP TO-13

$I_{C(MAX)} = 3A$ $V_{CEO(SUS)} = 30$ to 100V

Type #	NPN Comple-ment	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	Generic Product	General Information
2N1078	2N1330	60(V_{CES})	15	>40@.5/2	1@1/.1	1.1@.5/2	1.5[2]@60	20	3.0	85	**2N1078 Family.** 3 Amp PNP Germanium Alloy Power Transistors. Case 610	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1328	2N1329	30(V_{CES})	15	>40@.5/2	1@1/.1	.9@.5/2	1.5[2]@35	20	3.0	85		
2N1331	2N1332	80(V_{CES})	15	>40@.5/2	1@1/.1	1.2@.5/2	1.5[2]@80	20	3.0	85		
2N1333	2N1334	100(V_{CES})	15	>40@.5/2	1@1/.1	1.2@.5/2	1.5[2]@100	20	3.0	85		

NOTES:

[2] I_{CBO} @ V_{CB} (mA @ V)

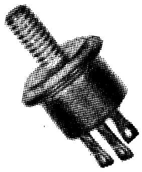


NPN TO-13

$I_{C(MAX)} = 3A$ $V_{CEO(SUS)} = 30$ to 80V

Type #	PNP Comple-ment	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	Generic Product	General Information
2N1329	2N1328	30(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	1[2]@35	25	3.0	100	**2N1329 Family.** 3 Amp NPN Germanium Alloy Power Transistors. Case 610	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1330	2N1078	45(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	2[2]@60	25	3.0	100		
2N1332	2N1331	60(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	3[2]@80	25	3.0	100		
2N1334	2N1333	80(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	4[2]@100	25	3.0	100		

[2] I_{CBO} @ V_{CB} (mA @ V)

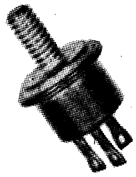


PNP TO-10

$I_{C(MAX)} = 3A$ $V_{CEO(SUS)} = 30$ to 100V

Type #	NPN Comple-ment	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	f_T (KHz)	Generic Product	General Information
2N538		60	28	20-50@2/2	.6@2/.2	1.3-3.3@2/2	2[2]@80	34	2.2	100	200	**2N1320 Family.** 3 Amp PNP Germanium Alloy Power Transistors. Case 630	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N538A		60	28	20-50@2/2	.6@2/.2	1.3-3.3@2/2	2[2]@80	34	2.2	100	200		
2N539		55	28	30-75@2/2	.6@2/.2	1.0-2.5@2/2	2[2]@80	34	2.2	100	200		
2N539A		55	28	30-75@2/2	.6@2/.2	1.0-2.5@2/2	2[2]@80	34	2.2	100	200		
2N540		55	28	45-113@2/2	.6@2/.2	.75-1.88@2/2	2[2]@80	34	2.2	100	200		
2N540A		55	28	45-113@2/2	.6@2/.2	.75-1.88@2/2	2[2]@80	34	2.2	100	200		
2N1320	2N1321	30(V_{CES})	15	>40@.5/2	1@1/.1	.9@.5/2	1.5[2]@35	20	3.0	85			
2N1322	2N1323	60(V_{CES})	15	>40@.5/2	1@1/.1	1.1@.5/2	1.5[2]@60	20	3.0	85			
2N1324	2N1325	80(V_{CES})	15	>40@.5/2	1@1/.1	1.2@.5/2	1.5[2]@80	20	3.0	85			
2N1326	2N1327	100(V_{CES})	15	>40@.5/2	1@1/.1	1.2@.5/2	1.5[2]@100	20	3.0	85			

[2] I_{CBO} @ V_{CB} (mA @ V)



NPN TO-10

$I_{C(MAX)} = 3A$ $V_{CEO(SUS)} = 30$ to 80V

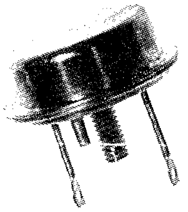
Type #	NPN Comple-ment	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	Generic Product	General Information
2N1321	2N1320	30(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	1[2]@35	25	3.0	100	**2N1321 Family.** 3 Amp NPN Germanium Alloy Power Transistors. Case 630	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N1323	2N1322	45(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	1[2]@60	25	3.0	100		
2N1325	2N1324	60(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	1[2]@80	25	3.0	100		
2N1327	2N1326	80(V_{CES})	15	>30@.5/2	1@1/.135	1@.5/2	1[2]@100	25	3.0	100		

[2] I_{CBO} @ V_{CB} (mA @ V)

SILICON TRANSISTOR CORPORATION

EAST GATE BLVD., GARDEN CITY, N.Y. 11530 • (516) 742-4100

germanium power transistors



PNP TO-36

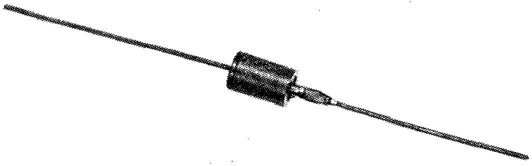
$I_{C(MAX)}$ = 5 to 30A $V_{CEO(SUS)}$ = 20 to 65V

Type #	$V_{CEO(SUS)}$ (Volts)	V_{EBO} (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE(SAT)}$ @ I_C/I_B (V @ A/A)	V_{BE} @ I_C/V_{CE} (V @ A/V)	I_{CEV} @ V_{CE} (mA @ V)	P_D @ $T_C = 25°C$ (Watts)	θ_{JC} (°C/W)	$T_{J(MAX)}$ (°C)	Generic Product	General Information
2N3311	20	20	60-120@3/2	.1@3/.3	.6@3/2	5^2@30	170	0.5	110	**2N3311 Family.** 5 Amp PNP Germanium Alloy Power Transistors. Case 510	General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N3312	30	25	60-120@3/2	.1@3/.3	.6@3/2	5^2@45	170	0.5	110		
2N3313	40	30	60-120@3/2	.1@3/.3	.6@3/2	5^2@60	170	0.5	110		
2N3314	20	20	100-200@3/2	.1@3/.3	.5@3/2	5^2@30	170	0.5	110		
2N3315	30	25	100-200@3/2	.1@3/.2	.5@3/2	5^2@45	170	0.5	110		
2N3316	40	30	100-200@3/2	.1@3/.3	.5@3/2	5^2@60	170	0.5	110		
2N2075	65	40	20-40@5/2	.7@12/2	.9@5/2	4^2@80	170	0.5	110	**2N2075 Family.** 15 Amp PNP Germanium Alloy Power Transistors. Case 510	High Current General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N2076	55	35	20-40@5/2	.7@12/2	.9@5/2	4^2@70	170	0.5	110		
2N2077	45	25	20-40@5/2	.9@12/2	.9@5/2	4^2@50	170	0.5	110		
2N2078	25	20	20-40@5/2	.9@12/2	.9@5/2	4^2@40	170	0.5	110		
2N2079	65	40	35-70@5/2	.7@12/2	.9@5/2	4^2@80	170	0.5	110		
2N2080	55	35	35-70@5/2	.7@12/2	.9@5/2	4^2@70	170	0.5	110		
2N2081	45	25	35-70@5/2	.9@12/2	.9@5/2	4^2@50	170	0.5	110		
2N2082	25	20	35-70@5/2	.9@12/2	.9@5/2	4^2@40	170	0.5	110		
2N2152	30	25	50-100@5/2	.3@25/2	1^3@5/.5	4^2@45	170	0.5	110	**2N2152 Family.** 30 Amp PNP Germanium Alloy Power Transistors. Case 510	High Current General Purpose Power Switch and Amplifier. Consumer, Industrial, and Military Usage.
2N2153	45	30	50-100@5/2	.3@25/2	1^3@5/.5	4^2@60	170	0.5	110		
2N2154	60	40	50-100@5/2	.3@25/2	1^3@5/.5	4^2@75	170	0.5	110		
2N2156	30	25	80-160@5/2	.3@25/2	1^3@5/.5	4^2@45	170	0.5	110		
2N2157	45	30	80-160@5/2	.3@25/2	1^3@5/.5	4^2@60	170	0.5	110		
2N2158	60	40	80-160@5/2	.3@25/2	1^3@5/.5	4^2@75	170	0.5	110		

NOTES:

[3] $V_{BE(SAT)}$ @ I_C/I_B (V @ A/A)

voltage transient suppressor diodes



DO-13

I_{PP} = 5.7 to 32 Amps V_R = 30.5 to 175 Volts P_P = 1500 Watts

Type #	V_R Stand-off Voltage (Volts)	BV_R Reverse Breakdown Voltage (Volts)	V_C Clamping Voltage (Volts)	V_F @ I_F Forward Voltage Drop (V @ A)	T.C. Temperature Coefficient (%/°C)	I_{PP} Peak Reverse Current 1.0 msec @ 25°C (Amps)	$I_{FM(SURGE)}$ One-Cycle Surge Current ½ Sine Wave 60 Hz, 25°C (Amps)	P_M D.C. Power Dissipation @ 25°C (Watts)	P_P Peak Pwr. Dissipation 1.0 msec @ 25°C (Watts)	Generic Product	General Information
1N5555	>30.5	>33.0	<47.5	3.5@100	.093	32	200	1.0	1500	**1N5555 Family.**	Voltage Transient Suppressor Diode. Industrial and Military Usage.
1N5556	>40.3	>43.7	<63.5	3.5@100	.094	24	200	1.0	1500		
1N5557	>49.0	>54.0	<78.5	3.5@100	.096	19	200	1.0	1500		
1N5558	>175.0	>191.0	<265.0	3.5@100	.100	5.7	200	1.0	1500		

Solid State Devices, Incorporated

12741 Los Nietos Rd., Santa Fe Springs, Calif. 90607 • Tel: (213) 698-0529 • TWX: (910) 586-1881

On the following pages Solid State Devices, Inc. presents a selection of popular, "off the shelf" semiconductor devices which will meet a wide variety of applications in military and commercial electronic equipment. All of the devices listed bear standard 1N and 2N designations from which you may order without getting "speced" in or out. Solid State Devices also manufactures and stocks many silicon semiconductor devices not listed here. Contact us with your requirements.

fast switching power rectifiers

(listed in order or trr).

Device Type No.	Recovery Time t_{rr} (nsec)	V_R (volts)	I_o @ T_A 55°C *TC 100°C †T_A 25°C (amps)	I_f (surge) @ 1/120 sec (amps)	Maximum Reverse Current at Rated V_R @		JEDEC Outline
					I_R TA 25°C (μA)	I_R T_A = 150°C *TC 100°C (μA)	
1N4942	150	200	1	10	1	200	DO15
1N4944	150	400	1	10	1	200	DO15
1N4946	150	600	1	10	1	200	DO15
1N5186	150	100	† 3	80	2	100	—
1N5187	200	200	† 3	80	2	100	—
1N3885	200	100	*12	150	25	*3000	DO10
1N3886	200	200	*12	150	25	*3000	DO10
1N3888	200	400	*12	150	25	*3000	DO10
1N3890	200	100	*12	150	25	*3000	DO4
1N3891	200	200	*12	150	25	*3000	DO4
1N3910	200	100	*30	300	80	*10000	DO5
1N3911	200	200	*30	300	80	*10000	DO5
1N3913	200	400	*30	300	80	*10000	DO5
1N4947	250	800	1	15	1	200	DO15
1N5188	250	400	† 3	80	2	100	—
1N5190	400	600	† 3	80	2	100	—
1N4948	500	1000	1	10	1	200	DO15

silicon power rectifiers

(listed in order of maximum DC output current)

Device Type No.	V_R (volts)	I_O @ T_C 150°C	I_f (surge) @ 1/120 sec (amps)	Max Reverse Current at Rated V_R @		JEDEC outlines
		†T_A 150°C T_A 100°C (amps)		†T_A 25°C T_C 25°C I_R	†T_A 150°C T_C 150°C *T_C 200°C **T_C 175°C ***T_A = 100°C I_R	
1N3611	200	†.3	20	†1 μA	†300 μA	—
1N3612	400	†.3	20	†1 μA	†300 μA	—
1N3613	600	†.3	20	†1 μA	†300 μA	—
1N3614	800	†.3	20	†1 μA	†300 μA	—
1N3957	1000	†.3	20	†1 μA	†300 μA	—
1N4245	200	†1	25	†1 μA	†150 μA	DO15
1N4246	400	†1	25	†1 μA	†150 μA	DO15
1N4247	600	†1	25	†1 μA	†150 μA	DO15
1N4248	800	†1	25	†1 μA	†150 μA	DO15
1N4249	1000	†1	25	†1 μA	†150 μA	DO15
1N5550	200	* 2	50	1 μA	***20 μA	—
1N5551	400	* 2	50	1 μA	***20 μA	—
1N5552	600	* 2	50	1 μA	***20 μA	—
1N5553	800	* 2	50	1 μA	***20 μA	—
1N5554	1000	* 2	50	1 μA	***20 μA	—
1N1202A	200	12	240	50 μA	1 mA	DO4
1N1204A	400	12	240	50 μA	1 mA	DO4
1N1206A	600	12	240	50 μA	1 mA	DO4
1N3671A	800	12	240	50 μA	1 mA	DO4
1N3673A	1000	12	240	50 μA	1 mA	DO4
1N1186	200	35	500	—	3 mA	DO5
1N1188	400	35	500	—	3 mA	DO5
1N1190	600	35	500	—	3 mA	DO5
1N3766	800	35	500	—	3 mA	DO5
1N3768	1000	35	500	—	3 mA	DO5
1N3289	200	75	1600	—	*30 mA	DO8
1N3291	400	75	1600	—	*30 mA	DO8
1N3293	600	75	1600	—	*20 mA	DO8
1N3294	800	75	1600	—	*15 mA	DO8
1N3295	1000	75	1600	—	*10 mA	DO8
1N3263	200	120	2000	20 mA	15 mA	DO9
1N3267	400	120	2000	20 mA	15 mA	DO9
1N3269	600	120	2000	20 mA	15 mA	DO9
1N3164	200	175	3000	—	**40 mA	DO9
1N3168	400	175	3000	—	**40 mA	DO9
1N3170	600	175	3000	—	**40 mA	DO9

Solid State Devices, Incorporated

12741 Los Nietos Rd., Santa Fe Springs, Calif. 90607 • Tel: (213) 698-0529 • TWX: (910) 586-1881

high voltage silicon cartridge rectifiers

types: 1N1730-34, 1N2382-85, 1N596-98, 1N1406-13.

		Absolute Maximum Ratings			Electrical Characteristics		
JEDEC Type Number	**Rate Peak Inverse Voltage(1)**	**RMS Input Voltage(2)**	**Rectified DC Output Current(2) 25°C**	**100°C**	**Maximum DC Forward Voltage Drop @ 100 mADC @ 25°C**	**Maximum DC Reverse Current @ Rated PIV (µA) @ 25°C**	**@ 100°C**
1N1730	1000	700	200	100	5	10	100
1N1731	1500	1050	200	100	5	10	100
1N1732	2000	1400	200	100	9	10	100
1N1733	3000	2100	150	75	12	10	100
1N1734	4000	2800	150	75	18	10	100
1N2382	5000	3500	100	50	18	10	100
1N2383	6000	4200	100	50	27	10	100
1N2384	8000	5000	70	35	27	10	100
1N2385	10000	7000	70	35	39	10	100
1N596	600	420	150	90	3	10	100
1N597	800	560	150	90	3	10	100
1N598	1000	700	150	90	3	10	100
1N1406	600	420	125	70	5	10	100
1N1407	800	560	125	70	5	10	100
1N1408	1000	700	125	70	5	10	100
1N1409	1200	840	125	70	5	10	100
1N1410	1500	1050	125	70	6.25	10	100
1N1411	1800	1260	125	70	7.50	10	100
1N1412	2000	1400	125	70	6.25	10	100
1N1413	2400	1680	125	70	7.50	10	100

Ambient Temperature Range: −55°C to 150°C. (1) Continuous DC rating same as P.I.V. (2) Resistive or inductive load.

hermetically sealed vacuum tube replacements

P/N	Replaces	Configuration	Pin Connections	PIV	Average DC Current @ 55°C
1N1150 1N2634	80, 82, 83, 83V, 5Z3	F.W.C.T.	Pin 4 (cathode) Pins 2 & 3 (anode)	1600	750 ma
1N1237 1N2633	0Z4, 5X4, 5Y4, 6AX5, 6X5, 6W5, 6ZY5, 5839, 5852	F.W.C.T.	Pin 8 (cathode) Pins 3 & 5 (anode)	1600	750 ma
1N1238 1N2631	5AV4, 5AW4, 5AZ4, 5T4, 5U4, 5V4, 5W4, 5Y4, 5Z4, 5931, 6087, 6106, 5AX4, 5AV4, 6004	F.W.C.T.	Pin 8 (cathode) Pins 4 & 6 (anode)	1600	750 ma
1N2389	5AU4, 5AW4, 5AZ4, 5T4, 5U4, 5Y4, 5WF, 5Y3, 5Z4	F.W.C.T.	Pin 8 (cathode) Pins 4 & 6 (anode)	1600	600 ma
1N1239 1N2632	5R4	F.W.C.T.	Pin 8 (cathode) Pins 4 & 6 (anode)	2800	500 ma
1N1262	6AV4, 6AX4, 6BL4, 25W4, 6U4, 6W4, 12AX4, 17AX4	H.W.	Pin 3 (cathode) Pin 5 (anode)	4500	250 ma
1N2490 1N2630 1N2635	6X4, 6032, 6202, 12X4	F.W.C.T.	Pin 7 (cathode) Pins 1 & 6 (anode)	1600	500 ma
1N2636	84, 6Z4	F.W.C.T.	Pin 4 (cathode) Pins 2 & 3 (anode)	1500	85 ma
1N2637	866, 866A, 3B28	H.W.	Pin 1 (cathode) Cap (anode)	10,400	750 ma

Solid State Devices, Incorporated

12741 Los Nietos Rd., Santa Fe Springs, Calif. 90607 • Tel: (213) 698-0529 • TWX: (910) 586-1881

Power Transistors

TYPE	Polarity	NPN/ PNP Comple-ment	$V_{CEO\ (SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE\ (S)}$ @I_C/I_B (V@A/A)	P_D @T_C=25°C (Watts)	$\Theta_{J\text{-}C}$ (°C/W)	Min. f_T (MHz)	t_{ON} @I_C/I_B (μs@A/A)	t_{OFF} @I_C/I_B (μs@A/A)	Package
2N1724	NPN		80	20-90 @ 2/15	1.0 @ 2/.2	88	2.0	10			TO - 61
2N1725	NPN		80	20-90 @ 15/2	1.0 @ 2/.2	88	2.0	10			TO - 61
2N2657	NPN		60	40-120 @ 1/2	.5 @ 1/.1	7.0	25	20	.5 @ 10/1	1.0 @ 10/1	TO - 5
2N2658	NPN		80	40-120 @ 1/2	.5 @ 1/.1	7.0	25	20	.5 @ 10/1	1.0 @ 10/1	TO - 5
2N2811	NPN		60	20-60 @ 5/5	1.5 @ 10/1	70	2.5	15			TO - 61
2N2812	NPN		60	40-120 @ 5/5	1.5 @ 10/1	70	2.5	15			TO - 61
2N2813	NPN		80	20-60 @ 5/5	1.5 @ 10/1	70	2.5	15			TO - 61
2N2814	NPN		80	40-120 @ 5/5	1.5 @ 10/1	70	2.5	15			TO - 61
2N2890	NPN		80	30-90 @ 1/2	.75 @ 2/.2	5.0	35	30	.3 @ 1/.05	1.5 @ 1/.05	TO - 5
2N2891	NPN		80	50-150 @ 1/2	.75 @ 2/.2	5.0	35	30	.3 @ 1/.05	1.5 @ 1/.05	TO - 5
2N2892	NPN		80	30-90 @ 1/2	.75 @ 2/.2	30	6.0	30	.3 @ 1/.05	1.5 @ 1/.05	TO - 59
2N2893	NPN		80	50-150 @ 1/2	.75 @ 2/.2	30	6.0	30	.3 @ 1/.05	1.5 @ 1/.05	TO - 59
2N3054	NPN		55	25-100 @ .5/4	1.0 @ .5/.05	25	7.0	1.0			TO - 66
2N3055	NPN	2N4908	60	20-70 @ 4/4	1.1 @ 4/0.4	117	1.5	0.8			TO - 3
2N3232	NPN		60	18-55 @ 3/10	2.5 @ 3/0.2	117	1.5	1.0			TO - 3
2N3233	NPN		100	18-55 @ 3/10	2.5 @ 3/0.2	117	1.5	1.0			TO - 3
2N3234	NPN		160	18-55 @ 3/10	2.5 @ 3/0.2	117	1.5	1.0			TO - 3
2N3441	NPN		140	20-80 @ .5/4	6 @ 2.7/.9	25	7.0	1.0			TO - 66
2N3442	NPN		140	20-70 @ 3/4	5.0 @ 10/2.0	117	1.5				TO - 3
2N3445	NPN		60	20-60 @ 3/5	1.5 @ 3/.3	115	1.5	10	.35 @ .5/.5	2.4 @ 5/.5	TO - 3
2N3446	NPN		80	20-60 @ 3/5	1.5 @ 3/.3	115	1.5	10	.35 @ .5/.5	2.4 @ 5/.5	TO - 3
2N3447	NPN		60	40-120 @ 5/5	1.5 @ 5/.5	115	1.5	10	.35 @ .5/.5	2.4 @ 5/.5	TO - 3
2N3448	NPN		80	40-120 @ 5/5	1.5 @ 5/.5	115	1.5	10	.35 @ .5/.5	2.4 @ 5/.5	TO - 3
2N3597	NPN		40	40-120 @ 10/2	1.5 @ 20/2	175	1.0	30	.7 @ 10/1	2.7 @ 10/1	TO - 63
2N3598	NPN		60	40-120 @ 10/2	1.5 @ 20/2	175	1.0	30	.7 @ 10/1	2.7 @ 10/1	TO - 63
2N3599	NPN		80	40-120 @ 10/2	1.5 @ 20/2	175	1.0	30	.7 @ 10/1	2.7 @ 10/1	TO - 63
2N3713	NPN	2N3789	60	25-90 @ 1/2	1.0 @ 5/0.5	150	1.17	2.5			TO - 3
2N3714	NPN	2N3790	80	25-90 @ 1/2	1.0 @ 5/0.5	150	1.17	2.5			TO - 3
2N3715	NPN	2N3791	60	50-150 @ 1/2	0.8 @ 5/0.5	150	1.17	2.5			TO - 3
2N3716	NPN	2N3792	80	50-150 @ 1/2	0.8 @ 5/0.5	150	1.17	2.5			TO - 3
2N3740	PNP		60	30-100 @ .25/1	0.6 @ 1/.125	25	7.0	4.0			TO - 66
2N3741	PNP		80	30-100 @ .25/1	0.6 @ 1/.125	25	7.0	4.0			TO - 66
2N3766	NPN		60	40-160 @ .5/5	1.0 @ .5/.05	20	7.5	10			TO - 66
2N4903	PNP	2N5069	80	20-80 @ 1/2	1.5 @ 5/1	87.5	2.0	4.0			TO - 3
2N4904	PNP	2N4913	40	25-100 @ 2.5/2	1.5 @ 5/1	87.5	2.0	4.0			TO - 3
2N4905	PNP	2N4914	60	25-100 @ 2.5/2	1.5 @ 5/1	87.5	2.0	4.0			TO - 3
2N4906	PNP	2N4915	80	25-100 @ 2.5/2	1.5 @ 5/1	87.5	2.0	4.0			TO - 3
2N4907	PNP		40	20-80 @ 4/4	2.0 @ 10/2	150	1.17	4.0			TO - 3
2N4908	PNP		60	20-80 @ 4/4	2.0 @ 10/2	150	1.17	4.0			TO - 3
2N4909	PNP		80	20-80 @ 4/4	2.0 @ 10/2	150	1.17	4.0			TO - 3
2N4910	NPN	2N4898	40	20-100 @ .5/1	.6 @ 1/.1	25	7.0	3.0			TO - 66
2N4911	NPN	2N4899	60	20-100 @ .5/1	.6 @ 1/.1	25	7.0	3.0			TO - 66
2N4912	NPN	2N4900	80	20-100 @ .5/1	.6 @ 1/.1	25	7.0	3.0			TO - 66
2N4913	NPN	2N4904	40	25-100 @ 2.5/2	1.5 @ 5/1.0	87.5	2.0	4.0			TO - 3
2N4914	NPN	2N4905	60	25-100 @ 2.5/2	1.5 @ 5/1.0	87.5	2.0	4.0			TO - 3
2N4915	NPN	2N4906	80	25-100 @ 2.5/2	1.5 @ 5/1.0	87.5	2.0	4.0			TO - 3
2N4998	NPN	2N4999	80	30-90 @ 1/5	.85 @ 2/.2	35	5.0	60			TO - 59
2N4999	PNP	2N4998	80	30-90 @ 1/5	.85 @ 2/.2	35	5.0	60			TO - 59
2N5000	NPN	2N5001	80	70-200 @ 1/5	.85 @ 2/.2	35	5.0	70			TO - 59
2N5001	PNP	2N5000	80	70-200 @ 1/5	.85 @ 2/.2	35	5.0	70			TO - 59

Solid State Devices, Incorporated

12741 Los Nietos Rd., Santa Fe Springs, Calif. 90607 • Tel: (213) 698-0529 • TWX: (910) 586-1881

POWER TRANSISTORS (cont'd.)

TYPE	Polarity	NPN/ PNP Complement	$V_{CEO\,(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE\,(S)}$ @I_C/I_B (V@A/A)	P_D @T_C=25°C (Watts)	$\theta_{J\text{-}C}$ (°C/W)	Min. f_T (MHz)	t_{ON} @I_C/I_B (µs@A/A)	t_{OFF} @I_C/I_B (µs@A/A)	Package
2N5002	NPN	2N5003	80	30-90 @ 2.5/5	1.5 @ 5/.5	58	3.0	60			TO - 59
2N5003	PNP	2N5002	80	30-90 @ 2.5/5	1.5 @ 5/.5	58	3.0	60			TO - 59
2N5004	NPN	2N5005	80	70-200 @ 2.5/5	1.5 @ 5/.5	58	3.0	70			TO - 59
2N5005	PNP	2N5004	80	70-200 @ 2.5/5	1.5 @ 5/.5	58	3.0	70			TO - 59
2N5006	NPN	2N5007	80	30-90 @ 5/5	1.5 @ 10/1	117	1.5	30			TO - 61
2N5007	PNP	2N5006	80	30-90 @ 5/5	1.5 @ 10/1	117	1.5	30			TO - 61
2N5008	NPN	2N5009	80	70-200 @ 5/5	1.5 @ 10/1	117	1.5	40			TO - 61
2N5009	PNP	2N5008	80	70-200 @ 5/5	1.5 @ 10/1	117	1.5	40			TO - 61
2N5038	NPN		90	20-100 @ 12/5	1.0 @ 12/1.2	140	1.25	60	0.5 @ 12/1.2	2.0 @ 12/1.2	TO - 3
2N5039	NPN		75	20-100 @ 10/5	1.0 @ 10/1.0	140	1.25	60	0.5 @ 10/1.0	2.0 @ 10/1.0	TO - 3
2N5067	NPN	2N4901	40	20-80 @ 1/2	1.5 @ 5/1.0	87.5	2.0	4.0			TO - 3
2N5068	NPN	2N4902	60	20-80 @ 1/2	1.5 @ 5/1.0	87.5	2.0	4.0			TO - 3
2N5069	NPN	2N4903	80	20-80 @ 1/2	1.5 @ 5/1.0	87.5	2.0	4.0			TO - 3
2N5083	NPN		60	40-120 @ 2/2	1.0 @ 10/2	35	5.0	50	.35 @ 5/.5	.65 @ 5/.5	TO - 59
2N5084	NPN		60	100-300 @ 2/2	1.0 @ 10/2	35	5.0	80	.35 @ 5/.5	.65 @ 5/.5	TO - 59
2N5085	NPN		80	40-120 @ 2/2	1.0 @ 10/2	35	5.0	50	.35 @ 5/.5	.65 @ 5/.5	TO - 59
2N5147	PNP	2N5148	80	30-90 @ 1/5	.85 @ 2/.2	7.0	25	60			TO - 5
2N5148	NPN	2N5147	80	30-90 @ 1/5	.85 @ 2/.2	7.0	25	50			TO - 5
2N5149	PNP	2N5150	80	70-200 @ 1/5	.85 @ 2/.2	7.0	25	70			TO - 5
2N5150	NPN	2N5149	80	70-200 @ 1/5	.85 @ 2/.2	7.0	25	60			TO - 5
2N5152	NPN	2N5151	80	30-90 @ 2.5/5	1.5 @ 5/.5	11.5	15	60			TO - 5
2N5154	NPN	2N5153	80	70-200 @ 2.5/5	1.5 @ 5/.5	11.5	15	70			TO - 5
2N5284	NPN	2N5286	100	30-90 @ 2.5/5	1.5 @ 5/.5	58	3.0	60			TO - 59
2N5285	NPN	2N5287	100	70-200 @ 2.5/5	1.5 @ 5/.5	58	3.0	70			TO - 59
2N5286	PNP	2N5284	100	30-90 @ 2.5/5	1.5 @ 5/.5	58	3.0	60			TO - 59
2N5287	PNP	2N5285	100	70-200 @ 2.5/5	1.5 @ 5/.5	58	3.0	70			TO - 59
2N5288	NPN	2N5290	100	30-90 @ 5/5	1.5 @ 10/1	117	1.5	30			TO - 61
2N5289	NPN	2N5291	100	70-200 @ 5/5	1.5 @ 10/1	117	1.5	40			TO - 61
2N5290	PNP	2N5288	100	30-90 @ 5/5	1.5 @ 10/1	117	1.5	30			TO - 61
2N5291	PNP	2N5289	100	70-200 @ 5/5	1.5 @ 10/1	117	1.5	40			TO - 6
2N5301	NPN	2N4398	40	15-60 @ 15/2	2.0 @ 20/2.0	200	0.87	2.0		3.0 @ 10/1.0	TO - 3
2N5302	NPN	2N4399	60	15-60 @ 15/2	2.0 @ 20/2.0	200	0.87	2.0		3.0 @ 10/1.0	TO - 3
2N5303	NPN		80	15-60 @ 10/4	2.0 @ 20/4.0	200	0.87	2.0		3.0 @ 10/1.0	TO - 3
2N5313	NPN		80	30-90 @ 10/5	1.5 @ 10/1	80	2.0	30	.5 @ 10/1	1.5 @ 10/1	TO - 61
2N5315	NPN		100	30-90 @ 10/5	1.5 @ 10/1	80	2.0	30	.5 @ 10/1	1.5 @ 10/1	TO - 61
2N5317	NPN		100	30-90 @ 5/5	0.6 @ 5/.5	80	2.0	30	.4 @ 5/.5	1.6 @ 5/.5	TO - 61
2N5319	NPN		80	30-90 @ 5/5	0.6 @ 5/.5	80	2.2	30	.4 @ 5/.5	1.6 @ 5/.5	TO - 61
2N5334	NPN		60	30-150 @ 1/2	0.7 @ 2/.2	6.0	29	60	.1 @ 1/.1	1 @ 1/.1	TO - 5
2N5335	NPN		80	30-150 @ 1/2	0.7 @ 2/.2	6.0	29	60	.1 @ 1/.1	1 @ 1/.1	TO - 5
2N5336	NPN		80	30-120 @ 2/2	1.2 @ 5/.5	6.0	30	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 5
2N5337	NPN		80	60-240 @ 2/2	1.2 @ 5/.5	6.0	30	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 5
2N5338	NPN		100	30-120 @ 2/2	1.2 @ 5/.5	6.0	30	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 5
2N5339	NPN		100	60-240 @ 2/2	1.2 @ 5/.5	6.0	30	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 5
2N5346	NPN		80	30-120 @ 2/2	1.2 @ 7/.7	60	3.0	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 59
2N5347	NPN		80	60-240 @ 2/2	1.2 @ 7/.7	60	3.0	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 59
2N5348	NPN		100	30-120 @ 2/2	1.2 @ 7/.7	60	3.0	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 59
2N5349	NPN		100	60-240 @ 2/2	1.2 @ 7/.7	60	3.0	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 59
2N5425	NPN		60		2.5 @ 5/.01	43	4.0	50	.3 @ 5/.01		TO - 5
2N5426	NPN		60		2.5 @ 5/.005	43	4.0	50	.3 @ 5/.01	1.8 @ 5/.01	TO - 5
2N5427	NPN		80	30-120 @ 2/2	1.2 @ 7/.7	40	4.5	30	.2 @ 2/.2	2.2 @ 2/.2	TO - 66

Solid State Devices, Incorporated

12741 Los Nietos Rd., Santa Fe Springs, Calif. 90607 • Tel: (213) 698-0529 • TWX: (910) 586-1881

POWER

TYPE	Polarity	NPN/ PNP Complement	$V_{CEO\,(SUS)}$ (Volts)	h_{FE} @ I_C/V_{CE} (Min-Max @ A/V)	$V_{CE\,(S)}$ @I_C/I_B (V@A/A)	P_D @T_C=25°C (Watts)	$\theta_{J\text{-}C}$ (°C/W)	Min. f_T (MHz)	t_{ON} @I_C/I_B (μs@A/A)	t_{OFF} @I_C/I_B (μs@A/A)	Package
2N5428	NPN		80	60-240 @ 2/2	1.2 @ 7/.7	40	4.5	30	.2 @ 2/.2	2.2 @ 2/.2	TO-66
2N5429	NPN		100	30-120 @ 2/2	1.2 @ 7/.7	40	4.5	30	.2 @ 2/.2	2.2 @ 2/.2	TO-66
2N5430	NPN		100	60-240 @ 2/2	1.2 @ 7/.7	40	4.5	30	.2 @ 2/.2	2.2 @ 2/.2	TO-66
2N5477	NPN		80	30-120 @ 2/2	1.2 @ 7/.7	60	3.0	30	.2 @ 2/.2	2.2 @ 2/.2	TO-59
2N5478	NPN		80	60-240 @ 2/2	1.2 @ 7/.7	60	3.0	30	.2 @ 2/.2	2.2 @ 2/.2	TO-59
2N5479	NPN		100	30-120 @ 2/2	1.2 @ 7/.7	60	3.0	30	.2 @ 2/.2	2.2 @ 2/.2	TO-59
2N5480	NPN		100	60-240 @ 2/2	1.2 @ 7/.7	60	3.0	30	.2 @ 2/.2	2.2 @ 2/.2	TO-59
2N5679	PNP	2N5681	100	40-150 @ .25/2	2.0 @ 1/.2	10	17.5	30	.15 @ 1/.1	.7 @ 1/.1	TO-5
2N5680	PNP	2N5682	120	40-150 @ .25/2	2.0 @ 1/.2	10	17.5	30	.15 @ 1/.1	.7 @ 1/.1	TO-5
2N5681	NPN	2N5679	100	40-150 @ .25/2	2.0 @ 1/.2	10	17.5	30	.15 @ 1/.1	.7 @ 1/.1	TO-5
2N5682	NPN	2N5680	120	40-150 @ .25/2	2.0 @ 1/.2	10	17.5	30	.15 @ 1/.1	.7 @ 1/.1	TO-5
2N5729	NPN	2N5769	80	30-300 @ 2/2	1.5 @ 5/.5	11.5	15	30	.2 @ 2/.2	3.5 @ 2/.2	TO-5
2N5730	NPN		80	30-300 @ 2/2	1.2 @ 5/.5	52	3.3	30	.2 @ 2/.2	3.5 @ 2/.2	TO-59
2N5731	NPN	2N5771	80	30-300 @ 5/2	1.2 @ 10/1	88	2.0	30	.3 @ 5/.5	3.6 @ 5/.5	TO-61
2N5732	NPN	2N5772	80	30-300 @ 5/2	1.2 @ 10/1	87.5	2.0	30	.3 @ 5/0.5	3.6 @ 5/0.5	TO-3
2N5733	PNP		80	30-300 @ 10/2	1.2 @ 20/2	175	1.0	30	.7 @ 10/1	4.0 @ 10/1	TO-61
2N5734	NPN		80	30-300 @ 10/2	1.2 @ 20/2	175	1.0	30	.7 @ 10/1	4.0 @ 10/1	TO-3
2N5769	PNP	2N5729	80	30-300 @ 2/2	1.5 @ 5/.5	11.5	15	30	.2 @ 2/.2	3.5 @ 2/.2	TO-5
2N5770	PNP	2N5730	80	30-300 @ 2/2	1.2 @ 5/.5	53	3.0	30	.2 @ 2/.2	3.5 @ 2/.2	TO-59
2N5771	PNP	2N5731	80	30-300 @ 5/2	1.2 @ 10/1	88	2.0	30	.3 @ 5/.5	3.6 @ 5/.5	TO-61
2N5772	PNP	2N5732	80	30-300 @ 5/2	1.2 @ 10/1	87	2.0	30	.3 @ 5/.5	3.6 @ 5/.5	TO-3

High voltage transistors

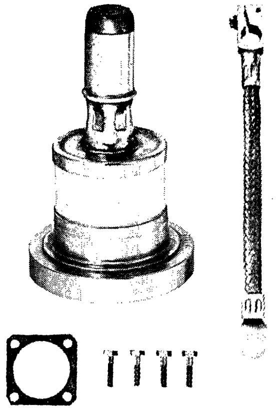
(listed in order of increasing voltage)

Device Type No.	Material and Polarity	P_C @ T_C *P_T Watts	*T_A °C	Maximum Ratings I_C *I_E Amps	 BV_{CBO}	 BV_{CEO} *BV_{CER}	 BV_{EBO}	Primary Electrical Characteristics h_{FE} Min	 I_C mA	 V_{CE}	 f (MHz)	JEDEC outline 1/
2N3659	Si, NPN	20W	25°C	.500	220	170	5.0	20	100	50	50	TO-5
2N3738	Si, NPN	4W	25°C	.250	250	225	6.0	40	100	10	10	TO-66
2N5059	Si, NPN	20W	25°C	.150	250	250	6.0	30	30	25	30	TO-5
2N3440	Si, NPN	1W	25°C	1	300	250	7.0	40	20	10	15	TO-5
2N4064	Si, NPN	5W	25°C	1	300	250	7.0	40	20	10	20	MD-14
2N4296	Si, NPN	10W	25°C	1	350	250	4.0	35	100	10	20	TO-66
2N4297	Si, NPN	20W	25°C	1	350	250	4.0	50	100	10	15	TO-66
2N3742	Si, NPN	1W	25°C	.500	300	300	7.0	20	30	10	30	TO-5
2N5279	Si, NPN	1W	25°C	1	400	300	7.0	40	20	10	15	TO-5
2N5058	Si, NPN	1W	25°C	1	300	300	7.0	35	30	25	30	TO-5
2N5252	Si, NPN	1W	25°C	1.0	300	300	6.0	40	100	10	30	TO-5
2N5253	Si, NPN	1W	25°C	1.0	300	300	6.0	80	100	10	30	TO-5
2N5280	Si, NPN	10W	25°C	1	400	300	7.0	40	20	10	15	MD-14
2N3739	Si, NPN	20W	25°C	.250	325	300	6.0	40	100	10	10	TO-66
2N3439	Si, NPN	5W	25°C	1	450	350	7.0	40	20	10	15	TO-5
2N5092	Si, NPN	5W	25°C	1	400	350	6.0	15	100	10	50	TO-5
2N4063	Si, NPN	10W	25°C	1	450	350	7.0	40	20	10	15	MD-14
2N4298	Si, NPN	20W	25°C	1	—	350	4.0	20	100	10	20	TO-66
2N4299	Si, NPN	20W	25°C	1	—	350	4.0	35	100	10	20	TO-66
2N5095	Si, NPN	5W	25°C	1	500	400	6.0	15	100	10	50	TO-5
2N5101	Si, NPN	10W	25°C	1	500	400	6.0	15	100	10	50	MD-14
2N5097	Si, NPN	5W	25°C	1	600	450	6.0	15	100	10	50	TO-5
2N5010	Si, NPN	5W	25°C	.500	500	*500	5.0	30	25	10	20	TO-5
2N5098	Si, NPN	5W	25°C	1	700	500	6.0	15	100	10	50	TO-5
2N5099	Si, NPN	5W	25°C	1	800	550	6.0	15	100	10	50	TO-5
2N5011	Si, NPN	5W	25°C	.500	600	*600	5.0	30	25	10	20	TO-5
2N5012	Si, NPN	5W	25°C	.500	700	*700	5.0	30	25	10	20	TO-5
2N5013	Si, NPN	5W	25°C	.500	800	*800	5.0	30	20	10	20	TO-5
2N5014	Si, NPN	5W	25°C	.500	900	*900	5.0	30	20	10	20	TO-5
2N5015	Si, NPN	5W	25°C	.500	1.0K	*1000	5.0	30	20	10	20	TO-5
2N5282	Si PNP	2W	25°C	1.0	325	300	5.0	20	1.0	10	20	TO-5
2N5281	Si PNP	2W	25°C	1.0	325	300	5.0	20	1.0	10	20	TO-5
2N3743	Si PNP	1W	25°C	.050	300	300	5.0	25	30	10	30	TO-5
2N5091	Si PNP	2W	25°C	1.0	350	300	6.0	20	100	15	20	TO-5
2N5093	Si PNP	2W	25°C	1.0	400	350	6.0	20	100	15	20	TO-5
2N5094	Si PNP	2W	25°C	1.0	450	400	6.0	20	100	15	20	TO-5
2N5096	Si PNP	2W	25°C	1.0	500	450	6.0	20	10	15	20	TO-5

TUNG-SOL® CONTROLLED AVALANCHE SILICON POWER RECTIFIERS

NEW—HIGH VOLTAGE/HIGH CURRENT TYPES

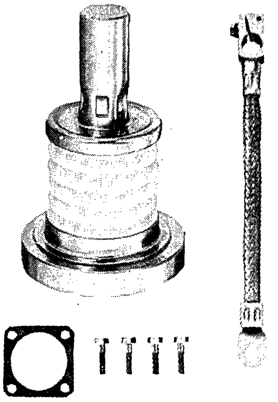
Controlled avalanche characteristic provides transient handling capability that results in increased reliability.



CH-1621 SERIES, 500 AMPERES, FLAT BASE OUTLINE*

* For complete information, write for Bulletin CT-45

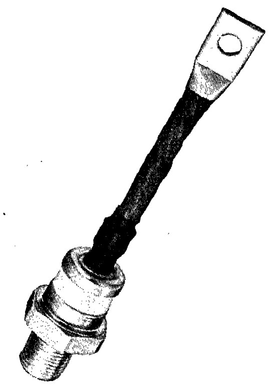
Type	B_{VR} (min.) V	V_{RM} V	V_R V	I_R (av.) mA	I_O @ 120° C (case) A	I_{FM} (surge) A
CH-1621	1100	900	635	15	500	8500
CH-1622	1400	1150	810	15	500	8500
CH-1623	1700	1400	990	15	500	8500
CH-1624	2000	1650	1170	15	500	8500
CH-1625	2300	1900	1340	15	500	8500



CH-1611 SERIES, 370 TO 470 AMPERES, FLAT BASE OUTLINE**

** For complete information, write for Bulletin CT-46

Type	B_{VR} (min.) V	V_{RM} V	V_R V	I_R (av.) mA	I_O @ 120° C (case) A	I_{FM} (surge) A
CH-1611	2600	2100	1470	20	470	5200
CH-1612	2900	2300	1600	20	450	5200
CH-1613	3200	2500	1750	20	430	5200
CH-1614	3800	3000	2100	20	410	5200
CH-1615	4400	3500	2450	20	390	5200
CH-1616	5000	4000	2800	20	370	5200



CH-1511 SERIES, 300 TO 420 AMPERES, JEDEC DO-9 OUTLINE***

*** For complete information, write for Bulletin CT-44

Type	B_{VR} (min.) V	V_{RM} V	V_R V	I_R (av.) mA	I_O @ 120° C (case) A	I_{FM} (surge) A
CH-1511	1250	1000	700	10	420	6000
CH-1512	1500	1200	840	10	375	5300
CH-1513	1750	1400	980	10	340	4500
CH-1514	2000	1600	1130	10	340	4500
CH-1515	2250	1800	1270	10	320	3500
CH-1516	2500	2000	1400	10	320	3500
CH-1517	3000	2400	1700	10	300	3500
CH-1518	3500	3000	2100	10	300	3500

TUNG-SOL DIVISION/Wagner Electric Corporation

630 W. Mt. Pleasant Avenue, Livingston, N.J. 07039 / TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426

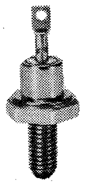
Trademark "TUNG-SOL" Reg. U. S. Pat. Off. and Marcas Registradas

TUNG-SOL® SILICON POWER RECTIFIERS

Tung-Sol silicon power rectifiers offer distinct advantages over similar competitive types. Exclusive design features combine with Tung-Sol's historically rigid quality control to assure designers unmatched operational reliability. Wide interchangeability permits specification of these outstanding components for most commercial and military applications.

- All the types shown are available in reverse polarity which may be ordered by the addition of the suffix 'R' to the indicated type number.

LOW CURRENT TYPES JEDEC DO-4 OUTLINE

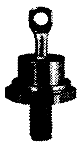


Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N1199A	50	12.0	3.0	240
1N1200A	100	12.0	2.5	240
1N1201A	150	12.0	2.25	240
1N1202A	200	12.0	2.0	240
1N1203A	300	12.0	1.75	240
1N1204A	400	12.0	1.5	240
1N1205A	500	12.0	1.25	240
1N1206A	600	12.0	1.0	240
1N3670A	700	12.0	0.9	240
1N3671A	800	12.0	0.8	240
1N3672A	900	12.0	0.7	240
1N3673A	1000	12.0	0.6	240

CONTROLLED AVALANCHE

Type	V_{RM} (wkg) V	I_o @ 135°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N4506	200	12.0	2.5	240
1N4507	400	12.0	2.5	240
1N4508	600	12.0	2.5	240
1N4509	800	12.0	2.0	240
1N4510	1000	12.0	1.75	240
1N4511	1200	12.0	1.5	240

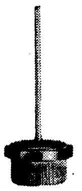
MEDIUM CURRENT TYPES JEDEC DO-5 OUTLINE



Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N1183A	50	40	10	500
1N1184A	100	40	10	500
1N1185A	150	40	10	500
1N1186A	200	40	10	500
1N1187A	300	40	10	500
1N1188A	400	40	10	500
1N1189A	500	40	10	500
1N1190A	600	40	10	500
1N1191	50	18	5	250
1N1192	100	18	5	250
1N1193	150	18	5	250
1N1194	200	18	5	250
1N1195	300	18	5	250
1N1196	400	18	5	250
1N1197	500	18	5	250
1N1198	600	18	5	250
1N2154	50	25	5.0	350
1N2155	100	25	4.5	350
1N2156	200	25	4.0	350
1N2157	300	25	3.5	350
1N2158	400	25	3.0	350
1N2159	500	25	2.5	350
1N2160	600	25	2.0	350
1N3208	50	15	10	250
1N3209	100	15	10	250
1N3210	200	15	10	250
1N3211	300	15	10	250
1N3212	400	15	10	250
1N3213	500	15	10	250
1N3214	600	15	10	250

Type	V_{RM} (wkg) V	I_o @ 140°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N4136	200	50	16	750
1N4137	400	50	12	750
1N4138	600	50	8	750

MEDIUM CURRENT TYPES JEDEC DO-21-OUTLINE



Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N3491	50	18	10	300
1N3492	100	18	10	300
1N3493	200	18	8	300
1N3494	300	18	6	300
1N3495	400	18	4	300
1N3659	50	25	5	400
1N3660	100	25	4.5	400
1N3661	200	25	4.0	400
1N3662	300	25	3.5	400
1N3663	400	25	3.0	400
1N3664	500	25	2.5	400
1N3665	600	25	2.0	400

CONTROLLED AVALANCHE

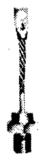
Type	V_{RM} (wkg) V	I_o @ 140°C. case A	I_R (AV) mA	I_{FM} (surge) A
PZ140B	200	25	4.0	400
PZ140D	400	25	3.0	400
PZ140F	600	25	2.0	400
PZ140H	800	25	2.0	400

Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
127350Z	50	35.0	2.0	400
127350A	100	35.0	2.0	400
127351Z	50	44.0	2.0	400
127351A	100	44.0	2.0	400

HIGH CURRENT TYPES JEDEC DO-8 OUTLINE

Type	V_{RM} (wkg) V	I_o @ 150°C. case A	I_R (AV) mA	I_{FM} (surge) A
1N1396	50	70	15	1500
1N1397	100	70	15	1500
1N1398	150	70	15	1500
1N1399	200	70	15	1500
1N1400	300	70	15	1500
1N1401	400	70	15	1500
CH119Z	50	150	15	4000
CH119A	100	150	15	4000
CH119AZ	150	150	15	4000
CH119B	200	150	15	4000
CH119C	300	150	15	4000
CH119D	400	150	15	4000

HIGH CURRENT TYPES JEDEC DO-9 OUTLINE



Type	V_{RM} (wkg) V	I_o @ 120°C. case A	I_R (AV) mA	I_{FM} (surge) A
CS131Z	50	275	16	4000
CS131A	100	275	16	4000
CS131AZ	150	275	16	4000
CS131B	200	275	16	4000
CS131C	300	275	16	4000
CS131D	400	275	16	4000

I_{FM} (surge)—Peak one-cycle surge current, under same conditions as I_o rating (μA—Microamperes).
I_o—Max. rectified avg. DC output current, resistive or inductive load, 60 cps sine wave input.
I_R(AV)—Max. avg. reverse current measured over full sine wave cycle with max. rated reverse voltage and forward current applied.

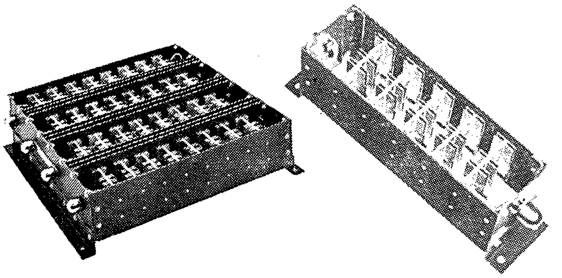
Full field technical consultation or complete up-to-date listings on all Tung-Sol products are available through: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Detroit, Mich.; Melrose Park, Ill.; Newark, N. J.; Seattle, Wash. IN CANADA: Abbey Electronics, Toronto, Ont., Canadian Electronics Ltd., Edmonton, Alta.

TUNG-SOL DIVISION/Wagner Electric Corporation
630 W. Mt. Pleasant Avenue, Livingston, N.J. 07039 / TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426

Trademark "TUNG-SOL" Reg. U. S. Pat. Off. and Marcas Registradas

TUNG-SOL SILICON RECTIFIER STACKS AND ASSEMBLIES

HIGH VOLTAGE ASSEMBLIES

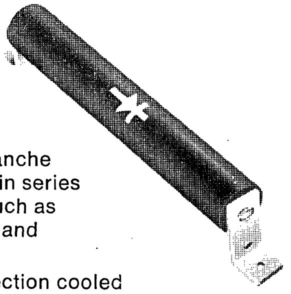


CM4 Series

The CM4 module consists of two each 1N3665 and 1N3665R silicon power diodes (see bulletin CT-16A) mounted on unique extruded aluminum radiators.

In rectifier service: Convection cooled
Maximum direct current (25°C ambient): 8.5 amperes
Maximum blocking voltage/module: 2400 volts d. c.
Available up to 36Kv d. c. in single stack. Also up to 45Kv d. c. for CM4A using PZ140 diodes (see bulletin CT-22)

Detailed information in bulletin CT-30



TM2 Series

TM2 uses controlled avalanche silicon diodes connected in series for high voltage service such as rectifiers, clipping diodes and charging diodes.

In rectifier service: Convection cooled
Maximum direct current (25°C ambient): 3.25 amperes
Maximum blocking voltage: up to 20Kv d. c.

Detailed information in bulletin CT-31

Balancing networks used in CM4 assemblies insure proper voltage distribution among the series diodes.

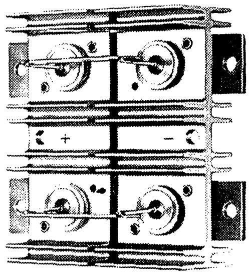
Reverse surge tested controlled avalanche diodes used in CM4A and TM2 assemblies eliminate the need for balancing networks. This reduces power dissipation.

Press-fit diodes used in these assemblies have a one-cycle surge overload rating of 400 amperes.

Corona is minimized by good mechanical design.

TUNG-SOL®
TUNG-SOL DIVISION
Wagner Electric Corporation
630 W. Mt. Pleasant Avenue, Livingston, N. J. 07039
TWX: 710-994-4865 Phone: (201) 992-1100; (212) 732-5426
Trademark "TUNG-SOL" Reg. U.S. Pat. Off. and Marcas Registradas

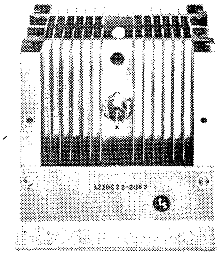
LOW VOLTAGE ASSEMBLIES



LOW CURRENT Simplicity, economy and efficiency are derived from the use of pressure-fit diodes of both polarities in compact modular assemblies: Single phase center tap; single phase bridge and three phase bridge.

CURRENT RATINGS:
18-38 amperes (Convection cooled)
18-73 amperes (Forced air cooled)
OUTPUT VOLTAGE RATINGS:
Single phase – up to 512 VDC
Three phase – up to 760 VDC
using controlled avalanche rectifiers.

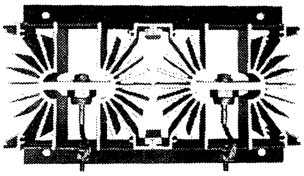
Detailed information in bulletin CT-17A



MEDIUM CURRENT Newly designed extruded aluminum heat radiator, combined with silicon rectifiers of low thermal impedance, achieves new efficiencies in size, weight and power output. Single phase center tap; single phase bridge; three phase bridge and six phase star.

CURRENT RATINGS:
47-181 amperes (Convection cooled)
47-290 amperes (Forced air cooled)
OUTPUT VOLTAGE RATINGS:
Single phase – up to 384 VDC
Three phase – up to 570 VDC

Detailed information in bulletin T-484



HIGH CURRENT Improvements in size, weight and power output are achieved through the use of low impedance silicon rectifiers. Assembly and mounting features are same as medium power stacks. Supplied in standard circuits and custom configurations.

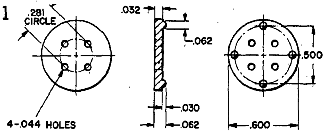
CURRENT RATINGS:
104-675 amperes (Convection cooled)
104-1100 amperes (Forced air cooled)
OUTPUT VOLTAGE RATINGS:
Single phase – up to 384 VDC
Three phase – up to 570 VDC

Detailed information in bulletin T-483

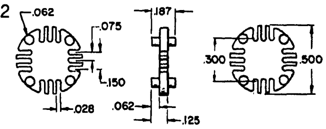
Transcon ENGINEERED HARDWARE IS THE STANDARD OF INDUSTRY

NYLON SEMICONDUCTOR MOUNTING PADS

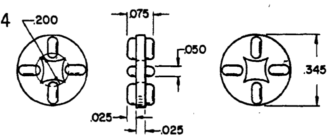
859-0101
(TO-8)


.291 CIRCLE
.032
.062
.500
.030
.062
.600
4-.044 HOLES

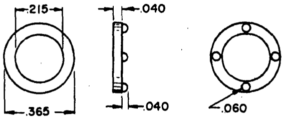
859-0102
(TO-8)


.062
.075
.187
.300
.500
.150
.028
.062
.125

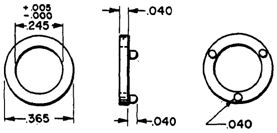
859-0004
(TO-5)


.200
.075
.050
.345
.025
.025

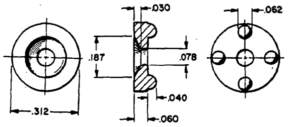
859-0005
(TO-5)


.215
.040
.365
.040
.060

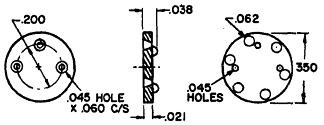
859-0006
(TO-5)
859-0402
(TO-99)
859-0502
(TO-100)
859-0602
(TO-101)


+.005 -.000
.245
.040
.365
.040
.040

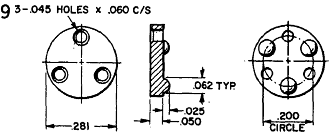
859-0007
(TO-5)


.030
.062
.187
.078
.312
.040
.060

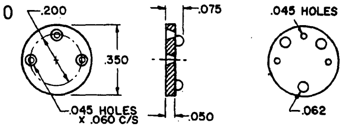
859-0008
(TO-5)


.200
.038
.062
.350
.045 HOLE x .060 C/S
.045 HOLES
.021

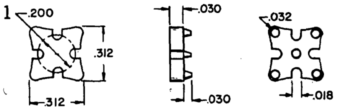
859-0009
(TO-5)


3-.045 HOLES x .060 C/S
.062 TYP.
.025
.050
.281
.200 CIRCLE

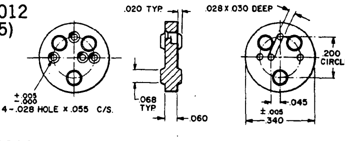
859-0010
(TO-5)


.200
.075
.045 HOLES
.350
.045 HOLES x .060 C/S
.050
.062

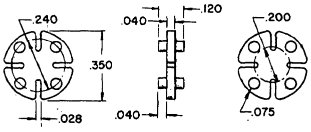
859-0011
(TO-5)


.200
.030
.032
.312
.312
.030
.018

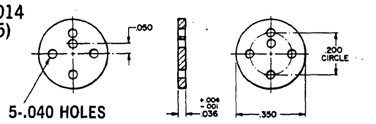
859-0012
(TO-5)


.020 TYP.
.028 x .030 DEEP
.200 CIRCLE
+.003 -.000
4-.028 HOLE x .055 C/S.
.068 TYP
.060
.045
±.005
.340

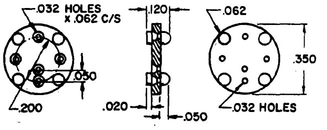
859-0013
(TO-5)


.240
.040
.120
.200
.350
.028
.040
.075

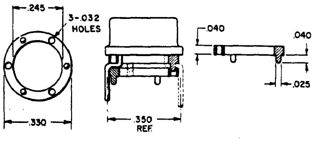
859-0014
(TO-5)


.050
5-.040 HOLES
+.004 -.001
.036
.200 CIRCLE
.350

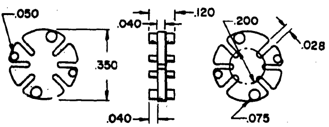
859-0015
(TO-5)


.032 HOLES x .062 C/S
.120
.062
.050
.350
.200
.020
.050
.032 HOLES

859-0016
(TO-5)
859-0403
(TO-99)
859-0501
(TO-100)
859-0601
(TO-101)

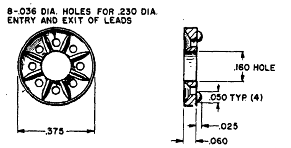

.245
3-.032 HOLES
.040
.040
.025
.330
.350 REF.

859-0017
(TO-5)


.050
.040
.120
.200
.028
.350
.040
.075

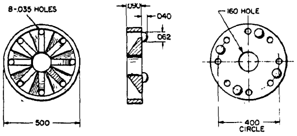
859-0404
(TO-99)

INTEGRATED CIRCUITS

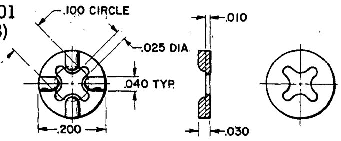

8-.036 DIA. HOLES FOR .230 DIA. ENTRY AND EXIT OF LEADS
.160 HOLE
.050 TYP (4)
.025
.060
.375

859-0405
(TO-99)

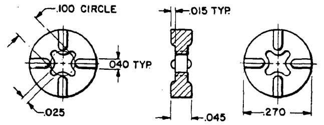
INTEGRATED CIRCUITS


8-.035 HOLES
.050
.040
.062
.160 HOLE
.500
.400 CIRCLE

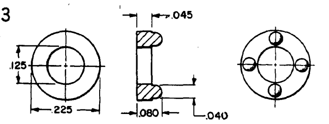
859-0201
(TO-18)


.100 CIRCLE
.010
.025 DIA
.040 TYP.
.200
.030

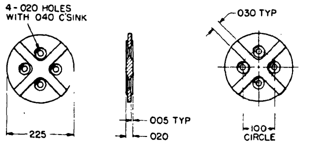
859-0202
(TO-18)


.100 CIRCLE
.015 TYP.
.040 TYP
.025
.045
.270

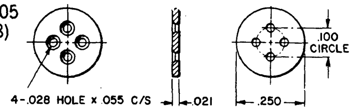
859-0203
(TO-18)


.045
.125
.225
.080
.040

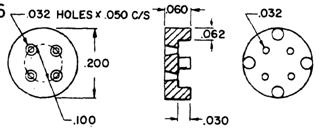
859-0204
(TO-18)


4-.020 HOLES WITH .040 C'SINK
.030 TYP
.005 TYP
.225
.020
.100 CIRCLE

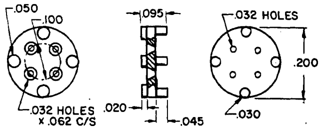
859-0205
(TO-18)


.100 CIRCLE
4-.028 HOLE x .055 C/S
.021
.250

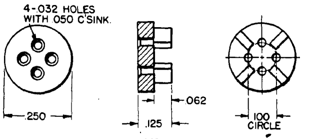
859-0206
(TO-18)


.032 HOLES x .050 C/S
.060
.062
.032
.200
.100
.030

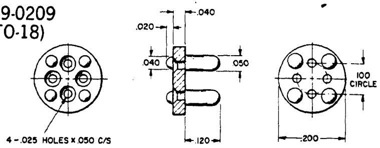
859-0207
(TO-18)


.050
.100
.095
.032 HOLES
.200
.032 HOLES x .062 C/S
.020
.045
.030

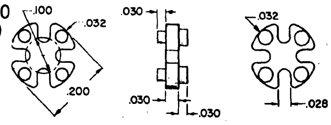
859-0208
(TO-18)


4-.032 HOLES WITH .050 C'SINK.
.250
.125
.062
.100 CIRCLE

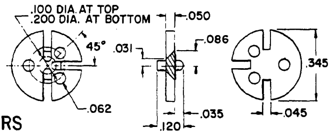
859-0209
(TO-18)


.020
.040
.040
.050
.100 CIRCLE
4-.025 HOLES x .050 C/S
.120
.200

859-0210
(TO-18)

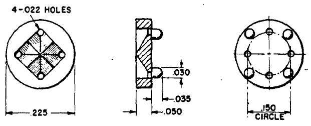

.100
.032
.030
.032
.200
.030
.030
.028

859-0001
(TO-5)
859-0211
(TO-18)


.100 DIA. AT TOP
.200 DIA. AT BOTTOM
.050
45°
.031
.086
.345
.062
.120
.035
.045

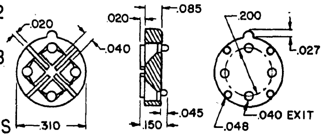
SPREADERS

859-0212
(TO-18)


4-.022 HOLES
.030
.035
.050
.225
.150 CIRCLE

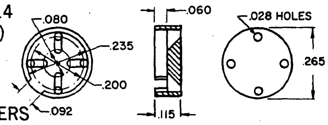
SPREADERS

859-0002
(TO-5)
859-0213
(TO-18)


.020
.020
.085
.040
.200
.027
.045
.040 EXIT
.310
.150
.048

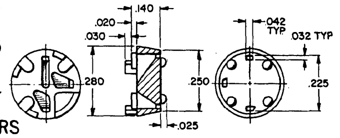
SPREADERS

859-0214
(TO-18)


.080
.060
.028 HOLES
.235
.265
.200
.092
.115

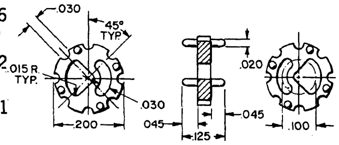
SPREADERS

859-0003
(TO-5)
859-0215
(TO-18)
859-0301
(TO-98)

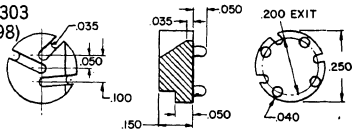

.140
.020
.030
.042 TYP.
.032 TYP
.280
.250
.225
.025

SPREADERS

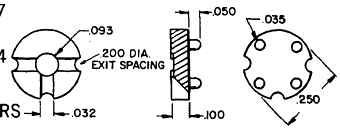
859-0216
(TO-18)
859-0302
(TO-98)
859-0401
(TO-99)


.030
45° TYP.
.015 R TYP.
.020
.030
.200
.045
.045
.125
.100

859-0303
(TO-98)


.035
.035
.050
.200 EXIT
.050
.250
.100
.150
.050
.040

859-0217
(TO-18)
859-0304
(TO-98)


.093
.050
.035
.200 DIA. EXIT SPACING
.032
.100
.250

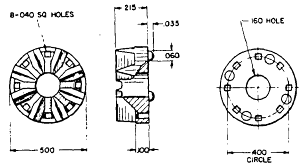
SPREADERS

For Information on Transcon's Broad Line of Tubings, Spiral Wrap, Clamps, Ties, Lacing Tape, Component Clips, etc., see Section 6000, Vol. III

NYLON SEMICONDUCTOR MOUNTING PADS

859-0406
(TO-99)

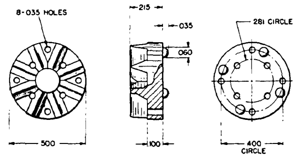
INTEGRATED CIRCUITS



8-.040 SQ HOLES
.215
.035
.060
.160 HOLE
.500
.100
.400 CIRCLE

859-0407
(TO-99)

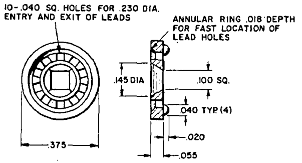
INTEGRATED CIRCUITS



8-.035 HOLES
.215
.035
.060
.281 CIRCLE
.500
.100
.400 CIRCLE

859-0503
(TO-100)

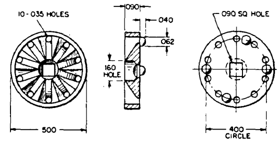
INTEGRATED CIRCUITS



10-.040 SQ. HOLES FOR .230 DIA. ENTRY AND EXIT OF LEADS
ANNULAR RING .018 DEPTH FOR FAST LOCATION OF LEAD HOLES
.145 DIA
.100 SQ.
.040 TYP (4)
.020
.055
.375

859-0504
(TO-100)

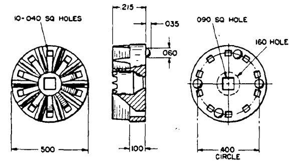
INTEGRATED CIRCUITS



10-.035 HOLES
.090
.040
.062
.160 HOLE
.090 SQ HOLE
.500
.400 CIRCLE

859-0505
(TO-100)

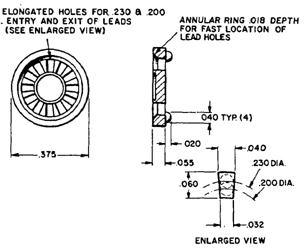
INTEGRATED CIRCUITS



10-.040 SQ HOLES
.215
.035
.060
.090 SQ HOLE
.160 HOLE
.500
.100
.400 CIRCLE

859-0603
(TO-101)

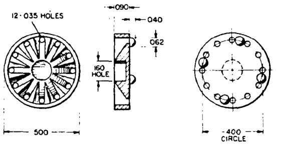
INTEGRATED CIRCUITS



12-ELONGATED HOLES FOR .230 & .200 DIA. ENTRY AND EXIT OF LEADS (SEE ENLARGED VIEW)
ANNULAR RING .018 DEPTH FOR FAST LOCATION OF LEAD HOLES
.040 TYP (4)
.375
.020
.055
.040
.230 DIA.
.060
.200 DIA.
.032
ENLARGED VIEW

859-0604
(TO-101)

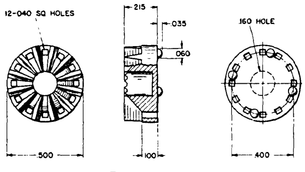
INTEGRATED CIRCUITS



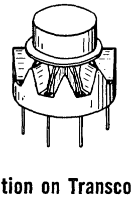
12-.035 HOLES
.090
.040
.062
.160 HOLE
.500
.400 CIRCLE

859-0605
(TO-101)

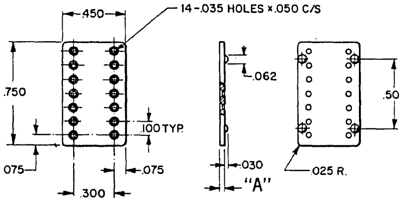
INTEGRATED CIRCUITS



12-.040 SQ HOLES
.215
.035
.060
.160 HOLE
.500
.100
.400

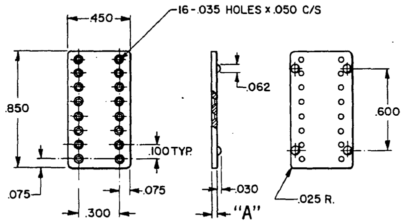


"A"
.060 859-0701 .100 859-0703
.080 859-0702 (TO-116 DIP)



.450
14-.035 HOLES x .050 C/S
.750
.100 TYP.
.075
.075
.300
.062
.030
"A"
.500
.025 R.

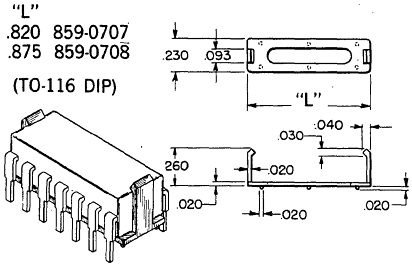
"A"
.060 859-0704 .100 859-0706
.080 859-0705 (TO-116 DIP)



.450
16-.035 HOLES x .050 C/S
.850
.100 TYP.
.075
.075
.300
.062
.030
"A"
.600
.025 R.

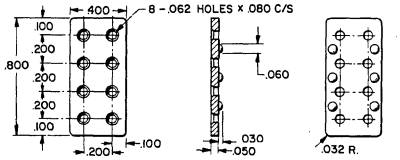
"L"
.820 859-0707
.875 859-0708

(TO-116 DIP)



.230
.093
"L"
.040
.030
.260
.020
.020
.020
.020

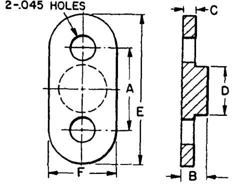
859-0801 RELAY PAD



.400
8-.062 HOLES x .080 C/S
.100
.200
.800
.200
.200
.100
.200
.100
.060
.030
.050
.032 R.

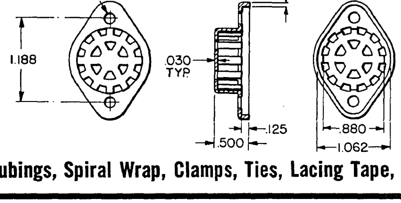
CAPACITOR PAD

	A	B	C	D	E	F
859-0901	.100	.045	.022	.050 .070	.180	.090
859-0902	.150	.045	.022	.090 .125	.270	.125
859-0903	.200	.045	.022	.090	.290	.090



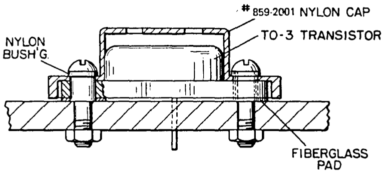
2-.045 HOLES
C
A
E
D
F
B

859-2001
2-.165 HOLES



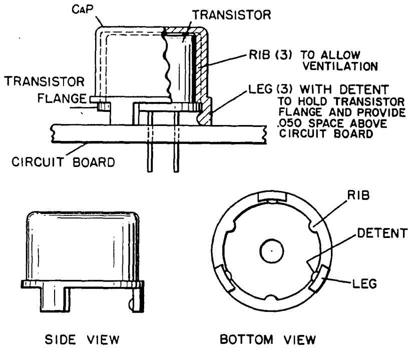
.062
1.188
.030 TYP.
.125
.500
.880
1.062

859-2001

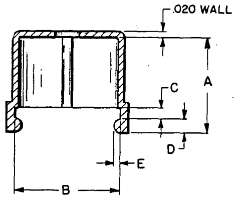


#859-2001 NYLON CAP
TO-3 TRANSISTOR
NYLON BUSH'G.
FIBERGLASS PAD

TRANSISTOR INSULATION CAPS



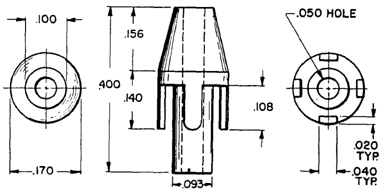
CAP
TRANSISTOR
RIB (3) TO ALLOW VENTILATION
TRANSISTOR FLANGE
LEG (3) WITH DETENT TO HOLD TRANSISTOR FLANGE AND PROVIDE .050 SPACE ABOVE CIRCUIT BOARD
CIRCUIT BOARD
RIB
DETENT
LEG
SIDE VIEW
BOTTOM VIEW



.020 WALL
A
C
D
E
B

PART NO.	FOR JEDEC	A	B	C	D	E
859-2002	TO-5	.330	.380	.036	.050	.015
859-2003	TO-18	.280	.240	.036	.050	.015

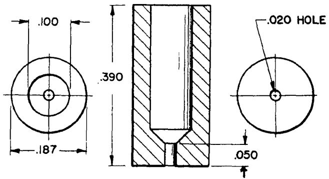
859-2101
BOBBINS



.100
.156
.400
.140
.108
.050 HOLE
.020 TYP.
.040 TYP.
.170
.093

859-2201

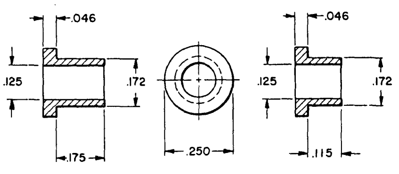
DIODE SLEEVES



.100
.390
.187
.020 HOLE
.050

BUSHINGS

816-2301 816-2302

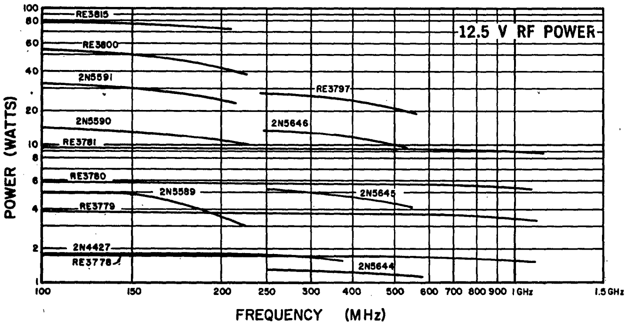


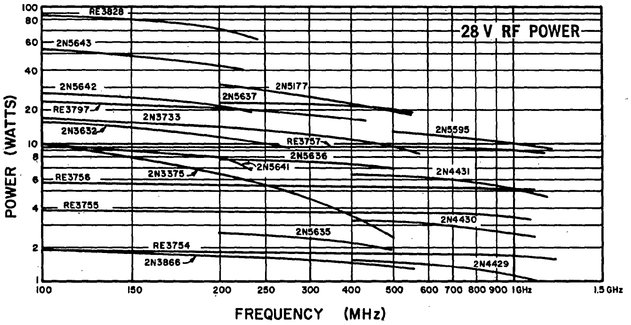
.046
.125
.172
.175
.250
.046
.125
.172
.115

For Information on Transcon's Broad Line of Tubings, Spiral Wrap, Clamps, Ties, Lacing Tape, Component Clips, etc., see Section 6000, Vol. III

Unisem
SUBSIDIARY OF UNITED AIRCRAFT CORPORATION
TREVOSE, PENNSYLVANIA 19047

HIGH POWER RF AND MICROWAVE TRANSISTORS





Type	Freq. MHz	Vcc (Volts)	Power Min (Watts)	Gain Min (db)	Eff Min (%)	Case
R. F. COMMUNICATIONS TRANSISTORS — NPN						
2N5589	175	12.5	3.5	8.2	50	MT-71
2N5590	175	12.5	10.0	5.2	50	MT-72
2N5591	175	12.5	25.0	4.4	50	MT-72
RE3800	175	12.5	40.0	5.0	50	MT-72
RE3815	175	12.5	75.0	4.8	50	MT-79
2N5641	175	28	7.0	8.0	60	MR-71
2N5642	175	28	20.0	8.0	60	MT-72
2N5643	175	28	40.0	7.5	60	MT-72
RE3823	175	28	75.0	5.4	60	MT-79
2N5644	470	12.5	1.0	7.0	50	MT-71
2N5645	470	12.5	4.0	6.0	50	MT-72
2N5646	470	12.5	12.0	4.8	50	MT-72
RE3797	470	12.5	25.0	4.0	50	MT-72
2N5635	400	28	2.5	6.2	50	MT-71
2N5636	400	28	7.5	5.7	50	MT-71
2N5637	400	28	20.0	4.6	60	MT-72
R. F. COMMUNICATIONS TRANSISTORS — PNP						
RE3842	175	12.5	3.5	10	55	I. Flange
RE3843	175	12.5	14.0	6.0	55	I. Flange
RE3844	175	12.5	25.0	5.0	55	I. Flange
RE3845	175	12.5	38.0	4.8	55	I. Flange
R. F. BROADBAND TRANSISTORS						
RH3761	100-400	12.5	.5	6	40	TO-46
RH3762	100-400	12.5	1.5	7	40	TO-39
RE3778	100-500	12.5	2.0	5	40	MT-59
RE3779	100-500	12.5	4.0	5	40	MT-59
RE3780	100-500	12.5	6.0	5	40	MT-59
RE3781	100-500	12.5	10.0	5	40	MT-59
RE3797	100-400	12.5	25.0	5	50	MT-72
RH3787	500-1000	28	2.0	5	45	MT-74
RH3788	500-1000	28	4.0	5	45	MT-74
RH3789	500-1000	28	6.0	5	45	MT-74
RH3790	500-1000	28	10.0	5	45	MT-74

Type	Freq. MHz	Vcc (Volts)	Power Min (Watts)	Gain Min (db)	Eff Min (%)	Case
R. F. UHF VHF TRANSISTORS						
2N2876	150	28	3.0	4.8	40	TO-60
2N3375	400	28	3.0	4.8	40	TO-60
2N3553	175	28	2.5	10	50	TO-39
2N3632	175	28	13.5	5.9	70	TO-60
2N3733	400	28	10	4.0	45	TO-60
2N3866	400	28	1.0	10	45	TO-39
2N4427	175	12.5	1.5	12	45	TO-39
2N4428	500	28	.75	10	35	TO-39
2N4429	1000	28	1.0	5.2	35	MT-59
2N4430	1000	28	2.5	5.0	35	MT-66
2N4431	1000	28	5.0	5.0	35	MT-66
2N4440	400	28	5.0	4.7	45	TO-60
2N5016	400	28	15	4.8	50	TO-60
2N5108	1000	28	1.0	5	35	TO-39
2N5090	400	28	1.2	7.8	40	TO-60
2N5160	400	28	1.0	10	45	TO-39
2N5177	500	28	25	4.9	50	MD-36
2N5178	500	28	50.0	4.0	50	MD-36
2N5595	1000	28	10.0	6.0	35	MT-74
2N5943	200	15	—	11	—	TO-39
2N5947	200	15	—	11	—	MT-59
RE3754	500-1000	28	2.0	6.0	45	TO-46
RE3755	500-1000	28	3.5	5.5	45	MT-59
RE3756	500-1000	28	5.0	6.0	45	MT-59
RE3757	500-1000	28	10.0	6.0	45	MT-59
RE3805	400	28	1.0	10.0	45	TO-131
S704	400	28	1.0	10.0	45	TO-39
S2002	500-1000	28	2.0	5.0	45	MT-66
S3006	400	28	1.2	10.0	45	MT-66
S3059	100-1000	12.5	1.5	7.0	50	TO-131
S3719	100-500	28	1.5	7.0	45	TO-39

THIN FILM PRODUCTS

RESISTORS — Thin film resistors networks are available as discrete units or custom networks and are available both as packaged units or dice. These resistors are used in applications requiring minimum size with maximum stability, accuracy, and thermal tracking.

The resistor material is tantalum nitride and is available from 5Ω/□ to 1000Ω/□. The interconnects and bonding pads are gold or aluminum, depending on customer preference. The substrate is gold backed silicon suitable for eutectic mounting.

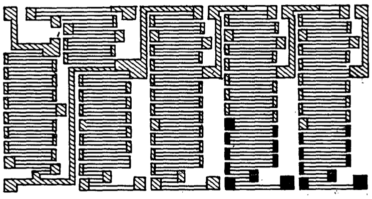
LADDER NETWORKS — Ladder networks are available in 4, 8, 10, and 12 bits with an accuracy of ±½ LSB. TaN is used as the resistor material on an oxidized silicon substrate resulting in an extremely stable network over the full military operating temperature range of −55°C to 125°C. Ladder networks are available both as packaged units and dice. Custom ladder networks with feedback resistors are available at a minimal tooling charge.

PRODUCTS

RESISTORS (4Ω to 1 MegΩ)
LADDER NETWORKS

UR4200 — 4 Bit Ladder	UR4202 — 10 Bit Ladder
UR4201 — 8 Bit Ladder	UR4203 — 12 Bit Ladder

4 BIT LADDER NETWORK



POST OFFICE BOX 11569 • PHILADELPHIA, PENNSYLVANIA 19116 • TELEPHONE: (215) 355-5000 • TWX 510-667-1717

Unisem
TREVOSE, PENNSYLVANIA 19047

SUBSIDIARY OF UNITED AIRCRAFT CORPORATION

J-FET'S General Purpose VHF/UHF Amplifiers; Monolithic Duals; Switching; Low Noise

NEW DIELECTRICALLY-ISOLATED MONOLITHIC DUALS offer advantages over p-channel isolated devices: Better isolation • Lower cross-talk • Excellent thermal tracking • Standard 2N packaging (no seventh lead needed).

GENERAL PURPOSE

Type	Package**	BV_{GSS} Volts Min.	I_{GSS} nA Max.	I_{DSS} mA		G_m µmho		V_p Volts		C_{iss} pf Max.	C_{rss} pf Max.	NF in db Max.
				Min.	Max.	Min.	Max.	Min.	Max.			
2N3069	TO-18	50	1	2	10	1000	2500	—	10	15	—	4
2N3070	TO-18	50	1	0.5	2.5	750	2500	—	5	15	—	4
2N3071	TO-18	50	1	0.1	0.6	500	2500	—	2.5	15	—	4
2N3365	TO-18	40	5	0.8	4	400	2000	—	12	15	—	—
2N3368	TO-18	40	5	2	12	1000	4000	—	12	20	—	—
2N3369	TO-18	40	5	0.5	3.5	800	2500	—	7	20	—	—
2N3437	TO-18	50	0.5	0.8	4	1500	6000	—	4	18	—	2
2N3438	TO-18	50	0.5	0.2	1	800	4500	—	2.5	18	—	2
2N3460	TO-18	50	0.25	0.2	1.0	800	4500	—	2	5	—	1
2N3822	TO-72	50	0.1	0.5	10	3000	6500	—	5	6	3	*200
2N4220	TO-72	30	0.1	0.5	3	1000	4000	—	4	6	2	—
2N4220A	TO-72	30	0.1	0.5	3	1000	4000	—	4	6	2	2.5
2N4221	TO-72	30	0.1	0.2	6	2000	5000	—	6	6	2	—
2N4221A	TO-72	30	0.1	0.2	6	2000	5000	—	6	6	2	2.5
2N4222	TO-72	30	0.1	0.5	15	2500	6000	—	8	6	2	—
2N4222A	TO-72	30	0.1	5	15	2500	6000	—	8	6	2	2.5
2N4224	TO-72	30	0.5	2	20	2000	7500	—	8	6	2	—
2N4338	TO-18	50	0.1	0.2	0.6	600	1800	0.3	1.2	6	2	1
2N4339	TO-18	50	0.1	0.5	1.5	800	2400	0.6	1.8	2	2	1
2N4340	TO-18	50	0.1	1.2	3.6	1300	3000	1	3	2	2	1
2N4341	TO-18	50	0.1	3	9	2000	4000	2	6	6	2	1
2N5103	TO-72	25	0.1	1	8	2000	8000	0.5	4	5	1	1.5
2N5104	70-72	25	0.1	2	6	3500	7500	0.5	4	5	1	1.5
2N5105	TO-72	25	0.1	5	15	5000	10000	0.5	4	5	1	1.5
2N5163	TO-106	25	10	1	40	2000	9000	—	8	20	5	0.05

* e_n in nV / √ Hz @ 10 ≈

AMPLIFIERS VHF/UHF JUNCTION FET/N CHANNEL, SINGLE

Type	Package**	I_{GSS} Volts Min.	BV_{GSS} nA Max.	I_{DSS} mA		Y_{fs} µmho Min.	V_p Volts Max.	C_{iss} pf Max.	C_{rss} pf Max.	C_{oss} pf Max.	G_{ps} db Min.	NF in db Max.
				Min.	Max.							
2N3822	TO-72	50	0.1	2	10	3000	6	6	3	—	—	—
2N3823	TO-72	30	0.5	4	20	3200	8	6	2	—	—	2.5 @ 100 MHz
2N4223	TO-72	30	0.25	3	18	2700	8	6	2	—	10 @ 200 MHz	5 @ 200 MHz
2N4224	TO-72	30	0.5	2	20	4000	6	4	0.8	2	—	—
2N4416	TO-72	30	0.1	5	15	4000	6	4	0.8	2	10 @ 400 MHz	4 @ 400 MHz
2N4416A	TO-72	35	0.1	5	15	2000	4	5	1	—	10 @ 400 MHz	4 @ 400 MHz
2N5103	TO-72	25	0.1	1	8	3500	4	5	1	—	—	—
2N5104	TO-72	25	0.1	2	6	1700	8	6	2	4	—	—
2N5105	TO-72	25	0.1	5	15	5000	4	5	1	—	—	—
2N5078	TO-72	30	0.25	4	25	4000	8	6	2	—	12 @ 400 MHz	4 @ 400 MHz

MONOLITHIC DUAL TRANSISTORS FET/J JUNCTION N-CHANNEL

Type	Package	Δ V_{GS} µV/°C Max.	BV_{GSS} Volts Min.	I_{GSS} nA Max.	I_{DSS} mA		$V_{GS} = 0$ $I_D = 700\ \mu A$ Y_{fs} µmho Min.	$V_{GS\ 1\text{-}2}$ mV Max.	Y_{fs} Match % Max.	I_{DSS} match % Max.	V_p Volts Max.	Y_{os} µmho Max.	$Y_{os\ 1\text{-}2}$ µmho Max.	NF in db Max.
					Min.	Max.								
2N3954	TO-71	10	50	0.1	0.5	5	1000	5	3	5	4.5	35	—	0.5
2N3954A	TO-71	5	50	0.1	0.5	5	1000	5	3	5	4.5	35	—	0.5
2N3955	TO-71	25	50	0.1	0.5	5	1000	10	5	5	4.5	35	—	0.5
2N3955A	TO-71	15	50	0.1	0.5	5	1000	10	3	5	4.5	35	—	0.5
2N3956	TO-71	50	50	0.1	0.5	5	1000	15	5	5	4.5	35	—	0.5
2N3957	TO-71	75	50	0.1	0.5	5	1000	20	10	10	4.5	35	—	0.5
2N3958	TO-71	100	50	0.1	0.5	5	1000	25	15	15	4.5	35	—	0.5
2N5452	TO-71	5	50	0.1	0.5	5	1000	5	3	5	4.5	1	.25	0.5
2N5453	TO-71	10	50	0.1	0.5	5	1000	10	3	5	4.5	1	.25	0.5
2N5454	TO-71	25	40	0.1	0.5	5	1000	15	5	5	4.5	1	.25	0.5
2N5564	TO-71	25	40	0.1	5.0	30	1000	5	5	5	3.0	1	.25	1.0
2N5565	TO-71	25	40	0.1	5.0	30	1000	10	5	5	3.0	1	.25	1.0
2N5566	TO-71	25	50	.25	5.0	30	1000	20	5	5	3.0	1	.25	1.0
JH2101	TO-71	5	50	.25	1.0	10	2000	5	3	5	5	10	—	*10
JH2102	TO-71	10	50	.25	1.0	10	2000	10	5	5	5	10	—	*10
JH2103	TO-71	25	50	.25	1.0	10	2000	25	5	10	5	10	—	*10
JH2104	TO-71	5	50	.25	1.0	10	2000	5	3	5	5	10	—	*20
JH2105	TO-71	10	50	.25	1.0	10	2000	10	5	5	5	10	—	*20
JH2106	TO-71	50	50	.25	1.0	10	2000	25	5	10	5	10	—	*20

* e_n in nV / √ Hz @ 10 ≈

SWITCHING JUNCTION FET/N-CHANNEL, SINGLE

Type	Package**	BV_{GSS} Volts Min.	I_{GSS} nA Max.	I_D off nA Max.	I_{DSS} mA		V_p Volts Max.	C_{iss} pf Max.	C_{rss} pf Max.	Ron Ohms Max.	ton nSec Max.	toff nSec Max.
					Min.	Max.						
2N3970	TO-18	40	0.25	0.25	50	150	10	25	6	30	20	30
2N3971	TO-18	40	0.25	0.25	25	75	5	25	6	60	30	60
2N3972	TO-18	40	0.25	0.25	5	30	3	25	6	100	80	100
2N4091	TO-18	40	0.2	0.2	30	—	10	16	5	30	25	40
2N4092	TO-18	40	0.2	0.2	15	—	7	16	5	50	35	60
2N4093	TO-18	40	0.2	0.2	8	—	5	16	5	80	60	80
2N4391	TO-18	40	0.1	0.1	50	150	10	14	3.5	30	20	35
2N4392	TO-18	40	0.1	0.1	25	75	5	14	3.5	60	20	55
2N4393	TO-18	40	0.1	0.1	5	30	3	14	3.5	100	20	80
*2N4856	TO-18	40	0.25	0.25	50	—	10	18	8	25	9	25
*2N4857	TO-18	40	0.25	0.25	20	100	6	18	8	40	10	50
*2N4858	TO-18	40	0.25	0.25	8	80	4	18	8	60	20	100
*2N4859	TO-18	30	0.25	0.25	50	—	10	18	8	25	9	25
*2N4860	TO-18	30	0.25	0.25	20	100	6	18	8	40	10	50
*2N4861	TO-18	30	0.25	0.25	8	80	4	18	8	60	20	100

LOW NOISE JUNCTION FET/N-CHANNEL, SINGLE

Type	Package**	BV_{GSS} Volts Min.	I_{GSS} nA Max.	I_{DSS} mA		Y_{fs} µmho		V_p Volts		C_{iss} pf Max.	C_{rss} pf Max.	NF in db Max.
				Min.	Max.	Min.	Max.	Min.	Max.			
*2N3684	TO-72	50	0.1	2.5	7.5	2000	3000	2	5	4	1.2	*150
*2N3685	TO-72	50	0.1	1	3.5	1500	2500	1	3.5	4	1.2	*150
*2N3686	TO-72	50	0.1	0.4	1.2	1000	2000	0.6	2	4	1.2	*150
*2N3687	TO-72	50	0.1	0.1	0.5	500	1500	0.3	1.2	4	1.2	*150
2N5105	TO-72	50	0.1	5	15	5000	10000	—	4	5	1	1.5
2N5592	TO-72	50	0.25	1.0	10	2000	7000	1	5	20	5	*10
2N5593	TO-72	50	0.25	1.0	10	2000	7000	1	5	20	5	*15
2N5594	TO-72	50	0.25	1.0	10	2000	7000	1	5	20	5	*20

* Also available in "A" versions.
** All single J-FETS available in plastic TO-106.

* e_n in nV / √ Hz @ 10 ≈

POST OFFICE BOX 11569 • PHILADELPHIA, PENNSYLVANIA 19116 • TELEPHONE: (215) 355-5000 • TWX 510-667-1717

UNITRODE CORPORATION

582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

ZENER DIODES

Industrial		Military		
Package	Body B1	Body A	Body B	Body C
Voltage 10% Tolerance	1 Watt	3 Watt	5 Watt	10 Watt (in lead mount version) 6 Watt
6.8	UZ8806	UZ806	UZ5806	UZ7806
7.5	UZ8807	UZ807	UZ5807	UZ7807
8.2	UZ8808	UZ808	UZ5808	UZ7808
9.1	UZ8809	UZ809	UZ5809	UZ7809
10	UZ8810	UZ810	UZ5810	UZ7810
12	UZ8812	UZ812	UZ5812	UZ7812
13	UZ8813	UZ813	UZ5813	UZ7813
14	UZ8814	UZ814	UZ5814	UZ7814
15	UZ8815	UZ815	UZ5815	UZ7815
16	UZ8816	UZ816	UZ5816	UZ7816
18	UZ8818	UZ818	UZ5818	UZ7818
20	UZ8820	UZ820	UZ5820	UZ7820
22	UZ8822	UZ822	UZ5822	UZ7822
24	UZ8824	UZ824	UZ5824	UZ7824
27	UZ8827	UZ827	UZ5827	UZ7827
30	UZ8830	UZ830	UZ5830	UZ7830
33	UZ8833	UZ833	UZ5833	UZ7833
36	UZ8836	UZ836	UZ5836	UZ7836
40	UZ8840	UZ840	UZ5840	UZ7840
45	UZ8845	UZ845	UZ5845	UZ7845
50	UZ8850	UZ850	UZ5850	UZ7850
56	UZ8856	UZ856	UZ5856	UZ7856
60	UZ8860	UZ860	UZ5860	UZ7860
70	UZ8870	UZ870	UZ5870	UZ7870
75	UZ8875	UZ875	UZ5875	UZ7875
80	UZ8880	UZ880	UZ5880	UZ7880
90	UZ8890	UZ890	UZ5890	UZ7890
100	UZ8210	UZ210	UZ5210	UZ7210
110	UZ8211	UZ211	UZ5211	
120	UZ8212	UZ212	UZ5212	
130	UZ8213	UZ213	UZ5213	
140	UZ8214	UZ214	UZ5214	
150	UZ8215	UZ215	UZ5215	
160	UZ8216	UZ216	UZ5216	
170	UZ8217	UZ217	UZ5217	
180	UZ8218	UZ218	UZ5218	
190	UZ8219	UZ219	UZ5219	
200	UZ8220	UZ220	UZ5220	
220		UZ222	UZ5222	
240		UZ224	UZ5224	
260		UZ226	UZ5226	
280		UZ228	UZ5228	
300		UZ230	UZ5230	
320		UZ232	UZ5232	
340		UZ234	UZ5234	
360		UZ236	UZ5236	
380		UZ238	UZ5238	
400		UZ240	UZ5240	

Specify 20% voltage tolerance by changing third digit from right up one digit. (UZ809 becomes UZ909).
Specify 5% voltage tolerance by changing third digit from right down one digit. (UZ2820 becomes UZ2720).

Polarity is cathode to stud.
For reverse polarity use suffix "R" with part numbers.
e.g. UZ7818R

JAN ZENER DIODES

5 Watts 5% Tolerance
Meets MIL-S-19500/356 (Body B)

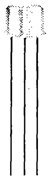
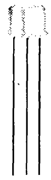
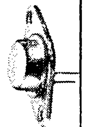
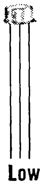
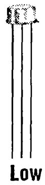
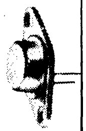
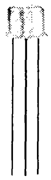
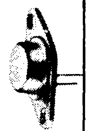
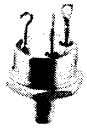
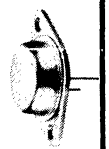
Part no.	V nom at Iz 1250 mV	Typical Temp. Coeff. Tz at Iz
JAN & JANTX 1N4954	6.8V	.05%/°C
JAN & JANTX 1N4955	7.5	.06
JAN & JANTX 1N4956	8.2	.06
JAN & JANTX 1N4957	9.1	.06
JAN & JANTX 1N4958	10	.07
JAN & JANTX 1N4959	11	.07
JAN & JANTX 1N4960	12	.07
JAN & JANTX 1N4961	13	.08
JAN & JANTX 1N4962	15	.08
JAN & JANTX 1N4963	16	.08
JAN & JANTX 1N4964	18	.085
JAN & JANTX 1N4965	20	.085
JAN & JANTX 1N4966	22	.085
JAN & JANTX 1N4967	24	.09
JAN & JANTX 1N4968	27	.09
JAN & JANTX 1N4969	30	.09
JAN & JANTX 1N4970	33	.095
JAN & JANTX 1N4971	36	.095
JAN & JANTX 1N4972	39	.095
JAN & JANTX 1N4973	43	.095
JAN & JANTX 1N4974	47	.095
JAN & JANTX 1N4975	51	.095
JAN & JANTX 1N4976	56	.095
JAN & JANTX 1N4977	62	.100
JAN & JANTX 1N4978	68	.100
JAN 1N4979	75	.100
JAN 1N4980	82	.100
JAN 1N4981	91	.100
JAN 1N4982	100	.100
JAN 1N4983	110	.100
JAN 1N4984	120	.100
JAN 1N4985	130	.105
JAN 1N4986	150	.105
JAN 1N4987	160	.105
JAN 1N4988	180	.110
JAN 1N4989	200	.110
JAN 1N4990	220	.115
JAN 1N4991	240	.115
JAN 1N4992	270	.120
JAN 1N4993	300	.120
JAN 1N4994	330	.120
JAN 1N4995	360	.120

UNITRODE quality takes the worry out of paying less.

UNITRODE CORPORATION

582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

POWER TRANSISTORS

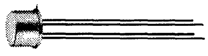
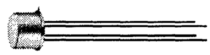
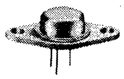
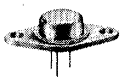
Package	 TO-5	 TO-5	 TO-66	 Low Profile TO-5	 Low Profile TO-5	 TO-66	TO-59 TO-111*	 TO-5	 TO-66	TO-59 TO-111*	TO-61 TO-61* Isolated Collector	 TO-63	 TO-3
V_{ceo} (sust)	2A 5W	3A 15W	3A 20W	5A 5W	5A 15W	5A 20W	5A 30W	10A 15W	10A 30W	20A 30W	20A 50W	30A 100W	30A 150W
40				SSP2853 ² SSP2854 SSP2855 SSP2856	2N2853 2N2854 2N2855 2N2856		2N3852 2N3853 SSP3852* SSP3853*						
50						2N3878							
60						SSP3050						SSP3303	SSP3301
70													
75						2N3879		2N4150*¹					
80				SSP2848 ² SSP2850 SSP2851 SSP2852	2N5487 ² 2N5850 2N5851 2N5852	SSP3051	2N3850 2N3851 SSP3850* SSP3851*	2N5552 ¹		2N5658 2N5659*	SSP3200 SSP3201*	SSP3302	SSP3300
100				SSP2849 ²	2N5488 ²			2N4150*¹					
120	†2N4863 †SSP3020							2N5552 ¹					
150													
200		2N5662 ¹	2N5660					2N5666 ¹	2N5664				
300		2N5663 ¹	2N5661					2N5667 ¹	2N5665				

†Also available in:
TO-5 Low Profile
TO-5 Low Profile 7/16 Stud
TO-5 7/16 Stud

¹ TO-5 7/16 Stud
² TO-5 Low Profile 7/16 Stud
TO-5
TO-5 7/16 Stud

*This device has 15 watt capability when packaged in SSPI exclusive RWTO5 package.

NPN POWER DARLINGTONS

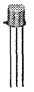
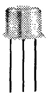
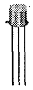
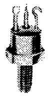
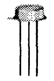
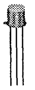
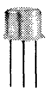
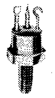
Type	Voltage Ratings (Volts) V_{CER}	V_{EBI}	Power Rating $I_O = 100°C$ (Watts)	h_{FE} min	V_{CE} (sat) max (Volts)	f_t Type (MHz)	Package
	5 Amp DC,	10 Amp, Peak		@ 5A	@ 5A		
U2T101	80	12	5	2000	1.5	50	 TO-33 (4-leaded TO-5)
U2T105	150	12	5	1000	2.5	50	 TO-33 (4-leaded TO-5)
U2T201	80	12	25	2000	1.5	50	 TO-66 (3 PIN)
U2T205	150	12	25	1000	2.5	50	 TO-66 (3 PIN)

UNITRODE quality takes the worry out of paying less.

UNITRODE CORPORATION

582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

SCRs

	C-line Industrial							
	Standard Grade		Industrial High Speed		Premium Grade			
Package	 TO-18	 TO-5	 TO-18	 TO-59	 TO-46	 TO-18	 TO-5	 TO-59
V_{EX} V_{RX} min Volts	0.5A @100°C case	1.6A @70°C case	0.4A @ 70°C case	6A @ 70°C case	0.5A @ 100°C case	0.5A @ 100°C case	1.6A @ 85°C case	5.0A @100°C case
30	ID100	ID600*			B150	BA150 CB200	CD200	
50		ID200 ID601*						
60	ID101		GA300 GA300A	GB300 GB300A	B151	AA100 AA107 AA114 BA151 CB201	AD100 AD107 AD114 CD201	CM106
100	ID102	ID201 ID602*	GA301 GA301A	GB301 GB301A	B152	AA101 AA108 AA115 BA152 CB202	AD101 AD108 AD115 CD202	CM107
150	ID103	ID202 ID603*						
200	ID104	ID203 ID604*				AA102 AA109 AA116 CB203	AD102 AD109 AD116 CD203	CM108
300		ID300 ID605*				AA103 AA110 AA117	AD103 AD110 AD117	CM109
400		ID301 ID606*				AA104 AA111 AA118	AD104 AD111 AD118	CM110

*Electrically equivalent hermetic replacement for the GE C106 with the same lead sequence.

	Military Aerospace			
Package	TO-18	TO-46	TO-5	TO-59
V_{EX} V_{RX} min Volts	0.5A @ 100°C case	0.5A @ 100°C case	1.6A @ 85°C case	5.0A @ 100°C case
30	2N3027 2N3030	3027-1 3030-1		
60	2N5719 2N3028 2N3031	3028-1 3031-1	2N5724	CM100
100	2N5720 2N3029 2N3032	3029-1 3032-1	2N5725	CM101
200	2N5721		2N5726	CM102
300	2N5722		2N5727	CM103
400	2N5723		2N5728	CM104

Military High Speed			
TO-18	TO-18	TO-46	TO-59
0.4A @ 100°C case	0.5A @ 100°C case	0.5A @ 100°C case	5.0A @ 100°C case
	2N3027 2N3030	3027-1 3030-1	
GA200 GA200A	2N3028 2N3031	3028-1 3031-1	GB200 GB200A
GA201 GA201A	2N3029 2N3032	3029-1 3032-1	GB201 GB201A

MILITARY APPROVED SCRs

JAN 2N1870A
JAN 2N1871A
JAN 2N1872A
JAN 2N1874A

JAN & JANTX 2N2323
JAN & JANTX 2N2323A
JAN & JANTX 2N2324
JAN & JANTX 2324A

JAN & JANTX 2N2326
JAN & JANTX 2N2326A
JAN & JANTX 2N2328
JAN & JANTX 2N2328A

JAN & JANTX 2N2329
JAN & JANTX 2N3027
JAN & JANTX 2N3028
JAN & JANTX 2N3029

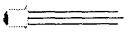
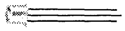
JAN & JANTX 2N3030
JAN & JANTX 2N3031
JAN & JANTX 2N3032

UNITRODE quality takes the worry out of paying less.

UNITRODE CORPORATION

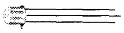
582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

PHOTO SCRs

Type	V_{FX} V_{RX} min Volts	Light trigger intensity min foot candles	Light trigger intensity max foot candles	I_{HX} max mA	Package
PR30	30	2	10	1.0 @ $R_{gk} = 4.7K$	 ROUND LENS TO-18
PR60	60				
PR100	100				
PR200	200				
PR30A	30	4	10	1.0 @ $R_{gk} = 4.7K$	
PR60A	60				
PR100A	100				
PR200A	200				
PF30	30	10	50	1.0 @ $R_{gk} = 4.7K$	 FLAT LENS TO-18
PF60	60				
PF100	100				
PF200	200				
PF30A	30	20	50	1.0 @ $R_{gk} = 4.7K$	
PF60A	60				
PF100A	100				
PF200A	200				

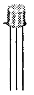
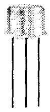
PUTs

Programmable Unijunction Transistors

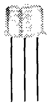
Type	V_{AK} V_{KA} Volts	I_v, $R_G = 10k$ μA min	I_p, $R_G = 10k$ μA max	V_T, $R_G = 10k$ Volts min	V_T, $R_G = 10k$ Volts max	V_F @ $I_F = 50mA$ Volts max	Package
U13T1	40	70	5	0.2	0.6	1.5	 TO-18
U13T2	40	25	1				
U13T3	100	70	5				
U13T4	100	25	1				

SPECIAL PURPOSE DEVICES

SCR s Gate Turn-off

Package	TO-18	 TO-18	 TO-5
Vf Volts min	I_{GQ} @ I_F max mA mA 2.0 @ 4.0	I_{GQ} @ I_F max mA mA 50 @ 250	I_{GQ} @ I_F max mA mA 100 @ 500
15	2N892, 3		
30	2N894, 5	CB5020	CD5000
60	2N896, 7	CB5021	CD5001
100	2N898, 9	CB5022	CD5002
200	2N990, 1	CB5023	CD5003

Solid State A C Switch

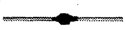
Package	 TO-5	TO-111
V_D min volts	I_t max RMS 0.8A @ 100°C case	I_t max RMS 4.0A @ 100°C case
175	PIC 110	PIC 130
200	PIC 100 PIC 101	PIC 120 PIC 121
350	PIC 111	PIC 131
400	PIC 102 PIC 103	PIC 122 PIC 123

UNITRODE quality takes the worry out of paying less.

UNITRODE CORPORATION

582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

RECTIFIERS

		General Purpose	2 Amp Series				4 Amp Series		12 Amp Series		
Package		 Body A	Body A				Body B		Body C		
Max. Av. D.C.† output current 25°C		3/4 A	1.0 A	1.25 A	1.5 A	2.0 A	2.0 A	4.0 A	7.5 A 100°C	9.0 A 100°C	12.0 A 100°C
PIV	50	UT111					UT2005	UT4005	UT5105	UT6105	UT8105
	100	UT112	UT236	UT249	UT251	UT261	UT2010	UT4010	UT5110	UT6110	UT8110
	200	UT113	UT234	UT242	UT252	UT262	UT2020	UT4020	UT5120	UT6120	UT8120
	225	*UT211									
	300	UT114 *UT212									
	400	UT115 *UT213	UT235	UT244	UT254	UT264	UT2040	UT4040	UT5140	UT6140	UT8140
	500	UT117 *UT214	UT237	UT245	UT255	UT265					
	600	UT118 *UT215	UT238	UT247	UT257	UT267	UT2060	UT4060	UT5160	UT6160	UT8160
	800	UT119	UT361	UT362	UT258	UT268					
	1000	UT120	UT347	UT363	UT364						

*Low Leakage Types
†For mounting vs. rating information see General Catalog c 159

MILITARY APPROVED RECTIFIERS

General Purpose — 1 Amp Types

JAN & JANTX 1N4245
JAN & JANTX 1N4246
JAN & JANTX 1N4247

Fast Recovery — 1 Amp Types

JAN & JANTX 1N4942
JAN & JANTX 1N4944
JAN & JANTX 1N4946

General Purpose — 2 Amp Types

JAN & JANTX 1N3611
JAN & JANTX 1N3612
JAN & JANTX 1N3613
JAN & JANTX 1N3614

Fast Recovery — 3 Amp Types

JAN & JANTX 1N5186
JAN & JANTX 1N5187
JAN & JANTX 1N5188
JAN & JANTX 1N5190

UNITRODE quality takes the worry out of paying less.

UNITRODE CORPORATION

582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

HIGH SPEED RECTIFIERS

Fast Recovery Rectifiers

9 amp. Series (Body C)

Type	PIV	Max. Av D.C. Current Output 100°C Case Temp.	Min. Forward Current at 1.1V 25°C	Max. Reverse Current at PIV		Max. Reverse Recovery Time	Max. Peak One Cycle Surge Sinusoidal 8.3 msec.
				25°C	100°C		
UTR 6405	50V	9.0A	6.0A	10μA	300μA	300nsec	150A
UTR 6410	100	9.0	6.0	10	300	300	150
UTR 6420	200	9.0	6.0	10	300	400	150
UTR 6440	400	9.0	6.0	10	300	500	150
UTR 5405	50	7.5	5.0	10	300	300	135
UTR 5410	100	7.5	5.0	10	300	300	135
UTR 5420	200	7.5	5.0	10	300	400	135
UTR 5440	400	7.5	5.0	10	300	500	135
UTR 4405	50	6.0	4.0	10	300	300	120
UTR 4410	100	6.0	4.0	10	300	300	120
UTR 4420	200	6.0	4.0	10	300	400	120
UTR 4440	400	6.0	4.0	10	300	500	120

Fast Recovery Rectifiers

2 amp. Series (Body A)

UTR 02	50V	2.0A	1.0A	1000mA	3μA	100μA	250nsec	25A
UTR 12	100	2.0	1.0	1000	3	100	250	25
UTR 22	200	2.0	1.0	1000	3	100	250	25
UTR 32	300	2.0	1.0	1000	3	100	300	25
UTR 42	400	2.0	1.0	1000	3	100	350	25
UTR 52	500	2.0	1.0	1000	3	100	400	25
UTR 62	600	2.0	1.0	1000	3	100	400	25
UTR 01	50	1.0	0.5	500	3	100	250	20
UTR 11	100	1.0	0.5	500	3	100	250	20
UTR 21	200	1.0	0.5	500	3	100	250	20
UTR 31	300	1.0	0.5	500	3	100	300	20
UTR 41	400	1.0	0.5	500	3	100	350	20
UTR 51	500	1.0	0.5	500	3	100	400	20
UTR 61	600	1.0	0.5	500	3	100	400	20
UTR 10	100	0.5	0.25	200	3	100	250	15
UTR 20	200	0.5	0.25	200	3	100	250	15
UTR 30	300	0.5	0.25	200	3	100	300	15
UTR 40	400	0.5	0.25	200	3	100	350	15
UTR 50	500	0.5	0.25	200	3	100	400	15
UTR 60	600	0.5	0.25	200	3	100	400	15

Fast Recovery Rectifiers

4 amp. Series (Body B)

TYPE	PIV	Max. Av. D.C. Output Current		Min. Forward Current @ 1.1V 25°C	Max. Reverse Current at PIV		Max. Reverse Recovery Time	Max. Pek One Cycle Surge Sinusoidal 8.3 msec
		25°C	100°C		25°C	100°C		
UTR 4305	50V	4.0A	2.0A	4A	5μA	100μA	250nsec	100A
UTR 4310	100	4.0	2.0	4	5	100	250	100
UTR 4320	200	4.0	2.0	4	5	100	250	100
UTR 4340	400	4.0	2.0	4	5	100	400	100
UTR 4350	500	4.0	2.0	4	5	100	400	100
UTR 4360	600	4.0	2.0	4	5	100	400	100
UTR 3305	50	3.0	1.5	3	5	100	250	80
UTR 3310	100	3.0	1.5	3	5	100	250	80
UTR 3320	200	3.0	1.5	3	5	100	250	80
UTR 3340	400	3.0	1.5	3	5	100	300	80
UTR 3350	500	3.0	1.5	3	5	100	350	80
UTR 3360	600	3.0	1.5	3	5	100	400	80
UTR 2305	50	2.0	1.0	2	5	100	250	60
UTR 2310	100	2.0	1.0	2	5	100	250	60
UTR 2320	200	2.0	1.0	2	5	100	250	60
UTR 2340	400	2.0	1.0	2	5	100	300	60
UTR 2350	500	2.0	1.0	2	5	100	350	60
UTR 2360	600	2.0	1.0	2	5	100	400	60

Ultra Fast Recovery Rectifiers

4 amp. Series (Body B)

UTX 4105	50V	4.0	2.0	3.0A @ 1.0V	5μA	75μA	100nsec	80A
UTX 4110	100	4.0	2.0	3.0	5	75	100	80
UTX 4115	150	4.0	2.0	3.0	5	75	100	80
UTX 4120	200	4.0	2.0	3.0	5	75	100	80
UTX 3105	50	3.0	1.5	2.0	5	75	100	60
UTX 3110	100	3.0	1.5	2.0	5	75	100	60
UTX 3115	150	3.0	1.5	2.0	5	75	100	60
UTX 3120	200	3.0	1.5	2.0	5	75	100	60

Ultra Fast Recovery Rectifiers

2 amp. Series (Body A)

UTX 205	50V	2.0A	1.0A	1.0A @ 1.0V	3μA	50μA	75nsec	25A
UTX 210	100	2.0	1.0	1.0	3	50	75	25
UTX 215	150	2.0	1.0	1.0	3	50	75	25
UTX 220	200	2.0	1.0	1.0	3	50	75	25
UTX 225	250	2.0	1.0	1.0	3	50	75	25
UTX 105	50	1.0	0.5	0.5	3	50	75	20
UTX 110	100	1.0	0.5	0.5	3	50	75	20
UTX 115	150	1.0	0.5	0.5	3	50	75	20
UTX 120	200	1.0	0.5	0.5	3	50	75	20
UTX 125	250	1.0	0.5	0.5	3	50	75	20

ADDITIONAL THYRISTOR & TRANSISTOR PRODUCT LISTING

(older types not recommended for new design)

SCR s

Type No	Vfx, Vrx min Volts	Igt max μA	Package
2N 876	15	200	TO-18
2N 877	30		
2N 878	60		
2N 879	100		
2N 880	150		
2N 881	200		
2N 882	300		
2N 883	400		
2N 884	15	20	TO-18
2N 885	30		
2N 886	60		
2N 887	100		
2N 888	150		
2N 889	200		
2N 890	300		
2N 891	400		
2N 948	30	20	TO-18
2N 949	60		
2N 950	100		
2N 951	200		
2N 1595	50	10mA	TO-5
2N 1596	100		
2N 1597	200		
2N 1598	300		
2N 1599	400		
2N 1875	15	20	TO-9
2N 1876	30		
2N 1877	60		
2N 1878	100		
2N 1879	150		
2N 1880	200		
2N 1881	30	2mA	TO-9
2N 1882	60		
2N 1883	100		
2N 1884	150		
2N 1885	200		
2N 2009	25	200	TO-5
2N 2010	60		
2N 2011	100		
2N 2012	200		
2N 2013	300		
2N 2014	400		
2N 2344	25	20	TO-5
2N 2345	50		
2N 2346	100		
2N 2347	150		
2N 2348	200		

SCR s cont.

Type No	Vfx, Vrx min Volts	Igt max μA	Package
2N 2679	30	20	TO-18
2N 2680	60		
2N 2681	100		
2N 2682	200		
2N 2683	30	20	TO-18
2N 2684	60		
2N 2685	100		
2N 2686	200		
2N 2687	30	200	TO-18
2N 2688	60		
2N 2689	100		
2N 2690	200		
2N 3001	30	20	TO-18
2N 3002	60		
2N 3003	100		
2N 3004	200		
2N 3005	30	200	TO-18
2N 3006	60		
2N 3007	100		
2N 3008	200		
2N 3254	15	20	TO-46
2N 3255	30		
2N 3256	60		
2N 3257	15	200	TO-46
2N 3258	30		
2N 3259	60		
2N 3273	100	200	TO-5
2N 3274	200		
2N 3275	300		
2N 3276	400		
2N 3555	30	20	TO-5
2N 3556	60		
2N 3557	100		
2N 3558	200		
2N 3559	30	200	TO-5
2N 3560	60		
2N 3561	100		
2N 3562	200		
2N 4096	60	200	TO-46
2N 4097	100		
2N 4108	50	200	TO-18
2N 4109	100		
2N 4110	200		
2N 4144	15		
2N 4145	30		

SCR s cont.

Type No	Vfx, Vrx min Volts	Igt max μA	Package
2N 4146	60	200	TO-52
2N 4147	100		
2N 4148	150		
2N 4149	200		
2N 4212	25	50	TO-5
2N 4213	50		
2N 4214	100		
2N 4215	150		
2N 4216	200		
2N 4217	250		
2N 4218	300		
2N 4219	400		

Transistors

Type No	BVceo	Ic	Package
2N 1208	60	2	TO-61
2N 1209	45		
2N 1212	60		
2N 1647	60	5	TO-59
2N 1648	80		
2N 1649	60		
2N 1650	80		
2N 1714	60	2	TO-5
2N 1715	100		
2N 1716	60		
2N 1717	100		
2N 1718	60	2	TO-5
2N 1719	100		
2N 1720	60		
2N 1721	100		
2N 1724	80	5	TO-61
2N 1724A	120		
2N 1725	80		
2N 1886	60	5	TO-59
2N 2150	80		
2N 2151	80		
2N 2657	50	5	TO-5
2N 2658	70		
2N 2811	50	20	TO-61
2N 2812	50		
2N 2813	70		
2N 2814	70		
2N 2828	60	5	TO-59
2N 2829	60		

Transistors cont.

Type No	BVceo	Ic	Package
2N 2858	80	5	TO-5
2N 2859	100		
2N 2877	50	5	TO-59
2N 2878	50		
2N 2879	70		
2N 2880	70		
2N 2890	80	5	TO-5
2N 2891	80		
2N 2892	80	5	TO-59
2N 2893	80		
2N 2995	50	5	TO-5
2N 3418	60	5	TO-5
2N 3419	80		
2N 3420	60		
2N 3421	80		
2N 3469	20		
2N 3487	60	10	TO-61
2N 3488	80		
2N 3489	100		
2N 3490	60	15	TO-61
2N 3491	80		
2N 3492	100		
2N 3744	30	5	TO-111
2N 3745	50	5	TO-111
2N 3746	70		
2N 3747	30		
2N 3748	50		
2N 3749	70		
2N 3750	30		
2N 3751	50		
2N 3752	70		
2N 3996	90	5	TO-111
2N 3997	80		
2N 3998	80	5	TO-59
2N 3999	80		
2N 4000	80	3	TO-5
2N 4001	100		
2N 4002	80	30	TO-63
2N 4003	100		
2N 4075	80	5	TO-111
2N 4076	80		
2N 4300	80	2	TO-5
2N 4301	80	10	TO-61
2N 5038	90	30	TO-3
2N 5039	75	30	TO-3
2N 5085	80	10	TO-111

UNITRODE quality takes the worry out of paying less.

UNITRODE CORPORATION

582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

STACKS

High Voltage Stacks

TYPE	PIV	Max. Av. DC Output Current		Max. Forward Voltage Drop at 25°C	Max. Reverse Current at PIV		Peak Surge Sinusoidal 8.3 msec	Body Size
		25°C—Air	50°C—Oil		25°C	100°C		
US 12	1200V	1000mA	2500mA	2.0V @ 400mA	2μA	100μA	20A	A
US 15	1500	800	2000	3.0V @ 400	2	100	20	A
US 18	1800	700	1750	3.0V @ 400	2	100	20	A
US 20	2000	600	1500	4.0V @ 400	2	100	20	A
US 25	2500	600	1500	5.0V @ 400	2	100	20	B
US 30	3000	500	1250	6.0V @ 400	2	100	20	B
US 35	3500	400	1000	7.0V @ 200	2	100	15	C
US 40	4000	350	850	7.0V @ 200	2	100	15	C
US 45	4500	300	750	8.0V @ 200	2	100	15	D
US 50	5000	300	750	9.0V @ 200	2	100	15	D
US 60	6000	200	500	10.0V @ 200	2	100	15	D
US 70	7000	200	500	12.0V @ 200	2	100	15	D
US 80	8000	150	375	14.0V @ 100	2	100	10	E
US 100	10000	150	375	17.0V @ 100	2	100	10	E
US 120	12000	150	375	21.0V @ 100	2	100	10	E
US 150	15000	100	250	26.0V @ 100	2	100	10	E
US 180	18000	80	200	31.0V @ 100	2	100	10	E
US 200	20000	80	200	34.0V @ 100	2	100	10	E

Fast Recovery Stacks

TYPE	PIV	Max. Av. DC Output Current		Max. Forward Voltage Drop at 25°C	Max. Reverse Recovery Time	Max. Reverse Current at PIV		Peak Surge Sinusoidal 8.3 msec	Body Size
		25°C—Air	50°C—Oil			25°C	100°C		
USR 12	1200V	750mA	1850mA	3.3V @ 400mA	500nsec	5μA	150μA	15A	A
USR 15	1500	600	1500	4.0V @ 400	500	5	150	15	A
USR 20	2000	500	1250	5.5V @ 400	500	5	150	15	B
USR 25	2500	400	1000	6.6V @ 400	500	5	150	15	B
USR 30	3000	400	1000	7.7V @ 400	500	5	150	15	C
USR 35	3500	350	850	8.8V @ 200	500	5	150	10	C
USR 40	4000	300	750	9.9V @ 200	500	5	150	10	D
USR 45	4500	250	625	11.0V @ 100	500	5	150	10	D
USR 50	5000	250	625	13.0V @ 100	500	5	150	10	D
USR 60	6000	150	375	15.4V @ 100	500	5	150	10	D
USR 70	7000	150	375	17.6V @ 100	500	5	150	10	E
USR 80	8000	125	300	20.0V @ 100	500	5	150	10	E
USR 100	10000	125	300	24.0V @ 100	500	5	150	10	E
USR 120	12000	100	250	31.0V @ 100	500	5	150	10	E
USR 150	15000	80	200	33.0V @ 100	500	5	150	10	E
USR 180	18000	75	175	35.0V @ 100	500	5	150	10	E

BRIDGES

High Voltage Bridges — Single Phase

TYPE	PIV Per Leg	Max. Av. DC Output Current		Max. Forward Voltage Drop Per Leg at 25°C	Max. Reverse Current Per Leg at PIV		Peak Surge Sinusoidal 8.3 msec	Body Size
		25°C—Air	50°C—Oil		25°C	100°C		
673-1	100V	1.5A	2.5A	1.1V @ 500mA	2μA	100μA	25A	G & S
673-2	200	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-3	300	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-4	400	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-5	500	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-6	600	1.5	2.5	1.1V @ 500	2	100	25	G & S
673-7	1200	.600	1.5	2.2V @ 400	2	100	15	H
673-75	1800	.500	1.25	3.3V @ 400	2	100	15	J
673-8	2400	.400	1.0	4.4V @ 400	2	100	15	K
673-85	3000	.300	.75	5.5V @ 300	2	100	15	L
673-9	3600	.200	.5	6.6V @ 200	2	100	15	M
673-10	4200	.180	.45	7.7V @ 200	2	100	15	N
673-11	4800	.160	.40	8.8V @ 150	2	100	15	O
673-12	5000	.160	.40	9.0V @ 150	2	100	15	O

Fast Recovery Bridges — Single Phase

TYPE	PIV Per Leg	Max. Av. DC Output Current		Max. Forward Voltage Drop Per Leg at 25°C	Max. Reverse Recovery Time nanosec.	Max. Reverse Current Per Leg at PIV		Peak Surge Sinusoidal 8.3 msec	Body Size
		25°C—Air	50°C—Oil			25°C	100°C		
676-1	100V	1.0A	1.8A	1.1V @ 500mA	500	5μA	150μA	20A	G & S
676-2	200	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-3	300	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-4	400	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-5	500	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-6	600	1.0	1.8	1.1V @ 500	500	5	150	20	G & S
676-12	1200	.400	1.0	3.3V @ 300	500	5	150	10	J
676-18	1800	.350	.850	4.4V @ 200	500	5	150	10	K
676-24	2400	.325	.800	5.5V @ 200	500	5	150	10	L
676-30	3000	.250	.625	7.7V @ 200	500	5	150	10	M
676-36	3600	.175	.425	8.8V @ 150	500	5	150	10	N
676-42	4200	.150	.375	9.9V @ 150	500	5	150	10	O
676-48	4800	.135	.325	11.0V @ 150	500	5	150	10	P
676-50	5000	.125	.300	11.0V @ 150	500	5	150	10	P

Ultra Fast Recovery Bridges — Single Phase

677-1	50	1.0	1.8	1.1V @ 500	75	2	100	20	G & S
677-2	100	1.0	1.8	1.1V @ 500	75	2	100	20	G & S
677-3	150	1.0	1.8	1.1V @ 500	75	2	100	20	G & S
677-4	200	1.0	1.8	1.1V @ 500	75	2	100	20	G & S

HIGH VOLTAGE DOORBELLS

Standard Modules

Type	Max. Av. D.C. Current Output			PIV	Max. Rev. Current at PIV	Max. Forward Voltage Drop	Max. Rev. Recovery Time	Max. Rev. Transient Energy Absorption	Outline
	75°C Case Air	60°C Case with Extender Plate-Air	50°C Oil						
200 amp. surge									
UGE 2.5	6.6A	8.25A	10.0A	2.5KV	10μA	5V @ 3.3A	—	8 joules	G
UDE 2.5††	6.0	7.0	7.7	2.5	10	5 3.0	—	8	D
UGE 5	5.0	6.25	7.5	5	15	10 2.5	—	14	G
UDE 5††	4.5	5.0	5.5	5	10	10 2.2	—	14	D
UGE 7.5	3.3	4.1	5.0	7.5	10	13 1.6	—	20	G
100 amp. surge									
UGB 5	4.4	5.5	6.6	5	5	9 2.2	—	7	G
UGB 7.5	3.0	3.75	5.0	7.5	5	13 1.5	—	10	G
UDB 2.5	3.0	3.75	5.0	2.5	5	4 1.5	—	4	D
UGB 10	2.3	2.85	3.5	10	5	17 1.1	—	14	G
UDB 5	2.0	2.5	2.75	5	5	8 1.0	—	8	D
UDB 7.5	1.33	1.65	2.0	7.5	5	12 0.7	—	12	D
30 amp. surge									
UDA 5	1.65	2.0	2.2	5	2	8 .82	—	1.5	D
UDA 7.5	1.25	1.55	1.75	7.5	2	12 .60	—	2.5	D
UDA 10	1.0	1.25	1.40	10	2	16 .50	—	3	D
UDA 15	0.67	0.8	0.90	15	2	25 .33	—	5	D

Fast Recovery Modules

150 amp. surge									
UGF 2.5	5.0	6.25	8.0	2.5	10	6 2.5	500nsec	8	G
UDF 2.5††	4.5	5.0	5.3	2.5	10	6 2.2	500	8	D
UGF 5	3.75	4.7	6.0	5	10	11 1.8	500	14	G
UDF 5††	3.3	4.0	4.4	5	10	11 1.6	500	14	D
UGF 7.5	2.5	3.1	4.0	7.5	10	17 1.2	500	20	G
80 amp. surge									
UGD 5	3.3	4.1	4.8	5	5	11 1.6	500	7	G
UGD 7.5	2.25	2.8	3.5	7.5	5	17 1.1	500	10	G
UDD 2.5	2.25	2.8	3.3	2.5	5	6 1.2	500	4	D
UGD 10	1.75	2.2	2.5	10	5	22 .85	500	14	G
UDD 5	1.5	1.85	2.0	5	5	11 .75	500	8	D
UDD 7.5	1.0	1.25	1.5	7.5	5	17 .50	500	12	D
25 amp. surge									
UDC 5	1.2	1.5	1.7	5	2	10 .70	500	1.5	D
UDC 7.5	0.9	1.1	1.25	7.5	2	15 .50	500	2.5	D
UDC 10	0.75	0.9	1.0	10	2	20 .37	500	3	D
UDC 15	0.5	0.6	0.7	15	2	30 .25	500	5	D

MAGNUM™ HIGH-CURRENT ASSEMBLIES

Fast Recovery Types

Part No.	PIV Per leg	Average D.C. Output Current Io		Max. Forward Voltage Drop Per Leg at 25°C V_F	Max. Reverse Leakage Current Per Leg at PIV Ir		Non-Repetitive Sinusoidal Surge, 8.3 Msec Is @ 100°C	Max. Reserve Recovery Time
		55°C case temp.	100°C case temp.		25°C	100°C		
25 Amp. Three Phase Bridges								
678-1	100V	25A	18.5A	1.2V @ 10A	10μA	200μA	150A	—
678-2	200	25	18.5	1.2	10	200	150	—
678-3	300	25	18.5	1.2	10	200	150	—
678-4	400	25	18.5	1.2	10	200	150	—
678-5	500	25	18.5	1.2	10	200	150	—
678-6	600	25	18.5	1.2	10	200	150	—
25 Amp. Single Phase Bridges								
679-1	100V	25A	18.5A	1.2V @ 10A	10μA	200μA	150A	—
679-2	200	25	18.8	1.2	10	200	150	—
679-3	300	25	18.5	1.2	10	200	150	—
679-4	400	25	18.5	1.2	10	200	150	—
679-5	500	25	18.5	1.2	10	200	150	—
679-6	600	25	18.5	1.2	10	200	150	—
10 Amp. Single Phase Bridges								
680-1	100V	10A	6A	1.2V @ 2A	2μA	50μA	50A	—
680-2	200	10	6	1.2	2	50	50	—
680-3	300	10	6	1.2	2	50	50	—
680-4	400	10	6	1.2	2	50	50	—
680-5	500	10	6	1.2	2	50	50	—
680-6	600	10	6	1.2	2	50	50	—

Standard Recovery Types

20 Amp. Three Phase Bridges								
682-1	100V	20A	14A	1.2V @ 6A	10μA	200μA	150A	500 nsec
682-2	200	20	14	1.2	10	200	150	500
682-3	300	20	14	1.2	10	200	150	500
682-4	400	20	14	1.2	10	200	150	500
682-5	500	20	14	1.2	10	200	150	500
682-6	600	20	14	1.2	10	200	150	500
20 Amp. Single Phase Bridges								
683-1	100V	20A	14A	1.2V @ 6A	10μA	200μA	150A	500 nsec
683-2	200	20	14	1.2	10	200	150	500
683-3	300	20	14	1.2	10	200	150	500
683-4	400	20	14	1.2	10	200	150	500
683-5	500	20	14	1.2	10	200	150	500
683-6	600	20	14	1.2	10	200	150	500
10 Amp. Single Phase Bridges								
684-1	100V	10A	6A	1.2V @ 2A	5μA	100μA	50A	500 nsec
684-2	200	10	6	1.2	5	100	50	500
584-3	300	10	6	1.2	5	100	50	500
684-4	400	10	6	1.2	5	100	50	500
684-5	500	10	6	1.2	5	100	50	500
684-6	600	10	6	1.2	5	100	50	500

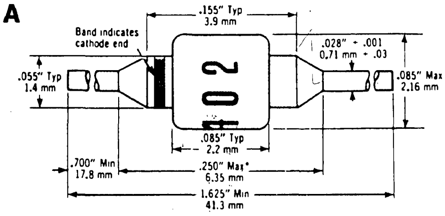
UNITRODE quality takes the worry out of paying less.

UNITRODE CORPORATION

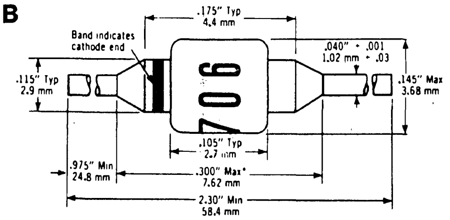
582 PLEASANT STREET • WATERTOWN, MASSACHUSETTS 02172 • TELEPHONE (617) 926-0404 • TWX (710) 327-1296 • TELEX 922-414

RECTIFIER, ZENER DIODE & ASSEMBLY OUTLINE DRAWINGS

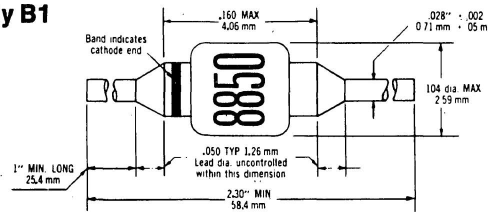
Body A


.155" Typ
3.9 mm
Band indicates cathode end
.028" ± .001
0.71 mm ± .03
.055" Typ
1.4 mm
.085" Max
2.16 mm
102
.085" Typ
2.2 mm
.700" Min
17.8 mm
.250" Max*
6.35 mm
1.625" Min
41.3 mm

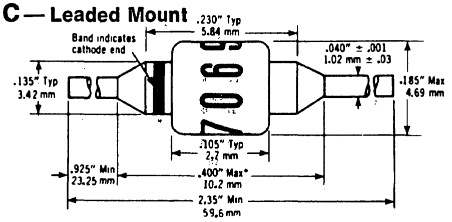
Body B


.175" Typ
4.4 mm
Band indicates cathode end
.040" ± .001
1.02 mm ± .03
.115" Typ
2.9 mm
.145" Max
3.68 mm
706
.105" Typ
2.7 mm
.975" Min
24.8 mm
.300" Max*
7.62 mm
2.30" Min
58.4 mm

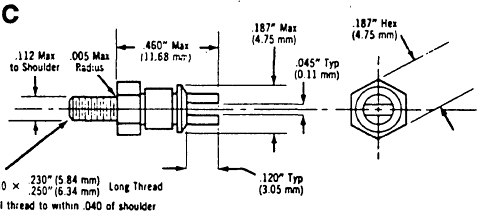
Body B1


.160 MAX
4.06 mm
.028" ± .002
0.71 mm ± .05 mm
Band indicates cathode end
8850
104 dia. MAX
2.59 mm
.050 TYP 1.26 mm
Lead dia. uncontrolled within this dimension
1" MIN. LONG
25.4 mm
2.30" MIN
58.4 mm

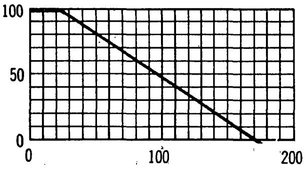
Body C — Leaded Mount


.230" Typ
5.84 mm
Band indicates cathode end
.040" ± .001
1.02 mm ± .03
.135" Typ
3.42 mm
.185" Max
4.69 mm
7069
.105" Typ
2.7 mm
.925" Min
23.25 mm
.400" Max*
10.2 mm
2.35" Min
59.6 mm

Body C


.112 Max to Shoulder
.005 Max Radius
.460" Max
(11.68 mm)
.187" Max
(4.75 mm)
.187" Hex
(4.75 mm)
.045" Typ
(0.11 mm)
#4-40 × .230" (5.84 mm) .250" (6.34 mm) Long Thread
Full thread to within .040 of shoulder
.120" Typ
(3.05 mm)

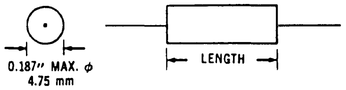
Rating vs Ambient Temperature



Lead Information

Standard diodes are supplied with "Fine" grade solid silver leads for maximum solderability. For welding or other applications, consult your Unitrode representative for optimum lead material. Tinned copper, nickel clad silver (gold plated), and nickel (gold plated) are denoted by the following suffix letters:

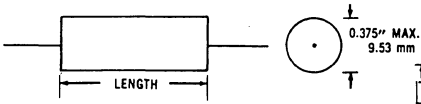
High Voltage Stacks


0.187" MAX. ϕ
4.75 mm
LENGTH

MAX. LENGTHS

A	B	C
0.50" 12.70 mm	0.85" 21.60 mm	1.125" 28.60 mm

Body A Leads: .028" tinned copper, 0.75" (min.) long


0.375" MAX. ϕ
9.53 mm
LENGTH

MAX. LENGTHS

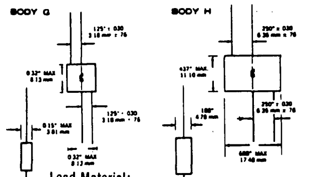
D	E
0.625" 18.88 mm	1.0" 25.40 mm

Body B three E leads: .028" tinned copper, 1.25" (min.) long.

High Voltage Bridges

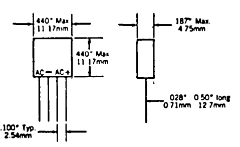
Lead Material Body G .028" diam. tinned copper (0.58 mm)

Lead Length 1.25" min. (31.8 mm)

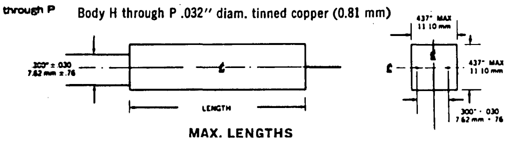

BODY G
.125" ± .030
3.18 mm ± .76
.032" MAX
8.13 mm
.125" ± .030
3.18 mm ± .76
.015" MAX
3.81 mm
.032" MAX
8.13 mm
BODY H
.250" ± .030
6.35 mm ± .76
.437" MAX.
11.10 mm
.188"
4.78 mm
.250" ± .030
6.35 mm ± .76
.688" MAX
17.48 mm

Lead Material:
.028" tinned
copper
1.125" (min.) long

BODY S


.440" Max
11.17mm
.440" Max
11.17mm
AC — AC +
.187" Max.
4.75mm
.028" 0.50" long
0.71mm 12.7mm
.100" Typ.
2.54mm

BODY J through P Body H through P .032" diam. tinned copper (0.81 mm)


.300" ± .030
7.62 mm ± .76
LENGTH
.437" MAX
11.10 mm
.437" MAX
11.10 mm
.300" ± .030
7.62 mm ± .76

MAX. LENGTHS

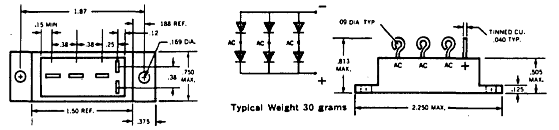
J	K	L	M	N	O	P
562" 14.27 mm	.688" 17.48 mm	.875" 22.23 mm	1.125" 28.58 mm	1.25" 31.75 mm	1.375" 34.92 mm	1.625" 41.28 mm

Magnum High Current Rectifier Assemblies

TERMINALS — Wire-loop terminals are standard.
Turret terminals available on special order.

678 Series
Three Phase
25 Amp Bridges

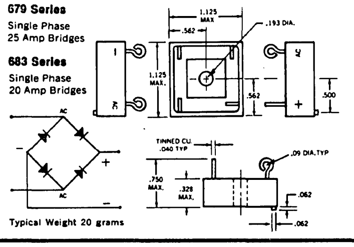
682 Series
Three Phase
20 Amp Bridges


1.87
.15 MIN
188 REF.
.12
.38
.38
.25
.169 DIA.
.750 MAX.
.38
1.50 REF.
.375
AC
AC
AC
−
+
.09 DIA TYP
TINNED CU. .040 TYP.
.813 MAX.
AC AC AC +
.505 MAX.
.125
2.250 MAX.

Typical Weight 30 grams

679 Series
Single Phase
25 Amp Bridges

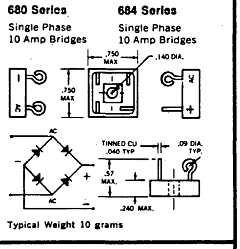
683 Series
Single Phase
20 Amp Bridges


1.125 MAX
.562
.193 DIA.
1.125 MAX.
.562
.500
AC
−
+
AC
TINNED CU. .040 TYP
.09 DIA. TYP
.750 MAX.
.328 MAX.
.062
.062

Typical Weight 20 grams

680 Series
Single Phase
10 Amp Bridges

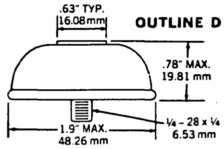
684 Series
Single Phase
10 Amp Bridges


.750 MAX
.140 DIA.
.750 MAX
AC
−
+
AC
TINNED CU .040 TYP
.09 DIA. TYP.
.57 MAX.
.240 MAX.

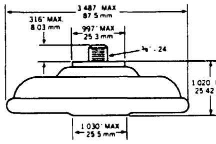
Typical Weight 10 grams

Doorbell® Rectifier Modules

OUTLINE D


.63" TYP.
16.08mm
.78" MAX.
19.81 mm
1.9" MAX.
48.26 mm
¼ - 28 x ¼
6.53 mm

OUTLINE G


3.487 MAX
87.5 mm
316" MAX.
8.03 mm
997" MAX
25.3 mm
¼" - 24
1.020 MAX
25.42 mm
1.030" MAX
25.5 mm

Polarity — Cathode connected to base

UNITRODE quality takes the worry out of paying less.

UPI

the only "spec." of difference is the lower price.

TRANSISTORS — DIODES — RECTIFIERS

SILICON CONTROLLED RECTIFIERS ● INTEGRATED CIRCUITS

PNP GERMANIUM TRANSISTORS

TO—5 CASE

MINIMUM 5,000 PCS. **8¢ ea.**

2N319
2N320
2N321
2N322
2N323
2N394,A
2N395,A
2N396,A
2N397,A
2N404
2N413
2N508,A
2N1175
2N1303
2N1305

2N1307
2N1309
2N1404
2N1414
2N1415
2N1705
2N1706
2N1707
2N1729
2N59
2N60
2N61
2N272
2N315,A
2N316,A

2N317,A
2N359
2N360
2N361
2N362
2N363
2N403
2N414,A
2N413,A
2N415,A
2N416
2N417
2N425
2N426
2N427

2N428,A
2N438,A
2N539,A
2N440
2N466
2N467
2N481
2N482
2N483
2N484
2N485
2N486
2N519,A
2N520,A
2N521,A

2N522,A
2N529
2N531
2N533
2N570
2N578
2N579
2N580
2N581
2N610
2N611
2N613
2N616
2N617

2N631
2N632
2N633
2N653
2N655
2N659
2N660
2N661
2N1008
2N1017
2N1018
2N1171
2N1265
2N1280

2N1284
2N1316
2N1317
2N1318
2N1343
2N1344
2N1345
2N1346
2N1347
2N1352
2N1353
2N1373
2N1374
2N1375

2N1376
2N1377
2N1378
2N1379
2N1380
2N1381
2N1382
2N1383
2N1681
2N1683
2N1853
2N1854
2N1969
2N2271

slightly higher prices for smaller quantities — minimum order $25.00

Quality controlled to AQL .065

1-99 @ .20 ea. 100-999 @ .15 ea. 1000-4999 @ .09 ea.

METAL CAN SMALL SIGNAL TRANSISTORS

PRIME QUALITY

TO—5 AND TO—18 CASES

MINIMUM 10,000 PCS. **8¢ ea.**

2N696
2N697
2N706
2N706A
2N706B
2N708
2N717
2N718
2N743
2N744
2N753
2N760
2N760A
2N783
2N784

2N834
2N834A
2N835
2N869
2N869A
2N914
2N929
2N930
2N996
2N1132
2N1132A
2N2217
2N2218
2N2218A
2N2219

2N2219A
2N2220
2N2221
2N2221A
2N2222
2N2222A
2N2303
2N2351
2N2351A
2N2352
2N2352A
2N2353
2N2353A
2N2368
2N2369

2N2369A
2N2453
2N2480
2N2480A
2N2481
2N2483
2N2484
2N2509
2N2510
2N2511
2N2586
2N2639
2N2640
2N2641
2N2642

2N2643
2N2644
2N2710
2N2729
2N2868
2N3009
2N3011
2N3013
2N3014
2N3252
2N3253
2N3299
2N3300
2N3301
2N3302

2N3326
2N3678
2N3724
2N3725
2N3729
2N3734
2N3726
2N4013
2N4014
2N4026
2N4027
2N4028
2N4029
2N4030
2N4031

2N4032
2N4033
2N4046
2N4047
2N497
2N498
2N656
2N657
2N719
2N719A
2N720
2N720A
2N870
2N871
2N909

2N910
2N911
2N912
2N1420
2N1889
2N1890
2N1972
2N1973
2N1974
2N1975
2N1983
2N1984
2N1985
2N1989
2N1990

Quality controlled to AQL .065

slightly higher prices for smaller quantities — minimum order $25.00

1-99 @ .20 ea. 100-999 @ .15 ea. 1000-4999 @ .10 ea. 5000-9999 @ .09 ea.

EPOXY CASE U29 SMALL SIGNAL SILICON TRANSISTORS

MINIMUM 10,000 PCS. **8¢ ea.**

2N2711
2N2712
2N2713
2N2714
2N2715
2N2716
2N3390

2N3392
2N3393
2N3394
2N3395
2N3396
2N3397
2N3398

2N3414
2N3415
2N3416
2N3417
2N3704
2N3705
2N3706

2N3707
2N3708
2N3709
2N3710
2N3711
2N3721
2N3793

2N3794
2N3843
2N3844
2N3845
2N3854A
2N3855A

2N3856A
2N3900
2N3900A
2N3901
2N3973
2N3976

2N4424
2N4994
2N4995
2N5172
2N5449
2N5450

2N5451
2N5824
2N5825
2N5826
2N5827
2N5828

Quality controlled to AQL .065

slightly higher prices for smaller quantities — minimum order $25.00

1-99 @ .20 ea. 100-999 @ .15 ea. 1000-4999 @ .10 ea. 5000-9999 @ .09 ea.

SILICON RECTIFIERS

IMMEDIATE OFF-THE-SHELF DELIVERY

Quality Controlled to AQL .065

1 AMP EPOXY				750 mA EPOXY			
TYPE	1000—4999	5000—9999	10,000 up	TYPE	1000—4999	5000—9999	10,000 up
IN4001	.06	.05	.045	IN2069	.10	.09	.08
IN4002	.065	.055	.05	IN2069A	.10	.09	.08
IN4003	.065	.055	.05	IN2070	.10	.09	.08
IN4004	.075	.065	.055	IN2070A	.11	.10	.09
IN4005	.085	.075	.07	IN2071	.11	.10	.09
IN4006	.095	.085	.075	IN2071A	.11	.10	.09
IN4007	.14	.12	.10				

IN4148 DOUBLE PLUG SWITCHING DIODES

3¢ ea. minimum quantity 10,000 pcs.

1,000—4,999 @.045 ea.
5,000—9,999 @.035 ea.
Quality Controlled To AQL .065

PRIVATE LABELING

We will send quick and accurate quotations based on your manufacturing specifications for selected devices or proprietary design semiconductors. On quantity orders we will mark parts with your part number at no charge. Send for our latest catalog and the latest issue of UPI ELECTRONIC MARKETING.

UNITED-PAGE, Inc.

481 GETTY AVE., PATERSON, N.J. 07503
TEL. (201) 279-7500 TWX: 710-988-5917

. . . The Most Trusted Source For Electron Tubes and Semiconductors

HEAT SINKS

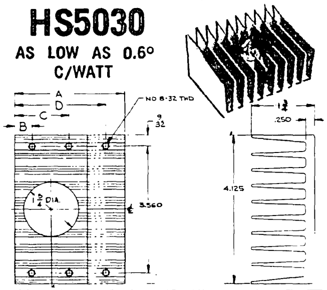
FOR HIGH POWER SEMICONDUCTORS

VEMALINE

For E. I. A. Jedec Outlines TO-3, TO-6, TO-10, TO-14, TO-15, TO-26, TO-27, TO-31, TO-32, TO-36, Special Hole Patterns Available

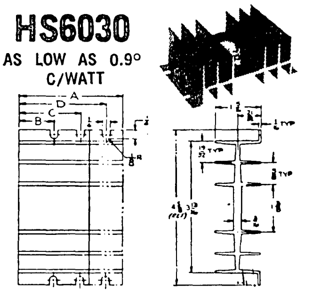
HS5030

AS LOW AS 0.6° C/WATT


A
D
C
B
NO 8-32 THD
.250
4.125
3.560
1 1/2 DIA

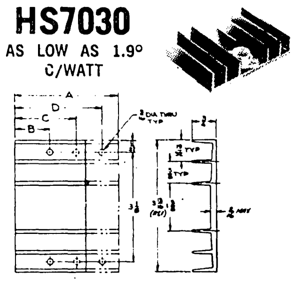
HS6030

AS LOW AS 0.9° C/WATT



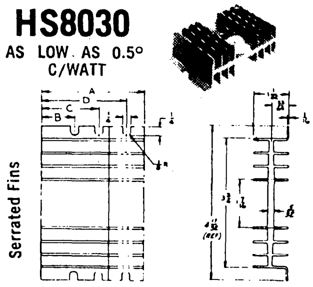
HS7030

AS LOW AS 1.9° C/WATT


A
D
C
B
DIA THRU TYP
TYP

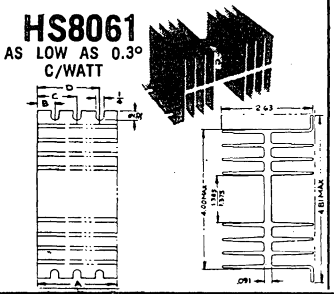
HS8030

AS LOW AS 0.5° C/WATT


A
D
C
B
Serrated Fins

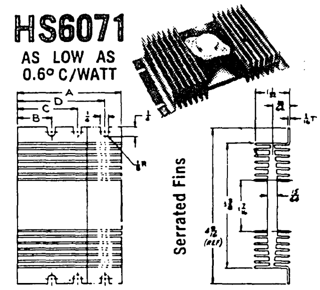
HS8061

AS LOW AS 0.3° C/WATT


D
C
B
A
2.63
4.81 MAX
.091

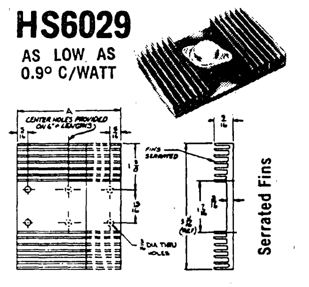
HS6071

AS LOW AS 0.6° C/WATT


A
D
C
B
Serrated Fins

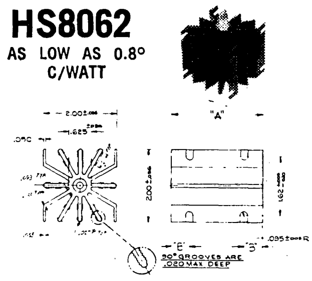
HS6029

AS LOW AS 0.9° C/WATT


A
CENTER HOLES PROVIDED ON 6" LENGTHS
FINS SERRATED
DIA THRU HOLES
Serrated Fins

HS8062

AS LOW AS 0.8° C/WATT


"A"
2.00
1.625
.050
.095
"B"
20° GROOVES ARE .020 MAX DEEP

	HS5030	HS6030	HS7030	HS8030	HS8061	HS6071	HS6029	HS8062
WEIGHT (per inch of length)	5 oz.	2 oz.	1¼ oz.	2¼ oz.	3¼ oz.	2¼ oz.	1¼ oz.	2 oz.
SURFACE AREA (per inch of length)	35 sq. in.	28 sq. in	15 sq. in.	32 sq. in.	55 sq. in.	50 sq. in.	28 sq. in.	25 sq. in.
FINISH	Dull Black Anodize (MIL-A-8625a) unless otherwise specified.							
MATERIAL	6061-T6 Aluminum							
MOUNTING	SEE ORDERING INFORMATION BELOW							

HOW TO ORDER FINISH

1—Unfinished Aluminum

2—Chromate Conversion (MIL-C-5541)

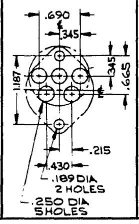
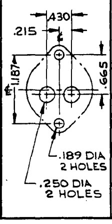
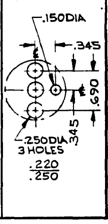
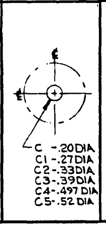
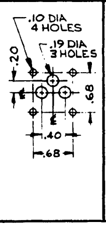
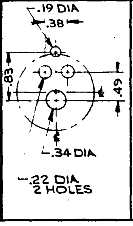
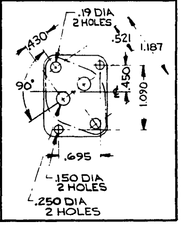
3—Black Anodize (MIL-A-8625a) Standard Finish

4—Hardcoat Anodize (MIL-F-14072) Insulating

Many others available.
Ask for catalog.

HOLE PATTERNS

Special hole patterns and lengths available.

O	U	A	B	C	D	E	F
BLANK NO HOLES	 .690 .345 .345 .665 1.187 .215 .430 .189 DIA 2 HOLES .250 DIA 5 HOLES	 .430 .215 1.187 .665 .189 DIA 2 HOLES .250 DIA 2 HOLES	 .150 DIA .345 .690 .345 .250 DIA 3 HOLES .220 .250	 C -.20 DIA C1 -.27 DIA C2 -.33 DIA C3 -.39 DIA C4 -.497 DIA C5 -.52 DIA	 .10 DIA 4 HOLES .19 DIA 3 HOLES .20 .68 .40 .68	 .19 DIA .38 .83 .49 .34 DIA .22 DIA 2 HOLES	 .19 DIA 2 HOLES .430 .521 1.187 90° .450 1.090 .695 .150 DIA 2 HOLES .250 DIA 2 HOLES

Many others available.

LENGTH AND MOUNTING SLOT LOCATIONS

Suffix Number	A Length	B	C	D
2	2	1		
3	3	½	2½	
4	4	½	3½	
5	5	½	4½	
6	6	¾	3	5¼

OTHER HEATSINKS
AVAILABLE.
WRITE FOR CATALOG.

EXAMPLE:

HS 7030 - 3 - B - 3

STYLE—FINISH—HOLE PATTERN—LENGTH

All tests made with 30 CFM measurements.

All specifications for reference only, and are subject to modification.

VEMALINE PRODUCTS COMPANY, INC.

WYCKOFF, NEW JERSEY / PHONE (201) 891-3200

Westinghouse

Westinghouse Electric Corporation
Semiconductor Division, Youngwood, Pa. 15697
(412) 925-7272 TWX 510-468-2840

rectifiers

Westinghouse offers more than 1,000 rectifiers to meet your application requirements. Rectifiers with ratings of 1 to 1,000 Amperes and voltages 50 through 3,000 volts are available in both standard and reverse polarity. Standard speed, fast recovery, Jan, Jan TX, JEDEC, Hi-Rel, and Industrial types are available for most all Westinghouse Rectifiers.

Westinghouse preferred types shown in bold print offer economy and are readily available from your local distributor or directly from Westinghouse.

Choose from low cost, low power, lead mount rectifiers; hermetically sealed glass to metal case medium power rectifiers; and the exclusive Westinghouse Compression Bonded Encapsulation (CBE), ceramic seal high power rectifiers for the ultimate in reliability.

Specify a rectifier marked with this symbol ✤ — the rectifier with a Lifetime Guarantee —available only from Westinghouse.

Lead Mount Rectifiers

Rating (Amps)	**1.0**	**3.0**	**1.5**		**3.0**
Package Outline	**DO-15**	**A-36**	**DO-27**	**DO-15**	**A-36**
T Ambient	40°C	50°C	40°C	40°C	50°C
I_{FSM} (Amps)	35	150	50	50	200
T_{rr}	200ns	300ns	....	....	....
Type	388	363	359	384	398
50 Volts	**388A**	**363A**	**1N4816**	**1N5391**	**1N5400**
100	**388B**	**363B**	**1N4817**	**1N5392**	**1N5401**
150	388C	....	....	....	....
200	**388D**	**363D**	**1N4818**	**1N5393**	**1N5402**
300	388F	363F	1N4819	1N5394	1N5403
400	**388H**	**363H**	**1N4820**	**1N5395**	**1N5404**
500	388K	363K	1N4821	1N5396	1N5405
600	**388M**	**363M**	**1N4822**	**1N5397**	**1N5406**
700	....	....	1N5052	384P	398P
800	....	....	1N5053	1N5398	1N5407
1000	....	....	1N5054	1N5399	1N5408
1200	....	....	359ZD	384ZD	398ZD
Data Sheet	New Product Bulletin	New Product Bulletin	54-161: 3, 4	54-171: 1, 2	54-171: 3, 4

Medium Power Rectifiers **3-70 AMP Stud Mount Rectifier** *Reverse polarity units are available for all types listed below.

Rating (Amps)	**3**	**3.3**	**3**	**5**	**6**				**12**				**15**
Package Outline	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-4**	**DO-5**
T Case	50°C	50°C	150°C	150°C	100°C	150°C	150°C	150°C	100°C	150°C	150°C	150°C	150°C
I_{FSM} (Amps)	25	25	40	150	75	150	150	160	150	240	240	250	250
T_{rr}	......	......	......	......	200ns	......	......	......	200ns	......	......	5μs	......
50 Volts	....	....	**1N1581**	1N1612	**1N3879**	**1N1341**	1N1341A	1N1341B	**1N3889**	**1N1199**	1N1199A	1N1199B	**1N3208**
100	....	....	**1N1582**	1N1613	**1N3880** ●	**1N1342**	1N1342A	1N1342B	**1N3890** ●	**1N1200**	1N1200A	1N1200B	**1N3209**
150	....	....	....	....	....	1N1343	1N1343A	1N1343B	....	1N1201	1N1201A	1N1201B	....
200	1N1124	1N1124A	**1N1583**	1N1614●	**1N3881** ●	**1N1344**	1N1344A	1N1344B	**1N3891**●	**1N1202**	1N1202A●	1N1202B	**1N3210**
300	1N1125	1N1125A	1N1584		1N3882	1N1345	1N1345A	1N1345B	1N3892	1N1203	1N1203A	1N1203B	1N3211
400	1N1126	1N1126A	**1N1585**	1N1615●	**1N3883**●	**1N1346**	1N1346A	1N1346B	**1N3893**●	**1N1204**	1N1204A●	1N1204B	**1N3212**
500	1N1127	1N1127A	1N1586	....	....	1N1347	1N1347A	1N1347B	....	1N1205	1N1205A	1N1205B	1N3213
600	1N1128	1N1128A	**1N1587**	1N1616●	**R3020606**	**1N1348**	1N1348A	1N1348B	**R3020612**	**1N1206**	1N1206A●	1N1206B	**1N3214**
700	....	....	....	....	....	....	....	....	....	1N3670	1N3670A	....	....
800	....	....	....	1N4458	....	....	....	....	....	**1N3671**	1N3671A	....	....
900	....	....	....	....	....	....	....	....	....	1N3672	1N3672A	....	....
1000	....	....	....	1N4459	....	....	....	....	....	**1N3673**	1N3673A	....	....
1200	....	....	....	....	....	....	....	....	....	**R3101212**	1N5331	....	....
Data Sheet	Catalog 54-100												

Rating (Amps)	**16**	**18**	**20**				**22**	**25**	**30**	**35**	**40**	**60**	**70**
Package Outline	**DO-4**	**DO-5**	**DO-5**	**DO-5**	**DO-5**	**DO-5**	**DO-5**	**DO-5**	**DO-5**	**DO-5**	**DO-5**	**DO-5**	**DO-5**
T Case	150°C	150°C	100°C	150°C	150°C	150°C	150°C	145°C	100°C	140°C	150°C	115°C	100°C
I_{FSM} (Amps)	300	220	225	250	250	350	500	300	300	500	800	900	750
T_{rr}	......	......	200ns	......	......	......	......	......	200ns	......	......	......	......
50 Volts	**1N3615**	1N1191	**1N3899**	1N248A	1N248B	1N248C	**1N1191A**	1N1254	**1N3909**●	**1N1183**	1N1183A	**1N2128**	**R4100070**
100	**1N3616**	1N1192	**1N3900**	1N249A	1N249B●	1N249C	**1N1192A**	1N1255	**1N3910**●	**1N1184**●	1N1184A	**1N2129**	**R4100170**
150	1N3617	1N1193	....	....	....	....	1N1193A	....	....	1N1185	1N1185A	1N2130	....
200	**1N3618**	1N1194	**1N3901**	1N250A	1N250B●	1N250C	**1N1194A**	1N1256	**1N3911**●	**1N1186**●	1N1186A	**1N2131**	**1N4136**
300	1N3619	1N1195	1N3902	....	....	....	1N1195A	1N1257	1N3912	1N1187	1N1187A	1N2133	....
400	**1N3620**	1N1196	**1N3903**	....	....	....	**1N1196A**	1N1258	**1N3913**	**1N1188**●	1N1188A	**1N2135**	**1N4137**
500	1N3621	1N1197	....	....	....	....	1N1197A	1N1259	....	1N1189	1N1189A	1N2137	....
600	**1N3622**	1N1198	**R4020620**	....	....	....	**1N1198A**●	1N1260	**R4020630**	**1N1190**●	1N1190A	**1N2138**	**1N4138**
700	....	....	....	....	....	....	....	....	....	1N3765	....	....	....
800	**1N3623**	....	....	....	....	....	**R4100822**	....	....	**1N3766**	R4100840	**R4100860**	**R4108070**
900	....	....	....	....	....	....	....	....	....	1N3767	....	....	....
1000	**1N3624**	....	....	....	....	....	**R4101022**	....	....	**1N3768**	R4101040	**R4101060**	**R4101070**
1200	**R3101216**	....	....	....	....	....	**R4101222**	....	....	**1N5332**	R4101240	**R4101260**	**R4101270**
Data Sheet	Catalog 54-100												

Bold face numbers indicate preferred types.
● Military types available.

Westinghouse

rectifiers

High Power Rectifiers

Reverse Polarity Units are Available for All Stud Types Listed Below

Rating (Amps)	**100**	**150**	**160**	**240**	**250**		**275**	**300**	
Package Outline	**DO8**	**DO8**	**DO9**	**DO9**	**DO9**	**DO9**	**DO9**	**DO9**	**DO9**
TCASE °C	130°C	110°C	125°C	125°C	130°C	135°C	120°C	120°C	120°C
ISURGE (Amps)	2300	3000	2000	3000	4500	4500	5000	5500	6250
Type	JEDEC	JEDEC	JEDEC	JEDEC	JEDEC	JEDEC	JEDEC	R600	R600
50	....	....	1N3260	1N3161	....	1N2054	**1N4044**	....	....
100	**1N3288A**	**1N4587**	1N3261	1N3162	1N3735	1N2055	**1N4045**	R6000130	....
150	....	....	1N3262	1N3163	....	1N2056	**1N4046**	....	....
200	**1N3289A** ●	**1N4588**	1N3263 ●	1N3164 ●	1N3736	1N2057	**1N4047**	R6000230	....
250	....	....	1N3264	1N3165	....	1N2058	**1N4048**	....	....
300	**1N3290A**	**1N4589**	1N3265	1N3166	1N3737	1N2059	**1N4049**	R6000330	....
350	....	....	1N3266	1N3167	....	1N2060	....	....	....
400	**1N3291A** ●	**1N4590**	1N3267 ●	1N3168 ○	1N3738	1N2061	**1N4050**	R6000430	....
500	**1N3292B**	**1N4591**	1N3268	1N3169	1N3739	1N2063	**1N4051**	R6000530	....
600	**1N3293A** ●	**1N4592**	1N3269 ●	1N3170 ●	1N3740	1N2064	**1N4052**	R6000630	....
700	....	....	1N3270	1N3171	....	1N2065	**1N4053**	R6000730	....
800	**1N3294A** ●	**1N4593**	1N3271	1N3172	1N3741	1N2066	**1N4054**	R6000830	....
900	....	....	1N3272	1N3173	....	1N2067	**1N4055**	R6000930	....
1000	**1N3295A**	**1N4594**	1N3273	1N3174	1N3742	1N2068	**1N4056**	R6001030	....
1200	**1N3296A**	**1N4595**	1N3274	R6001224	1N3743	....	....	....	R6001230
1400	**1N3297A**	**1N4596**	1N3275	R6001424	1N3744	....	....	....	R6001430
1600	....	....	1N3276	R6001624	....	....	....	....	R6001630
1800	....	....	R6001816	R6001824	....	....	....	....	R6001830
2000	....	....	R6002016	R6002024	....	....	....	....	R6002030
2200	....	....	R6002216	R6002224	....	....	....	....	R6002230
2400	....	....	R6002416	R6002424	....	....	....	....	R6002430
Data Sheet	54-166: 1, 2	54-166: 3, 4	54-167: 1, 2	54-168: 5–8	....	....	54-168: 1, 2	....	....

Bold face JEDEC numbers indicate preferred types.
● Military types available.

Rating (Amps)	**400**	**470**	**500**		**800**		**1000**	
Package Outline	**R620**	**R620**	**R700**	**R700**	**R720**	**R720**	**R720**	**R730**
TCASE °C	145°C	105°C	105°C	120°C	95°C	130°C	115°C	110°C
ISURGE (Amps)	4500	6250	8000	10,000	8000	10,000	10,000	10,000
Type	R620	R620	R700	R700	R720	R720	R720	R730
50	....	....	....	....	....	....	....	....
100	....	....	....	....	....	....	....	R7300110
150	....	....	....	....	....	....	....	....
200	....	....	....	....	....	....	....	R7300210
250	....	....	....	....	....	....	....	....
300	....	....	....	....	....	....	....	R7300310
350	....	....	....	....	....	....	....	....
400	....	....	....	....	....	....	....	R7300410
500	....	....	....	....	....	....	....	R7300510
600	R6200640	R6200647	....	R7000605	....	R7200608	....	R7300610
700	....	....	....	....	....	....	....	....
800	R6200840	R6200847	....	R7000805	....	R7200808	....	R7300710
900	....	....	....	....	....	....	....	R7300810
1000	R6201040	R6201047	....	R7001005	....	R7201008	R7201010	R7301010
1200	R6201240	R6201247	R7001205	....	....	R7201208	R7201210	....
1400	....	R6201447	R7001405	....	....	R7201408	R7201410	....
1600	....	R6201647	R7001605	....	R7201608	....	R7201610	....
1800	....	R6201847	R7001805	....	R7201808	....	R7201810	....
2000	....	R6202047	R7002005	....	R7202008	....	R7202010	....
2200	....	....	R7002205	....	R7202208	....	R7202210	....
2400	....	....	R7002405	....	R7202408	....	....	....
2600	....	....	R7002605	....	R7202608	....	....	....
2800	....	....	R7002805	....	R7202808	....	....	....
3000	....	....	R7003005	....	R7203008	....	....	....
Data Sheet	New Product Bulletin							

assemblies

You save $/Amperes with a Westinghouse assembly. Our new modular construction saves you engineering design and development, inventories, parts, labor, and testing costs. And you get off-the-shelf delivery of a wide range of distinct current and voltage ratings and circuit configurations. All ratings are guaranteed. In addition, Westinghouse assemblies are compact, light weight and easy to mount.

With our new modular design, we can make assemblies on a paced conveyor beltline. This conveyor means shorter lead times on prototypes and faster delivery on volume requirements.

High quality control standards are maintained for both military and commercial applications. Devices and heat sinks are matched for optimum electrical and thermal performance. Westinghouse semiconductor components are used in our assemblies assuring a top quality finished product.

The chart on the right shows the various standard circuit configurations and voltage and current ratings available. For detailed information on your specific requirement, refer to the technical data referenced. If you have special requirements, call us.

	Half Wave	Doubler	Center Tap	AC Switch	Single Phase Bridge	3 Phase Bridge	6 Phase Bridge	Current Range (Amps)	Maximum PRV (Volts)	Data Reference
Molded		X	X		X			2-20	1000V	SA-10015
Rectifier Gold Line	X	X	X		X	X	X	25-2000	2000V	CAT. 54-300
SCR Gold Line	X	X	X	X	X	X	X	30-1500	2000V	CAT. 54-300
Pow-R-Bridge		X	X		X	X	X	300-1000	600V	T.D. 54-100
H.V. Stacks	X	X	X					3-300	200KV	T.D. 54-261–8

For the right assembly at the right price at the right time—
TRY Westinghouse!

Westinghouse Sales Offices

California
600 St. Paul Avenue
Los Angeles, Calif. 90017 (213) 482-9660

California
Building 73, Hendy Avenue
Sunnyvale, Calif. 94088 (408) 735-2191

Florida
Box 20513
1010 Executive Center Drive
Orlando, Florida 32184 (305) 841-3421

Illinois
10 South Riverside Plaza
Chicago, Ill 60606 (312) 461-7200

Indiana
Anthony Wayne Bank Building
727 S. Clinton Street
Ft. Wayne, Ind. 46802 (219) 742-0221

Maryland
Box 1693
Friendship Int'l Airport
Baltimore, Md. 21203 (301) 765-1000

Massachusetts
800 Boyleston Street
Boston, Mass. 02199 (617) 542-0600

Michigan
Box 700
24700 11 Mile Road
Detroit, Michigan (Southfield) 48076
(313) 352-9000

Minnesota
3501 S. Highway 100
Minneapolis, Minnesota 55416
(612) 927-6551

New Jersey
67 Evergreen Place
East Orange, New Jersey 07109
(201) 465-0222

New York
1501 Franklin Avenue
Mineola, N.Y. 11501 (516) 248-9800

New York
50 Pershing Avenue
Poughkeepsie, New York 12601
(914) 454-1024

New York
711 Exchange Street
Rochester, N.Y. 14603 (716) 232-4380

Ohio
Illuminating Building
55 Public Square
Cleveland, Ohio 44113 (216) 579-2135

Ohio
1306 Farr Drive
Dayton, Ohio 45404 (513) 461-3720

Pennsylvania
One Decker Square
Philadelphia, Pa. (Bala Cynwyd)
19004 (215) 878-1300

Texas
8400 John Carpenter Freeway
Dallas, Texas 75247 (214) 631-2811

Wisconsin
731 North Jackson
Milwaukee, Wisconsin 53202
(414) 264-6400

See YELLOW SECTION for Local Offices, Phones

Westinghouse

Westinghouse Electric Corporation
Semiconductor Division, Youngwood, Pa. 15697
(412) 925-7272 • TWX 510-468-2840

SCR's

For quick response to your SCR needs, select from the Westinghouse line of power SCR's. Prompt delivery of quality product is made possible by these Westinghouse innovations:

- Fusion Stocking — Finished fusions available for encapsulation.
- Computerized Matrix Testing — Fast selection of special parameters.
- Paced Conveyor Assembly — Rapid encapsulation of selected fusions.

In addition, all Westinghouse SCR's are designed for reliable operation under severe operating conditions. Superior reliability is provided by these exclusive features:

- 100% Power Testing — Assures consistent operation.
- CBE—Compression Bonded Encapsulation eliminates solder fatigue.
- Lifetime Guarantee — Proven dependability.

Westinghouse offers SCR capability in general purpose, high temperature, high voltage and fast switching ratings. Look for these key features:

- Current—through 850 A_{RMS}.
- Voltage—through 2000 V.
- Packages—stud, Pow-R-Disc, flat base and integral heat sink.
- High Temperature—125°C maximum junction temperature.
- Fast Switching—10-60 microseconds.
- di/namic Gate—through 10 KHz operation.

For more detailed information, refer to the referenced Technical Data Sheet or New Product Bulletin.

High Temperature SCR's

Current Rating Amps RMS		16-35	63-125		200-275	
Westinghouse Type Numbers	New	T405	T505		T605	
	Old	....	2515	2505	2615	2605
JEDEC Number		....	....	2N2023/2N2030	....	
Peak Voltage Ratings		50-1000	50-1000	25-1000	50-600	
Package Outline		**TO-48**	**TO-94, TO-83**		**TO-93**	
Features		40 or 80 mA I_{GT}, 150°C T_j	High dv/dt, high surge, all diffused, 150°C T_j		High dv/dt, high surge, all diffused, 150°C T_j	
Data Sheet		New Product Bulletin	54-565: 9, 10	54-566: 9, 10	54-567: 5, 6	54-568: 3, 4

Standard SCR's

Current Rating Amps RMS		16-35						
Westinghouse Type Numbers	New	T408				T400		
	Old	202	203	201	....	....	....	....
JEDEC Number		2N1842 thru 2N1850	2N1842A thru 2N1850A	2N681 thru 2N692	....	....	2N5204 thru 2N5207	2N3896 thru 2N3899
Peak Voltage Ratings		25-500		25-800	50-1200		600-1200	100-600
Package Outline		**TO-48**						
Features		Maximum T_j = 100°C, general purpose	Similar to 2N1842/2N1850 series, max. T_j = 125°C	General purpose	High voltage extension of 2N681/2N692 series, 40 or 80 mA I_{GT} all diffused	High surge, high dv/dt, high voltage, 40 or 80 mA I_{GT} all diffused	High voltage, high surge	
Data Sheet		54-563: 1, 2		54-564: 1, 2	54-564: 3-10		New Product Bulletin	

Current Rating Amps RMS		63-125						200-350		200-500		
Westinghouse Type Numbers	New	T500		T508				T600		T620		
	Old	251	250	809		254		261	260	263	273	272
JEDEC Number		....		2N1909 thru 2N1916	2N1792 thru 2N1799	2N4361 thru 2N4368	2N4371 thru 2N4378	....	2N3884 thru 2N3895	....	....	....
Peak Voltage Ratings		50-1400		50-1200		50-1400		100-1400		100-1400		
Package Outline		**TO-94, TO-83**		**TO-94, TO-83**		**TO-94, TO-83**		**TO-93**		**Pow-R-Disc, T62**		
Features		High voltage, high dv/dt, high surge, all diffused		General purpose		General purpose, 200 mA I_{GT}		High voltage, high dv/dt, high surge, all diffused.		High voltage, high dv/dt, high surge, all diffused double sided cooling		
Data Sheet		54-565: 7, 8	54-566: 7, 8	54-566: 1, 2		54-566: 3, 4		54-567: 1, 2	54-568: 1, 2, 5, 6	54-570: 3, 4	54-570: 5, 6	54-570: 7, 8

Westinghouse

SCR's

Standard SCR's (cont'd)

Current Rating Amps RMS	470	400-470	400-550	625-850	625	550-625
Westinghouse Type Numbers New	T660	T680	T700	T720	T760	T780
Westinghouse Type Numbers Old	276	278-2248	271 270	283 282	286	288
JEDEC Number	2N3530 thru 2N3541	....	....	....	....	....
Peak Voltage Ratings	100-1400	100-1400	100-1600	100-1600	100-1600	100-1600
Package Outline	**Integral Heat Sink, T66**	**Flat Base, T68**	**Stud (¾-16), T70**	**Pow-R-Disc, T72**	**Integral Heat Sink, T76**	**Flat Base, T78**
Features	High voltage, high dv/dt, high surge, all diffused	High voltage, high dv/dt, high surge, all diffused	High voltage, high dv/dt, high surge, all diffused, very high current	High voltage, high dv/dt, high surge, all diffused, very high current, double sided cooling	High voltage, high dv/dt, high surge, all diffused, very high current	High voltage, high dv/dt, high surge, all diffused, very high current
Data Sheet	54-569: 3, 4	54-569: 1, 2	New Product Bulletin	New Product Bulletin	New Product Bulletin	New Product Bulletin

Fast Switching SCR's

Current Rating Amps RMS	16-35		63-125							200-275		
Westinghouse Type Numbers New	T404	T407	T504	T507	T504					T604		
Westinghouse Type Numbers Old	....	....	....	T502	2193 2543	2191	2541	2192	2542	....	2611-2	2601-2
Turn Off Time µsec	10-40	10-30	10-60		10	15		20		15-60	20-30	30-40
Peak Voltage Rating	50-600	50-600	50-1200		50-800	50-1000				100-1200		
Package Outline	**TO-48**	**TO-48**	**TO-94, TO-83**							**TO-93**		
Features	80 or 180 mA I_{GT}	High dv/dt High di/dt 80 or 180 I_{GT} for inverter applications	High dv/dt, High di/dt for inverter applications	di/namic gate, very high di/dt soft fire gate control, low dynamic forward drop	100V/µsec dv/dt					High dv/dt for inverter applications		
Data Sheet	New Product Bulletin			54-566: 11-14	New Product Bulletin	54-565: 5, 6	54-566: 5, 6	54-565: 5, 6	54-566: 5, 6	54-567: 7-10	54-567: 3, 4	54-568: 3, 4

Current Rating Amps RMS	200-275	200-400				235-400		315-420	315-475	470-700	400-550
Westinghouse Type Numbers New	T607	T624				T627	T684	T687	T707	T727	T787
Westinghouse Type Numbers Old	....	....	2631/2	2731/2	2721/2	....		....	....	....	....
Turn Off Time µsec	15-40	15-60	20-30	30-40		15-60	30-40	15-40	15-80	15-80	15-80
Peak Voltage Rating	100-1200	100-1200				100-1200		100-1200	100-1200	100-1200	100-1200
Package Outline	**TO-93**	**Pow-R-Disc, T62**				**Pow-R-Disc, T62**	**Flat Base, T68**	**Flat Base T68**	**Stud (¾-16), T70**	**Pow-R-Disc, T72**	**Flat Base, T78**
Features	di/namic gate, high di/dt, soft firing low dynamic forward drop	High dv/dt, fast turn off, double sided cooling				di/namic gate, high di/dt, soft firing	High dv/dt for inverter applications	di/namic gate, high di/dt, low dynamic forward drop	di/namic gate, high di/dt, low dynamic forward drop	di/namic gate, high di/dt, low dynamic forward drop double sided cooling	di/namic gate, high di/dt, low dynamic forward drop
Data Sheet	54-566: 15-18	54-567: 11-14				54-566: 23-26	New Product Bulletin	New Product Bulletin	54-566: 19-22	54-566: 27-30	New Product Bulletin

High Voltage SCR's

Current Rating Amps RMS	470	630	470
Westinghouse Type Numbers New	T700	T720	T760
Westinghouse Type Numbers Old	270Y30	282Y40	286Y30
Peak Voltage Rating	600-2000	600-2000	600-2000
Package Outline	**Stud (¾-16), T70**	**Pow-R-Disc, T72**	**Integral Heat Sink, T76**
Features	Very high voltage, high dv/dt, all diffused	Very high voltage, high dv/dt, all diffused	Very high voltage, high dv/dt, all diffused
Data Sheet	New Product Bulletin	New Product Bulletin	New Product Bulletin

SEE PAGE 1859 FOR WESTINGHOUSE SALES OFFICES

Westinghouse

Westinghouse Electric Corporation
Semiconductor Division, Youngwood, Pa. 15697
(412) 925-7272 • TWX 510-468-2840

transistors

Westinghouse NPN silicon transistors are designed for high power applications in industrial systems, high reliability military and space systems, computers, communication systems and power supplies. These devices offer the outstanding advantages of freedom from thermal fatigue and second breakdown and are 100% power tested. All production lots are tested in accordance with MIL-S-19500. All JEDEC registered devices bear the Westinghouse Lifetime Guarantee symbol. ✤

The broad variety of power transistors are grouped into general purpose, industrial and military categories and by maximum collector current ratings from 4A to 250A. $V_{CEO\,(sus)}$ ranges from 40 to 375 volts. Saturation resistance limits apply at the collector currents given for the gain rating. Typical gain bandwidth product (f_T) ranges from .5 MHZ for the alloy devices, to 1 MHZ for the single diffused, to 60 MHZ for epitaxial base product.

The industrial and general purpose low cost transistors are designed expressly to meet the needs of original equipment manufacturers of electronic apparatus. Their low saturation resistance, high collector voltage and high temperature characteristics make them ideally suited for use in regulators, power supplies, inverters and amplifiers.

General Purpose Transistors Low Current/Medium Freq.

I_C Rating	4 Amperes			
Package Outline	**TO-66**	**TO-66**	**TO-66**	**TO-66**
Type	1571	1571	1571	1571
h_{fe} min.	20 @ ½ Amp	25 @ ½ Amp	20 @ 1 Amp	20 @ 2 Amp
V_{ce} (sat) max.	1.0V	1.0V	1.0V	1.0V
f_T typical	1.0MHz	1.0MHz	1.0MHz	1.0MHz
V_{ceo} (sus) 40	1571-0420	1571-0425	1571-0401	1571-0402
60	1571-0620	2N3054	1571-0601	1571-0602
80	1571-0820	1571-0825	1571-0801	1571-0802
100	1571-1020	1571-1025	1571-1001	1571-1002
120	1571-1220	1571-1225	1571-1201	1571-1202
140	2N3441	1571-1425	1571-1401	1571-1402
160	1571-1620	1571-1625	1571-1601	1571-1602
180	1571-1820	1571-1825	1571-1801	1571-1802
200	1571-2020	1571-2025	1571-2001	....
Max. Ratings	V_{EB} = 7V, I_B = 2A T_J = −65°C to +200°C P_T = 29W @ T_C = 25°C $R_{\theta JC}$ = 6°C/Watt			
Data Sheet	54-673: 11, 12			

General Purpose Medium Current/Medium Freq.

I_C Rating	15 Amperes			30 Amperes		
Package Outline	**TO-3**	**TO-3**	**TO-3**	**TO-3**	**TO-3**	**TO-3**
Type	1561	1561	1561	1561	1561	1561
h_{fe} min.	20 @ 3A	20 @ 4A	20 @ 5A	15 @ 8A	15 @ 10A	15 @ 15A
V_{ce} (sat) max.	1.1 V	1.1 V	1.1 V	1.1 V	1.1 V	1.1 V
f_T (typical)	1.0 MHz	1.0 MHz	1.0 MHz	1.0 MHz	1.0 MHz	1.0 MHz
V_{ceo} (sus) 40	1561-0403	1561-0404	2N5034	1561-0408	1561-0410	2N3771
60	2N3232	2N3055/JAN2N3055	2N5036	1561-0608	2N3772	1561-0615
80	1561-0803	1561-0804	1561-0805	1561-0808	1561-0810	1561-0815
100	2N3233	2N3236	1561-1005	1561-1008	1561-1010	1561-1015
120	2N4347	2N4348	1561-1205	1561-1208	1561-1210	1561-1215
140	2N3442	1561-1404	1561-1405	2N3773	1561-1410	1561-1415
160	2N3234	1561-1604	1561-1605	2N3240	1561-1610	1561-1615
180	1561-1803	1561-1804	1561-1805	1561-1808	1561-1810	1561-1815
200	1561-2003	1561-2004	....	1561-2008	1561-2010	....
Maximum Ratings	V_{EB} = 7V I_B = 7A T_J = −65°C to 200°C P_T = 115W @ T_C = 25°C $R_{\theta JC}$ = 1.5°C/W			V_{EB} = 7V I_B = 7A T_J = −65°C to 200°C P_T = 150W @ T_C = 25°C $R_{\theta JC}$ = 1.17°C/W		
Data Sheet	54-673: 15, 16	54-673: 1, 2, 13, 14		54-673: 7-10		

General Purpose & Industrial Medium Current/Medium Freq. Minimization of Thermal Fatigue Transistors

I_C Rating	15 Amperes			30 Amperes		
Package Outline	**TO-3**	**TO-3**	**TO-3**	**TO-3**	**TO-3**	**TO-3**
Type	1582	1582	1582	1582	1582	1582
h_{fe} min.	20 @ 3	20 @ 4	20 @ 5	15 @ 8	15 @ 10	15 @ 15
V_{ce} (sat) max.	1.1 V	1.1 V	1.1 V	1.1 V	1.1 V	1.1 V
f_T (typical)	1.0 MHz	1.0 MHz	1.0 MHz	1.0 MHz	1.0 MHz	1.0 MHz
V_{ceo} (sus) 40	1582-0403	1582-0404	1582-0405	1582-0408	1582-0410	1582-0415
60	1582-0603	1582-0604	1582-0605	1582-0608	1582-0610	1582-0615
80	1582-0803	1582-0804	1582-0805	1582-0808	1582-0810	1582-0815
100	1582-1003	1582-1004	1582-1005	1582-1008	1582-1010	1582-1015
120	1582-1203	1582-1204	1582-1205	1582-1208	1582-1210	1582-1215
140	1582-1403	1582-1404	1582-1405	1582-1408	1582-1410	1582-1415
160	1582-1603	1582-1604	1582-1605	1582-1608	1582-1610	1582-1615
180	1582-1803	1582-1804	1582-1805	1582-1808	1582-1810	1582-1815
200	1582-2003	1582-2004	....	1582-2008	1582-2010	....
Maximum Ratings	V_{EB}=7V I_B=7A T_J=−65°C to 200°C P_T = 115W @ T_C = 25°C $R_{\theta JC}$ = 1.5°C/W			V_{EB}=7V I_B=7A T_J=−65°C to 200°C P_T = 150W @ T_C = 25°C $R_{\theta JC}$ = 1.17°C/W		
Data Sheet	New Product Bulletin					

Westinghouse

transistors

Military & Industrial Low Current/High Frequency

I_C Rating	10 Amperes						20 Amperes	
Package Outline	**TO-66**	**TO-66**	**TO-61**	**TO-61**	**TO-111**	**TO-111**	**TO-3**	**TO-3**
Type	1714	1714	1716	1716	1718	1718	1723	1723
h_{fe} min.	20 @ 2A	20 @ 5A	20 @ 2A	20 @ 5A	20 @ 2A	20 @ 5A	20 @ 5A	20 @ 10A
V_{ce} (sat) max.	0.60V	0.75V	0.50V	0.60V	0.50V	0.60V	1.0V	1.25V
f_T typical	60MHz	60MHz	60MHz	60MHz	60MHz	60MHz	40MHz	40MHz
V_{ceo} (sus) 40	1714-0402	1714-0405	1716-0402	1716-0405	1718-0402	1718-0405	1723-0405	1723-0410 ....
60	1714-0602	1714-0605	1716-0602	1716-0605	1718-0602	1718-0605	1723-0605	1723-0610 ....
80	1714-0802	1714-0805	1716-0802	1716-0805	1718-0802	1718-0805	1723-0805	1723-0810 **2N5039**
100	1714-1002	1714-1005 **2N5202**	1716-1002	1716-1005 **2N2811/2**	1718-1002	1718-1005	1723-1005	1723-1010 **2N5038**
120	1714-1202	1714-1205 **2N3879**	1716-1202	1716-1205	1718-1202	1718-1205	1723-1205	1723-1210 ....
140	1714-1402	1714-1405	1716-1402	1716-1405 **2N2813/4**	1718-1402	1718-1405	1723-1405	1723-1410 ....
160	1714-1602	1714-1605	1716-1602	1716-1605	1718-1602	1718-1605	1723-1605	1723-1610 ....
180	1714-1802	1714-1805	1716-1802	1716-1805 **2N1724**	1718-1802	1718-1805	1723-1805	1723-1810 ....
Maximum Ratings	V_{EB} = 7V, I_B = 2A $T_{J\&STG}$ = −65°C to +200°C P_T = 44W @ T_C = 25°C $R_{\theta JC}$ = 4.0°C/Watt		V_{EB} = 7V, I_B = 2A $T_{J\&STG}$ = −65°C to +200°C P_T = 50W @ T_C = 100°C $R_{\theta JC}$ = 2.0°C/Watt		V_{EB} = 7V, I_B = 2A $T_{J\&STG}$ = −65°C to +200°C P_T = 33W @ T_C = 100°C $R_{\theta JC}$ = 3.0°C/Watt		V_{EB} = 7V, I_B = 5A $T_{J\&STG}$ = −65°C to +200°C P_T = 150W @ T_C = 25°C $R_{\theta JC}$ = 1.17°C/Watt	
Data Sheet	TD54-673: 17-20		New Product Bulletin				TD54-673: 21-24 TD54-661: 9-12	

Military & Industrial Medium Current/High Frequency

I_C Rating	40 Amperes								
Package Outline	**TO-3**	**TO-3**	**TO-3**	**TO-3**	**TO-3**	**TO-3**	**TO-63**	**TO-63**	**TO-63**
Type	1743	1743	1743	1763	1763	1763	1748	1748	1748
h_{fe} min.	20 @ 10A	20 @ 20A	20 @ 30A	20 @ 10A	20 @ 20A	20 @ 30A	20 @ 10A	20 @ 20A	20 @ 30A
V_{ce} (sat) max.	2.0V	2.0V	2.0V	1.0V	1.25V	1.50V	2.0V	2.0V	2.0V
f_T typical	40MHz	40MHz	40MHz	40MHz	40MHz	40MHz	40MHz	40MHz	40MHz
V_{ceo} (sus) 60	1743-0610	2N5932	1743-0630	1763-0610	1763-0620	1763-0630	1748-0610	**2N6046**	1748-0630
80	2N5929	1743-0820	2N5935	1763-0810	1763-0820	1763-0830	1748-0810	1748-0820	1748-0830
100	1743-1010	2N5933	1743-1030	1763-1010	1763-1020	1763-1030	1748-1010	**2N6047**	1748-1030
120	2N5930	1743-1220	2N5936	1763-1210	1763-1220	1763-1230	1748-1210	1748-1220	1748-1230
140	1743-1410	2N5934	1743-1430	1763-1410	1763-1420	1763-1430	1748-1410	**2N6048**	1748-1430
160	2N5931	1743-1620	2N5937	1763-1610	1763-1620	1763-1630	1748-1610	1748-1620	1748-1630
180	1743-1810	1743-1820	1743-1830	1763-1810	1763-1820	....	1748-1810	1748-1820	1748-1830
Maximum Ratings	V_{EB} = 7V, I_B = 10A $T_{J\&STG}$ = −65°C to +200°C P_T = 100W @ T_C = 100°C $R_{\theta JC}$ = 1.0°C/Watt						V_{EB} = 7V, I_B = 10A $T_{J\&STG}$ = −65°C to +200°C P_T = 114W @ T_C = 100°C $R_{\theta JC}$ = 0.875°C/Watt		
Data Sheet	TD54-651: 13-24			New Product Bulletin			TD54-651: 25-36		

Medium Current/High Frequency (Continued)

I_C Rating	40 Amperes		
Package Outline	**TO-63**	**TO-63**	**TO-63**
Type	1768	1768	1768
h_{fe} min.	20 @ 10A	20 @ 20A	20 @ 30A
V_{ce} (sat) max.	1.0V	1.25V	1.50V
f_T typical	40MHz	40MHz	40MHz
V_{ceo} (sus) 60	1768-0610	1768-0620	1768-0630
80	1768-0810	1768-0820	1768-0830
100	1768-1010	1768-1020 **2N4002**	1768-1030
120	1768-1210	1768-1220 **2N4003**	1768-1230
140	1768-1410	1768-1420	1768-1430
160	1768-1610	1768-1620	1768-1630
180	1768-1810	1768-1820	....
Maximum Ratings	V_{EB} = 7V, I_B = 10A $T_{J\&STG}$ = −65°C to +200°C P_T= 114W @ T_C = 100°C $R_{\theta JC}$ = 0.875°C/Watt		
Data Sheet	New Product Bulletin		

Military & Industrial High Current/High Frequency

I_C Rating	75 Amperes				90 Amperes		
Package Outline	**TO-63**	**TO-63**	**TO-63**	**TO-63**	**TO-114**	**TO-114**	**TO-114**
Type	1756	1756	1776	1776	1781	1781	1781
h_{fe} min.	15 @ 40A	15 @ 60A	15 @ 40A	15 @ 60A	15 @ 50A	15 @ 70A	10 @ 90A
V_{ce} (sat) max.	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V
f_T typical	30MHz	30MHz	30MHz	30MHz	30MHz	30MHz	30MHz
V_{ceo} (sus) 40	1756-0440	1756-0460	1776-0440	1776-0460	1781-0450	1781-0470	1781-0490
60	1756-0640	1756-0660	1776-0640	1776-0660	1781-0650	1781-0670	1781-0690
80	1756-0840	1756-0860	1776-0840	1776-0860	1781-0850	1781-0870	1781-0890
100	1756-1040	1756-1060	1776-1040	1776-1060	1781-1050	1781-1070	1781-1090
120	1756-1240	1756-1260	1776-1240	1776-1260	1781-1250	1781-1270	1781-1290
140	1756-1440	1756-1460	1776-1440	1776-1460	1781-1450	1781-1470	....
160	1756-1640	1756-1660	1776-1640	1776-1660	1781-1650	....	....
Maximum Ratings	V_{EB} = 7V, I_B = 15A $T_{J\&STG}$ = −65°C to +200°C P_T = 150W @ T_C = 100°C $R_{\theta JC}$ = 0.67°C/Watt				V_{EB} = 7V, I_B = 20A $T_{J\&STG}$ = −65°C to +200°C P_T = 200W @ T_C = 100°C $R_{\theta JC}$ = 0.5°C/Watt		
Data Sheet	New Product Bulletin				New Product Bulletin		

Military & Industrial High Voltage Low, Medium and High Current/High Frequency

I_C Rating	10 Amperes			30 Amperes			65 Amperes	
Package Outline	**TO-66**	**TO-66**	**TO-66**	**TO-3**	**TO-3**	**TO-3**	**TO-63**	**TO-63**
Type	1814	1814	1814	1843	1843	1843	1856	1856
h_{fe} min.	20 @ 1A	20 @ 2A	20 @ 5A	20 @ 5A	15 @ 10A	10 @ 20A	15 @ 30A	15 @ 40A
V_{ce} (sat) max.	0.60V	0.60V	0.75V	1.0V	1.25V	1.75V	1.5V	1.5V
f_T typical	50MHz	50MHz	50MHz	25MHz	25MHz	25MHz	20MHz	20MHz
V_{ceo} (sus) 200	1814-2001	1814-2002	1814-2005	1843-2005	1843-2010	1843-2020	1856-2030	1856-2040
225	1814-2201	1814-2202	1814-2205	1843-2205	1843-2210	1843-2220	1856-2230	1856-2240
250	1814-2501	1814-2502	1814-2505	1843-2505	1843-2510	1843-2520	1856-2530	1856-2540
275	1814-2701	1814-2702	1814-2705	1843-2705	1834-2710	1843-2720	1856-2730	1856-2740
300	1814-3001	1814-3002	1814-3005	1843-3005	1843-3010	1843-3020	1856-3030	1856-3040
325	1814-3201	1814-3202	1814-3205	1843-3205	1843-3210	1843-3220	1856-3230	1856-3240
350	1814-3501	1814-3502	....	1843-3505	1843-3510	....	1856-3530	....
375	1814-3701	....	....	1843-3705	....	....	....	....
Maximum Ratings	V_{EB} = 7V, I_B = 2A $T_{J\&STG}$ = −65°C to +200°C P_T = 44W @ T_C = 25°C $R_{\theta JC}$ = 4.0°C/Watt			V_{EB}= 7V, I_B = 10A $T_{J\&STG}$ = −65°C to +200°C P_T = 85W @ T_C = 100°C $R_{\theta JC}$ = 1°C/Watt			V_{EB} = 7V, I_B = 15A $T_{J\&STG}$ = −65°C to +200°C P_T = 150W @ T_C = 100°C $R_{\theta JC}$ = 0.67°C/Watt	
Data Sheet	TD54-652: 1, 2			New Product Bulletin			New Product Bulletin	

SEE PAGE 1859 FOR WESTINGHOUSE SALES OFFICES

Westinghouse

Westinghouse Electric Corporation
Semiconductor Division, Youngwood, Pa. 15697
(412) 925-7272 • TWX 510-468-2840

transistors

Industrial High Current/Ultra High Power/Medium Freq.

I_C Rating	250 Amperes					
Package Outline	**TO-93**	**TO-93**	**TO-93**	**TO-93**	**TO-93**	**TO-93**
Type	1401	1401	1401	1401	1401	1401
h_{fe} min.	10 @ 50 Amps	10 @ 70	10 @ 100	10 @ 150	10 @ 200	10 @ 250
V_{ce} (sat) max.	.15 @ 30A	.15 @ 30A	.15 @ 30A	.15 @ 30A	.15 @ 30A	.15 @ 30A
f_T (typical)	.5 MHz	.5 MHz	.5 MHz	.5 MHz	.5 MHz	.5 MHz
V_{ceo} (sus) 40	1401-0405	1401-0407	1401-0410	1401-0415	1401-0420	1401-0425
60	1401-0605	1401-0607	1401-0610	1401-0615	1401-0620	1401-0625
80	1401-0805	1401-0807	1401-0810	1401-0815	1401-0820	1401-0825
100	1401-1005	1401-1007	1401-1010	1401-1015	1401-1020	1401-1025
120	1401-1205	1401-1207	1401-1210	1401-1215	1401-1220	....
Maximum Ratings	V_{EB}=7V I_B=75A P_T = 625 Watts @ T_C = 75°C $R_{\theta JC}$ = .2°C/W					
Data Sheet	TD54-674: 1-4					

Industrial & General Purpose Low Current/Low Frequency

I_C Rating	6 Amperes		7.5 Amperes		10 Amperes			20 Amperes	
Package Outline	**MT-1**	**MT-1**	**MT-52**	**MT-52**	**TO-3**	**TO-3**	**TO-3**	**MT-33**	**MT-33**
Type	151	152	153	154	A580	A580	A580	163	164
h_{fe} min.	11 @ 1.5A	18 @ 1.5A	15 @ 1.5A	25 @ 1.5A	15 @ 2A	15 @ 3A	15 @ 5A	15 @ 5A	25 @ 5A
V_{ce} (sat) max.	1.3V	1.25V	1.3V	1.25V	0.8V	0.9V	1.0V	1.1V	1.0V
f_T typical	0.5 MHz	0.5 MHz	0.5 MHz	0.5 MHz	0.5 MHz	0.5 MHz	0.5 MHz	0.5 MHz	0.5 MHz
V_{ceo} (sus) 40	151-04	152-04	153-04	154-04	A580-0402	A580-0403	A580-0405	163-04	164-04
50	151-05	152-05	153-05	154-05	....	....	....	163-05	164-05
60	151-06	152-06	153-06	154-06	....	....	....	163-06	164-06
70	151-07	152-07	153-07	154-07	....	....	....	163-07	164-07
80	151-08	152-08	153-08	154-08	A580-0802	A580-0803	A580-0805	163-08	164-08
90	151-09	152-09	153-09	154-09	....	....	....	163-09	164-09
100	151-10	152-10	153-10	154-10	....	....	....	163-10	164-10
120	151-12	152-12	153-12	154-12	A580-1202	A580-1203	A580-1205	163-12	164-12
140	151-14	152-14	153-14	154-14	....	....	....	163-14	164-14
160	151-16	152-16	153-16	154-16	A580-1602	A580-1603	A580-1605	163-16	164-16
180	151-18	152-18	153-18	154-18	A580-1802	A580-1803	A580-1805	163-18	164-18
200	151-20	152-20	153-20	154-20	A580-2002	A580-2003	A580-2005	163-20	164-20
220	151-22	152-22	153-22	154-22	A580-2202	A580-2203	A580-2205	163-22	164-22
240	151-24	152-24	153-24	154-24	A580-2402	A580-2403	....	163-24	164-24
260	151-26	152-26	153-26	154-26	....	....	....	163-26	164-26
280	151-28	152-28	153-28	154-28	....	....	....	163-28	164-28
300	151-30	152-30	153-30	154-30	....	....	....	163-30	164-30
Maximum Ratings	V_{EB}=25V, I_B=3A $T_{J\&STG}$ = −65°C to +150°C P_T=100W @ 80°C $R_{\theta JC}$ = 0.7°C/Watt		V_{EB} = 25V, I_B = 3A $T_{J\&STG}$ = −65°C to +175°C P_T=200W @ 25°C $R_{\theta JC}$ = 0.75°C/Watt		V_{EB}=25V, I_B=3A $T_{J\&STG}$ = −65°C to +175°C P_T=175W @ 25°C $R_{\theta JC}$ = 0.857°C/Watt			V_{EB}=15V, I_B=7.5A $T_{J\&STG}$ = −65°C to +175°C P_T=200W @ 75°C $R_{\theta JC}$ = 0.5°C/Watt	
Data Sheet	TD54-672: 1, 2		TD54-672: 3, 4		TD54-672: 7-10			TD54-672: 5, 6	

Military Low Current/Low Frequency

I_C Rating	7.5 Amperes			10 Amperes (High Gain)				20 Amperes		
Package Outline	**MT-1**	**MT-1**	**MT-52**	**MT-1**	**MT-1**	**MT-33**	**MT-33**	**MT-1A**	**MT-1A**	**MT-1A**
Type	107	108	113	118	118	120	120	109	109	109
h_{fe} min.	10 @ 2A	10 @ 5A	10 @ 5A	100 @ 10A	400 @ 10A	100 @ 10A	400 @ 10A	10 @ 10A	10 @ 15A	10 @ 20A
V_{ce} (sat) max.	1.5V	2.5V	1.0 V	3.5V	3.5V	3.5V	3.5V	1.5V	1.5V	1.5V
f_T typical	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz
V_{ceo} (sus) 30	2N1015	2N1016	....	....	....	....	....	....	....	....
50	2N1015A	2N1016A	2N3429	2N2226	2N2230	2N3470	2N3474	2N2739	2N2745	2N2751
100	2N1015B	2N1016B	2N3430	2N2227	2N2231	2N3471	2N3475	2N2740	2N2746	2N2752
150	2N1015C	2N1016C	2N3431	2N2228	2N2232	2N3472	2N3476	2N2741	2N2747	2N2753
200	2N1015D	2N1016D	2N3432	2N2229	2N2233	2N3473	2N3477	2N2742	2N2748	2N2754
250	2N1015E	2N1016E	2N3433	....	....	....	....	....	....	....
Maximum Ratings	V_{EB} = 25V, I_B = 5A $T_{J\&STG}$ = −65°C to +150°C P_T = 150W @ 45°C $R_{\theta JC}$ = 0.7°C/Watt		V_{EB} = 25V, I_B = 3A $T_{J\&STG}$ = −65°C to +175°C P_T = 150W @ 60°C $R_{\theta JC}$ = 0.75°C/W	V_{EB} = 15V, I_B = 1A $T_{J\&STG}$ = −65°C to +150°C P_T = 150W @ 75°C $R_{\theta JC}$ = 0.5°C/W				V_{EB} =15V, I_B = 7.5A $T_{J\&STG}$ = −65°C to +175°C P_T = 200W @ 75°C $R_{\theta JC}$ = 0.5°C/Watt		
Data Sheets	TD54-661: 1, 2		TD54-661: 3-6	TD54-663: 1-4				TD54-661: 9-12		

Military Medium Current/Low Frequency

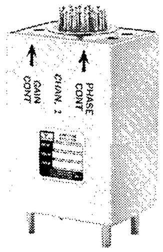
I_C Rating	30 Amperes											
Package Outline	**MT-33**	**MT-33**	**MT-33**	**MT-33**	**MT-14**	**MT-14**	**MT-14**	**MT-14**	**MT-17**	**MT-17**	**MT-17**	**MT-17**
Type	110	110	110	110	115	115	115	115	125	125	125	125
h_{fe} min.	10 @ 10A	10 @ 15A	10 @ 20A	10 @ 25A	10 @ 10A	10 @ 15A	10 @ 20A	10 @ 25A	10 @ 10A	10 @ 15A	10 @ 20A	10 @ 25A
V_{ce} (sat) max.	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V	1.5V
f_T typical	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz	0.5MHz
V_{ceo} (sus) 50	2N2757	2N2763	2N2769	2N2775	2N1809	2N1816	2N1823	2N1830	2N2109	2N2116	2N2123	2N2130
100	2N2758	2N2764	2N2770	2N2776	2N1810	2N1817	2N1824	2N1831	2N2110	2N2117	2N2124	2N2131
150	2N2759	2N2765	2N2771	2N2777	2N1811	2N1818	2N1825	2N1832	2N2111	2N2118	2N2125	2N2132
200	2N2760	2N2766	2N2772	2N2778	2N1812	2N1819	2N1826	2N1833	2N2112	2N2119	2N2126	2N2133
250	2N2761	....	....	....	2N1813	2N1820	....	....	2N2113	2N2120	....	....
300	....	....	....	....	2N1814	....	....	....	2N2114	....	....	....
Maximum Ratings	V_{EB} = 15V, I_B = 7.5A $T_{J\&STG}$ = −65°C to +175°C P_T = 200W @ 75°C $R_{\theta JC}$ = 0.5°C/Watt				V_{EB} = 15V, I_B = 10A $T_{J\&STG}$ = −65°C to +200°C P_T = 400W @ 60°C $R_{\theta JC}$ = .35°C/Watt							
Data Sheet	TD54-662: 5-12				TD54-662: 1-4							

SEE PAGE 1859 FOR WESTINGHOUSE SALES OFFICES

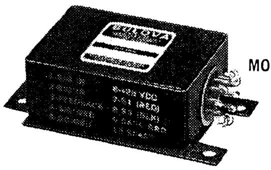
BULOVA SERVO PRODUCTS

RESOLVER AMPLIFIERS

MODEL 310



MODEL 315

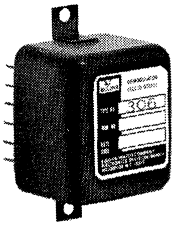


MODEL B61320104

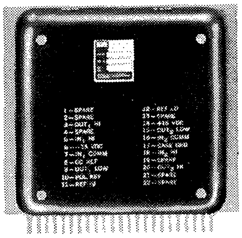
	Model 310	Model 315	Model 366	Model B61320104	Model B81320104
Number of Channels:	2	2	2	1	2
Inputs/Channel:	1	1-3	1	2	2
Voltage Gain: (Comp. Out/Signal In)	1.0000	1.0000	1.0000	.4995	.4995
Gain Stability:	±.1%	±.025%	±.1%	±.02%	±.02%
Phase Shift: (Degrees)	.0 ±.1	.0 ±.1	.0 ±.1	180 ±.1	180 ±.1
Max. Linear Output: (Volts RMS)	0–10	0–10	0–20	0–10	0–10
Summing Accuracy:	.03%	.025%	.03%	.03%	.03%
Input Impedance (ohms)	1 meg	200k	1 meg	200k	200k
Input Voltage (DC)	28	28	50	28	28
Type:	Series Summing	Parallel Summing	Series Summing	Universal	Universal
Load:	AEL 8RP6	Vernitron VRE23/41	AEL 8RP6	Size 8, 11 & 15	Size 8, 11 & 15
Package Size:	.938 diam. x 1.22	1.76 x 1.26 x 2.5	.938 diam. x 1.22	1.25 x 1.75 x .76	1.25 x 1.75 x .76

NOTE: Operating Frequency, all units 400 Hz.

MODULATORS/DEMODULATORS—400 Hz—800 Hz



MODEL 306



MODEL 468

	Model 307 Modulator	Model 306 Demodulator	Model 468 (Dual Channel) Demodulator*
Ref. Voltage:	26V RMS	26V RMS	10 Vrms
Input Signal:	±15V DC	0.30V RMS	0–1 Vrms
Output Voltage:	0–7V RMS	±7V DC	±5V DC
Gain:	.9 ±10%	1.0 ±10%	1 ±0.5%
Null:	30mV rms max.	30mV rms max.	.003%/C°
Freq. Response:	Flat +1 −3dB from DC to 200 Hz	Flat +1 −3dB from DC to 200 Hz	0–30 Hz
Linearity:	±10%	±10%	±.5%
Output Impedance:	4000 ohms	2000 ohms	500 ohms
Input Impedance:	—	6000 ohms min	500 K ohms
Package Size:	—	—	4.5 x 4.5 x 1.0 Card Plug In

*Has common mode rejection of 60 db or greater at 800 and 60 Hz.

AC Summing (Operational) Amplifiers

Gains up to 10. Summing inputs matched to .02%. Up to 4 inputs. Single or dual channel units available.

Quadrature Rejection Amplifiers

Available with gains of up to 10 and rejection ratios of up to 150:1. Units may be supplied with up to 3 summing inputs. Units operate from 28 or 40V DC.

DC Power Supplies

Up to K W Range. Current limit, voltage limit, filtered, highly regulated.

Error Signal Detectors

These solid state circuits are designed to drive external or built-in relays. Time delays built in to avoid tripping due to pickup signals, low hysteresis. Wide magnitude of voltage ranges available.

Gain Control Amplifiers

Automatic gain control for 400 Hz servo systems; with transfer function of 26 divided by the control voltage. Other transfer functions available on request.

Gyro Wheel Supplies

Gyro Wheel Supplies can be provided to drive gyro-motors ranging in frequency from 400 to 3200 Hz. Units are specifically designed to drive 2 phase gyro motors and their respective pick-off windings.

Phase shift between outputs are held to 90° ±1 degree. Oscillator stability is better than 10^5 per degree C.

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA sp

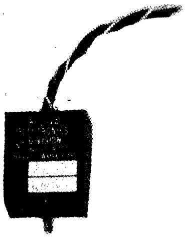
BULOVA SERVO PRODUCTS

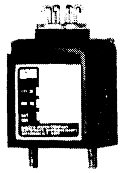
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

BULOVA SERVO PRODUCTS

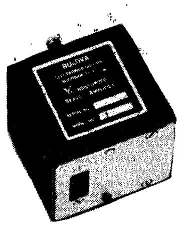
Miniature Solid State, 400 Hz, Servo Amplifiers for Military and Industry





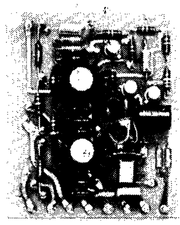
*All units available in 90° phase shift.

POWER OUTPUT		2 WATT	3.5 WATT	6 WATT	
PHASE SHIFT		0°	0°	0°	
MODEL NUMBER		S4121 S4131 S4141 S4161	S4221 S4231 S4241 S4261	S4321 S4331 S4341 S4351	S4322 S4332 S4342
INPUT SIGNAL (vrms max. at max. gain)		26	26	26	26
VOLTAGE OUTPUT (vrms nominal)	(linear region)	0-25	0-25	0-25	0-18
	(at rated power)	40	40	40	26
VOLTAGE GAIN ±1db (v/v max. adjustable down)		Model # Gain	Model # Gain	Model # Gain	Model # Gain
		S4121 1000 S4131 2500 S4141 5000 S4161 25000	S4221 1000 S4231 2500 S4241 5000 S4261 25000	S4321 1000 S4331 2500 S4341 5000 S4351 10000	S4322 1000 S4332 2500 S4342 5000
OUT IMPEDANCE (ohms typical)		100	100	100	10
POWER SUPPLY (voltage ±10%)		28 V DC	28 V DC	28 V DC	26 VRMS
INPUT POWER (watts)	(at zero signal)	1	1	2	2
	(at rated load)	5	7	12	12
MOTOR LOAD	winding	TCT**	TCT**	TCT**	USE***
	voltage	33-40	33-40	33-40	26
	effec. resistance	800 ±25%	460 ±25%	270 ±25%	100-350
AMBIENT TEMP. RANGE	operating	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C
	storage	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C
CONFIGURATION		I	I	I	III
WEIGHT (ounces, approximate)		1.5	1.5	1.5	2



*All units available in 90° phase shift.

POWER OUTPUT		9 WATT	16 WATT	25 WATT	40 WATT	
PHASE SHIFT		0°	0°	0°	0°	
MODEL NUMBER		S4421 S4431 S4441 S4461	S4521 S4531 S4541 S4551	S4621 S4631 S4641 S4651	S4721 S4731 S4741 S4751	S4722 S4732 S4742
INPUT SIGNAL (vrms max. at max. gain)		26	26	26	26	26
VOLTAGE OUTPUT (vrms nominal)	(linear region)	0-25	0-25	0-25	0-25	0-18
	(at rated power)	40	40	40	40	26
VOLTAGE GAIN ±1db (v/v max. adjustable down)		Model # Gain	Model # Gain	Model # Gain	Model # Gain	Model # Gain
		S4421 1000 S4431 2500 S4441 5000 S4461 25000	S4521 1000 S4531 2500 S4541 5000 S4551 10000	S4621 1000 S4631 2500 S4641 5000 S4651 10000	S4721 1000 S4731 2500 S4741 5000 S4751 10000	S4722 1000 S4732 2500 S4742 5000
OUT IMPEDANCE (ohms typical)		50	50	40	25	2
POWER SUPPLY (voltage ±10%)		28 V DC	28 V DC	28 V DC	28 V DC	26 VRMS
INPUT POWER (watts)	(at zero signal)	3	3	3	3	3
	(at rated load)	20	32	50	100	100
MOTOR LOAD	winding	TCT**	TCT**	TCT**	TCT**	USE***
	voltage	33-40	33-40	33-40	33-40	26
	effec. resistance	177 ±25%	100 ±25%	60 ±25%	40 ±20%	20-100
AMBIENT TEMP. RANGE	operating	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C	−55°C to 125°C
	storage	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C	−65°C to 150°C
CONFIGURATION		IV	IV	V	V	V
WEIGHT (ounces, approximate)		8	8	12	12	12



Notes: 1. Operating frequency: 400Hz ±20. 60Hz available. **2.** Input Signal (Max): 26V. **3.** Gain Stability: ±2 db over environment. **4.** Input Impedance: 10K ohms minimum. **5.** Deadband: 500/V. Gain. [mv, no output referred to input.] **6.** Noise: 250 MV, max, output with input shorted. **7.** Bandwidth: 200Hz minimum. **8.** **TCT - Tuned center tap; ***USE - untuned single ended. **9.** Mechanical Configuration: Consult factory over 25 Standard Packages available for units shown:

Typical Dimensions:

I .81 x .43 x 1.1
II 1 x 1 x 1.5
III 1.2 x 1.2 x 1.3
IV 1.43 x 1.87 x 2.03
V 2.21 x 2.51 x 2.37

Manufacturer of the widest range of Frequency Control Components: Crystals ● Crystal Oscillators ● Crystal Filters ● LC Filters ● Tuning Forks ● Fork Oscillators ● Ovens ● Coils ● Servo Amplifiers

BULOVA SERVO PRODUCTS

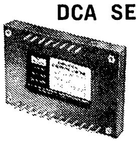
ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

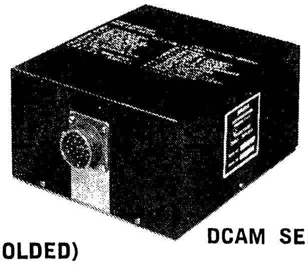
61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

BULOVA SERVO PRODUCTS

DC SERVO AMPS...2.5w to 2,500w

DCA SERIES





DCAM SERIES

FEATURES:

- Adjustable Gain
- Current Limiting
- Voltage or Current Feedback
- Wide Bandwidth
- Low Cost

DESIGNED TO DRIVE:

- DC Torque Motors
- Low Inertia Motors
- DC Servo Motors
- Deflection Coils

DCA SERIES (PLUG-IN, MOLDED)

SPECIFICATIONS (Nominal)	DCA 25 (60)*	DCA 25*	DCA 200	DCA 300
OUTPUT (at 28 VDC supply)				
Voltage	±50 VDC peak	±20 VDC peak	±20 VDC peak	±20 VDC peak
Current	±0.5 amps peak	±1.25 amps peak	±10 amps peak	±15 amps peak
Current Limit Adjust	0.2 to 0.5 amps	0.2 to 1.25 amps	1 to 10 amps	1 to 15 amps"
INPUT				
Supply Voltage	+55 to +65 VDC	+20 to +32 VDC	+20 to +32 VDC	+20 to +32 VDC
Supply Quiescent Current	0.05 amps	0.05 amps	0.05 amps	0.05 amps
Bias Supply Voltage	−15 ±2 VDC	−15 ±2 VDC	−15 ±2 VDC	−15 ±2 VDC
Bias Supply Current	0.03 amps	0.03 amps	0.03 amps	0.03 amps
AMPLIFIER PARAMETERS				
Input Impedance	10K ohms	10K ohms	10K ohms	10K ohms
Gain (Adjustable)				
As Voltage Amplifier	20 V/V	20 V/V	20 V/V	20 V/V
As Current Amplifier	0.5 A/V	0.5 A/V	0.5 A/V	0.5 A/V
Frequency Response				
Small Signal	10K Hz	10K Hz	10K Hz	10K Hz
Full Output	1K Hz	1K Hz	1K Hz	1K Hz
Output Impedance (Dynamic)	0.1 ohm	0.1 ohm	0.1 ohm	0.1 ohm
Drift, Referred to Input	10 micro V/°C	10 micro V/°C	10 micro V/°C	10 micro V/°C
DC Dead Band	±50 micro V	±50 micro V	±50 micro V	±50 micro V
Weight	4 oz. approx.	4 oz. approx.	10 oz. approx.	10 oz. approx.
INTERNAL DISSIPATION (at 25°C Mounting Base Temperature)				
Continuous	10 watts	10 watts	100 watts	150 watts
100 Milliseconds (10% Duty Cycle)	20 watts	20 watts	200 watts	300 watts
Derating for Temperature	.075 watts/°C	.075/°C	.75 watts/°C	1.0 watts/°C

Operating Temperature Range: −55°C to +125°C

* DCA 25 and DCA 25 (60) can be used to drive external bridge with rating up to 300 watts.

DCAM SERIES (MODULAR, FIELD REPAIRABLE)

SPECIFICATIONS	DCAM-100	DCAM-300	DCAM-1000
OUTPUT			
Voltage	±20V DC (1)	±20V DC (1)	±65V DC (2)
Current	±7.5 Amps	±15 Amps	±15 Amps
Current Limit Adjust	1 to 7.5 Amps	1 to 15 Amps	7.5 to 15 Amps
INPUT			
Supply Voltage	26V DC ±6V DC	26V DC ±6V DC	±75V DC ±5V DC
Supply Quiescent Current	0.05 Amps	0.15 Amps	None
Bias Supply Voltage	−15V DC	Not required	±75V DC ±5V DC (3)
Bias Supply Current	25ma	Not required	100ma
Fan Power	Not required	Not required	115V AC, 60Hz
AMPLIFIER PARAMETERS			
Input Impedance	10K ohms	10K ohms	10K ohms
Gain (Adjustable)			
As Voltage Amplifier	20V/V	20V/V	10V/V
As Current Amplifier	5A/V	5A/V	Not app.
Frequency Response			
Small Signal	10KHz	10KHz	10KHz
Full Output	1KHz	1KHz	1KHz
Output Impedance (Dynamic)	0.1 ohm	0.1 ohm	0.1 ohm
Drift, Referred to Input	10 micro V/°C	10 micro V/°C	10 micro V/°C
DC Dead Band	±50 micro V	±50 micro V	±50 micro V
Weight	2 lbs. approx.	3.5 lbs. approx.	13 lbs. approx.
Size	3" x 6" x 2.5"	3" x 6" x 5.5"	7" x 6" x 12"
Operating Temperature Range	−55°C to +125°C Mtg. Base Temp.	−55°C to +125°C Mtg. Base Temp.	0-50°C Ambient
INTERNAL DISSIPATION			
Continuous	50 Watts (4)	150 Watts (4)	500 Watts (5)
100 Milliseconds (10% Duty Cycle)	100 Watts (4)	300 Watts (4)	1000 Watts (5)
Derating for Temperature	.25 Watts/°C	1 Watt/°C	10 Watts/°C

All DCAM units have option for internal preamplifier.

(1) At 26V DC Supply Voltage

(2) At 75V DC Supply Voltage

(3) Can be same as supply voltage source connected with separate leads

(4) At 25°C Mounting Base Temperature

(5) At 25°C Ambient Temperature

BULOVA SERVO PRODUCTS

ELECTRONICS DIVISION
OF BULOVA WATCH COMPANY, INC.

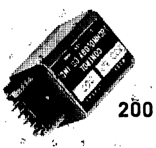
61-20 WOODSIDE AVENUE
WOODSIDE, N. Y. 11377 • 212 335-6000

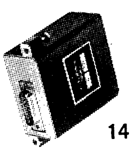
SERVO ELECTRONICS

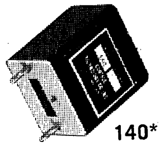
STANDARD AND CUSTOM DESIGNED

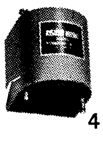
A.C. Servo Amplifiers	Demodulators	Digital Controllers
D.C. Servo Amplifiers	Modulators	Clutch Control Amplifiers
D.C. Torquer Amplifiers	Servo Valve Amplifiers	Relay Control Amplifiers
Resolver Booster Amplifiers	Isolation Amplifiers	

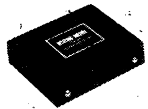
- Standard units available which will meet applicable MIL Specs.
- Amplifiers available which utilize state of the art Integrated Circuits, Chips and Hybrids.
- Units for industrial applications available
- SPECIAL electronics designed to your detailed specification

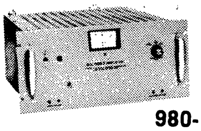

200 HP*


141*


140*


416-3


901 (Flat Pack)


980-1

*STOCK ITEMS Immediate Delivery	MODEL	Output Power	Output Voltage	Output Frequency	Input Signal Frequency	Input Impedance	Gain	Power Required	Temperature Range
AMPLIFIERS FOR A.C. SERVO MOTORS	*200-HP	3.5 W	40 VCT	400 CPS	400 CPS	10K	2,500	28 VDC	—55°C +125°C
	*200-5	3.5 W	40 VCT	400 CPS	400 CPS	10K	5,000	28 VDC	—55°C +125°C
	930	3.5 W	40 VCT	400 CPS	400 CPS	250K	2,000	28 VDC	—55°C +125°C
	*200-8	3.5 W	40 VCT	400 CPS	400 CPS	10K	2,500	115 V 400 CPS	—55°C +125°C
	216B	6 W	40 VCT	60 CPS	60 CPS	10K	1,000	28 VDC	—55°C +85°C
	*140	6 W	40 VCT	400 CPS	400 CPS	50K	1,000	28 VDC	—55°C +125°C
	141	6 W (90°)	40 VCT	400 CPS	400 CPS	30K	1,000	28 VDC	—55°C +125°C
	416-3	16 W	40 VCT	400 CPS	400 CPS	10K	1,000	28 VDC	—55°C +71°C
	*416A/D	16 W (0°/90°)	40 VCT	400 CPS	400 CPS (2)	10K	1,000	28 VDC	—55°C +100°C
	416E	16 W (90°)	40 VCT	400 CPS	DC (2)	50K	1000	28 VDC 115V 400 CPS	−55°C +125°C
	*159	16 W	40 VCT	60 CPS	60 CPS	10K	1,000	28 VDC	—55°C +100°C
	159A	16 W	40 VCT	60 CPS	DC	100K	1000	28 VDC	−55°C +100°C
	174	40 W (90°)	40 VCT	60 CPS	60 CPS	20K	1000	28 VDC	−55°C +71°C
	*956B	40 W (90°)	40 VCT	400 CPS	400 CPS	10K	1,000	28 VDC	—55°C +100°C
	956C	40 W (90°)	40 VCT	400 CPS	DC	10K	500	28 VDC 115 V 400 CPS	—55°C +100°C
	157-2	100 W (90°)	40 VCT	400 CPS	400 CPS	10K	800	28 VDC	—55C° +85°C
	MODIFICATIONS to gain, input impedance, signal frequency, and power level are available. Matching transformers for driving motors at other voltages in stock.								
AMPLIFIERS FOR D.C. TORQUERS	901	10W/200W (Flat Pack - Short Circuit Proof)	20 V	DC	DC (2)	10K	10	28 VDC	−55°C +100°C
	996-5	20 W	22V	DC	DC (2)	10K	500	28 VDC	—55°C +85°C
	998-6	40 W (Short Proof)	22V	DC	DC (2)	10K	500	28 VDC	—55°C +85°C
	912-6	125 W (Short Proof)	20V	DC	DC (2)	100K	200	28 VDC	—55°C +71°C
	914-3	220 W (Short Proof)	20V	DC	DC (2)	25K	200	28 VDC	—55°C +71°C
	980-1	500 W (Short Proof)	50V	DC	DC	10K	100	50-400 CPS 3 Phase (1 Phase Available.)	—55°C +71°C
	980-8	800 W	50V	DC	DC	10K	100	50-400 CPS 3 Phase (1 Phase Available.)	—55°C +71°C
	MODIFICATIONS to gain, input impedance, signal frequency, power level and operating temperature available.								
AMPLIFIERS FOR SERVO VALVES AND CLUTCHES	985	6.5 W	23 VDC	DC	DC	10K	20	28 VDC 115 V 400 CPS	—55°C +71°C
	Provisions for Balance and Null current adjustment. Will drive either a single center tapped coil or two separate coils.								
MODULATORS AND DEMODULATORS	312	Full Wave	10V	DC	60 CPS	10K	10	28 VDC 115V Reference	—55°C +125°C
	334-1	Full Wave	50V	DC	400 CPS	10K	180	28 VDC 115V 400 CPS	—55°C +125°C
	312-1	Full Wave	10V	DC	60 to 5000 CPS	10K	10	28 VDC 115 V Reference	—55°C +125°C
	350-1	Full Wave	15V	DC	400 CPS	10K	10	28 VDC 115V 400 CPS	—55°C +125°C
	MODIFICATIONS to gain, output voltage and input impedance available.								
RESOLVER BOOSTER & ISOLATION AMPLIFIER	328	0.1% Accuracy	10V	400 CPS	400 CPS	200K	1 ±.1%	28 VDC	—55°C +125°C
	Available as single channel or dual channel unit. Will operate size 8 or size 11 resolvers. Amplifiers with modifications to above parameters available.								
TEMPERATURE CONTROLLERS	703	Will drive heaters with power ranges up to 500 watt. Operates directly from 115 volt power line. Noise free switching with built in over current protection.							
	MODIFICATIONS to sensing circuit, accuracy and power output available.								

CONTROL TECHNOLOGY CO., inc., 41-16 29th Street, Long Island City, N.Y. 11101 • 212 EMpire 1-2133

DIGITAL • ANALOGUE CONTROL SYSTEMS

STANDARD AND CUSTOM DESIGNED

Servo Indicators
Servo Actuators
Servo Repeaters

Two Speed Servos
Servo Computers
Data Transmission Systems

Computer Interface Systems

Analogue to Digital Converters
Nuclear Control Rod Indicators

Process Controllers
Special Control Systems

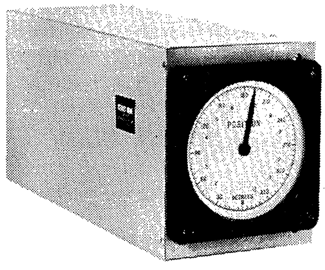
CTC
SERVO ELECTRONICS • INDICATORS • SPECIAL SYSTEMS • ACTUATORS

- Units available which will meet applicable MIL Specifications
- Devices designed to operate with A.C., D.C., synchro or resolver command signals.
- All units feature self-contained transistorized high reliability electronics and power supplies.
- Units now in use on numerous systems involving:

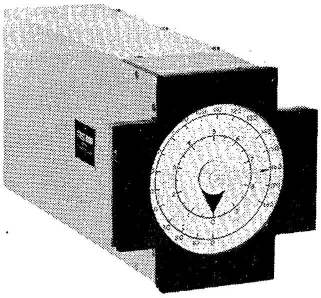
Simulators	Ground Support	Aircraft instrumentation
Fire Control	Missile Tracking	Missile instrumentation
ASW	High Accuracy Positioning	Stable Platforms

- Special systems can be designed in accordance to your detailed specifications. CTC will also design **"Interface"** equipment to integrate major control systems.

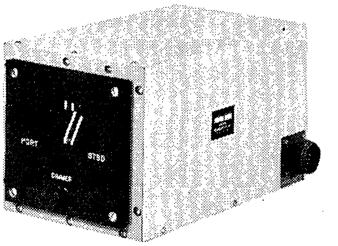
INDICATORS



CS-106 Single Pointer Indicator

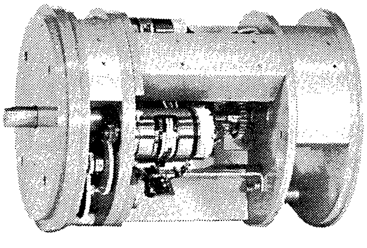


CS-109 Dual Pointer Indicator

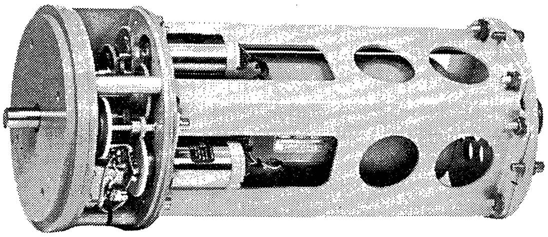


CS-211 Shipboard Indicator

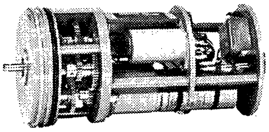
ACTUATORS



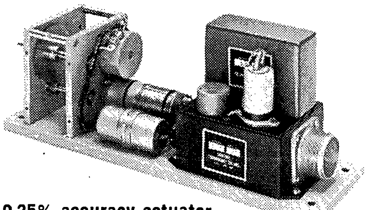
CS-202-2 300 lb. in. actuator



CS-202-1 Two speed synchro high accuracy actuator

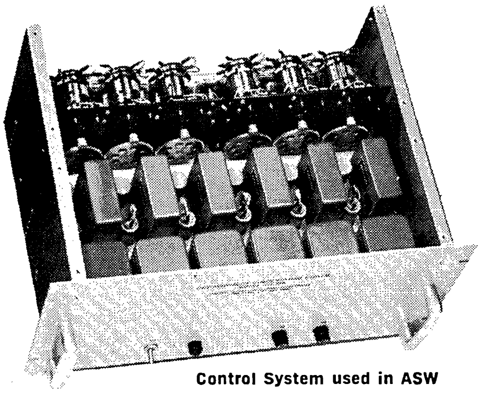


CS-198 250 oz. in. 0.1% accuracy actuator

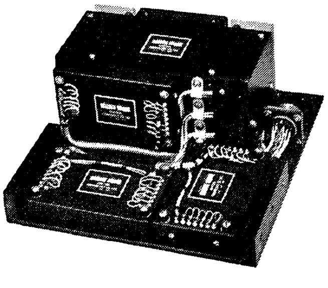


CS-133 0.25% accuracy actuator

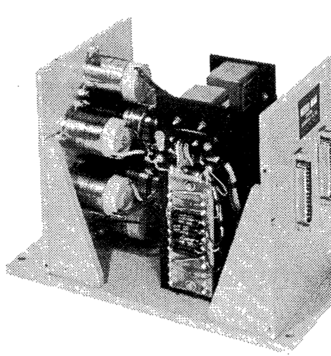
SPECIAL SYSTEMS



Control System used in ASW



Digital Control System



Dual Channel Resolver Angle Computer

CONTROL TECHNOLOGY CO., inc., 41-16 29th Street, Long Island City, N.Y. 11101 • 212 EMpire 1-2133

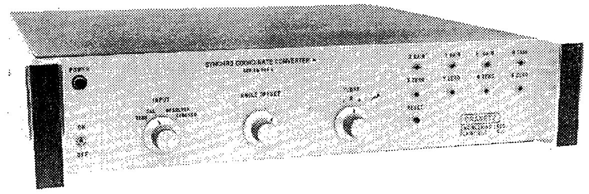
DRANETZ

ENGINEERING LABORATORIES INCORPORATED

PLAINFIELD, NEW JERSEY 07062 • TEL. (201) 755-7080

SERIES 506, 506A

SYNCHRO COORDINATE CONVERTERS



Series 506 and 506A Synchro Coordinate Converters, through the use of coordinate transformation techniques, convert an X-Y recorder into a synchro recorder for plotting polar and rectangular beam patterns (signal levels vs. synchro shaft angle).

FEATURES:

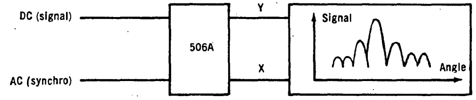
- Synchro angle offset control
- No moving parts
- Front panel zero and calibrate controls
- Compatible with most 60 Hz synchros such as 15CX6, 23TX6 (400 Hz units also available)

APPLICATIONS:

- Antenna testing
- Range and bearing plotting
- Calibration of underwater and airborne acoustical devices
- Measurements of electromagnetic and acoustical fields

SPECIFICATIONS

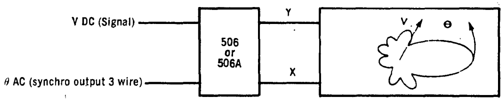
Rectilinear Beam Plots (506A only)



Converts linear (V) vs. AC Synchro (θ) to linear V vs. Linear θ

DC Signal Input: Direct feed thru to recorder
AC Synchro Input: 115/90 V 60 Hz, 1X (36x usable for highest accuracy)
X Output: 0 to +4.5 Vdc
Full Scales: 18° and 36° with 36X synchro; 90°, 180° and 360° with 1X synchro.
Acuracy: ±0.02° for 18° and 36° scales; 0.15° for 90° and 180° scales; ±0.3° for 360° scale.

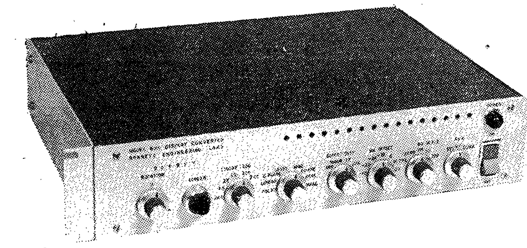
Polar Beam Patterns (506 or 506A)



Converts linear (V) vs. AC Synchro (θ) to V sin θ vs. V cos θ

DC Signal Input*: 0 to +5 Vdc
AC Synchro Input: 115/90 V 60 Hz, 1X
Y Output: ±(0 to 2.2 V) from origin of +1.4 v
X Output: ±(0 to 2.2 V) from origin of +2.2 v
Accuracy: ±1% fs Radius; ±1° in angle
AC Power Input: 115 V, 60-400 Hz, 0.1 amps rms approx.
Mechanical — Size: 3½″ high x 17″ deep x 19″ wide for rack mounting
Weight: 18 pounds; shipping, 27 pounds

SERIES 505 DISPLAY COORDINATE CONVERTER



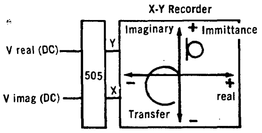
Series 505 Display Coordinate Converter is an interface device which provides coordinate transformation of inputs for plotting on X-Y recorders. It performs an integrated series of functions, selectable by a front panel mode switch. Depending on the recording mode chosen, the 505 selects the proper coordinate system, sets the gains, and injects the proper axes offsets in accordance with preset controls. In addition, the operator may select special conditions for his application, such as scale expansion of signal level or synchro angle, or axis offset of the signal input.

The Series 505 Display Coordinate Converter performs all of the functions of the Series 506 and 506A. In addition the 505 has provisions for plotting one function against the log of a second function (e.g.: output vs log frequency), as well as plotting X-Y data.

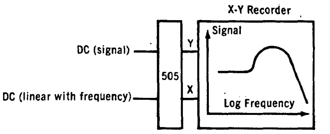
APPLICATIONS:

- Complex plane or other X-Y plots, imaginary vs. real, or other DC vs. DC signals.
- Response
  Level, phase or immitance vs. frequency, log frequency or other functions
- Response Reference Comparison
  Provision for subtraction of curve follower output from input signal for recording deviation from precalibrated standard.

SPECIFICATIONS



Presents linear vs linear plotting with preset gain and offsets



Converts linear vs linear to: linear vs linear, linear vs one decade log, linear vs two decade log

Rectilinear Beam Plots (Same as for 506A).

Polar Beam Patterns (Same as for 506 & 506A)

Linear vs. log

DC Signal Input*: 0 to +5 Vdc**
DC (Frequency) Input*: 0 to +10 Vdc; +1 to +10 v for one decade log; +0.1 to +10 V for two decade log
Y Output: 0 to +2.5 Vdc, adjustable
X Output: 0 to +5 Vdc, adjustable
Accuracy: Linear ±0.1% fs; Log ±1% of reading
Calibrated offsets from −40 dB to +20 dB in steps of 10 dB, and selection of 20, 50 and 100 dB full scale on the Y axis when using dc logarithmic input signal (e.g. from Dranetz Model 220 Log Sampling Voltmeter).

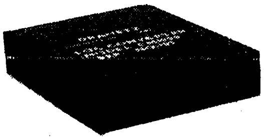
Linear X-Y Plotting

DC Inputs*: Two - each ±5.0 Vdc
X & Y Outputs: each 0 to +2.5 Vdc, adjustable
Accuracy: ±0.1% fs
Suitable for use with Dranetz 202 or 202A Vector Component Computer
AC Power Input: 115 V, 60-400 Hz, 0.1 amps rms
Size: 3½″ high x 17″ deep x 19″ wide for rack mounting
Weight: 18 pounds; shipping, 27 pounds

* Suggested levels — will accommodate ±25% gain and offset variation.
** Additional input for subtration of curve follower output. −5 vdc (regulated) available for connection across curve follower potentiometer.

DRANETZ
ENGINEERING LABORATORIES INCORPORATED
PLAINFIELD, NEW JERSEY 07062 • TEL. (201) 755-7080

COMPUTING MODULES



Series CM Computing modules consists of the CM-1000 DC Log Amplifier; CM-1100 Phase Generator; CM-1200 Phase to DC Converter and CM-1300 Phase Sensitive Detector. All are packaged in low-profile, flat package for printed circuit mounting.

FEATURES:

- Temperature stabilized
- Integrated circuit design
- Reverse voltage protection
- Printed circuit mounting
- 32-125°F operating temperature range
- Meet MIL-E-16400
- Input Power: ±15 Vdc ±2%

CM-1100 SYNCHRO TO PHASE CONVERTERS

The Model CM-1100 converts the output of a 3-wire or 4-wire synchro to variable phase square waves. This module, using an AC reference, produces three square wave outputs: a reference signal, a quadrature signal (a signal shifted 90° from reference) and a signal shifted by an angle equal to the shaft angle. If grounding of one side of a 4-wire synchro resolver is permissible, the Phase Generator will operate from the 4-wire resolver through an isolation network (see data sheet). When used with a 3-wire synchro or torque transmitter, a Scott-T transformer must be employed. Used with a CM-1200 or CM-1300 module, the phase generator will convert a synchro signal to a DC analog, or to sin and cos functions for rectangular coordinates. Its new conversion method features matched phase shift networks for variable and reference signals to assure an accurate output. Matched filters for the reference and variable channels makes the phase generator insensitive to noise or distortion.

APPLICATIONS:

- Signal Conditioning
- Polar to Rectangular Conversion
- Synchro to Analog Conversion
- Synchro to Digital Conversion

SPECIFICATIONS

Signal Input Levels (Simultaneous):
#1, 3 V ±10% AC (representing sine of shaft angle)
#2, 3 V ±10% AC (representing cosine of shaft angle)
#3, 3 V ±10% AC Reference (CM-1100 only)

Output:
#1, 20 V p-to-p square wave (phase variable with shaft angle)
#2, (CM-1100 only) 20 V p-to-p square wave locked in phase with reference signal
#3, (CM-1100 only) 20 V p-to-p in quadrature with output #2

Accuracy: ±12 minutes of arc

Temperature Coefficient: ±0.01 minutes of arc per °F

Slew Rate: 1000°/second at 60 Hz — 7000°/second at 400 Hz

Frequency:
CM-1100-60 and 60 Hz, ±5%
CM-1100-400 and 400 Hz, ±5%

Output Load: 2 kΩ or higher (DC coupled)

Size & Weight: 3″ x 4.5″ x 0.625″; 7 oz.

CM-1200 AND CM-1210 PHASE TO DC CONVERTERS

The CM-1200 series module converts an input of two square waves of the same frequency to a DC output proportional to the phase between the signals. The Model CM-1200 produces full scale output for 360°, 720°, to 1440°, selectable by means of external jumpers, and including provision for externally resetting the output to correspond to less than 360°. The CM-1210 produces a single full scale output for 360°. When used with a CM-1100 module, the two combine to convert a synchro output to a DC signal proportional to shaft angle. The output drive is compatible with CM-1100 or TTL logic levels.

APPLICATIONS:

- Signal Conditioning
- Synchro to Digital Conversion
- Synchro to Analog Conversion

SPECIFICATIONS

Input Signals: Reference & Variable Phase
A. Direct Coupled from CM-1100 or any phase related pair of square wave signals 15 V p-p to 25 V p-p
B. TTL logic levels (+4 and 0 V, 4 mA sinking logic)

Input Impedance: A. kΩ; B. 4 mA sinking logic at 0 v.

DC Output Signal: +3.6 volts full scale (provisions for external adjustment of offset and gain)

Output Impedance: 100 ohms maximum

Range: CM-1200: 0-360°, 0-720°, or 0-1440°. CM-1210: 0-360°

Temperature Coefficient: ±0.005% FS per °F

Frequency: CM-1200-60 and CM-1210-60: 60 Hz ±5%
CM-1200-400 and CM-1210-400: 400 Hz ±5%

Rise/Fall Time (10% - 90% points): CM-1200-60: 200 ms
CM-1200-400: 30 ms

Accuracy: ±12 minutes of arc per 360 degree cycle

Size & Weight: 3″ x 4.5″ x .625″; 7 oz.

CM-1300 PHASE SENSITIVE DETECTOR

The CM-1300 series Phase Sensitive Dectector produces DC outputs corresponding to real and imaginary components of an AC signal, using as inputs, three phase related square waves and a DC level. The outputs from the CM-1300 are equivalent to E cos θ and E sin θ. Internal gain and offset adjustments for each output channel are preset at the factory. Provisions are made for external changes of these settings. Internal filters provide maximum harmonic rejection.

APPLICATIONS:

- Signal Conditioning
- Navigation Plotting
- Transducer Pattern Measurement
- Antenna Pattern Recording
- Polar to Rectangular Conversion

For application information on any of the CM MODULES, request specific bulletins.

SPECIFICATIONS

Input: #1, 20 V p-to-p square wave variable phase
#2, 20 V p-to-p square wave reference phase
#3, 20 V p-to-p square wave in quadrature with #2
#4, 0 to +5 V dc

Output: E cos θ, 0 to ±10 Vdc; E sin θ, 0 to ±10 Vdc

Frequency: CM-1300-60: 60 Hz; CM-1300-400: 400 Hz

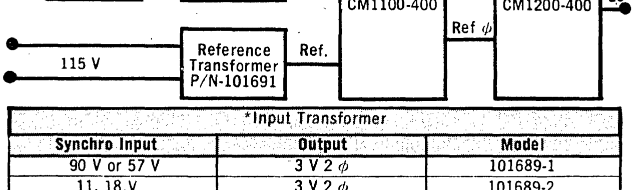
Accuracy (at 25°C): ±1 degree (angle); ±2% fs (Magnitude)

Temperature Coefficient: Magnitude: ±0.05% fs per °F

Size & Weight: 3″ x 4.5″ x 0.625″; 7 oz.

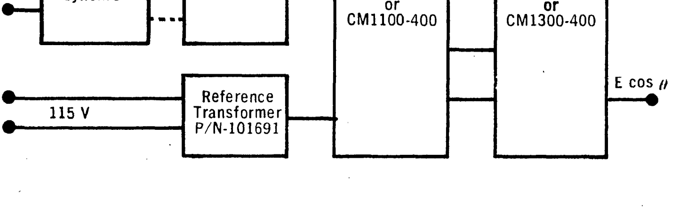
TYPICAL SYSTEM APPLICATIONS OF CM MODULES

SYNCHRO TO DC CONVERTER



*Input Transformer		
Synchro Input	**Output**	**Model**
90 V or 57 V	3 V 2 ϕ	101689-1
11. 18.V	3 V 2 ϕ	101689-2
22.5, 26V	3 V 2 ϕ	101689-3
Resolver Input	**Output**	
11.8, 20.5, 26	3 V 2 ϕ	101690

SYNCHRO TO SIN/COS CONVERTER



For information describing synchro-to-digital converters and logarithmic dc amplifiers, please call or write our plant or sales representative.

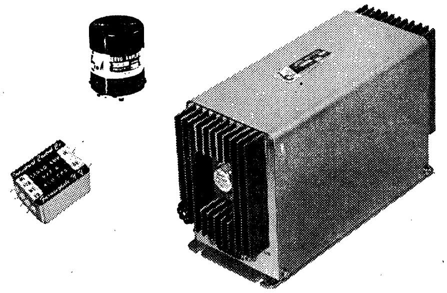
SERVO COMPONENTS

INSTRUMENTS, AMPLIFIERS and ACCESSORIES

FOR MILITARY AND INDUSTRIAL CONTROL SYSTEMS

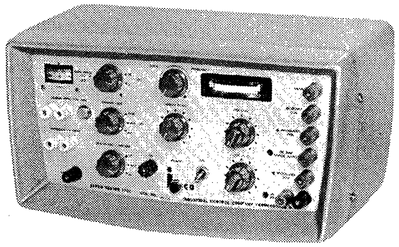
SERVO AMPLIFIERS

- *DC, pot and synchro inputs*
- *60 and 400∿ outputs*
- *Hybrid 972A (.5 cu in, 9 watts) to Triac 893A (800 watts)*
- *160 different models*



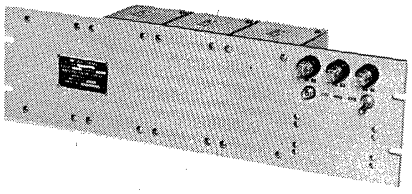
SERVO TESTERS

- *100C, general purpose use*
- *103A, prod and field test*
- *Frequency and transient response*
- *For DC and AC servos*



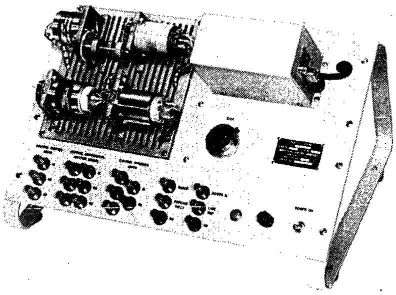
SYNCHRO AMPLIFIERS

- *929R, 90V./line, 400∿ stators*
- *820A, 90V./line, 60∿ stators*
- *Buffer CX's from CT and TR loads*
- *High accuracy and fast response*



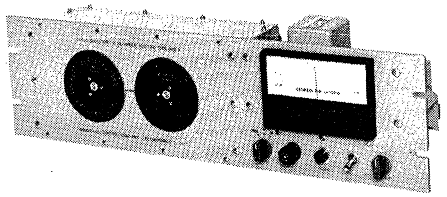
SERVO DEMONSTRATORS

- *Laboratory experiments*
- *Industrial training*
- *Synchro and pot data*
- *60 and 400∿ models.*



SYNCHRO DIRECTORS

- *Generate 1 and 36 speed stator voltages*
- *Constant velocity and harmonic motion modes*
- *Computer programmed*
- *60 and 400∿ stator outputs.*



Write for Catalog of our COMPLETE Servo Line.

INDUSTRIAL CONTROL COMPANY

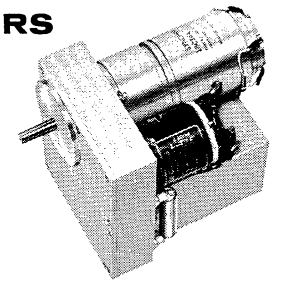
CENTRAL AVENUE AT PINELAWN ▪ FARMINGDALE, L.I., N.Y. 11735 ▪ 516-694-3000

SERVO SYSTEMS

STANDARD MODULES or SPECIALS

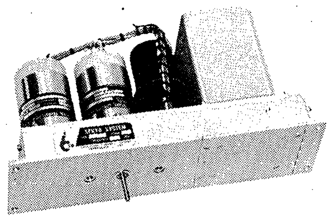
MIL-GRADE AND FAST DELIVERY

High Torque SYNCHRO REPEATERS



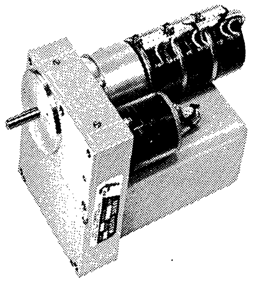
- *770 Series for 400∿*
- *847 Series for 60∿*
- *8′ error*
- *300 oz in shaft torque*
- *117V. line power*

Two Speed SYNCHRO REPEATERS



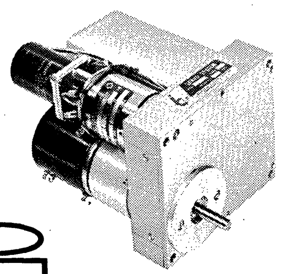
- *771 Series for 400∿*
- *921 Series for 60∿*
- *16, 25 and 36 speed*
- *Shaft at hi speed*
- *117V. line power*

DC and AC POT FOLLOWERS



- *900 Series*
- *DC, 60 or 400 ∿ inputs*
- *1, 3 or 10 turn pots*
- *Torques to 300 oz in*
- *117V. 60 or 400 ∿ power*

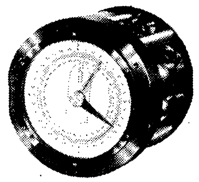
Precision DC VELOCITY SERVOS



- *982 Series for 60~*
- *983 Series for 400~*
- *±10V. DC command*
- *117V. line power*
- *Wide range of torques and speed.*

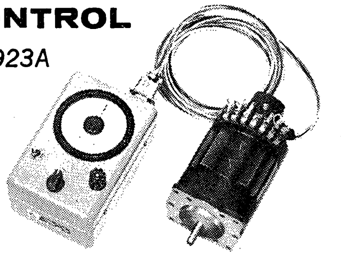
3 Axis SERVO INDICATOR

- *type 909A*



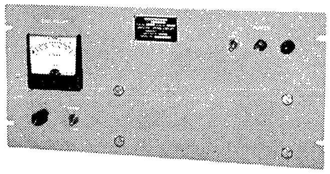
Bi-Directional PRECISION SPEED CONTROL

- *type 923A*



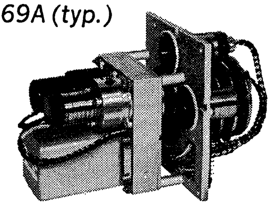
Process Control DELAYED SIGNAL GENERATOR

- *type 849B*



Custom Assemblies TO CUSTOMER SPECS.

- *type 869A (typ.)*



Modifications from Standards readily available.

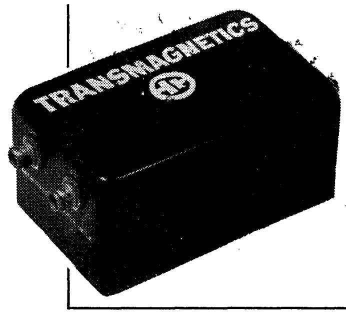
INDUSTRIAL CONTROL COMPANY

CENTRAL AVENUE AT PINELAWN ▪ FARMINGDALE, L.I., N.Y. 11735 ▪ 516-694-3000

D-A and A-D Converters

MULTIPLEXED SYNCHRO TO DIGITAL

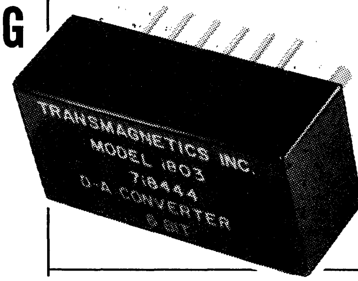
SERIES 1601
All solid state converters convert up to 8 mixed synchros or resolvers to binary digital output. A three line address selects the input to be converted. Upon receipt of a start conversion pulse, conversion of the addressed input begins. The output appears in a storage register and is retained until the next conversion command. Over 300 conversions per second may be made.



SYNCHRO/RESOLVER INPUTS: 400 Hz, 11.8V or 90 VRMS line-to-line.
AC REFERENCE: 26V or 115V RMS
DIGITAL OUTPUT: 12 bit binary MSB 180°
DATA LEVELS: TTL-DTL
STATIC ACCURACY: six minutes
CONVERSION TIME: 3.6 milliseconds max.
OPERATING TEMP.: 0 to 70°C
PACKAGE: 10 x 6 x 5″ metal case plus connectors. Converter is mounted on plug-in P.C. boards
OPTIONS: Up to 64 channels input, 60 Hz Synchro or Resolvers, one millisecond conversion time, 19″ rack mounting, −55 to +85°C operation

DIGITAL TO ANALOG CONVERTERS

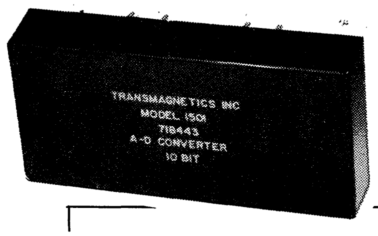
SERIES 1800
Converts up to 13 bit digital input to DC output. These miniature low cost converters contain their own reference.



DIGITAL INPUT: 8, 10, 12, or 13 Parallel, DTL-TTL compatible.
OUTPUT VOLTAGE: 0 to +10V, Output impedance: 1 Ohm max.
LINEARITY: ½ LSB
SETTLING TIME: 10 μs max (to 1 LSB)
OPERATING TEMPERATURE: 0 to 70°C or −55 to +85°C.
TEMP. COEFFICIENT: ± 20 ppm of FS/°C.
DC POWER: ± 15V ± 3% at 30 MA
PACKAGE: Metal case 1.53 x 2.03 x 0.75″H plus P.C. terminals and studs on base.
OPTIONS: 300 nanoseconds settling time, bipolar DC or AC output

ANALOG TO DIGITAL CONVERTERS

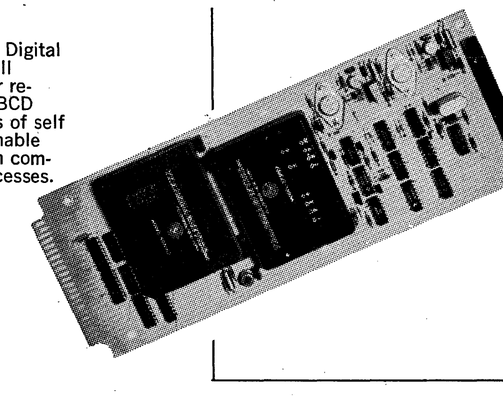
SERIES 1500
Are miniaturized analog to digital converters which, on command convert a D.C. input, to 8 or 10 bit digital output



DC INPUT: 0 to +10V into 10K ohms min.
DIGITAL OUTPUT: 8 or 10 bits parallel, DTL-TTL compatible.
CONVERSION TIME: 25 microseconds max.
RELATIVE ACCURACY: ½ LSB
TEMP. COEFFICIENT: ± 20 ppm of FS/°C.
OPERATING TEMPERATURE: 0 to 70°C or −55 to +85°C
DC POWER: ± 15V ± 1% at 70 MA each and 5.2V ± 0.3V at 300 MA max.
PACKAGE: 0.75″ H. x 2.03 x 4.03 metal case with P.C. terminals and 4 mounting studs.

SYNCHRO TO DIGITAL CONVERTER

SERIES 1623
Synchro/Resolver to Digital Converters convert all standard synchros or resolvers to binary or BCD output. Three modes of self or slave operation enable easy interfacing with computers and data processes.



INPUT: Synchro or Resolver or both, 60 or 400 Hz, 11.8 or 90V line-to-line, 26 or 115V RMS line.
DIGITAL OUTPUT: 12 bit parallel binary register, DTL-TTL compatible, MSB 180°, or 4 decade BCD.
CONTROL MODES: (a) Internal Convert and update; (b) External Command Convert and Update; (c) External Command Convert, Internal Update
CONVERSION TIME: 2.4 ms Max. In internal mode, conversion time adjustable down to one conversion in 3 seconds.
CONTROL OUTPUT: Data ready pulse of 100 ns nominal width appears when conversion is complete
STATIC ACCURACY: ± 1 LSB
OPERATING TEMPERATURE: 0 to 70°C
DC POWER: ± 15V ± 2V at 50 MA max and + 5V ± 10% at 350 MA max.
PACKAGE: Furnished on 4½ x 12 P.C. plug-in board

TRANSMAGNETICS INC.

210 Adams Boulevard, Farmingdale, New York 11735 • Phone: 516-293-3100

Solid State Synchro Drivers

Transmagnetics solid state synchro drivers will drive torque receivers, control transformers and differentials. Torque receivers, in particular, are difficult loads, drawing large surges on turn-on or with step changes. Years of design effort have resulted in the Transmagnetics line of drivers with protection against short circuit and synchro load malfunction but with the required surge current drive capability for synchro operation without "hang-up"

SINE-COSINE TO SYNCHRO OUTPUT

676 SERIES
Accepts DC Sine and Cosine inputs and generates three-wire synchro output

STANDARD MODELS AVAILABLE:

Model No.	Nom. V Line to Line	Ref VRMS	HZ Frequency	Plug-In P.C. Card	Synchro Load Capability TR=torque receivers CT=control transformer CDX=control differential
650-31	11.8	26±5%	400±5%	4½x8	to 3 size 11 TR's
A676-10	11.8	26±5%	400±5%	4½x8	to 3 size 11TR's, CT's, CDX
A676-10HP	11.8	26±5%	400±5%	4½x12	to 2 size 15TR's, CT's, CDX
A676-90	90	115±5%	400±5%	4½x8	1 size 11TR, CT's & CDX
A676-90HP	90	115±5%	400±5%	4½x12	size 23TR, CT's & CDX
A676-60	90	115±5%	60±5%	4½x8	CT's & CDX
A676-60HP	90	115±5%	60±5%	4½x12	Size 23TR, CT's & CDX's

OTHER SPECIFICATIONS:

INPUTS: Two DC inputs from—10 to +10V into 100K ohms min. representing sine and cosine of the angle.

ACCURACY: 10 minutes of arc

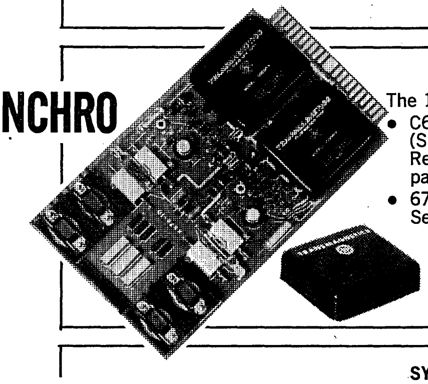
DC POWER: Three wire + and —25V for 11.8V L.L outputs. Three wire + and —150V for 90V L.L outputs.

DC CURRENT: The DC current drawn is approximately ½ the AC current drawn by the load. TR's are extremely heavy loads. Consult Transmagnetics application engineering for specific requirements.

TO ORDER: Add "C" to model number for 0-70°C operation. Add "M" for —55 to +85°C operation.

LINEAR. DC TO SYNCHRO OUTPUT

1612 SERIES
Accepts a linear DC input proportional to angle and generates a three-wire synchro output.

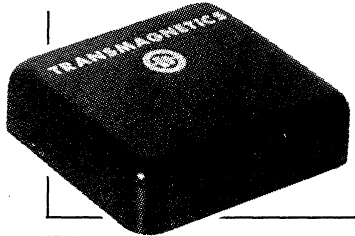


The 1612 Series consists of:

- C670 sin-cos generator. (Specifications will be found in Computing Resolver Section of Transmagnetics EEM pages.
- 676 Synchro Driver. Select model from listing above.

SYNCHRO BUFFER AMPLIFIER

1620 SERIES
are synchro buffer amplifiers to drive up to three size 11 11.8V L.L torque receivers.



SYNCHRO INPUT: 90V or 11.8V L.L 400 Hz into 100K ohm min. impedance. Input is transformer isolated.

SYNCHRO OUTPUT: 3 wire synchro 11.8V nominal L.L. 52 output is common to DC supply common.

ACCURACY: 6 minutes of arc.

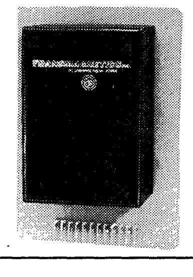
DC POWER: Plus and minus 25V ± 5%. Torque receivers draw heavy surges. Consult Transmagnetics application engineering for current requirements on supply.

OPERATING TEMPERATURE:
0 to 70°C or —55 to +85°C

PACKAGE: 1.78"H X 3.19 X 3.44

DIGITAL TO SYNCHRO/RESOLVERS CONVERTERS

1670 SERIES
converts 13 bit binary digital input to 3 wire synchro or 4 wire resolver output.



DIGITAL INPUT: 13 parallel lines, DTL-TTL compatible, MSB is 180°.

SYNCHRO/RESOLVER OUTPUT: 3 wire synchro or 4 wire resolver output, isolated. 11.8V L.L for loads of 100 ohms min or 90V L.L at 6000 ohms min, 400 Hz.

REFERENCE INPUT: 26V or 115V RMS ± 10%, 400 Hz ± 5%.

ACCURACY: ± 4 minutes

DC POWER:
+ 15V ± 5% at 120 MA no load
— 15V ± 5% at 120 MA no load
+ 5V ± 5% at 150 MA

CONVERSION TIME: 50 microseconds max.

PACKAGE: P.C. card 4.5X6X1.5" above board.

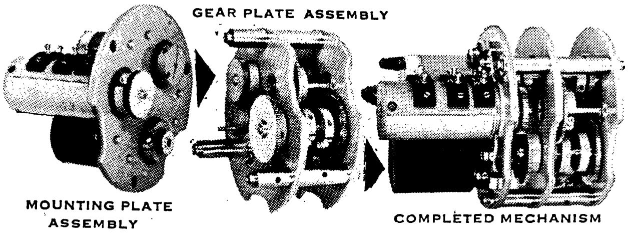
TRANSMAGNETICS INC.

210 Adams Boulevard, Farmingdale, New York 11735 • Phone: 516-293-3100

SERVO MECHANISMS & COMPONENTS

PREDESIGNED MECHANISMS

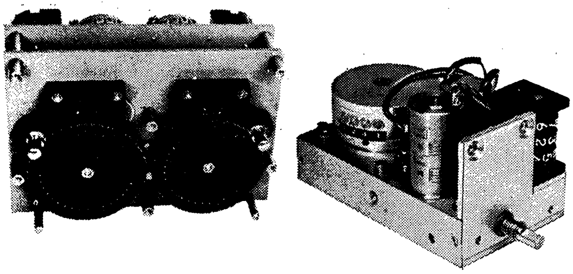
A complete line of off-the-shelf components for assembling an unlimited variety of geared mechanisms. Gear ratios to 78,125:1, zero-backlash spring-loaded gears and torque-limiting slip clutches are featured. Assembled units meet design and materials requirements of MIL-E-5400 and MIL-E-16400.



For complete data and catalog of stocked components, request Bulletin 102.

CUSTOM DESIGNS

PMC specializes in design and manufacture servo mechanisms and mechanical modules to user requirements for airborne, ground support, communications, fire control and other critical applications. The units shown below are typical of the mechanisms designed and manufactured for military and industrial equipments.



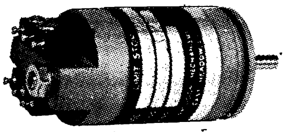
Short lead time delivery on both prototypes and production quantities.

ADJUSTABLE LIMIT SWITCHES & STOPS

0-10, -20, -40 revolutions without snap action switch, 0-25 revolutions with snap action switches actuated just before mechanical stops. All models infinitely adjustable with single external screw. SPDT snap action switch rated 7A, 250V.

LIMIT STOP
RANGE 0-10 REVS
PART NO. LS 101
PRECISION MECHANISMS

Limit Stop
Series LS 100
⅝ and ⅞" dia.



Limit Stop And Switch
Series LS 300
$1\frac{5}{16}$" dia.

For complete data, request Bulletins 103 and 104

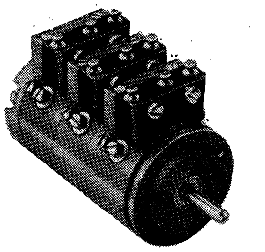
CAM SWITCHES

Adjustable-In-Motion

PMC's patented cam switch design incorporates in a single component all the functions of a conventional plate cam, cam follower and snap-action switch, eliminating the need for separately-mounted cam mechanisms and switches and their associated hardware. Externally-adjustable dwell angles can be set to any position with respect to the shaft. All models available as single- or multi-switch types, with ganged switches independently adjustable.

Model CS 402 Miniature Cam Switches

Miniature units designed and manufactured to military and aerospace specifications.

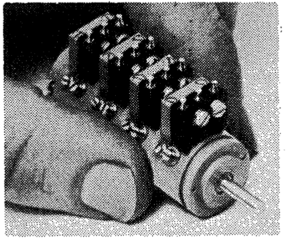


Diameter: 1-1/16", equivalent to to BuOrd Size 11
Length: 0.8", one switch, plus 0.5" per switch
Dwell Angle: 3° to 357°
Switch: SPDT
Rating: 5A, 250VAC, 30VDC
Multi-Switch Models: up to 10 switches
Shaft: 0.125" dia.

For complete data, request Bulletin 106

Model CS 601 Subminiature Cam Switches

Subminiature units for airborne, space vehicle and other applications where size and weight are critical.

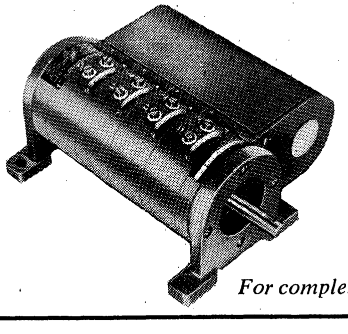


Diameter: 0.75", equivalent to BuOrd Size 8
Length: 0.730" one switch, plus 0.437" per switch
Dwell Angle: 3° to 357°
Switch: SPDT
Rating: 7A, 250VAC, 30VDC
Shaft: 0.125" dia.
Multi-Switch Models: up to 8 switches

For complete data, request Bulletin 109

Model CS 501 High-Power Cam Switches

Industrial types for control, cycling and sequencing of machine operations. End- or side-mounting, with or without switch covers. Dials permit visual adjustment of switching points and dwell angles.



Dwell Angle: 5° to 355°
Diameter: 3.5"
Length: 3" one switch, plus 1.5" per switch
Shaft: 0.5" dia.
Switches: SPDT, DPDT. Special types to requirements.
Ratings: to 25A and 600 V, inrush current to 75A.

For complete data, request Bulletin 108

PRECISION MECHANISMS CORPORATION
44 BROOKLYN AVENUE, WESTBURY, L.I., NEW YORK 11590 • (516) ED 3-5955

CIRCUIT BREAKERS

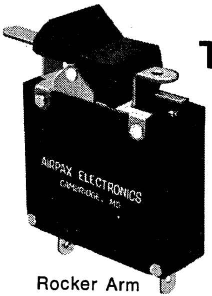
AIRPAX
ELECTRONICS

Airpax magnetic circuit protectors provide reliable, low cost circuit protection for industrial applications and ground support military equipment. Handle action is trip free, making it impossible to hold the circuit closed against a fault. Multi-pole assemblies can be furnished with a mix of ratings, delays and internal circuit configurations.

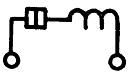
Type APG protectors offer a choice of actuators: toggle, thumbwheel, rocker arm, and panel seal. Two and three pole assemblies have single actuators, a unique feature which simplifies mounting.

Type APL protectors have a higher interrupting capacity than any other comparable protector on the market. They are available with extended delay times to accommodate high inrush or motor starting currents without tripping.

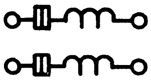
Type APG



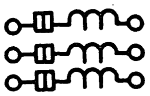
Rocker Arm
Single Pole



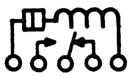
APG1



APG11

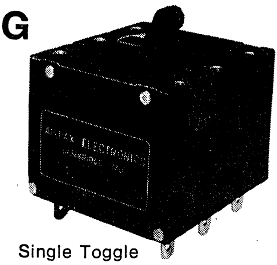


APG111



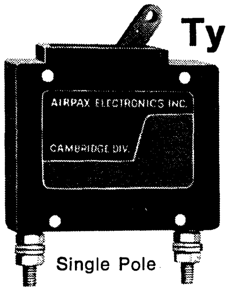
APG1-R

Type APG

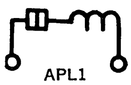


Single Toggle
3 Pole

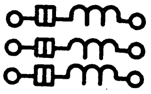
Type APL



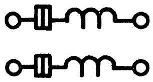
Single Pole



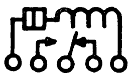
APL1



APL111

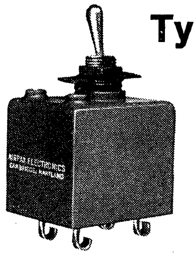


APL11

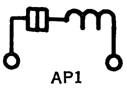


APL1-RE

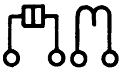
Type AP



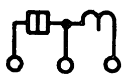
Single Toggle 2 Pole



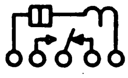
AP1



AP4



AP3



AP1-R

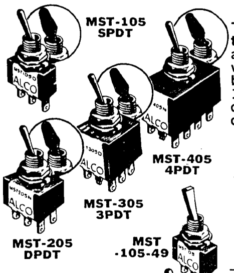
TYPE	SERIES	POLES	MAXIMUM VOLTAGES	CURRENT RANGE (AMPERES)	INTERRUPTING CAPACITY (AMPERES)	CSA AND UL — APPROVALS AVAILABLE
SEALED, MILITARY	AP	1, 2, 3	250 VAC, 60 Hz.	0.05 to 20	300	NO
			250 VAC, 400 Hz.	0.05 to 20	300	NO
			50 VDC	0.05 to 20	500	NO
						M39019 APPROVED
SEALED, COMMERCIAL	UP	1	120 VAC, 60 Hz.-400 Hz.	0.05 to 15	1000	YES
			250 VAC, 60 Hz.-400 Hz.	0.05 to 7½	1000	YES
			50 VDC	0.05 to 20	1000	YES
GENERAL PURPOSE	APG	1, 2, 3	277 VAC, 60 Hz.	0.05 to 20	1000	YES
			250 VAC, 60 Hz.	0.05 to 30	1000	YES
			250 VAC, 400 Hz.	0.05 to 30	1000	YES
			65 VDC	0.05 to 30	1000	YES
HEAVY DUTY GENERAL PURPOSE	APL	1, 2, 3, 4, 5, 6	277 VAC, 60 Hz.	0.05 to 20	5000	YES
			250 VAC, 60 Hz.	0.05 to 50	5000	YES
			250 VAC, 400 Hz.	0.05 to 50	1000	YES
			65 VDC	0.05 to 50	1000	YES
			32 VDC	0.05 to 100	2000	YES
MOTOR STARTING AND PROTECTION	MPL	1, 2, 3	277 VAC, 60 Hz.	0.05 to 20	5 H.P. RATING	YES
			120 VAC, 60 Hz.	0.05 to 50	7½ H.P. RATING	YES
			65 VDC	0.05 to 50	1 H.P. RATING	YES

AIRPAX ELECTRONICS
CAMBRIDGE DIVISION, CAMBRIDGE, MARYLAND 21613

PHONE: (301) 228-4600
TELEX: 8-7715
TWX: 710 865-9655

ALCOSWITCH®

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.



MST MINIATURE TOGGLE SWITCHES

The original Alcoswitch Series of high quality ultra-miniature toggle switches combines high current capacity and long life in a ½″ case. Slim, bat handle or optional plastic caps(*) are provided. Terminals and contacts are solid silver. Case material is black phenolic resin; 1/4-40 threaded bushing. Rated 5 amps at 115 VAC. SPDT and DPDT types have life cycle of over 80,000 on-off operations. High voltage barriers between terminals and contacts.

Hardware supplied mounted. (On) Indicates momentary positions.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MST-115D*	SPDT	On-None-On	1.70	1.16	1.02	.85
MST-105D	SPDT	On-None-On	1.65	1.12	.99	.83
MST-105E	SPDT	On-Off-On	1.95	1.33	1.17	.975
MST-105F	SPDT	None-On-(On)	1.95	1.33	1.17	.975
MST-105G	SPDT	(On)-Off-(On)	1.95	1.33	1.17	.975
MST-105H	SPDT	On-Off-(On)	1.95	1.33	1.17	.975

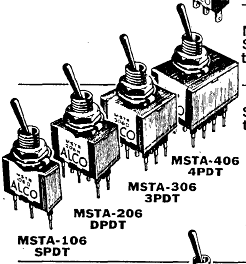
Model	Contacts	Description	One-24	25-99	100-499	500-999
MST-215N*	DPDT	On-None-On	2.20	1.47	1.32	1.10
MST-205N	DPDT	On-None-On	2.15	1.43	1.29	1.08
MST-205P	DPDT	On-Off-On	2.55	1.72	1.53	1.28
MST-205R	DPDT	None-On-(On)	2.55	1.72	1.53	1.28
MST-205S	DPDT	(On)-Off-(On)	2.55	1.72	1.53	1.28
MST-205T	DPDT	On-Off-(On)	2.55	1.72	1.53	1.28
MST-205PA	DP3T	On-On-On	2.85	1.90	1.71	1.42
MST-205SA	DP3T	(On)-On-(On)	3.15	2.14	1.89	1.58
MST-205TA	DP3T	On-On-(On)	3.15	2.14	1.89	1.58
MST-315D*	3PDT	On-None-On	3.50	2.32	2.05	1.73
MST-305D	3PDT	On-None-On	3.45	2.28	2.02	1.70
MST-305E	3PDT	On-Off-On	3.75	2.48	2.19	1.86
MST-305F	3PDT	None-On-(On)	3.75	2.48	2.19	1.86
MST-305H	3PDT	On-Off-(On)	3.75	2.48	2.19	1.86
MST-415N*	4PDT	On-None-On	4.40	2.91	2.57	2.18
MST-405N	4PDT	On-None-On	4.35	2.88	2.54	2.15
MST-405P	4PDT	On-Off-On	4.85	3.21	2.84	2.40

MINIATURE PADDLE TOGGLE SWITCHES

New style miniature flat handle is used on the original MST Series Alcoswitch. See above story for specs; available in the types listed at right.

Hardware supplied mounted. (On) Indicates momentary positions.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MST-105D49	SPDT	On-None-On	2.15	1.62	1.49	1.33
MST-105E49	SPDT	On-Off-On	2.45	1.83	1.67	1.475
MST-105G49	SPDT	(On)-Off-(On)	2.45	1.83	1.67	1.475
MST-205N49	DPDT	On-None-On	2.65	1.93	1.79	1.58
MST-205P49	DPDT	On-Off-On	3.05	2.22	2.03	1.78



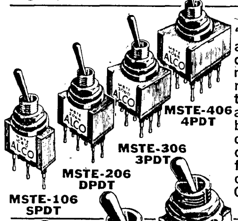
MSTA SERIES MINIATURE TOGGLE SWITCHES

Similar in specs to Alco "E" Series but without waterproof feature. "No Tear" shoulder on bushing. 6A 125V/3A 250 VAC.

Hardware supplied mounted. (On) Indicates momentary positions.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTA-106D	SPDT	On-None-On	1.80	1.23	1.08	.90
MSTA-106E	SPDT	On-Off-On	2.25	1.53	1.35	1.125
MSTA-106F	SPDT	None-On-(On)	2.25	1.53	1.35	1.125
MSTA-106G	SPDT	(On)-Off-(On)	2.25	1.53	1.35	1.125
MSTA-106H	SPDT	On-Off-(On)	2.25	1.53	1.35	1.125

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTA-206N	DPDT	On-None-On	2.35	1.60	1.41	1.18
MSTA-206P	DPDT	On-Off-On	2.85	1.90	1.71	1.42
MSTA-206R	DPDT	None-On-(On)	2.85	1.90	1.71	1.42
MSTA-206S	DPDT	(On)-Off-(On)	2.85	1.90	1.71	1.42
MSTA-206T	DPDT	On-Off-(On)	2.85	1.90	1.71	1.42
MSTA-206PA	DP3T	On-On-On	3.15	2.14	1.89	1.58
MSTA-306D	3PDT	On-None-On	4.05	2.75	2.43	2.03
MSTA-306E	3PDT	On-Off-On	4.45	3.03	2.67	2.23
MSTA-406N	4PDT	On-None-On	5.10	3.47	3.06	2.55
MSTA-406P	4PDT	On-Off-On	5.65	3.84	3.39	2.83
MSTA-406PA	4P3T	On-On-On	6.15	4.18	3.69	3.08

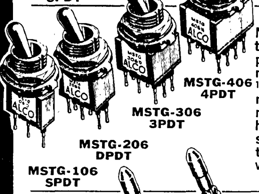


MSTE SERIES MINIATURE TOGGLE SWITCHES

"E" Series has the most-wanted features. Waterproof 'O' rings are located inside toggle and on shoulder. A mechanical shoulder on the bottom of bushing prevents "tear-offs" when single mounting nut is employed. High voltage barriers between terminals inside as well as outside. Case has superior plastic material capable of withstanding higher impact; guards against accidental damage. Low-loss case has extremely high resistance between terminals and case ground, and its high temperature coefficient is ideally suited for prolonged soldering and printed circuits. Turret type terminals are used for simplified wiring or for P.C. Extra-wide, solid silver contacts are bonded, not riveted, on copper-silver plated terminals. Long-life cycle over 100,000 On-Off operations. (SPDT). 6 amps @ 125 VAC.

Hardware supplied mounted. (On) Indicates momentary positions.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTE-106D	SPDT	On-None-On	1.95	1.33	1.17	.975
MSTE-106E	SPDT	On-Off-On	2.55	1.72	1.53	1.28
MSTE-106F	SPDT	None-On-(On)	2.55	1.72	1.53	1.28
MSTE-106G	SPDT	(On)-Off-(On)	2.55	1.72	1.53	1.28
MSTE-106H	SPDT	On-Off-(On)	2.55	1.72	1.53	1.28
MSTE-206N	DPDT	On-None-On	2.55	1.72	1.53	1.28
MSTE-206P	DPDT	On-Off-On	3.15	2.14	1.89	1.58
MSTE-206R	DPDT	None-On-(On)	3.15	2.14	1.89	1.58
MSTE-206S	DPDT	(On)-Off-(On)	3.15	2.14	1.89	1.58
MSTE-206T	DPDT	On-Off-(On)	3.15	2.14	1.89	1.58
MSTE-206PA	DP3T	On-On-On	3.45	2.35	2.07	1.73
MSTE-306D	3PDT	On-None-On	4.25	2.89	2.55	2.13
MSTE-306E	3PDT	On-Off-On	4.75	3.23	2.85	2.38
MSTE-406N	4PDT	On-None-On	5.35	3.64	3.21	2.68
MSTE-406P	4PDT	On-Off-On	5.95	4.05	3.57	2.98



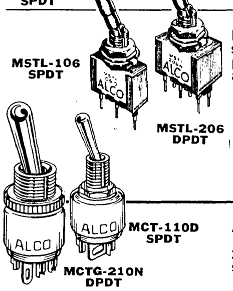
MSTG SERIES MINIATURE TOGGLE SWITCHES

Mustang Series is for designers who prefer the feel of a larger toggle switch but have space limitations behind today's compact panel. Alcoswitch ½″ case is utilized, however Mustang mounting requirements are the same as larger switches with 15/32″ bushings. This concept is a space-saver in all Mustang models and is especially true in 3 Pole and 4 Pole Series where non-miniature switches are bulky in size. Mustang switches have the most-wanted features as itemized in the "E" Series story with the exception of waterproof 'O' rings. Case construction is of low-loss, high impact and high temperature materials with turret terminals and silver contacts. 6 amps @ 125 VAC.

Hardware supplied mounted.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTG-106D	SPDT	On-None-On	2.15	1.43	1.29	1.08
MSTG-106E	SPDT	On-Off-On	2.75	1.87	1.65	1.38
MSTG-206N	DPDT	On-None-On	2.75	1.87	1.65	1.38
MSTG-206P	DPDT	On-Off-On	3.35	2.28	2.01	1.68
MSTG-206PA	DP3T	On-On-On	3.65	2.48	2.19	1.83
MSTG-306D	3PDT	On-None-On	4.45	3.03	2.67	2.23
MSTG-306E	3PDT	On-Off-On	4.95	3.37	2.97	2.48
MSTG-406N	4PDT	On-None-On	5.55	3.77	3.33	2.78
MSTG-406P	4PDT	On-Off-On	6.15	4.18	3.69	3.08
C-15*	Cap for Mustang		.06	.04	.036	.033
N-1B*	15/32″ "Perfect Fit" Nut		.08	.056	.05	.044

*Packaged in multiples of 25; when ordering caps specify, red, white, black, blue or green.



MSTL SERIES LOCKING TOGGLE SWITCHES

Lever-Lock Alcoswitch is the world's first "pull-to-unlock" toggle switch for use in hazardous applications. The toggle locks in position to safeguard against accidents. Optional interchangeable color-coded toggle tips available. Rated 6 amps @ 125 VAC.

Hardware supplied mounted. (On) Indicates momentary positions.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTL-106D	SPDT	On-None-On	3.15	2.14	1.89	1.58
MSTL-106E	SPDT	On-Off-On	3.85	2.57	2.31	1.925
MSTL-106F	SPDT	None-On-(On)	3.85	2.57	2.31	1.925
MSTL-106G	SPDT	(On)-Off-(On)	3.85	2.57	2.31	1.925

Model	Contacts	Description	One-24	25-99	100-499	500-999
MSTL-206N	DPDT	On-None-On	3.85	2.57	2.31	1.925
MSTL-206P	DPDT	On-Off-On	4.45	3.03	2.67	2.23
MSTL-206R	DPDT	None-On-(On)	4.45	3.03	2.67	2.23
MSTL-206S	DPDT	(On)-Off-(On)	4.45	3.03	2.67	2.23
MSTL-206PA	DP3T	On-On-On	4.75	3.23	2.85	2.38
MSTL-306D	3PDT	On-None-On	5.65	3.84	3.39	2.83
MSTL-306E	3PDT	On-Off-On	6.25	4.24	3.75	3.13
MSTL-406N	4PDT	On-None-On	6.95	4.73	4.17	3.48
MSTL-406P	4PDT	On-Off-On	7.45	5.06	4.47	3.73
MSTL-406PA	4P3T	On-On-On	7.95	5.40	4.77	3.98
C-16*	Color-Coded Caps		.18	.12	.11	.10

*Lever-lock switches are stocked with natural aluminum caps only. Extra caps in Red, Blue, Green, Black, (specify color).

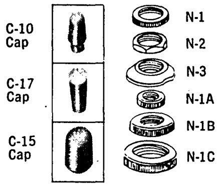
MINIATURE CYLINDRICAL TOGGLE SWITCHES

All metal construction, high impact terminal insulator. 10 amps @ 125 VAC. Internal contact resistance; under 20 milliohms @ 2-4 VDC, 1 amp. Life 250,000 on-off operations. Contact material, silver on copper. U/L Approval available.

Hardware supplied mounted.

Model	Contacts	Description	One-24	25-99	100-499	500-999
MCT-110D*	SPDT	On-None-On	1.95	1.33	1.17	.975
MCT-210N*	DPDT	On-None-On	2.55	1.72	1.53	1.28
MCTG-110D**	SPDT	On-None-On	1.95	1.33	1.17	.975
MCTG-210N**	DPDT	On-None-On	2.55	1.72	1.53	1.28

*With miniature bushings. **With standard size 15/32″ bushings.



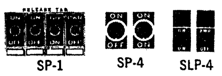
ACCESSORIES

Color-Coded Caps. Packaged in multiples of 25.
*Specify: Red, White, Black, Blue, Gray, Green, Yellow or Pink.
°Specify: Red, White, Black, Blue, or Green.

Model	Description	One-24	25-99	100-499	500-999
C-10*	Plastic caps for MST, A, E Series	.04	.028	.025	.022
C-15°	Plastic caps for MSTG Series	.06	.04	.036	.033
C-17*	Flat top caps for MST, A, E Series	.04	.028	.025	.022

Decorative Mounting Nuts — 4 styles are available for use with ALCOSWITCH and other miniature switches. Packaged in multiples of 25. **STANDARD** double chamfered knurled nuts for ¼-40 threaded bushings only. **"PERFECT FIT"** round bevel top with lip for automatic stop ¼-40, ⅜, and 15/32″ bushings. Decorative is conical shape; ¼-40.

Model	Description	One-24	25-99	100-499	500-999
N-1	¼-40 Standard Knurl Nut	.04	.028	.025	.022
N-1A	¼-40 "Perfect Fit" Knurl Nut	.06	.04	.036	.033
N-1B	15/32″ "Perfect Fit" Knurl Nut	.08	.056	.05	.044
N-1C	⅜″ "Perfect Fit" Knurl Nut	.08	.056	.05	.044
N-2	¼-40 Standard Hex Nut	.03	.022	.02	.018
N-3	¼-40 Decorative Mounting Nut	.06	.04	.036	.033



SP1, SP2 Aluminum Foil, pressure-sensitive "ON-OFF" plates ¼″ or 15/32″ bushing switches.

SP3, SP4 Stamped Aluminum Plates. Black anodized, raised letters. 3 ON-OFF, 1 ON-ON, 1 PWR-OFF.

SLP4 Stamped Aluminum Plates for ¼″ dia. switch bushings and ⅜″ pilot lights. 3 ON-OFF, 1 ON-ON, 1 PWR-OFF.

Model	Hole Size	No. Plates	1-24	25-99	100-499
SP-1	¼″ Dia.	12	.25	.18	.17
SP-2	15/32″ Dia.	12	.25	.18	.17
SP-3	¼″ Dia.	5	.75	.55	.50
SP-4	15/32″ Dia.	5	.75	.55	.50
SLP-4	¼″ Dia. and ⅜″ pilot	5	.90	.65	.61

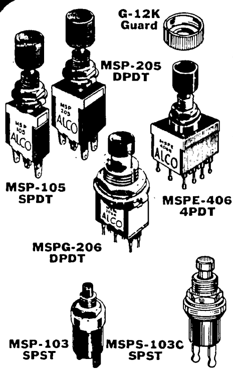
ALCO® ELECTRONIC PRODUCTS, INC.

MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

AREA CODE 617
686-3887

ALCOSWITCH®

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.



MINIATURE PUSH BUTTON SWITCHES

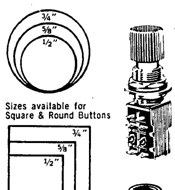
MSP Miniature Pushbutton Switches, snap-action, 5 amps @ 115VAC. Solid silver contacts, terminals. Bushing size, ¼-40 with keyway. Black phenolic case. 25,000 life cycle.
MSPE Waterproof Pushbutton Switches, 6 amps resistive, 2 amps inductive @ 125VAC. Double "O" waterseals, low-loss "E" Series case; turret terminals. Versatile "double-throw".
MSP-103 Economy Pushbutton Switches, 3 amps @ 125VAC. Low-pressure. Silverplated brass contacts, terminals. Plunger travels .098". Depth behind panel, ¾". 1-pc. ¼-40 bushing.
MSPS-103C is similar to MSP-103C except smaller diameter .310. Rated 0.5 amps @ 125 VAC.
MSPG Mustang Push Button Switches rated 6 amps @ 125 VAC (Specs same as MSPE series, less waterproof). 15⁄32" bushings.

Model	Description	One-24	25-99	100 499	500-999
C-12	Extra plastic button*	.05	.036	.032	.03
C-13	Large button◆	.09	.06	.054	.05
C-14	Chrome button (thin)	.06	.04	.036	.033
C-14L	Chrome button	.09	.06	.054	.05
G-12- (‡)	Plain guard, use with C-12	.25	.17	.15	.14
G-12-K (‡)	Knurl guard, use with C-12	.30	.20	.18	.165
G-13- (‡)	Plain guard, use with C-13	.25	.17	.15	.14
G-13-K (‡)	Knurl guard, use with C-13	.30	.20	.18	.165

Buttons are packaged in multiples of 25.

Model	Contacts	Application	One-24	25-99	100-499	500-999
MSP-105D*	SPDT	Push on-off	2.15	1.46	1.29	1.08
MSP-105F*	SPDT	Momentary	2.15	1.46	1.29	1.08
MSP-205N*	DPDT	Push on-off	2.95	2.01	1.77	1.48
MSP-205R*	DPDT	Momentary	2.95	2.01	1.77	1.48
MSPE-106D*	SPDT	Push on-off	2.55	1.72	1.53	1.28
MSPE-106F*	SPDT	Momentary	2.55	1.72	1.53	1.28
MSPE-206N*	DPDT	Push on-off	3.45	2.35	2.07	1.73
MSPE-206R*	DPDT	Momentary	3.45	2.35	2.07	1.73
MSPE-406N*	4PDT	Push on-off	5.95	4.05	3.57	2.98
MSPE-406R*	4PDT	Momentary	5.95	4.05	3.57	2.98
MSP-103B†	SPST	Normally closed	.65	.44	.39	.33
MSP-103C°	SPST	Normally open	.65	.44	.39	.33
MSP-103C-B†	SPST	Normally open	.65	.44	.39	.33
MSPS-103C°	SPST	Normally open	.50	.34	.30	.25
MSPG-206N**	DPDT	Push on-off	3.15	2.14	1.89	1.58
MSPG-206R**	DPDT	Momentary	3.15	2.14	1.89	1.58

*Supplied with C-12 red, green, or black plastic button; specify.
**Supplied with one red or black plastic button; specify color.
◆Specify red, green or black. †With black button. °With red.
‡Specify finish: add suffix **C** chrome, **A** alum., **B** black.



ILLUMINATED PUSH BUTTON SWITCHES

MSPN Illuminated Push Button Switches are snap-action types capable of handling a high current rating for its small size. DPDT action in a miniature case with separate connections to its replaceable T-1¾ grooved base lamps. Side terminals for simplified wiring or P.C. use. Metal construction, phenolic case, hole. Wide choice of plastic buttons. **TRANSPARENT** colors: Red, Amber, Blue, Green, Clear. **TRANSLUCENT:** Red, Yellow, Green, White. Uses grooved base lamps.

Model	Description	One-9	10-99	100-499	500-999
379	6.3V @ 0.2A Lamps	.85	.57	.43	.40
386	14.0V @ 0.08A Lamps	.90	.60	.45	.42
388	28.0V @ 0.04A Lamps	.95	.63	.47	.44

MSPN-206N	DPDT	Push on-off	4.80	3.26	2.88	2.40
MSPN-206R	DPDT	Momentary	4.80	3.26	2.88	2.40

Note: supplied less colored button and lamps, see listing below.

RS*	½" Round Button	.10	.068	.06	.05
RM*	⅝" Round Button	.12	.082	.072	.06
RL*	¾" Round Button	.15	.102	.09	.075
SS*	½" Square Button	.10	.068	.06	.05
SM*	⅝" Square Button	.12	.082	.072	.06
SL*	¾" Square Button	.15	.102	.09	.075

*Specify Transparent or Translucent Type and Color.

CGR-½	½" Rd. Guard, Chromed Brass	.30	.204	.18	.15
CCR-⅝	⅝" Rd. Guard, Chromed Brass	.40	.27	.24	.20
CGR-¾	¾" Rd. Guard, Chromed Brass	.50	.33	.30	.25
CGS-½	½" Sq. Guard, Chromed Plastic	.30	.204	.18	.15
CGS-⅝	⅝" Sq. Guard, Chromed Plastic	.40	.27	.24	.20
CGS-¾	¾" Sq. Guard, Chromed Plastic	.50	.33	.30	.25

MSPM-101 SPST
ALCO

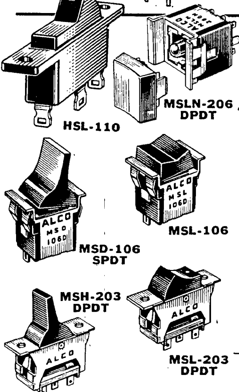
MAGNETIC REPULSION PUSH BUTTON SWITCHES

Momentary switches designed for data entry. Ceramic magnets eliminate springs. Contacts are glass-encapsulated reeds. Plunger is keyed, non-rotating. Metal case withstands abuse, serves as shield. Rated 100 mA @ 50 VDC, resistance 100 milliohms. Contact bounce 1 m/sec. Plunger travel 5⁄64". Operating force, under 2 ozs. Life, 10 million.

MSPM-101B†	SPST	N.C., Solder Lug	4.25	3.40	2.98	2.76
MSPM-101C°	SPST	N.O., Solder Lug	3.90	3.12	2.73	2.54
MSPM-101B-1†	SPST	N.C., 110" Term.	4.25	3.40	2.98	2.76
MSPM-101C-1°	SPST	N.O., 110" Term.	3.90	3.12	2.73	2.54

†Supplied with C-12 black button. °Supplied with C-12 red button.

MSPM Series also accepts C-13, C-14, C-14L buttons listed.



ILLUMINATED ROCKER SWITCHES

New brilliance in a miniature rocker featuring convenient front panel lamp replacement. Entire switch simply snaps into a .655" x .728" hole. Choice of 3 double pole switching actions, 4 lens colors & 3 voltages. Rated 6 amps @ 125 VAC.
*Supplied with one red, green, amber or white lens cap; specify

MSLN-206N*	DPDT	On-None-On	4.45	3.03	2.67	2.23
MSLN-206P*	DPDT	On-Off-On	4.75	3.23	2.85	2.38
MSLN-206R*	DPDT	(On)-None-On	4.75	3.23	2.85	2.38

			1-9	10-99	100-499	500-
362	14.0V	@ 0.080 Lamps	.90	.60	.45	.42
378	6.3V	@ 0.200 Lamps	.85	.57	.43	.40
399	28.0V	@ 0.040 Lamps	.95	.63	.47	.44

MINIATURE ROCKER SWITCHES

New series of economy "snap-in" switches have unusually high 6 amps @ 125 VAC rating. Features ease of installing in .50" x .60" hole. Exclusive molded silver terminals and contacts.
*Supplied with one red, black, gray or white cap; specify.

			1-24	25-99	100-499	500-
MSL-106D*	SPDT	On-None-On	1.65	1.12	.99	.83
MSL-106E*	SPDT	On-Off-On	1.95	1.33	1.17	.975
MSL-206N*	DPDT	On-None-On	2.15	1.43	1.29	1.08
MSL-206P*	DPDT	On-Off-On	2.55	1.72	1.53	1.28

MINIATURE LEVER SWITCHES

Adds distinction to the front panel. "Snap-in" miniature switches have 6 amps @ 125 VAC rating. Ease of installation in .50" x .60" hole. Has molded silver terminals and contacts.
*Supplied with red, black, gray or white lever; specify color.

MSD-106D*	SPDT	On-None-On	1.65	1.12	.99	.83
MSD-106E*	SPDT	On-Off-On	1.95	1.33	1.17	.975
MSD-206N*	DPDT	On-None-On	2.15	1.43	1.29	1.08
MSD-206P*	DPDT	On-Off-On	2.55	1.72	1.53	1.28

U/L APPROVED ROCKER SWITCHES

10 Amps @ 125 VAC, 6A @ 250 VAC. Over 100,000 operations. Extra-wide surface silver-clad contacts; tab terminals. Black.

HSL-110A	SPST	Push On-Off	.85	.578	.51	.425
HSL-110D	SPDT	Push On-On	.95	.646	.57	.475

MSH LEVER AND MSL ROCKER SWITCHES

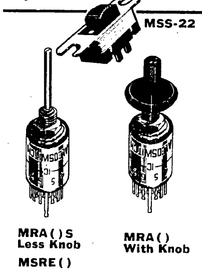
Versatile DPDT action. Rated 3 amps @ 125 VAC; 25,000 life cycle; contacts silverplated.

MSH-203N	DPDT Lever-Switch	1.25	.85	.75	.63
MSL-203N	DPDT Rocker Switch	1.15	.78	.69	.58

MSS SERIES MINIATURE SLIDE SWITCHES

Anti-tease design. Rated 2 amps @ 120 VAC. Gold on nickel on silver-plated brass contacts. 250,000 operations. .500" x .305"

MSS-22	SPDT, 2 circuit	1.75	1.17	.88	.73
MSS-44	DPDT, 2 circuit	3.15	2.11	1.58	1.31



MINIATURE ROTARY SWITCHES

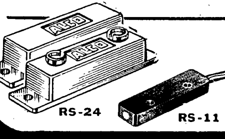
MRA Adjustable-Stop Rotary Switches are miniature types rated 500 mA @ 125 VAC. Features: adjustable-stop; non-shorting; 36° spacing; up to 4 poles on single deck; solid silver terminals and contacts. Types with suffix **S,** ⅛", dia. shaft less knob. Bushing, ¼-40

MRA 30° Position Rotary Switches are slightly larger than standard MRA Series and have ⅛" shaft. Other specs similar to MRA Series. Knobs not included. Type MRA 30° can be converted to an adjustable-stop switch when used with KCVS-500 knob (see Alco miniature knob listings).

MSRE Waterproof Rotary Switches are non-adjustable. Similar to MRA Series but feature internal and external 'O' rings. One-piece metal case construction, and molded in terminals. ⅛" shaft. Ideal for printed circuits. Supplied less knob. Rated 500 mA @ 125 VAC. Can be converted to an adjustable-stop switch when used with KCVS-500 knob (see knob listings).

Model	Pole	Positions	Knob Supplied	One-24	25-99	100-499	500-999
MRA-1-10	1	2-10	Yes	4.35	2.96	2.61	2.18
MRA-2-5	2	2-5	Yes	4.35	2.96	2.61	2.18
MRA-3-3	3	2-3	Yes	4.35	2.96	2.61	2.18
MSRA-4-2*	4	2	Yes	4.35	2.96	2.61	2.18
MRA-1-10S	1	2-10	No	4.25	2.89	2.55	2.13
MRA-1-10SC**	1	10	No	4.25	2.89	2.55	2.13
MRA-2-5S	2	2-5	No	4.25	2.89	2.55	2.13
MRA-3-3S	3	2-3	No	4.25	2.89	2.55	2.13
MSRA-4-2S*	4	2	No	4.25	2.89	2.55	2.13
MRA-1-12S	1	2-12	No	4.75	3.23	2.85	2.38
MRA-1-12SC**	1	12	No	4.75	3.23	2.85	2.38
MRA-4-3S	4	3	No	4.75	3.23	2.85	2.38
MSRE-1-10*	1	10	No	5.35	3.64	3.21	2.68
MSRE-2-5*	2	5	No	5.35	3.64	3.21	2.68
MSRE-3-3*	3	3	No	5.35	3.64	3.21	2.68
MSRE-4-2*	4	2	No	5.35	3.64	3.21	2.68

**Continuous rotation. *Switches are non-adjustable.



PROXIMITY MAGNETIC REED SWITCH ASSEMBLIES

RS-24 — Alnico-5 magnet actuates reed switch within distance of 1". Rated 0.5 amps break, 1.0 amps carry, over 5-million operations.
Miniature RS-11 — Alnico-5 magnet actuates reed switch within distance of .39". Current rating @ 50 VDC: .15 amps break, .5 amps carry. 200 VDC breakdown. Life: 10-million cycles.

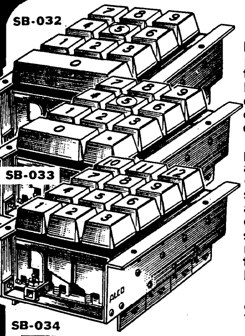
Model	Description	One-24	25-99	100-499	500-999
RS-24-NO	N.O. (Apart) Pair	2.85	1.90	1.71	1.42
RS-24-NC	N.C. (Apart) Pair	3.15	2.14	1.89	1.58
RS-11-NO	N.O. (Apart) Pair	2.75	1.87	1.65	1.38
RS-11-NC	N.C. (Apart) Pair	3.05	2.08	1.83	1.53

ALCO® ELECTRONIC PRODUCTS, INC.
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

AREA CODE 617
686-3887

ALCOSWITCH®

DIV. OF ALCO ELECTRONIC PRODUCTS, INC.



REED SWITCH OPERATED KEYBOARD BANKS

Now designers can be assured of highest reliability in data processing equipment. Short strokes provides a smooth operation of the switch plunger resulting in one of the finest keyboard actions obtainable. It is also suitable for test equipment, communication gear, and many other applications. All details of this switch line are designed for light pressure (5 ounces), operator's convenience, and positive input of data with long life under heavy office type of usage. Highly efficient "single-pole open circuit" reed switches are used assuring reliability and extremely long life expectancy. Square light grey keys (19/32") have an industry standard 0-9 marking and format. All switch positions contain a "positive lockout" between sections and rows. This feature prevents more than one position from operating at the same time. This basic keyboard system is designed for flexibility and can be customized to meet the special needs of quantity users. Up to 12 switches may be installed in the basic module in any combination including momentary, or lockout design.

Keyboard switches are supplied with Light Grey Key Tops, Colored Blank Key Tops are available separately (see below); Key Tops with special markings are quoted on request.

SPECIFICATIONS

Dimensions: 2.81" W. x 3.62" L. x 2.25" D.
Depth: 1⅝"
Switch Contact: Normally Open
Rating: 100 ma @ 48VDC
Operating Force: 5 Ounces
Mechanical Life: 10,000,000 Cy
Reed Switch Life: 10,000,000 Cy
Full Stroke Travel: 7/32"
Travel to Contact: 5/32"
Symbols (black): 3/16" h.
Key Color: Grey

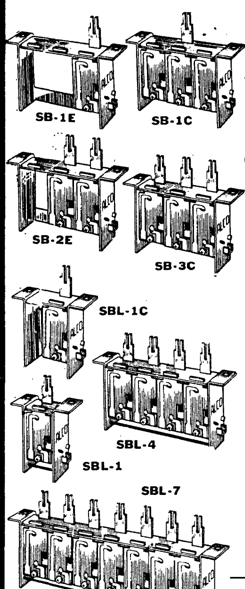
NON-DOUBLE LOCK (LOCKOUT)

Model	Description	Switching Mode	One-24
SB-032	Lockout 0-9 ("0" Triple Bar)	4	28.50
SB-032PC*	Lockout 0-9 ("0" Triple Bar)	4	29.50
SB-033	Lockout 0-9 and Period	4	28.50
SB-033PC*	Lockout 0-9 and Period	4	29.50
SB-034	Lockout 1-12 Numerals	4	29.95
SB-034PC*	Lockout 1-12 Numerals	4	30.95

NON-LOCK (MOMENTARY)

Model	Description	Switching Mode	One-24
SB-035	Momentary 1-12 Numerals	1	28.50
SB-035PC*	Momentary 1-12 Numerals	1	29.50

*With printed circuit connections.



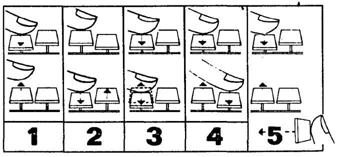
UNIVERSAL "ADD-ON" MODULES

This modular concept allows the design engineer to create his own custom pushbutton layout or add to the mating assemblies mentioned (SB-032, SB-033, SB-034, SB-035). Highly efficient single pole, Normally Open reed switches are used throughout. Light pressure (5 ounces) and short stroke result in optimum operator's convenience and positive input of data. Stacking allows any number of these switch sections to be used in a group.

SPECIFICATIONS

Rating: 100 mA @ 48VDC
Operating Force at Point of Contact: 2.8 ozs.
Min. Operating Force: 2.4 ozs.
Operating Force at Completion of Stroke: 3.5 ozs.
Full Travel: .20"
Travel to Contact: .14"
Depth Requirements: 1.90"
Life: 10,000,000 cy.
Mounting: 2 threaded

SWITCHING MODES FOR SWITCHES



MODE 1 — NON-LOCK (MOMENTARY)
Makes contact only while being depressed.
MODE 2 — LOCK-RELEASE (INTERLOCK)
When one button is locked, others are automatically released.
MODE 3 — SELF-RELEASE (PUSH TO UNLOCK)
Push to lock, push to release. The button locks when depressed.
MODE 4 — NON-DOUBLE LOCK (LOCKOUT)
Prevents more than one button to be actuated at one time. First button to be actuated stays locked in position until released.
MODE 5 — ACCUMULATIVE-LOCK (ALL LOCK)
Button locks when depressed. All buttons are restored to normal by actuating the remote bar.

NON-LOCK (MOMENTARY)
LOCK-RELEASE (INTERLOCK)

Model	Description	Switching Mode	One-24
SB-1E	1-pole, end	1	2.90
SB-1C	1-pole, ctr.	1	2.90
SB-2E	2-pole, end	1	4.80
SB-3C	3-pole, ctr. & ends	1	6.70
SB-4C	4-pole, ctr. & ends	1	8.60
SBL-1C	1-pole, ctr.	3	3.90
SBL-2E	2-pole, ctr. & end	3 & 1	5.80

LOCK-RELEASE (INTERLOCK)

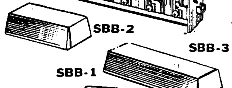
Model	Description	Switching Mode	One-24
SB-1	1-position	1	2.70
SBL-2	2-position	2	4.95
SBL-3	3-position	2	6.90
SBL-4	4-position	2	8.90
SBL-5	5-position	2	10.85
SBL-6	6-position	2	12.85
SBL-7	7-position	2	14.80
SBL-8	8-position	2	16.80
SBL-9	9-position	2	18.75
SBL-10	10-position	2	20.75
SBL-12	12-position	2	24.70

Above switches are supplied less buttons; order below. Buttons with special markings quoted on request.

SELF-RELEASE (PUSH TO UNLOCK)

Model	Description	Switching Mode	One-24
SBLR-1	1-position	3	2.95
SBLR-2	2-position	3	5.35
SBLR-3	3-position	3	7.50
SBLR-4	4-position	3	9.70
SBLR-5	5-position	3	11.85
SBLR-6	6-position	3	14.10
SBLR-7	7-position	3	16.20
SBLR-8	8-position	3	18.40
SBLR-9	9-position	3	20.55
SBLR-10	10-position	3	22.75
SBLR-12	12-position	3	27.10

SBLR Series
Is Not Stocked
But Available
On Special
Order - Write



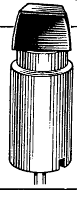
KEY TOPS AND MOUNTING BRACKETS

Key tops for above switches. Extended keys span 2 or 3 switches (note: by use of longer key tops it is possible to form 2 or 3 pole functions).

9" long brackets offer ease of mounting and assembly; hold up to 12 pushbutton switch modules.

Model	Description	One-24	25-99	100-499
SBB-1*	Button only, 1 pole	.15	.12	.105
SBB-2*	Button only, 2 pole	.25	.20	.175
SBB-3*	Button only, 3 pole	.35	.28	.245
SB-BKT	Mounting Brackets (pr.)	1.95	1.56	1.37

*Specify color: Light Grey, Dark Grey, White, Blue, Red, Black. Key tops with special markings — quoted on request.



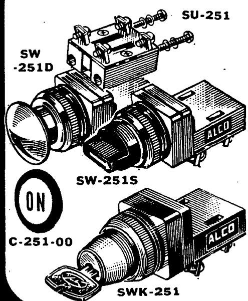
BASE MOUNTED KEYBOARD SWITCH

Reed actuated low profile, single pole Normally Open unit provides the low operating force and high reliability required in keyboards. RSM-41 is suitable for an 0.75 inch matrix, and is free from interaction between units. The switch is molded in high quality glass filled nylon and acetal resin, and is an FR Hamlin reed switch actuated by a permanent magnet.

°Black Keytops — Specify Choice of Figures: 0 through 12.

Model	Description	One-24	25-99	100-499
RSM-41*	Keyboard Switch (10° Base)	1.95	1.46	1.36
RSM-61*	Keyboard Switch (Flat Base)	1.95	1.46	1.36
RSB-1†	Blank Keytop (Specify Color)	.15	.12	.105
RSB-1N°	2-Shot Molded Keytop Black (Specify 0-12)	.20	.16	.14

*Less Keytop
†Specify Choice of Color: Black, White, Blue, Red, Grey for Blank keys only.



MINIATURE PUSH BUTTON MOTOR START SWITCHES

Mount in a 1" hole. Rated to carry 6 amps @ 230 VAC. These switches may be used to control circuits independently or with optional relays. All models supplied with a single (N.O.-N.C.) contact block but have provisions for additional (SU) blocks thereby converting to DPDT, 3PDT, 4PDT.

3-Way Selector Power Switch is the same basic model as above but instead has a bar knob with pointer. Electrical and physical specifications are the same available in black only.

Key-Lock Push Button type is an accident-proof power switch that has its own key lock to prevent unwanted operations of machines and controls. The switch functions only when the key disengages the lock. Same specs as the series described above.

Model	Description	Action	One-24	25-99	100-499	500-999
SW-251*	Standard Button	Mom. ON	2.95	1.97	1.77	—
SW-251D*	Mushroom Button	Mom. ON	3.35	2.23	2.01	—
SW-251L*	Long Button	Mom. ON	3.10	2.07	1.86	—
SWS-251	Selector	ON-OFF-ON	3.35	2.23	2.01	—
SWK-251	Key/Lock Switch	ON-OFF-ON	7.95	5.30	4.77	—
SU-251	N.O.-N.C. Block		1.85	1.23	1.11	—
C-251-00†	ON-OFF Buttons (pr.)		.35	.23	.21	.18
C-251-SS†	STOP-START Buttons (pr.)		.35	.23	.21	.18
C-251-HL	HIGH-LOW Buttons (pr.)		.35	.23	.21	.18
C-251-UD	UP-DOWN Buttons (pr.)		.35	.23	.21	.18

*Push button models are equipped with spare (snap-on) colored buttons offering a choice of use in red, black, or green.
†Standard snap-on buttons with legend for SW-251 switches.

COMPACT FOOT SWITCH FOR RELIABLE OPERATION

SPDT momentary-contact switch has spring return and non-skid base. Size: 3¼"x3¼"x1".

Model	Supplied	One-24	25-99	100-499
SFK	Less Cable	4.65	3.16	2.79
SFK-6	With 6-ft. Cable	5.85	3.98	3.51

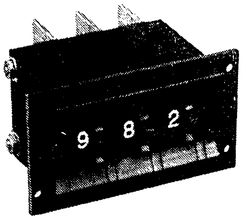
ALCO® ELECTRONIC PRODUCTS, INC.

AREA CODE 617
686-3887

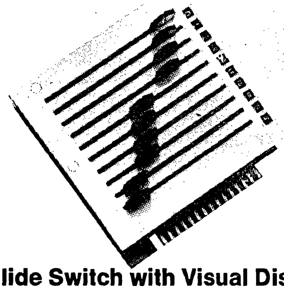
MAILING ADDRESS: P.O. BOX 1348, LAWRENCE, MASS. 01842

AMP switches are special... even when they're standard.

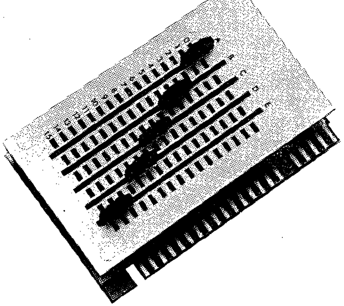
Special or standard, AMP switches give you features you won't find on a "me too" kind of switch . . . quality features that deliver longer switch life and dependable performance.



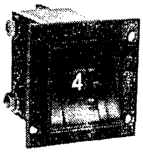
Ganged Thumbwheel Switch
- Decimal, BCD or BCD with complement
- modular design, supplied assembled or unitized
- spacers and decimal point spacers available
- designed for mounting from behind panel or from front of panel



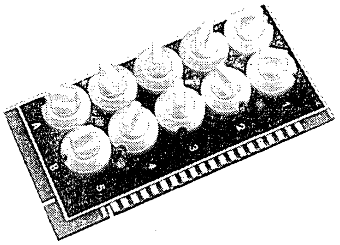
Slide Switch with Visual Display
- standard sizes—5-slide by 10-positions, also 5 x 16, 10 x 10 and 10 x 16. Special sizes available on request.
- positive detent positioning
- small, compact—takes up minimal space
- ⅛″ high characters



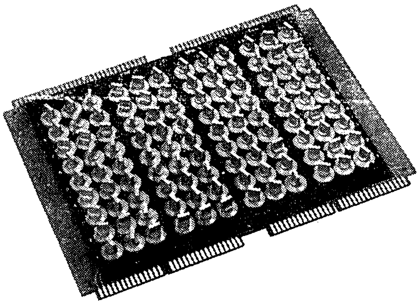
Matrix Slide Switch without Visual Display
- standard sizes—5-slide by 10-positions, also 5 x 16, 10 x 10 and 10 x 16
- positive detent positioning
- completely solderless wiring interface
- available decimal and hexadecimal codes



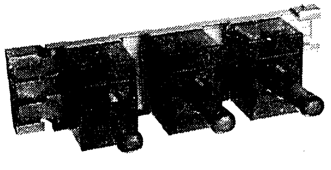
Thumb Wheel Switch
- decimal and BCD
- standard miniature size
- long-life tested to 1,000,000 cross points
- printed circuit interconnection or directly solderable



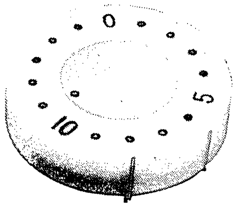
Matrix Rotary Switch
- direct visual display
- positive detent action
- wide selection of sizes
- economy achieved through integral interwiring



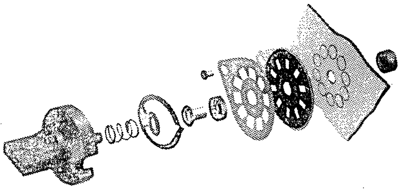
Special Rotary Matrix Switch
- example of AMP's flexibility
- 3 each of 10 x 36 matrices
- compact—only 15.18″ x 8.50″
- all switch interconnections built into assembly. Saves assembly time



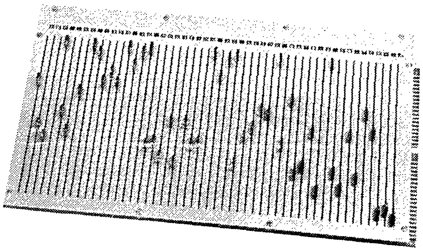
Dashboard Toggle Switch



BCD Printed Circuit Switch
- low profile for printed circuit board mounting
- economical programming for computers, instruments and machine control
- no interconnecting leads, flow soldered to your artwork



Rotary Matrix Switch Kit
- build your own special switches using standard parts
- economical decimal switch eliminates interconnection wiring
- integrates with your printed circuit board



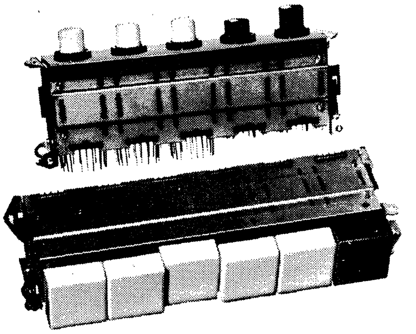
Message Composer Switch
- 40 characters x 50 position shown
- unique in-line visual display with minimum of front panel space
- user oriented, large characters, no operation device needed such as stylus

For information on these switches or on custom designs, write
Industrial Division,
AMP Incorporated,
Harrisburg, Pa. 17105.

AMP
INCORPORATED

American Zettler, inc.

MULTIPLE SWITCH SERIES T-596

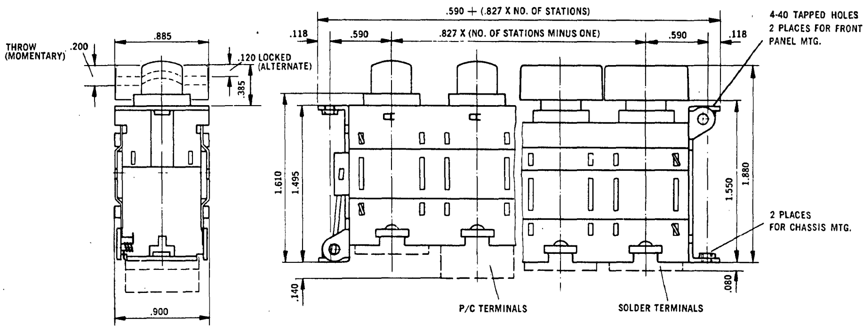


SERIES T596 MULTIPLE SWITCHES

For front panel, chassis, or PC board mounting using 4-40 screws. Up to 6 PDT silver-nickel self-cleaning slide-action contacts. Occupies less than one square inch of panel space. Only 1½″ depth behind panel. Long-life special nylon parts used throughout. Pushbutton switch can be furnished with round ⅜″ diameter or square ⅞″ x ¹³⁄₁₆″ with 0.827″ center-to-center spacing, in white, black, red, yellow, green, or blue buttons. Square buttons may be engraved or hot stamped. Illuminated pushbutton switches are available using lamps, which are accessible from front. Special unbased lamps in 6, 12, 24 v 1 watt are available all over the world. Prices per station approximately $2.50 for non-illuminated; $4.50 for illuminated (1-9 pcs).

FEATURES

- Illuminated or non-illuminated
- Up to 6 PDT contacts per station
- All contacts are inside of switch
- Self-cleaning slide action contacts
- From 2 to 11 stations in one frame
- Easy front or back panel mounting
- PC or solder lug terminals
- Square buttons can be mounted in tight parallel rows to form a block.


THROW (MOMENTARY)
.200
.885
.120 LOCKED (ALTERNATE)
.385
.900
.590 + (.827 X NO. OF STATIONS)
.118
.590
.827 X (NO. OF STATIONS MINUS ONE)
.590
.118
4-40 TAPPED HOLES 2 PLACES FOR FRONT PANEL MTG.
1.610
1.495
1.550
1.880
2 PLACES FOR CHASSIS MTG.
.140
.080
P/C TERMINALS
SOLDER TERMINALS

SPECIFICATIONS

Contact Rating: 1 amp at 30 vdc or 0.2 amp at 115 vac

Contact Arrangement: Two, four, and six form C contacts

Life expectancy: 10^5 mechanical; 5 x 10^4 at rated load.

Ambient Temperature Range: −20°C to 60°C

Dielectric Strength: Under room conditions, 500v rms

Insulation Resistance: Under room conditions, 10^9 ohms

Terminals: Solder lugs or PC terminals

MOUNTING

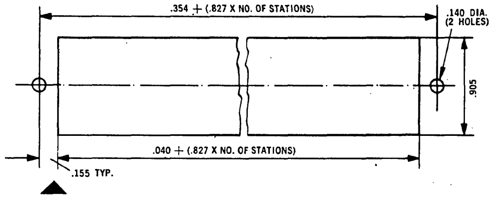
2 holes 4-40 NC-2B in front
2 holes 4-40 NC-2B in back
Required Screw Length: .125 Max., .080 Min. + Material Thickness

PART NUMBERS

For Incandescent Lamps and Accessories

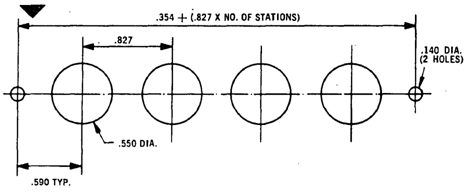
P/N	Description
2305	6-7V, 1W Unbased Lamp
2321	12-15V, 1W Unbased Lamp
2341	24-30V, 1W Unbased Lamp
LTa110Z1	Lamp Inserter

SUGGESTED PANEL LAYOUT

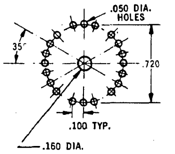

.354 + (.827 X NO. OF STATIONS)
.140 DIA. (2 HOLES)
.905
.040 + (.827 X NO. OF STATIONS)
.155 TYP.

SQUARE BUTTONS

ROUND BUTTONS

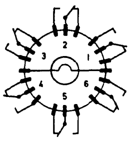

.354 + (.827 X NO. OF STATIONS)
.827
.140 DIA. (2 HOLES)
.550 DIA.
.590 TYP.

P/C BOARD PATTERN FOR ONE STATION 6 FORM C CONTACTS


.050 DIA. HOLES
35°
.720
.100 TYP.
.160 DIA.

Hole for PC - Center Guide

SOCKET DIAGRAM



CONTACTS	SECTION
2 pole	1 + 4
4 pole	1 + 3 + 4 + 6
6 pole	all

Button colors:

white	W
black	BK
red	R
yellow	Y
green	G
blue	B

SWITCH CHARACTERISTICS

Switch Function	Frame Part Number
Non-lock (momentary) Push lock, push release	T596.10
Interlock	T596.20
Interlock with one non-locking reset button	T596.30

STATION PART NUMBERS

Function	Non-illuminated Round	Non-illuminated Square	Illuminated Round	Illuminated Square
Non-lock (momentary)	500.1	520.1	600.1	620.1
Interlock	500.2	520.2	600.2	620.2
Push lock, push release	540.4	560.4	640.4	660.4
Reset	500.0	520.0	600.0	620.0

FOR EXAMPLE, TO ORDER:

A multiple-station pushbutton switch with: Ten interlock, non-illumnated stations with white round buttons, four form C contacts, and printed circuit terminals, the following part number would be developed: (See example at right)

T 596.20-10 / 500.2W / 4C / PC

Frame #
Number of stations
Station part #
Color of buttons
Contacts on each station
PC pins

Note: Solder temp.: Max. 270°C (500°F) Solder time: Max. 5 sec.

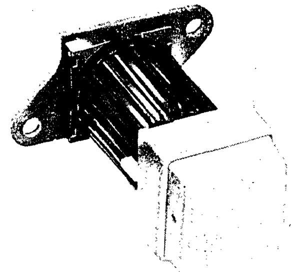
American Zettler, inc.
697 RANDOLPH AVE. ▪ COSTA MESA, CALIF. 92626 ▪ PHONE (714) 540-4190 ▪ TELEX: 67-8472

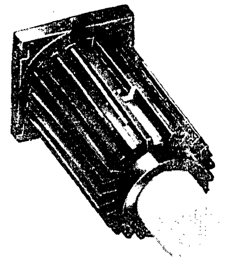
American Zettler, inc.

PUSHBUTTON SWITCHES SERIES K500

SERIES K-500 PUSHBUTTON SWITCHES

For chassis or PC board mounting only. No front panel screws. Six PDT silver alloy self-cleaning slide-action contacts. Occupies less one square inch of panel space. Only 1½" depth behind panel. Long-life special nylon parts used throughout. Pushbutton switches can be furnished with round ⅜" diameter or ¾" square button in white (W), black (BK), red (R), yellow (Y), green (G), or blue (B). Square buttons may be engraved or hot stamped. Illuminated pushbutton switches are available using lamps which are accessible from front. Special unbased lamps in 6, 12, 24 v 1 watt are available all over the world. Prices from $1.80 to $5.00 (1-24 pcs).

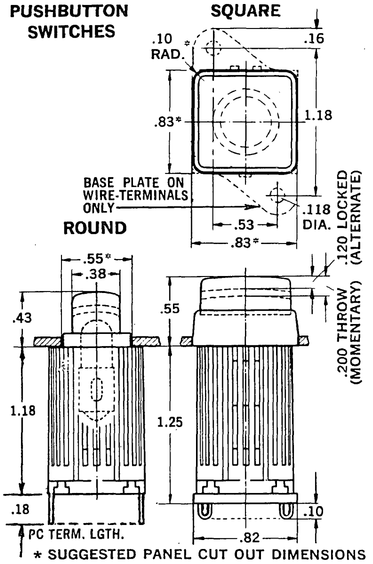




FEATURES

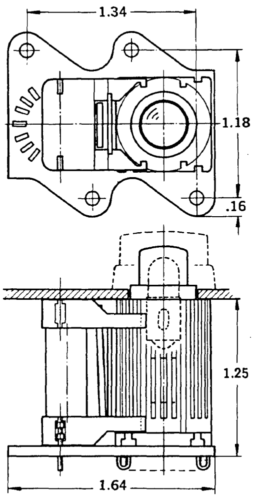
- Six PDT contacts in less than one square inch
- Overall depth behind panel only 1.5 inches
- No mounting screws needed on front panel
- Self-cleaning, slide-action contacts
- Long-life special nylon parts used throughout
- No lubricant needed; metal parts rub against nylon
- All pushbutton switches can be illuminated
- Lamps are accessible from front
- Available with solder lugs or PC pins

PUSHBUTTON SWITCHES

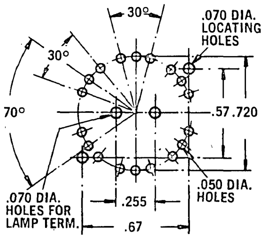


* SUGGESTED PANEL CUT OUT DIMENSIONS

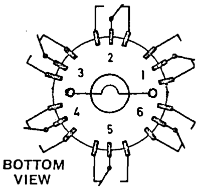
PUSHBUTTON SWITCHES, SOLENOID (SQUARE AND ROUND)



PC BOARD PATTERN FOR 6 FORM C CONTACTS



SOCKET DIAGRAM



CONTACTS	SECTION
2 pole	1 + 4
4 pole	1 + 3 + 4 + 6
6 pole	all

SPECIFICATIONS

Contact Rating: 1 amp at 30 vdc or 0.2 amp at 115 vac

Contact Arrangement: Two, four, and six form C contacts

Life Expectancy: 10^6 mechanical; 5 x 10^4 at rated load

Ambient Temperature Range: −20°C to 60°C

Dielectric Strength: Under room conditions, 500v rms

Insulation Resistance: Under room conditions, 10^9 ohms.

Terminals: Solder lugs or PC pins

HOW TO ORDER

Your part number consists of the switch part number, color of button, contact arrangement and PC if printed circuit terminals are desired. Add letters "PC' 'at end of part number.

For example: to order a pushbutton switch with a push lock, push release function, a non-illuminated square black button, four form C contacts, and printed circuit terminals, the following part number would be used: **K560 BK-4C-PC.**

Note: Solder temperature: Max. 270°C (500°F) Solder time: Max. 5 sec.

PART NUMBERS FOR PUSHBUTTON SWITCHES

Function	Non-Illuminated		Illuminated	
	Round	Square	Round	Square
Momentary	K 500	K 520	K 600	K 620
Push Lock, Push Release	K 540	K 560	K 640	K 660
Push Lock, Reset Solenoid*	K 502	K 522	K 602	K 622

PART NUMBERS

For Incandescent Lamps and Accessories

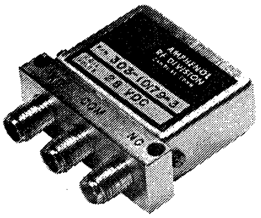
P/N	Description
2305	6 - 7V, 1W Unbased Lamp
2321	12 - 15V, 1W Unbased Lamp
2341	24 - 30V, 1W Unbased Lamp
LTa110Z1	Lamp Inserter
Z1693	Button Remover

* Standard solenoid is for 24 vac or vdc (200 ohms); other coils can be supplied to special order.

American Zettler, inc.
697 RANDOLPH AVE. • COSTA MESA, CALIF. 92626 • PHONE (714) 540-4190 • TELEX: 67-8472

ALL SPECIFICATIONS IN THIS CATALOG SUBJECT TO CHANGE WITHOUT NOTICE

303 Series/High Isolation Miniature & Standard Size Microwave Coaxial Switches



AMPHENOL 303 SERIES
High Isolation Miniature
Fail-Safe 1P2T

Broadband Miniature Switch Series Offering State-of-the-Art Characteristics through 18 GHz

Ideally suited for applications where crosstalk interference must be kept to an absolute minimum, Amphenol's miniature 303 Series provides uniform characteristics through KU band (18 GHz) with isolation of 60 dB minimum, VSWR of 1.5:1 maximum and insertion loss of 0.5 dB maximum. When operating at lower frequencies, isolation can be greater than 90 dB with 0.2 dB insertion loss and VSWR of 1.2:1.

New Amphenol SMA connectors . . . offering significantly better electrical and mechanical performance than competitive designs . . . contribute to the switch's high reliability and fine electrical performance. The miniature 1P2T weight only 2 ozs. and, excluding terminals, is less than 1½ inches high by 1$\frac{11}{32}$ inches wide by ½ inch. In addition to its compact design and reliable RF performance, this switch is capable of operating in environments where temperatures reach 100°C.

Standard Size 303 Series Switches offering High Isolation Qualities through 12.4 GHz

Amphenol's 303 Series of standard size switches is constantly expanding. Cataloged here are a representative collection of the more popular variations. Many combinations of these basic items are available. The ideal switching device tailored for your specific application can be selected from the options described in the table of General Characteristics. This is true of the miniature size 303 Series as well. Whatever combination of specifications you select . . . whether other coil voltage, hermetic sealing, auxiliary contacts, cut-throat latching, etc. . . . the same high isolation and uniform RF performance characteristic of Amphenol's 303 Switch Series will prevail.

RF PERFORMANCE

Frequency (GHz)	VSWR (Max.)	Isolation (dB)	Insertion Loss (Max.)
MINIATURE SIZE			
0-3.0	1.2	>90 dB	0.2 dB
3.0-8.0	1.3	>80 dB	0.3 dB
8.0-12.4	1.4	>70 dB	0.4 dB
12.4-18.0	1.5	>60 dB	0.5 dB
STANDARD SIZE			
0-3.0	1.3	>80 dB	0.25 dB
3.0-6.0	1.4	>75 dB	0.35 dB
6.0-10.0	1.5	>65 dB	0.50 dB
10.0-12.4	1.5	>60 dB	0.50 dB
MINIATURE ECONOMY AND 1P1T SHUTTER			
0-3.0	1.3	>80 dB	0.25 dB
3.0-8.0	1.4	>70 dB	0.35 dB
8.0-12.4	1.5	>60 dB	0.50 dB

RF POWER @ STP (watts CW)

Freq. (GHz)	SMA	N & TNC	Freq. (GHz)	SMA	N & TNC
0.1	400W	1000W	5.0	50W	100W
0.4	200W	500W	10.0	35W	70W
1.0	120W	280W	12.0	30W	60W
3.0	70W	145W	18.0	24W	45W

GENERAL CHARACTERISTICS

ELECTRICAL

FREQUENCY RANGE

Miniature Size:	0-18.0 GHz
Others:	0-12.4 GHz
CONNECTORS	
Miniature Size:	SMA
Standard Size:	N, TNC, SMA
SWITCHING TIME:	15 mS (maximum)
SWITCHING ACTION:	Break before make
28 VDC COIL RESISTANCE	
1P2T Fail-Safe:	Miniature 250 ohms Standard 200 ohms
1P2T Latching:	Miniature 150 ohms
Transfer:	Miniature Latching 18 ohms Standard Fail-Safe 90 ohms
1P2T Economy:	200 ohms
1P1T Shutter:	135 ohms

(Also available with 6, 12, 48, 110 VDC and 115 VAC coils.)

MECHANICAL

LIFE: 1×10^6 cycles minimum

WEIGHT

1P2T: Miniature 2 oz., standard 7 oz.
Transfer: Miniature 5 oz., standard 8 oz.
1P2T economy 3½ oz.
1P1T shutter 4 oz.

ENVIRONMENTAL (MIL-S-3928B)

TEMPERATURE RANGE

1P2T Miniature −55°C to 100°C. Others −55°C to 85°C (higher temperature operation available upon request).

MOISTURE RESISTANCE: 10 day cycle

SHOCK

MIL-STD-202D, Method 202C
Test Condition A, 15 G's peak

VIBRATION

Test Condition A
55 to 2000 Hz @ ± 10 G's

HERMETIC SEALING: Available when required

MINIATURE SIZE
(28 VDC COIL■)

Connector	Function	Fail-Safe (Non-Latching)	Cut-Throat Latching	Fail-Safe with Aux. Contacts	Manual
		AMPHENOL PART NUMBERS			
SMA	1P2T	303-10179-3	303-10179-23	303-10179-53	—
	1P2T Economy	303-10116-3	—	—	—
	Transfer	303-11022-3	303-11022-23	303-11022-53	303-11028

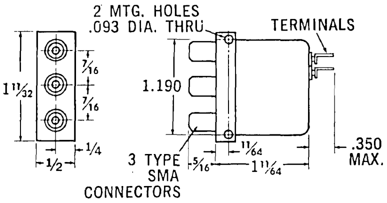
STANDARD SIZE
(28 VDC COIL■)

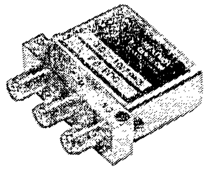
Connectors	Function	Fail-Safe (Non-Latching)	Fail-Safe with Aux. Contacts	Manual
		AMPHENOL PART NUMBERS		
TNC	1P1T Shutter	303-10969-3	—	—
	1P2T	303-10168-3	303-10168-53	303-10171
	Transfer	303-11020-3	303-11020-53	—
N	1P2T	303-10167-3	303-10167-53	303-10170
	Transfer	303-11017-3	303-11017-53	—
SMA	1P2T	303-10166-3	303-10166-53	303-10175
	Transfer	303-11016-3	303-11016-53	—

■ Also available with 6, 12, 48, 110 VDC and 115 VAC Coils.

303 Series/High Isolation Miniature & Standard Size Microwave Coaxial Switches (cont'd)

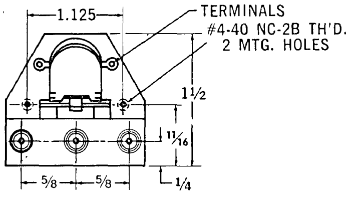
MINIATURE SIZE 1P2T FAIL-SAFE

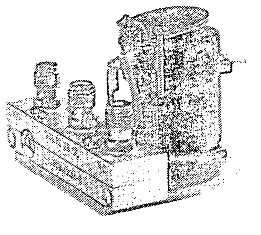

2 MTG. HOLES
.093 DIA. THRU
TERMINALS
1 11/32
7/16
7/16
1.190
1/4
1/2
3 TYPE SMA CONNECTORS
5/16
11/64
1 11/64
.350 MAX.

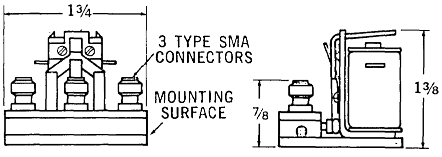


303-10179-3

MINIATURE SIZE 1P2T ECONOMY VERSION

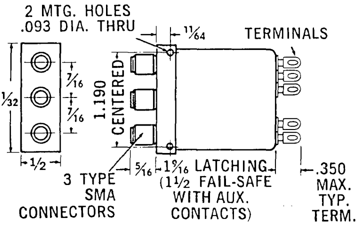

1.125
TERMINALS
#4-40 NC-2B TH'D.
2 MTG. HOLES
1 1/2
11/16
5/8
5/8
1/4

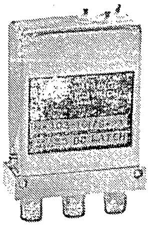



1 3/4
3 TYPE SMA CONNECTORS
MOUNTING SURFACE
7/8
1 3/8

303-10116-3

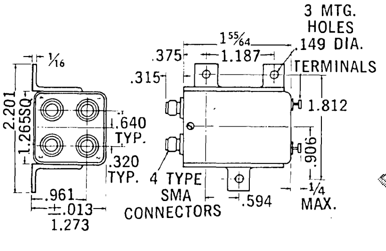
MINIATURE SIZE 1P2T LATCHING AND FAIL-SAFE WITH AUXILIARY CONTACTS

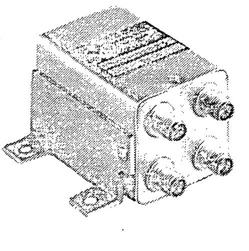

2 MTG. HOLES
.093 DIA. THRU
11/64
TERMINALS
1 11/32
7/16
7/16
1.190 CENTERED
1/2
3 TYPE SMA CONNECTORS
5/16
1 9/16 LATCHING
(1 1/2 FAIL-SAFE WITH AUX. CONTACTS)
.350 MAX. TYP. TERM.



303-10179-23

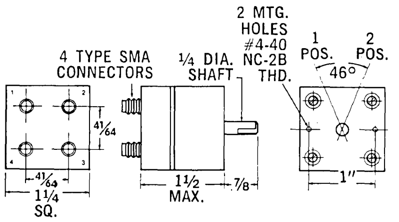
MINIATURE SIZE TRANSFER LATCHING

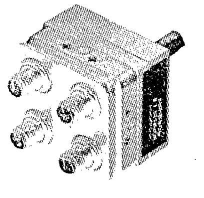

3 MTG. HOLES
.149 DIA.
1/16
1 55/64
.375
1.187
TERMINALS
.315
2.201
1.265SQ.
1.640 TYP.
.320 TYP.
1.812
.906
.961
±.013
1.273
4 TYPE SMA CONNECTORS
.594
1/4 MAX.



303-11022-23

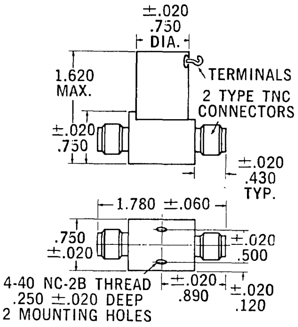
MINIATURE SIZE TRANSFER MANUAL

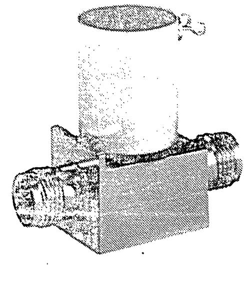

2 MTG. HOLES
#4-40 NC-2B THD.
4 TYPE SMA CONNECTORS
1/4 DIA. SHAFT
1 POS.
2 POS.
46°
4 1/64
4 1/64
1 1/4 SQ.
1 1/2 MAX.
7/8
1"



303-11028

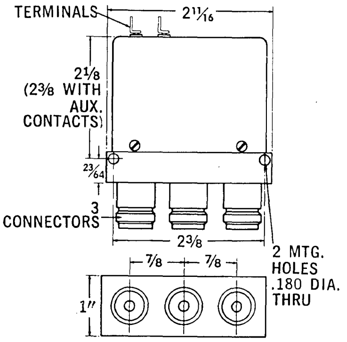
STANDARD SIZE 1P1T SHUTTER

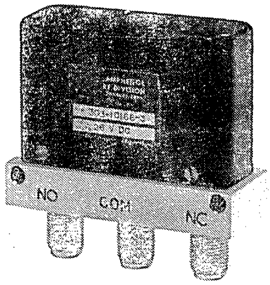

±.020
.750
DIA.
1.620 MAX.
TERMINALS
2 TYPE TNC CONNECTORS
±.020
.750
±.020
.430 TYP.
1.780 ±.060
.750
±.020
±.020
.500
4-40 NC-2B THREAD
.250 ±.020 DEEP
2 MOUNTING HOLES
±.020
.890
±.020
.120



303-10969-3

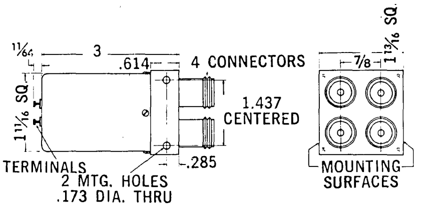
STANDARD SIZE 1P2T FAIL-SAFE AND AUXILIARY CONTACT VERSION

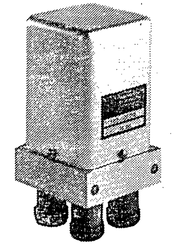

TERMINALS
2 11/16
2 1/8
(2 3/8 WITH AUX. CONTACTS)
23/64
3 CONNECTORS
2 3/8
7/8
7/8
2 MTG. HOLES
.180 DIA. THRU
1"



303-10168-3

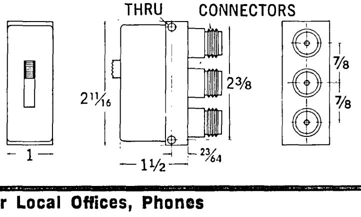
STANDARD SIZE TRANSFER

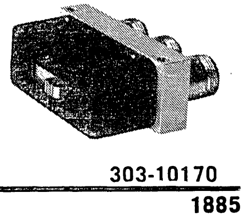

11/64
3
.614
4 CONNECTORS
1 11/16 SQ.
1.437 CENTERED
TERMINALS
2 MTG. HOLES
.173 DIA. THRU
.285
7/8
1 11/16 SQ.
MOUNTING SURFACES



303-11017-3

STANDARD SIZE 1P2T MANUAL


2 MTG. HOLES
.180 DIA. THRU
3 CONNECTORS
2 11/16
2 3/8
7/8
7/8
1
1 1/2
23/64

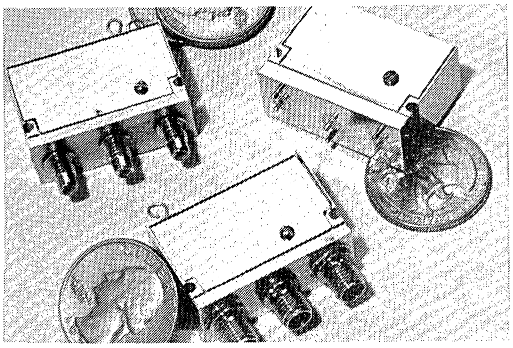


303-10170

COAXIAL SWITCHES

BUNKER RAMO AMPHENOL

MINIform / Sub-Miniature, High Power, Microwave Coaxial Switches



For Applications Requiring Minimum Size, High Power, Minimum Crosstalk and Low Cost

GENERAL CHARACTERISTICS

ELECTRICAL

Frequency Range: 0-6.0 GHz
Connectors: SMA, SUB-Minax 27 Series and Printed Circuit Pins
Switching Time: 15 ms Maximum
Switching Action: Break Before Make
Coil Resistance:
12 VDC Coil: 65 ohms, 28 VDC Coil: 250 ohms
(Also available in other DC coil voltages)
Function: 1P2T Failsafe

ENVIRONMENTAL (per MIL-S-3928B)

Temperature Range: −55°C to 100°C
Moisture Resistance: 10 Day Cycle
Shock: MIL-STD-202D, Method 202C, Test Condition A, 15 G's Peak
Vibration: MIL-STD-202D, Test Condition A, 55 to 2000 Hz at ±10 G's

RF PERFORMANCE (SMA)

VSWR
0-2 GHz: 1.1 max.
2-4 GHz: 1.2 max.
4-6 GHz: 1.3 max.
Isolation
0-1 GHz: >80 dB
1-3 GHz: >70 dB
3-6 GHz: >50 dB
Insertion Loss
0-3 GHz: 0.1 dB max.
3-5 GHz: 0.2 dB max.
5-6 GHz: 0.3 dB max.
RF Power
0.1 GHz: 400 watts
1.0 GHz: 120 watts
3.0 GHz: 70 watts
6.0 GHz: 45 watts

MECHANICAL

Life: 1 million cycles min.
Weight: 1.2 oz.

Amphenol 303 Series MINIform is the industry's most inexpensive miniature high-power, high-performance line of microwave coaxial switches — offering for the first time superior operational performance through six GHz in an economical unit weighing only 1.2 ounces.

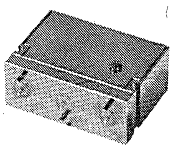
The switches are the smallest and least expensive of this type ever introduced by Amphenol and are designed to outperform all comparable offerings by industry available until now. Displacing less than one-half cubic inch volume, the tiny switches' ratings include performance through 150 watts below specified frequency limitations, offering immediate physical and operational compatibility for a host of signalling, communications and EDP matrix switching applications.

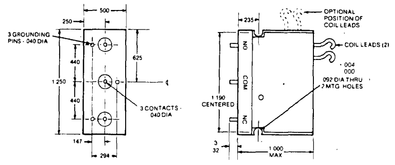
Amphenol 303 Series MINIform switches are 1P2T configurations offered in choice of three popular termination styles: SMA connectors, Amphenol SUB-Minax 27 Series connectors, or printed circuit contacts suitable for solder and solderless wrap board termination. All switches can be provided with coil voltages of 6, 12, 26, 48 and 120 VDC.

Although ideal for typical microwave applications through six GHz where 60 dB isolation is offered by new units, Amphenol's MINIform switches also offer unusually high power handling capabilities for communciations applications for the first time. Through 0 to 1.0 GHz, for example, the MINIform can switch up to 150 watts CW while maintaining maximum VSWR of only 1.1, 0.1 dB insertion loss and 80 dB minimum crosstalk attenuation. Over the range of 1.1 through 3 GHz, VSWR climbs only to 1.2 with power handling capacity of up to 70 watts CW while maintaining 75 dB minimum crosstalk attenuation and 0.1 dB maximum insertion loss.

PRINTED CIRCUIT

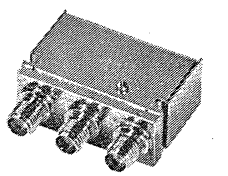
Coil Volts	AMPHENOL Part No.
12 VDC	303-10001-2
28 VDC	303-10001-3

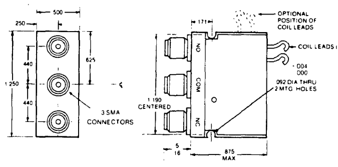




CONNECTORS (SMA shown)

Coil Volts	SMA Conn.	27 Series
12 VDC	303-10002-3	303-10003-2
28 VDC	303-10002-3	303-10003-3

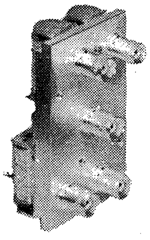


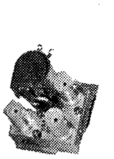


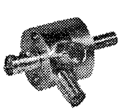
Coaxial Relays

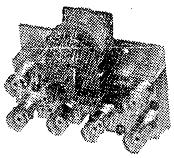
Precision coax units. Maximum time to operate and release is 20 milliseconds. Gold-plated, fine silver contacts assure reliable low-level operation. Minimum life expectancy is 1,000,000 cycles, when switch is operated at speeds of less than 10 Hz. Switches are impedance matched to 50-ohm cable, though loss is negligible with 75-ohm cable. Operation is break-before-make. All materials are corrosion resistant.

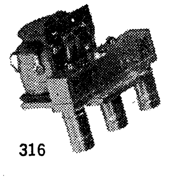
Units meet applicable portions of military connector specs as follows: BNC — Mil-C-3608 and N — Mil-C-71.

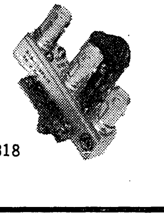

323

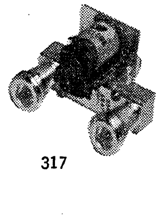

315


319


321


316


318


317

Part No.	Termination	Function	Connectors	Frequency (MHz)	RF Power (W)	Coil Volts	Coil Ohms
315-10002-3	Open	SPDT	BNC	1000	100	26 DC	280
316-10082-3	Short	SPDT	BNC	2000	100	26 DC	280
316-10082-6	Short	SPDT	BNC	2000	100	120 DC	6000
316-10102-8	Short	SPDT	BNC	2000	100	115 AC	550
317-10202-3	Short	SPDT	BNC	2000	100	26 DC	280
317-10215-8	Short	SPDT	BNC	2000	100	115 AC	550
317-10242-3	Short	SPDT	N	2000	100	26 DC	280
317-10255-8	Short	SPDT	N	2000	100	115 AC	550
318-10407-3	Open	SPDT	BNC	2000	100	26 DC	280
318-10381	Short	SPDT	BNC	2000	100	lever manual	—
318-10382-3	Short	SPDT	BNC	2000	100	26 DC	280
318-11165-3	Res.	SPDT	BNC	2000	100	26 DC	280
318-11576-8	Res.	SPDT	BNC	2000	100	115 AC	550
319-11141	Open	SPDT	BNC	2000	100	rotary manual	—
320-10931-3	Open	SPDT	N	3000	1000	26 DC	200
321-11062	Open	DPDT	BNC	1000	100	lever manual	—
321-11064-3	Open	DPDT	BNC	1000	100	26 DC	200
322-11431	Open	1P4T	BNC	3000	100	rotary manual	—
323-11651-3	Open	1P4T	BNC	1000	100	26 DC	280
322-11442	Open	1P6T	BNC	3000	100	rotary manual	—
325-11635-3	Short	1P6T	BNC	400	100	26 DC	280
325-11641-3	Open	1P6T	BNC	400	100	26 DC	280

RF SWITCHES

BUNKER RAMO AMPHENOL

Series 360 DYNAFORM FUNCTIONS AND PART NUMBERS

Conn.	Term.	Schematic	Coil Volts	SPDT Outline Dwg. A	SPDT Outline Dwg. B	DPDT Outline Dwg. C	DPDT Outline Dwg. D	Transfer Outline Dwg. E
BNC	SH	1	26 DC	360-11891-12	360-11891-13	360-11896-12	360-11896-13	
			110 DC	360-11891-34	360-11891-35	360-11896-34	360-11896-35	
			115 AC	360-11891-45	360-11891-46	360-11896-45	360-11896-46	
	NS	2	26 DC	360-11891-14	360-11891-15	360-11896-14	360-11896-15	
			110 DC	360-11891-36	360-11891-37	360-11896-36	360-11896-37	
			115 AC	360-11891-47	360-11891-48	360-11896-47	360-11896-48	
	50 Ω RT	3	26 DC	360-11891-16	360-11891-17	360-11896-16	360-11896-17	
			110 DC	360-11891-38	360-11891-39	360-11896-38	360-11896-39	
			115 AC	360-11891-49	360-11891-50	360-11896-49	360-11896-50	
	75 Ω RT	3	26 DC	360-11891-18	360-11891-19	360-11896-18	360-11896-19	
			110 DC	360-11891-40	360-11891-41	360-11896-40	360-11896-41	
			115 AC	360-11891-51	360-11891-52	360-11896-51	360-11896-52	
	95 Ω RT	3	26 DC	360-11891-20	360-11891-21	360-11896-20	360-11896-21	
			110 DC	360-11891-42	360-11891-43	360-11896-42	360-11896-43	
			115 AC	360-11891-53	360-11891-54	360-11896-53	360-11896-54	
	TRANS	4	26 DC					360-11891-22
			110 DC					360-11891-44
			115 AC					360-11891-55
TNC	SH	1	26 DC	360-11892-12	360-11892-13	360-11897-12	360-11897-13	
			110 DC	360-11892-34	360-11892-35	360-11897-34	360-11897-35	
			115 AC	360-11892-45	360-11892-46	360-11897-45	360-11897-46	
	NS	2	26 DC	360-11892-14	360-11892-15	360-11897-14	360-11897-15	
			110 DC	360-11892-36	360-11892-37	360-11897-36	360-11897-37	
			115 AC	360-11892-47	360-11892-48	360-11897-47	360-11897-48	
	50 Ω RT	3	26 DC	360-11892-16	360-11892-17	360-11897-16	360-11897-17	
			110 DC	360-11892-38	360-11892-39	360-11897-38	360-11897-39	
			115 AC	360-11892-49	360-11892-50	360-11897-49	360-11897-50	
	75 Ω RT	3	26 DC	360-11892-18	360-11892-19	360-11897-18	360-11897-19	
			110 DC	360-11892-40	360-11892-41	360-11897-40	360-11897-41	
			115 AC	360-11892-51	360-11892-52	360-11897-51	360-11897-52	
	95 Ω RT	3	26 DC	360-11892-20	360-11892-21	360-11897-20	360-11897-21	
			110 DC	360-11892-42	360-11892-43	360-11897-42	360-11897-43	
			115 AC	360-11892-53	360-11892-54	360-11897-53	360-11897-54	
	TRANS	4	26 DC					360-11892-22
			110 DC					360-11892-44
			115 AC					360-11892-55
N	SH	1	26 DC	360-11890-12	360-11890-13	360-11895-12	360-11895-13	
			110 DC	360-11890-34	360-11890-35	360-11895-34	360-11895-35	
			115 AC	360-11890-45	360-11890-46	360-11895-45	360-11895-46	
	NS	2	26 DC	360-11890-14	360-11890-15	360-11895-14	360-11895-15	
			110 DC	360-11890-36	360-11890-37	360-11895-36	360-11895-37	
			115 AC	360-11890-47	360-11890-48	360-11895-47	360-11895-48	
	50 Ω RT	3	26 DC	360-11890-16	360-11890-17	360-11895-16	360-11895-17	
			110 DC	360-11890-38	360-11890-39	360-11895-38	360-11895-39	
			115 AC	360-11890-49	360-11890-50	360-11895-49	360-11895-50	
	75 Ω RT	3	26 DC	360-11890-18	360-11890-19	360-11895-18	360-11895-19	
			110 DC	360-11890-40	360-11890-41	360-11895-40	360-11895-41	
			115 AC	360-11890-51	360-11890-52	360-11895-51	360-11895-52	
	95 Ω RT	3	26 DC	360-11890-20	360-11890-21	360-11895-20	360-11895-21	
			110 DC	360-11890-42	360-11890-43	360-11895-42	360-11895-43	
			115 AC	360-11890-53	360-11890-54	360-11895-53	360-11895-54	
	TRANS	4	26 DC					360-11890-22
			110 DC					360-11890-44
			115 AC					360-11890-55

COIL CHARACTERISTICS

@ 20°C

Nominal Voltage	Operating Range	Resistance, ohms ±10%
26 DC	20 - 32	260 ohms
110 DC	85 - 130	5100 ohms
115 AC (50 - 400 Hz)	90- 130	1500 ohms thru diodes

ELECTRICAL CHARACTERISTICS

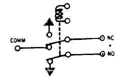
Conn.	Term.	Typical VSWR (Frequency GHz) .03	0.2	0.4	1.0	2.0	4.0	6.0	Typical Crosstalk - db (Frequency GHz) .03	0.2	0.4	1.0	2.0	4.0	6.0
BNC	SH	1.03	1.06	1.08	1.10	1.20	1.25	1.35	70	66	60	53	42	30	20
	NS	1.03	1.06	1.08	1.10	1.21	1.27	1.40	50	45	41	30	27	24	18
	50 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
	75 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
	95 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
	TRANS	1.05	1.10	1.15	1.20	1.50	—	—	45	38	32	24	17	—	—
TNC	SH	1.03	1.06	1.08	1.10	1.20	1.25	1.35	70	66	60	53	42	35	25
	NS	1.03	1.06	1.08	1.10	1.21	1.27	1.40	51	43	41	30	27	26	21
	50 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
	75 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
	95 Ω RT	1.03	1.06	1.08	1.14	1.25	1.50	—	40	35	31	24	17	14	—
	TRANS	1.05	1.10	1.15	1.20	1.50	—	—	45	38	32	24	17	—	—
N	SH	1.03	1.04	1.07	1.10	1.15	1.18	1.30	70	66	60	53	42	35	25
	NS	1.03	1.04	1.07	1.10	1.17	1.20	1.35	51	43	41	30	27	26	21
	50 Ω RT	1.03	1.05	1.08	1.12	1.18	1.50	—	41	35	31	24	17	14	—
	75 Ω RT	1.03	1.05	1.08	1.12	1.18	1.50	—	39	32	30	23	16	14	—
	95 Ω RT	1.03	1.05	1.08	1.12	1.18	1.50	—	37	31	29	22	15	14	—
	TRANS	1.05	1.10	1.15	1.20	1.50	—	—	45	38	32	24	17	—	—

NOTE: High frequency electrical characteristics are typical values (not maximum) as measured in a 50 ohm circuit and may be used for most design analyses. For more exacting applications, maximum values in the frequency range may be obtained upon request. SWR measured to common with a matched 50 ohm termination. **For additional specifications request Amphenol RF Switches Catalog SS-1.**

SCHEMATICS

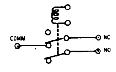
1

SHORTING



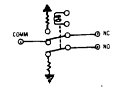
2

NON-SHORTING



3

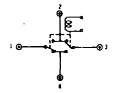
RESISTOR TERMINATED



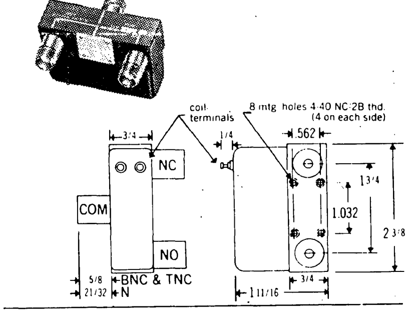
4

TRANSFER

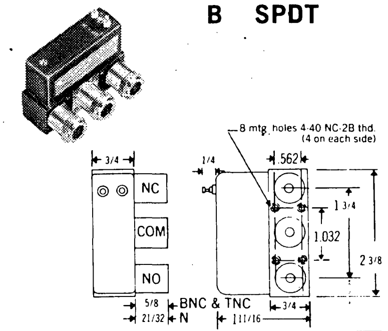
NC	NO
1 - 4	1 - 2
2 - 3	3 - 4



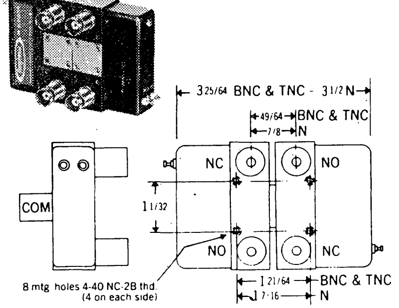
A SPDT


coil terminals
8 mtg holes 4-40 NC-2B thd. (4 on each side)
3/4
1/4
.562
NC
COM
NO
1 3/4
1.032
2 3/8
5/8 BNC & TNC
21/32 N
1 11/16
3/4

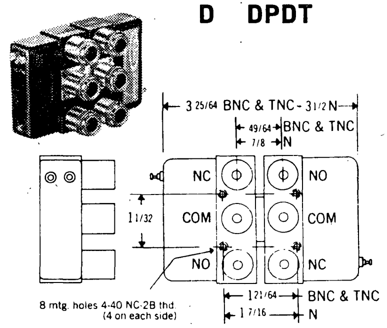
B SPDT


8 mtg. holes 4-40 NC-2B thd. (4 on each side)
3/4
1/4
.562
NC
COM
NO
1 3/4
1.032
2 3/8
5/8 BNC & TNC
21/32 N
1 11/16
3/4

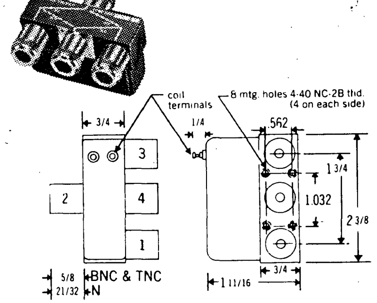
C DPDT


3 25/64 BNC & TNC - 3 1/2 N
49/64 BNC & TNC
7/8 N
NC
NO
COM
1 1/32
NO
NC
8 mtg holes 4-40 NC-2B thd. (4 on each side)
1 21/64 BNC & TNC
1 7/16 N

D DPDT


3 25/64 BNC & TNC - 3 1/2 N
49/64 BNC & TNC
7/8 N
NC
NO
1 1/32
COM
COM
NO
NC
8 mtg. holes 4-40 NC-2B thd. (4 on each side)
1 21/64 BNC & TNC
1 7/16 N

E TRANSFER


coil terminals
8 mtg. holes 4-40 NC-2B thd. (4 on each side)
3/4
1/4
.562
3
2
4
1
1 3/4
1.032
2 3/8
5/8 BNC & TNC
21/32 N
1 11/16
3/4

PUSHBUTTON SWITCHES & KEYBOARDS

BUNKER RAMO AMPHENOL

WIDE CHOICE OF DISPLAY SCREENS

SINGLE SECTION DISPLAY SCREENS

Single-section type. Has transparent cap, transparent legend insert and translucent colored base.

Amphenol Part Number 1 Piece	 3 Piece	Color
602-A101	602-A201	WHITE
602-A102	602-A202	RED
602-A103	602-A203	YELLOW
602-A104	602-A204	GREEN
602-A105	602-A205	BLUE

3 PIECE DISPLAY SCREENS

Two-section types. Have transparent caps and legend inserts. Translucent colored bases have either lateral or longitudinal split. Silicone rubber light baffles prevent spillage from one section to another.

Amphenol Part Number Lateral	 Longitudinal	Colors
602-A306	602-A406	WHITE-WHITE
602-A307	602-A407	WHITE-RED
602-A308	602-A408	WHITE-YELLOW
602-A309	602-A409	WHITE-GREEN
602-A310	602-A410	WHITE-BLUE
602-A311	602-A411	RED-RED
602-A312	602-A412	RED-YELLOW
602-A313	602-A413	RED-GREEN
602-A314	602-A414	RED-BLUE
602-A315	602-A415	YELLOW-YELLOW
602-A316	602-A416	YELLOW-GREEN
602-A317	602-A417	YELLOW-BLUE
602-A318	602-A418	GREEN-GREEN
602-A319	602-A419	GREEN-BLUE
602-A320	602-A420	BLUE-BLUE

Three and four section types. Available in any combination of white, red, yellow, green and blue.

LEGEND SERVICE

AMPHENOL provides legend service on the inserts supplied with three-piece screens. Contact your AMPHENOL representative for ordering information.

COLOR FILTERS

Silicon rubber filters are available to fit over the lamp for projected color.

Amphenol Part Number	Color
602-F11	WHITE
602-F12	RED
602-F13	YELLOW
602-F14	GREEN
602-F15	BLUE
602-F16	AMBER

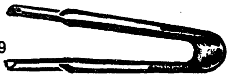
LAMPS AND LAMP VOLTAGES

Each Series 602 assembly will accept four T 1¾ miniature flanged base lamps available in 6, 14 and 28 volts; long-life or standard.

Voltage	6	14	28
Long-Life	602-K11	602-K12	602-K13
Standard	602-K14	602-K15	602-K16

LAMP AND FILTER TOOL

Part Number 602-P3T09



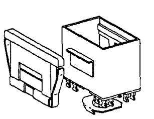
INDICATORS

Used when an indicator light is desired, without switching function. Fixed bracket holds the display screen at the same height as the operator indicator unit. Available in either barrier mount or flange mount styles; they utilize the same panel cutout, screens and barriers as operator indicators.

Amphenol Part Number Barrier Mounted	 Flange Mounted	Barrier Type	Number of Sockets
602-D102	602-D302	Short	A and C
602-D104	602-D304	Short	A, B, C and D
602-D202	602-D402	Long	A and C
602-D204	602-D404	Long	A, B, C and D

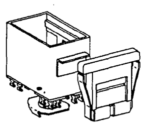
OPERATOR-INDICATORS

Units accept switch modules, provide both indication and switching. Barriers serve as mounting devices and separate the display screens to prevent accidental operation. Flange mounted units are supplied with spring clip mounting devices ready-attached. Can be individually installed or replaced.



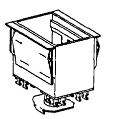
LONG BARRIER MOUNTS

Part Number	Number of Sockets
602-B202	A and C
602-B204	A, B, C and D



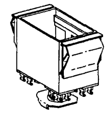
SHORT BARRIER MOUNTS

Part Number	Number of Sockets
602-B102	A and C
602-B104	A, B, C and D



LONG SIDE FLANGE MOUNTS

Part Number	Number of Sockets
602-B402	A and C
602-B404	A, B, C and D



SHORT SIDE FLANGE MOUNTS

Part Number	Number of Sockets
602-B302	A and C
602-B304	A, B, C and D

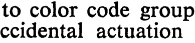
LENGTH OF PANEL CUTOUT

Number of Units	Type of Operator Indicator Long Barrier*	 Short Barrier*	 Long Flange*	 Short Flange*
1	1.187	1.421	1.102	.862
2	2.197	2.677	2.195	1.717
3	3.212	3.932	3.290	2.570
4	4.224	5.186	4.384	3.424
5	5.240	6.440	5.479	4.279
6	6.256	7.697	6.574	5.134
7	7.268	8.949	7.668	5.988
8	8.283	10.207	8.763	6.843
9	9.299	11.461	9.857	7.697
10	10.311	12.713	10.952	8.552
11	11.327	13.968	12.046	9.406
12	12.342	16.224	13.140	10.260

* Nominal dimensions in inches, tolerance ±.010. Add .165 inch to length for each optional spacing barrier used with flange mount units.

MOUNTING BARRIERS

Molded color barriers are available in two panel thickness ranges.



Barrier Type	Panel Thick.	Black	Gray	White	Red
Short	0.06″ to 0.19″	602-E10B	602-E10G	602-E10W	602-E10R
	0.19″ to 0.31″	602-E30B	602-E30G	602-E30W	602-E30R
Long	0.06″ to 0.19″	602-E20B	602-E20G	602-E20W	602-E20R
	0.19″ to 0.31″	602-E40B	602-E40G	602-E40W	602-E40R

OPTIONAL SPACING BARRIERS

Spacing barriers, not necessary for mounting are used to color code groupings and to prevent accidental actuation of adjacent switches.

Barrier Type	Black	Gray	White	Red
Short	602-H10B	602-H10G	602-H10W	602-H10R
Long	602-H20B	602-H20G	602-H20W	602-H20R

AMPHENOL KEYBOARDS

Most keyboard applications have very special requirements. Surprisingly few are alike. So we build a custom keyboard—one that's made to meet your specs in every way. Just call your Amphenol Sales Engineer and tell him what you need, and we'll take it from there.

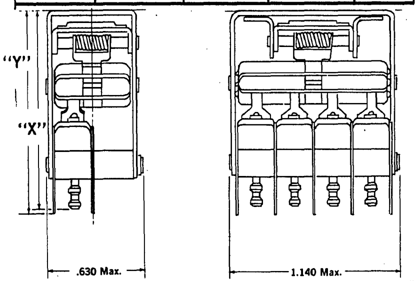
MULTI-SPDT SWITCH MODULES

Electrical ratings:

Voltage	Non-inductive Load (A) Resistive Load Normally Closed	 Normally Open	 Lamp Load Normally Closed	 Normally Open
110-125 VAC 220-250 VAC	5 5		1.5 1	0.7 0.5
28 VDC	5	5	3	3

Voltage	Inductive Load (A) Inductive Load Normally Closed	 Normally Open	 Motor Load Normally Closed	 Normally Open
110-125 VAC 220-250 VAC	4 4		2.5 1.5	1.3 0.8
28 VDC	4	4	3	3

Alternate Action Amphenol Part Number Silver Contacts	 Gold Contacts	Momentary Action Amphenol Part Number Silver Contacts	 Gold Contacts	No. of Circuits
602-C151	602-C152	602-C111	602-C112	1
602-C161	602-C162	602-C121	602-C122	2
602-C171	602-C172	602-C131	602-C132	3
602-C181	602-C182	602-C141	602-C142	4



Switch Type	Dim. "X"	Dim. "Y"
Alternate	1.300	1.330
Momentary	1.000	1.040

COMPACT SPDT-DPDT SWITCH MODULES

Miniature units with quick-connect terminals for fast, easy wiring. Assemblies built up from short flange operator units should have spacing barriers between them to prevent mechanical interference.

Electrical ratings:

Rated Voltage	Non-inductive Load (A) Resistive Load	 Lamp Load	Inductive Load (A) Inductive Load	 Motor Load
110-125 VAC	15	3	10	4
220-250 VAC	15	2	10	3
28 VDC	10	4	6	4

Amphenol Part Number	Number of Circuits
602-C211	1
602-C221	2

Note: Maximum depth of switch behind panel when completely assembled is 3.047″.

601 SERIES — KEYBOARD SWITCH

Variations	Part No.
Spadetop for sloped keyboard	601-R111A
Octagonal top for sloped keyboard	601-R211A
Spadetop for stepped keyboard	601-R311A

Other variations are available.
Contact your sales engineer for details.

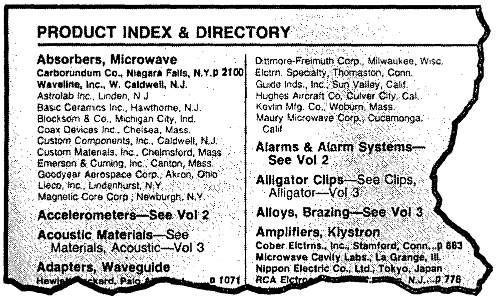
Electrical Characteristics

Contact resistance (initial):	0.200 ohms max.
Contact rating (SPNO):	
Max. contact voltage:	125 vdc (resistive)
Max. contact current:	500 ma dc (resistive)
Max. contact power:	10 watts (resistive)
Voltage breakdown:	300 volts ac. 60 Hz

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y. p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N J
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass
Emerson & Cuming, Inc., Canton, Mass.
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp , Newburgh, N.Y.

Accelerometers—See Vol 2

Acoustic Materials—See Materials, Acoustic—Vol 3

Adapters, Waveguide

Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif

Alarms & Alarm Systems—See Vol 2

Alligator Clips—See Clips, Alligator—Vol 3

Alloys, Brazing—See Vol 3

Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. .. p 883
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan

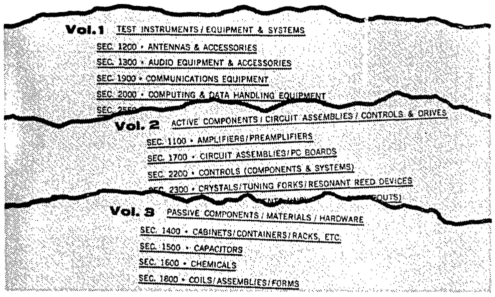
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT

Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
SEC. 2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES

Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

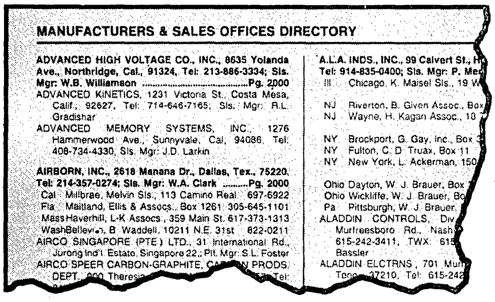
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal, 94086, Tel: 408-734-4330, Sls. Mgr: J.D. Larkin

AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St. 617-373-1313
Wash Bellevue, B Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE) LTD., 31 International Rd., Jurong Ind'l. Estate, Singapore 22.; Plt. Mgr: S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C PRODS. DEPT. Theresi Tel:

A.L.A. INDS., INC., 99 Calvert St.,
Tel: 914-835-0400; Sls. Mgr: P. Me
Ill Chicago, K. Maisel Sls., 19 W

NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18

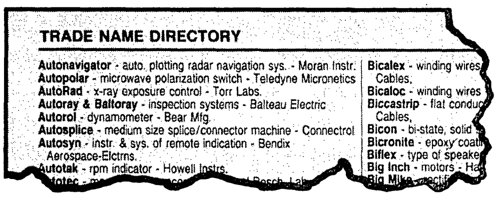
NY Brockport, G. Gay, Inc., Box
NY Fulton, C. D Truax, Box 11
NY New York, L. Ackerman, 150

Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer, Bo
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-3411, TWX: 615 Bassler
ALADDIN ELCTRNS , 701 Mur 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.

Bicalex - winding wires Cables,
Bicaloc - winding wires
Biccastrip - flat condu Cables,
Bicon - bi-state, solid
Bicronite - epoxy coati
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

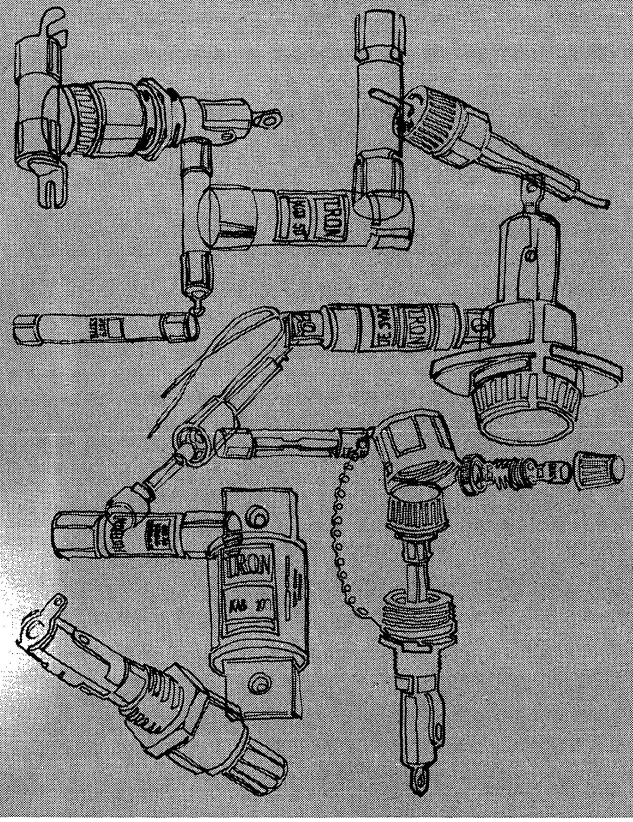
if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

BUSS Quality

Small Dimension

FUSES and FUSEHOLDERS



FOR THE PROTECTION OF ALL TYPES OF ELECTRONIC & ELECTRICAL CIRCUITS & DEVICES

The complete BUSS line of fuses includes dual-element "slow-blowing," single-element "quick-acting" and signal or visual indicating types . . . in sizes from 1/500 amp. up—plus a companion line of fuse clips, blocks and holders.

Only a representative listing is shown here of the thousands of different types and sizes of fuses and holders available from BUSS.

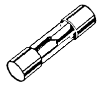
All standard items are easily obtained through your BUSS distributor—but if you don't find what you want, get in touch with us.

When special fuses, fuse clips, fuse blocks or fuseholders are required, our staff of fuse engineers is at your service to help in selecting or designing the fuse or fuse mounting best suited to your requirements.

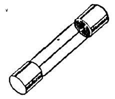
For detailed information on the complete BUSS line write for BUSS bulletin SFB.

BUSSMANN MFG. DIVISION, *McGraw-Edison Co.* **St. Louis, Mo. 63107**

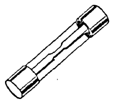
For fuses and fuseholders of unquestioned high quality. . .



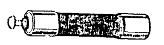
BUSS AGX FAST ACTING FUSES
¼ x 1 inch, glass tube, "quick-acting" type, 1/500 to 2 amp.



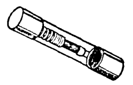
BUSS AGC AND MTH GLASS TUBE FUSES
¼ x 1¼ inch. AGC: 2½, 3 amps. MTH: 4, 5 or 6 amp.



BUSS AGC GLASS TUBE FUSES
¼ x 1¼ inch. 4 to 30 amp.

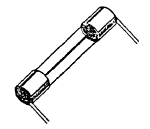


BUSS INDICATING FUSES
¼ x 1¼ inch, ¾ to 30 amp., and 1 3/32 x 1½ inch, 1/10 to 30 amp. Silverplated pin pops out when fuse is blown and provides quick, positive identification of faulted circuit . . . by visual signal, by activating an alarm, or both.

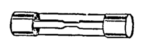


MDL FUSETRON DUAL-ELEMENT FUSES
¼ x 1¼ inch, glass tube "slow-blowing" 1/100 to 30 amp.

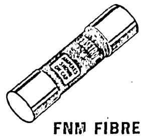
BUSS ABC CERAMIC TUBE FUSES
¼ x 1¼ inch, ¼ to 30 amp. For circuits having fault current capacity up to 25,000 amp. at 125 volts or 10,000 amps. at 250 volts.



BUSS GJV PIGTAIL FUSES
¼ x 1½ inch, glass tube, with 1¼ inch leads of No. 20 tinned wire. 1/16 to 6 amp.

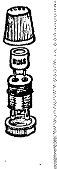


BUSS SFE STANDARD FUSES
⅝ to 1 7/16 inches in length, glass tube, 4 to 30 amp. Fuses of different amperages are of different lengths — to make it impossible to insert too large a size.

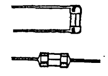


FNM FIBRE TUBE FUSETRON DUAL-ELEMENT FUSES
1 13/32 x 1½ inch, dual-element "slow-blowing" 1/10 to 30 amp.

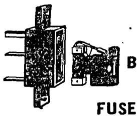
FNA SIGNAL OR VISUAL INDICATING FUSETRON DUAL-ELEMENT FUSES
1/10 to 10 amp. Silver-plated pin pops out when fuse is blown and provides quick, positive identification of faulted circuit . . . by visual signal, by activating an alarm, or both.



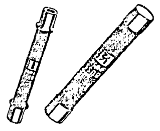
BUSS SUB-MINIATURE GMW FUSE AND HWA FUSEHOLDER
Fuse size only .270 x .250 inches. Fuse has window for visual inspection of element. Fuse may be used with or without holder. 1/200 to 5 amps. Fuses and holders available to meet military specifications.



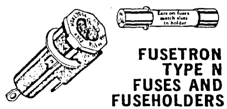
GFA TRON SUB-MINIATURE PIGTAIL FUSES
Body size only .145 x .300 inches. Glass tube construction permits visual inspection of element. Hermetically sealed. Twenty-three ampere sizes from 1/100 thru 15 amps.



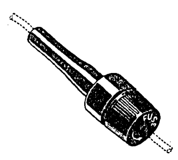
BUSS GMT FUSES — HLT FUSEHOLDERS
Signal Indicating, Alarm Activating. For multiple circuit apparatus where space is at a premium. Holders take panel mounting space of only ¼ inch horizontal by 1 15/32 inches vertical. 18/100 to 10 amp.



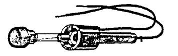
BUSS HIGH VOLTAGE FUSES
For protection of circuits up to 20 KW on d.c. and 30 KVA on a.c. 1/16 to 2 amp.



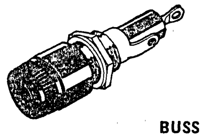
FUSETRON TYPE N FUSES AND FUSEHOLDERS
¼ by 1¼ inch, 0 to 1¼ amps. and ¼ x 1 7/16 inch, 1-3/10 to 7 amp. Glass tube, "slow-blowing". Especially suitable for protection of TV. Ears on fuses match slots in holder to safeguard against use of wrong size and type of fuse.



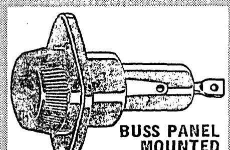
BUSS IN-THE-LINE FUSEHOLDERS
For ¼ inch fuses, ⅝ to 1¼ inches long.



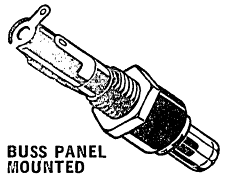
BUSS IN-THE-LINE PANEL-MOUNTED FUSE & HOLDER COMBINATIONS
HLR holder makes it simple to protect wide variety of devices or equipment, including fluorescent fixtures. Should fuse open, entire fuse-knob assembly is replaced.



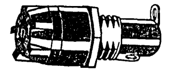
BUSS PANEL MOUNTED FUSEHOLDERS
Non-Indicating Series HJ. HK and HCM. For ¼ x 1, ¼ x 1¼ and 9/32 x 1¼ inch fuses.



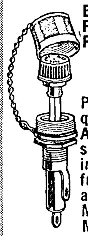
BUSS PANEL MOUNTED FUSEHOLDERS. SERIES HPC
For 13/32 x 1⅜ and 13/32 x 1½ inch fuses. Also available in military type.



BUSS PANEL MOUNTED FUSEHOLDERS
Lamp Indicating Series HK and HJ. For ¼ x 1 and ¼ x 1¼ inch fuses

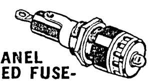


BUSS SPACE SAVER PANEL MOUNTED FUSEHOLDERS
Fuseholder only 1⅝ inches long . . . extends just one inch behind front of panel. Takes ¼ x 1¼ inch fuses. Holder rated at 15 ampere for any voltage up to 250.



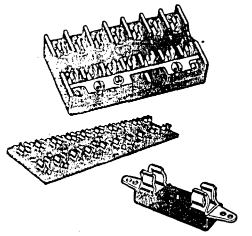
BUSS SHIELDED PANEL MOUNTED FUSEHOLDERS

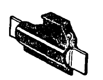
Prevent radio frequency interference. Available to take two size fuses ¼ x 1¼ inch and ¼ x 1 inch fuses. Meet performance specs of both MIL-1-6181D and MIL-F-19207B.



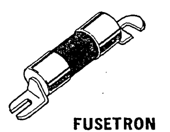
BUSS PANEL MOUNTED FUSEHOLDERS. VISUAL INDICATING SERIES HLD.
For ¼ x 1¼ inch BUSS GBA fuses (or GLD fuses) ¾ to 5 amps. Transparent knob permits visual indicating pin on open fuse to be seen.

BLOCKS FOR BUSS FUSES
All types available for every application. Single pole, multiple pole, small base, full base, molded base, laminated base, porcelain base for fuses from ¼ x ⅝ inches up. Also signal fuse blocks and special blocks of all types.





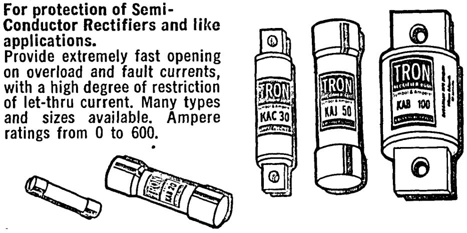
BUSS AIRCRAFT FUSES
Mechanical Indicating — Limiter type. Meet rigorous requirement of high speed, high performance aircraft. 1 to 60 amp.



FUSETRON ACK STUD MOUNTED FUSES
1 to 300 amp., dual-element type.

LIMITRON KTK HIGH INTERRUPTING CAPACITY FUSES
13/32 x 1½ inch, 1/10 to 30 amp. For circuits having fault current capacity up to 100,000 amps. AC only.

TRON RECTIFIER FUSES.
For protection of Semi-Conductor Rectifiers and like applications.
Provide extremely fast opening on overload and fault currents, with a high degree of restriction of let-thru current. Many types and sizes available. Ampere ratings from 0 to 600.



SUPPLIED THE ECONOMICAL WAY
. . . THRU DISTRIBUTORS

. . . for every protection need, insist on **BUSS QUALITY** FUSES

THE SWITCH IS ON TO C&K.

SUBMINIATURE TOGGLE, ROCKER AND PADDLE HANDLE SWITCHES

The switches shown below are available in SPDT, 2PDT, 3PDT and 4PDT configurations in about thirty different models with a wide variety of options. All made-in-America, of course. Comprehensive information is immediately available upon request.

GENERAL SPECIFICATIONS:

Contact Ratings:

Coin Silver Contacts — 5 amps resistive load @ 115 VAC or 28 VDC, or 2 amps @ 250 VAC.

Brass contacts with gold over nickel plate — 0.4 volt-amps @ 20V Max. (AC or DC).

Coin Silver Contacts with gold over nickel plate — 5 amps resistive load @ 115 VAC or 28 VDC, or 2 amps @ 250 VAC — and 0.4 volt-amps Max. @ 20V Max. (AC or DC).

Electric Life: 100,000 make-and-break cycles minimum on all models ending in 01 only; all other models 40,000 cycles.

Initial Contact Resistance For Silver: 10 milliohms Max. @ 2-4 VDC, 1 amp.

Insulation Resistance: 1,000 megohms minimum.

Dielectric Strength: 1,000 volts rms @ sea level.

Case Material: General purpose phenolic.

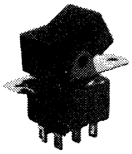
Operating Lever: Bright chrome-plated brass.

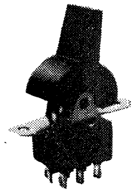
Mounting Bushing: Cadmium w/clear chromate over brass.

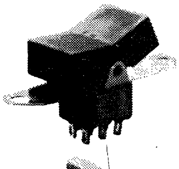
Housing: Stainless Steel.

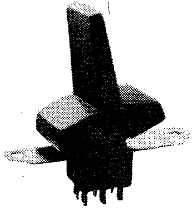
Standard Hardware Supplied: 2 hex mounting nuts; 1 internal tooth lockwasher; 1 locking ring.

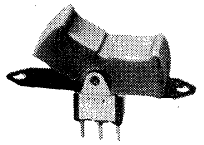
Basic Models available with UL Listing.

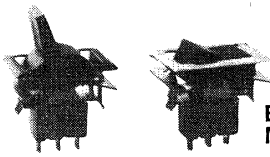

J-1
Rocker

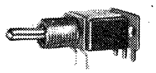

J-2
Paddle Handle

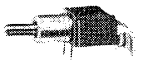

J-3
Rocker

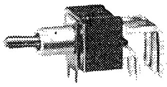

J-4
Paddle Handle

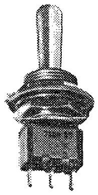

J-10
Rocker

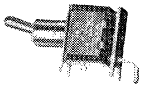

BEZEL MOUNTING

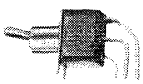

R
Right Angle
Mounting, P.C.
SPDT

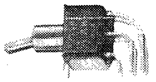

A
Right Angle
Mounting SPDT

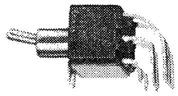

A
Right Angle
Mounting DPDT

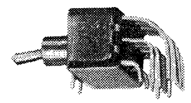

T
$^{15}/_{32}$" Bushing
w/Large Toggle

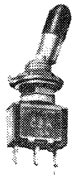

VW
Right Angle
Mounting, P.C.
SPDT

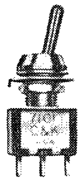

AV
Vertical
Mounting SPDT

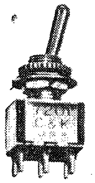

AV
Vertical
Mounting DPDT

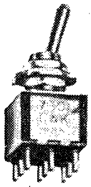

AV
Vertical
Mounting 3PDT

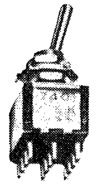

AV
Vertical
Mounting 4PDT

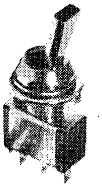

K
Locking Lever

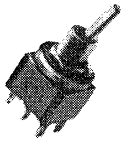

7101
SPDT


7201
DPDT


7301
3PDT


7401
4PDT


P
Flatted


CKW
Splashproof

C&K COMPONENTS, INC.,

Yours for the asking: Rotary Printswitches, Catalog 900
Subminiature and Microminiature Momentary Pushbutton Switches, Catalog 800
Subminiature Toggle, Rocker and Paddle Handle Switches, Catalog 700

SUBMINIATURE BUTT CONTACT SPST MOMENTARY PUSHBUTTON SWITCHES

GENERAL SPECIFICATIONS:

Contact Ratings: Coin Silver Contacts — 1 amp resistive load @ 115 VAC or 28 VDC or 0.5 amps @ 250 VAC, or Brass Contacts with gold over nickel plate — 0.4 volt-amps Max. @ 20 V Max. (AC or DC).

Insulation Resistance: 10,000 megohms, Min.

Dielectric Strength: 1,000 volts rms at sea level.

Electric Life: 1,000,000 make-and-break cycles.

Initial Contact Resistance: 10 milliohms, Max.

Terminal Type: Solder.

Mounting Hole: ¼" Dia.

MATERIALS AND FINISHES:

Bushing: Brass, Cadmium Plated with Clear Chromate Finish.

Mounting Nut: Brass, Bright Nickel Plated. Hex nut is standard. On request, panel dress nut may be substituted at no extra charge.

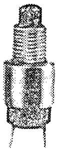
Lockwasher, Internal Tooth: Bright Nickel Plated CRS.

Base: General Purpose Phenolic (Red).

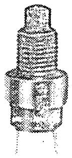
Pushbutton: General Purpose Phenolic. Black supplied unless otherwise specified.

Contacts and Terminals:

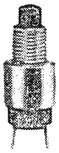
1. Coin Silver Standard
2. For ½ hd. brass with 100 millionths Min. Gold over 20 millionths Min. Nickel, add "B" suffix.
3. For Coin Silver (90% Ag 10% Cu) with 100 millionths Min. Gold over 20 millionths Min. Nickel, add "G" suffix.



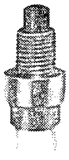
8531
N.O. with Overtravel
Total Travel: .110
Overtravel: .020 Min.
Actuation Force: 8 oz. ±4



8532
N.O.
Total Travel: .060
Actuation Force: 10 oz. ±4



8533
N.C. with Pretravel
Total Travel: .055
Pretravel: .020 Min.
Actuation Force: 8 oz. ±4



8534
N.C.
Total Travel: .055
Total Travel: .040
Actuation Force: 8.5 oz. ±4

MICROMINIATURE BUTT CONTACT SPST MOMENTARY PUSHBUTTON SWITCHES

GENERAL SPECIFICATIONS:

Insulation Resistance: 10,000 megohms Min.

Dielectric Strength: 500 volts rms at sea level.

Electric Life:
1,000,000 make-and-break cycles (8631)
250,000 make-and-break cycles (8633)
100,000 make-and-break cycles (8632)

Initial Contact Resistance: 10 milliohms Max.

Terminal Type: Solder.

Mounting Hole: 11/64" Dia.

MATERIALS AND FINISHES:

Bushing: Brass, Cadmium Plated with Clear Chromate finish.

Mounting Nut: Brass, Bright Nickel finish.

Base: General Purpose Phenolic (Red).

Pushbutton: General Purpose Phenolic. Black supplied unless otherwise specified.

Contacts and Terminals:

1. Coin Silver Standard.
2. For ½ hd. brass with 100 millionths Min. Gold over 20 millionths Min. Nickel, add "B" suffix.
3. For Coin Silver (90% Ag 10% Cu) with 100 millionths Min. Gold over 20 millionths Min. Nickel, add "G" suffix.

8631
N.O.
Total Travel: .040 ±.015
Actuation Force: 5 oz. ±3

Contact Ratings: Coin Silver Contacts ½ amp resistive load @ 115 VAC or 28 VDC; or ¼ amp @ 250 VAC.

8632
N.O. with Overtravel
(0.15 Min. O.T.)
Total Travel: .080 ±.025
Actuation Force: 5 oz. ±3

Contact Ratings: Coin Silver Contacts ½ amp resistive load @ 115 VAC or 28 VDC; or ¼ amp @ 250 VAC.

8633
N.C.
Total Travel: .040 ±.015
Actuation Force: 5 oz. ±3

Contact Ratings: Coin Silver Contacts ¼ amp resistive load @ 115 VAC or 28 VDC; or ⅛ amp @ 250 VAC.

MOMENTARY PUSHBUTTON SWITCHES — SUBMINIATURE STANDARD CONFIGURATIONS

GENERAL SPECIFICATIONS:

Contact Ratings: Gold contact surfaces on copper alloy terminals (epoxy sealed terminals are standard). 1 ampere resistive load @ 115 VAC — 28 VDC. Designed for use in dry (very low energy) circuits.

Insulation Resistance: 1000 megohms minimum.

Dielectric Strength: 1000 volts rms at sea level.

Electric Life: 60,000 cycles minimum at full load.

Mechanical Life: 100,000 make-and-break cycles minimum.

Max. Allowable Force on Plunger: 10 lb.

MATERIALS AND FINISHES:

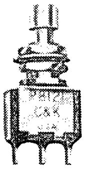
Pushbutton: Nylon plunger and cap.

Mounting Bushing: Cadmium w/clear chromate over brass. High torque to withstand 12 in.-lbs. with no distortion or loosening of parts.

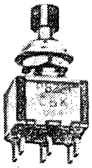
Housing: Stainless Steel.

Case Material: General purpose phenolic.

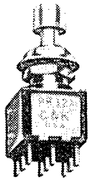
Standard Hardware Supplied: 2 Hex mounting nuts. 1 Internal lockwasher, 1 Locking ring. On request, 1 hex nut, and 1 special nut may be substituted at no charge.



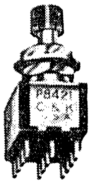
8121
SPDT



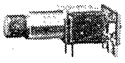
8221
DPDT



8321
3PDT



8421
4PDT



8121
R

103 Morse Street, Watertown, MA. 02172 (617) 926-0800 TWX: 710 327 0460

CTS CORPORATION ELKHART, INDIANA

Rotary Selector Switches

WHY ENGINEERS SPECIFY CTS ROTARY SWITCHES

CTS Reliability. The heart of selector switch reliability is the wafer. CTS offers two wafers with uniquely reliable characteristics. The CTS selector switch 212 wafer is of a molded, glass alkyd, rivet-free construction which will not break if dropped or jarred. It eliminates mechanical shifting of stator circuitry and terminals and allows the construction of more compact switches. Automated manufacture provides unprecedented uniformity. In each production run, all switches are identical, terminal placement is exact and permanent—the result is trouble-free assembly into your circuit. The CTS 216 wafer employs the more conventional "clip" terminals but utilizes unbreakable glass reinforced alkyd for both the rotor and stator. The precision molded stator incorporates strut spacers to evenly space the contacts and eliminate radial shifting as well as a rib design to increase insulation resistance. Tight quality control on both wafers and detents from the raw material stage through final assembly and packaging assures you of the fine quality and reliability associated with all CTS products.

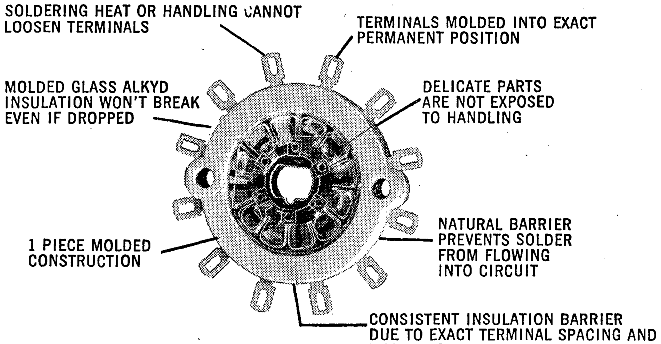
CTS Design Flexibility. CTS selector switches provide thousands of variations of shorting and non-shorting circuitry including mixed shorting and non-shorting circuit combinations within the same pole. Design flexibility's further enhanced by a wide selection of index assemblies, two wafer constructions which can be intermixed on the same switch and attached CTS manufactured power switches and variable resistors. CTS truly offers a one-source supply for the complete switch package.

CTS Military Switches. CTS types 211, 212 and 215 are available to meet the requirements of MIL-S-3786C, type SRO-3/D.

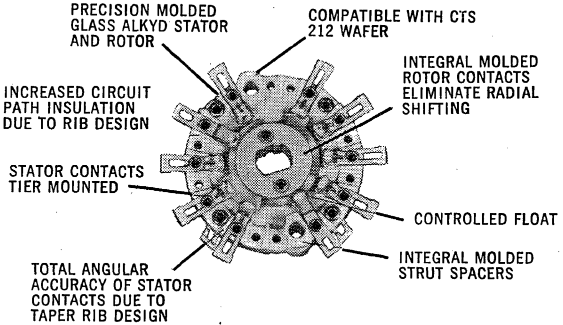
CTS Switches are Made to Your Exact Specifications. All orders received for CTS selector switches are handled individually and are custom manufactured to your exact specifications. The majority of applications can be met with switches which are custom designed from parts shown in this catalog, giving you the advantages of lower cost and faster delivery.

On special applications our engineering staff is at your disposal for designing the best and most economical switch to meet your exact requirements.

WAFERS


SOLDERING HEAT OR HANDLING CANNOT LOOSEN TERMINALS
TERMINALS MOLDED INTO EXACT PERMANENT POSITION
MOLDED GLASS ALKYD INSULATION WON'T BREAK EVEN IF DROPPED
DELICATE PARTS ARE NOT EXPOSED TO HANDLING
NATURAL BARRIER PREVENTS SOLDER FROM FLOWING INTO CIRCUIT
1 PIECE MOLDED CONSTRUCTION
CONSISTENT INSULATION BARRIER DUE TO EXACT TERMINAL SPACING AND MOLDED GLASS ALKYD MATERIAL

212 WAFER

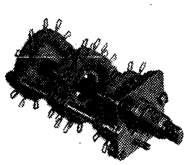

PRECISION MOLDED GLASS ALKYD STATOR AND ROTOR
COMPATIBLE WITH CTS 212 WAFER
INTEGRAL MOLDED ROTOR CONTACTS ELIMINATE RADIAL SHIFTING
INCREASED CIRCUIT PATH INSULATION DUE TO RIB DESIGN
STATOR CONTACTS TIER MOUNTED
CONTROLLED FLOAT
INTEGRAL MOLDED STRUT SPACERS
TOTAL ANGULAR ACCURACY OF STATOR CONTACTS DUE TO TAPER RIB DESIGN

216 WAFER

DETENTS

STAR WHEEL DETENT

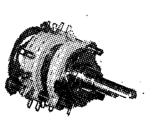
Type 211



HIGHEST QUALITY • POSITIVE FEEL • 250,000 CYCLE LIFE • FREE FROM END AND SIDE THRUST • HIGH SWITCHING TORQUE 15—60" OZ.

DIE CAST DETENT

Type 222



LOWEST COST OF ALL DETENTS • LOW COST STAKED CONSTRUCTION • AVAILABLE FOR 1 AND 2 WAFER SWITCHES • 20,000 CYCLE LIFE • SWITCHING TORQUE 18 — 40" OZ.

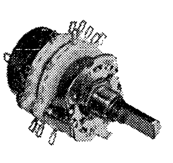
Adjustable stops available on all detents except Type 222.

Description	Series	Data Sheet	Order Form
1⅛" diameter rotary wafer switch with star wheel detent	211	4001	Keene
1⅛" diameter rotary wafer switch with hill and valley detent	212	4001	Elkhart*
1⅛" diameter rotary wafer switch with double ball detent	215	4001	Keene
1¼" diameter rotary wafer switch with hill and valley detent	216	4001	Keene
1¼" diameter rotary wafer switch with star wheel index	217	4001	Keene
1¼" diameter rotary wafer switch with double ball detent	218	4001	Keene
1⅛" diameter rotary wafer switch with die cast detent	222	4001	Elkhart
1" diameter rotary wafer switch with double ball detent	223	4223	Keene
1¼" diameter rotary wafer switch with die cast detent	226	4001	Canada

*West of the Mississippi River, excluding Minnesota, order from CTS Keene

HILL AND VALLEY DETENT

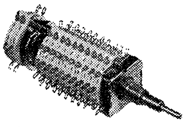
Type 212



LOW COST • DESIGNED FOR HOME ENTERTAINMENT AND LOW COST INSTRUMENT APPLICATIONS • 25,000 CYCLE LIFE • SWITCHING TORQUE 20—48" OZ.

DOUBLE BALL DETENT

Type 215



DESIGNED PRIMARILY FOR INSTRUMENT MARKET • HIGH QUALITY • CRISP FEEL • 25,000 CYCLE LIFE • SWITCHING TORQUE 6 —35" OZ.

ORDERING INFORMATION: Place orders at locations shown above, using the following addresses:

CTS of Elkhart, Div., 1142 W. Beardsley Ave., Elkhart, Indiana 46514 • Telephone 219-523-0210 • TWX 810-294-2256
CTS Keene, Inc., P.O. Box 1977, Paso Robles, Calif. 93446 • Telephone 805-238-0350 • TWX 510-842-1085
In Canada, order from:
CTS of Canada, Ltd., 80 Thomas Street, Streetsville, Ontario, Canada • Telephone 416-826-1141

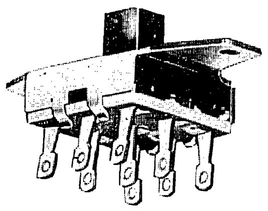
INDUSTRIES

SLIDE SWITCHES

QUALITY PRODUCTS THROUGH CREATIVE ENGINEERING

STANDARD SLIDE SWITCHES

Wide Range of Basic Types Available

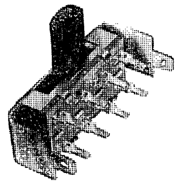


TOP ACTUATED SLIDE SWITCHES

Available from current rating of 3.0 amps AC 0.5 amps DC at 125 volts to 11.0 amps AC at 125 volts, and 8.0 amps DC at 12 volts.

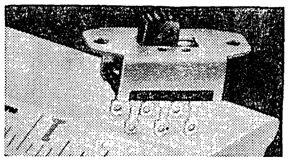
Types include 1 pole, 2 pole, 3 pole and 4 pole in two positions, three positions and four positions. Detent or spring return action.

Variety of mounting options, terminal choice and supplemental features available. Request bulletin 2085-68.



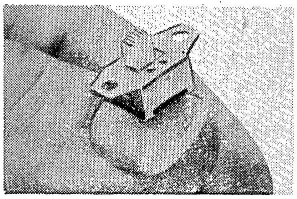
"SYDEWYNDER®" SIDE-ACTUATED SLIDE SWITCHES

Available as single and double pole in 2 positions or 3 positions. Current rating 3.0 amps AC 0.5 amp DC at 125 volts. Mount with two mounting holes on 1⅛" centers or snap into printed circuit board. Variety of knob lengths and colors available. Particularly suitable for applications where switch actuation from side of switch saves extra mechanical assembly. Request bulletin 2085-68.



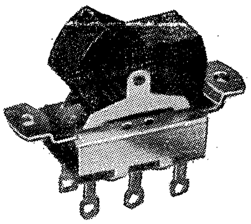
SWIDGET® MINIATURE SLIDE SWITCHES

Available in types having up to 3 poles and 4 positions. 2-position switches mount on .812" centers; other switches have slightly longer mounting centers. Side or top actuated. Detent or spring return. Variety of terminals and knob sizes. Rated at 0.5 amp AC/DC at 125 volts. Request bulletin 2093-70.



"SWIDGET® JR." SUB-MINIATURE SLIDE SWITCHES

Available as SPDT and DPDT. Mount on 0.562" centers. Overall length .762". Rated 0.5 amp AC/DC at 125 volts. Request bulletin 2093-70.



ROCKER SWITCHES

Dress up your unit with handsome CW rocker switches. Four basic rocker superstructures can be added to most CW models. Types include 2-position switches with one, two, three or four poles, in a variety of mountings, rocker knobs and features. Rated from 3.0 amps AC 0.5 amp DC at 125 volts, to 11.0 amps AC at 125 volts and 8.0 amps DC at 12 volts. Request bulletin 2085-68.

Additional types of components manufactured by CW Industries include Precision Film Resistors, Wirewound Potentiometers and Automotive Spark Suppressors. Commercial and military type Precision Resistors qualified to MIL-R-10509 are available in 1/10 through 1 watt (RN55 through RN75) and are fully described in Bulletin 2094.

Wirewound Potentiometers described in Bulletin 2080 (¾" diameter) and Bulletin 2060 (1⅛" diameter), are designed for commercial applications requiring exacting electrical characteristics at competitive cost. They feature simplicity of design and construction aimed at trouble-free operation.

Automotive Spark Suppressors effective in suppressing ignition noises on automotive and marine radio equipment are detailed in Bulletin 125.

CW Research and Engineering facilities are always at your service, to consult with you on any development or engineering problem. Engineering bulletins describing in detail our products are also readily available on request. Call or write at any time for consultation.

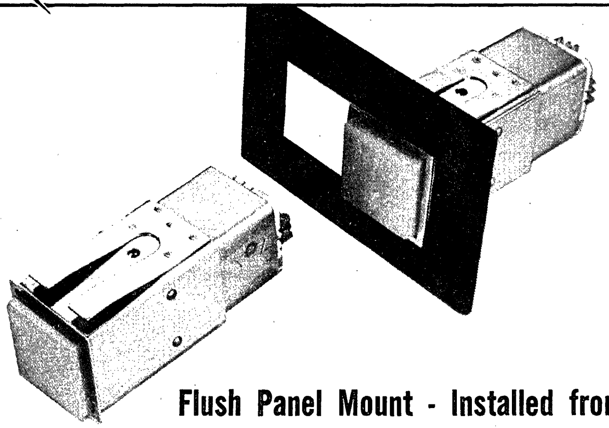
INDUSTRIES

550 DAVISVILLE ROAD • WARMINSTER, PA. 18974
Phone: 215-355-7080 / TWX 510-667-1875

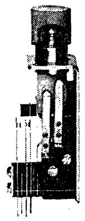
CAPITOL CIRCUIT SELECTOR SWITCHES

NEW

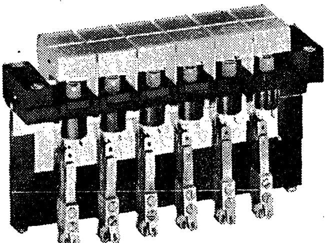
RF SERIES FRONT MOUNTING SWITCH



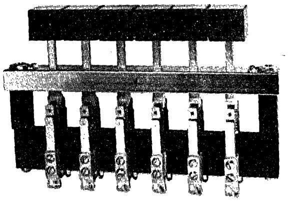
Flush Panel Mount - Installed from Front of Panel.



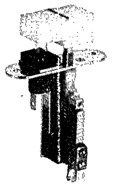
Model PLH



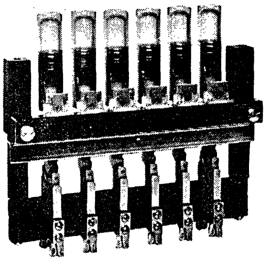
Model S-IC



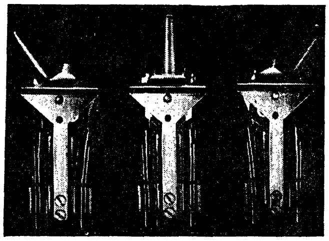
Model S



Model PSL-IC

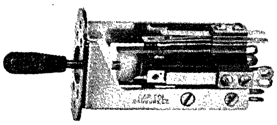


Model S-IA

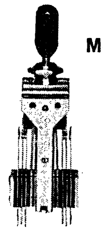


Model HLB

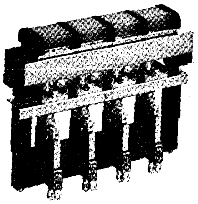
Model HLL illuminated multicolor coded lever switch



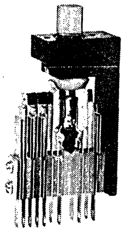
Model 4HLB



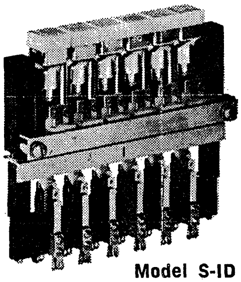
Model HLBS



Model S-IDR



Model HPC



Model S-ID features New illuminated square button

CAPITOL SWITCHES are rated at 3 amps, 110 v. AC, non inductive.
Capitol manufactures many standard and special switches in addition to those shown.

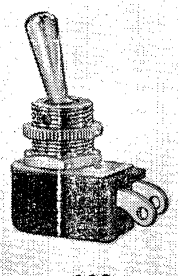
CAPITOL

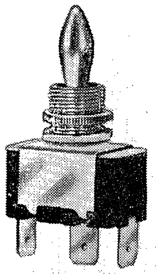
THE CAPITOL MACHINE AND SWITCH CO.
87 Newtown Road, Danbury, Conn. 06810
Representatives in principal cities Tel: 203-744-3300 TWX:710-456-0365

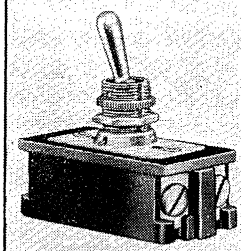
WRITE FOR
NEW
28 PAGE
CATALOG

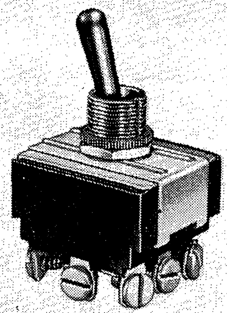
CARLINGSWITCH

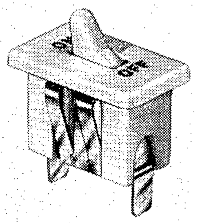
THE BIGGEST SINGLE NAME IN SWITCHES

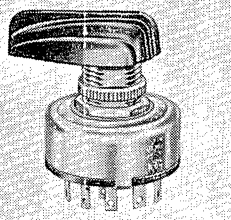

110 SERIES

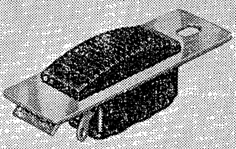

F SERIES

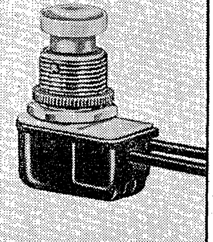

D & E SERIES

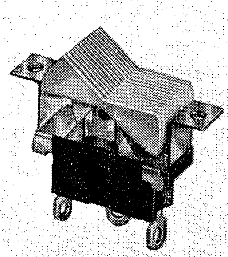

H SERIES

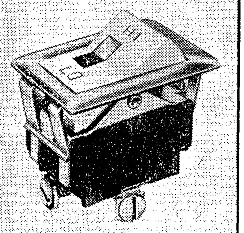

215 SERIES


800 SERIES


SL-110 SERIES


P-27 SERIES


TIPPETTE SERIES


LIGHTED TIPPETTE SERIES

PUSH • SLIDE • TOGGLE • ROTARY • TRIGGER • TIPPETTE and LIGHTED TIPPETTE SWITCHES

for Appliance, Aircraft, Automotive, Electronic, Marine, Military, Motor Control, Special Applications

In addition to the items shown above are thousands of variations and adaptations designed for our customers' specific needs. We are constantly engaged in the development of new products and welcome the opportunity to serve your needs. Please contact one of our distributors to discuss your requirements in detail or write for our latest catalog.

Carling
ELECTRIC, INC.

505 New Park Avenue, West Hartford, Conn. 06110. Telephone: (203) 233-5551 TWX 710-425-0034

MASTER STOCKING DISTRIBUTORS:

ATLANTIC SWITCH CONTROLS, INC.
520 Oakwood Ave., West Hartford, Conn.

PACIFIC SWITCH CONTROLS, INC.
14048 Burbank Blvd., Van Nuys, Calif.

CONECTRIX, INC.
201 N. Gables Blvd., Wheaton, Ill.

SWITCH CONTROLS, INC.
5299 Buford Highway, Deraville, Ga.

TEXASWITCH, INC.
2942 Congressman La., Dallas, Texas

Centralab
rotary, slide and lever
switches
PUSH BUTTON SWITCHES

Switches, switches, and more Switches from Centralab!

Centralab has the industry's broadest line of rotary and special switches. A summary of the basic types is given below.

For complete design data, request your copy from Centralab's advertising department.

ROTARY SWITCHES	Diameter	Maximum No. of Positions	Minimum Index Life (cycles)	Insulation	Current Rating (make & break)	MIL-S-3786 SR Number
Miniature Series 020-090	1-1/2″	6 x 60° 12 x 30°	25,000	Phenolic Ceramic Glass Silicone	2.6 A. @ 28 VDC; 450 ma @ 115 VAC	SR 02
Subminiature Series 160	1″	4 x 90° 6 x 60° 8 x 45° 12 x 30°	25,000	Phenolic Glass Silicone Ceramic	335 ma @ 115 VAC; 1.1 A. @ 28 VDC	SR 05
Subminiature Series 140	1-1/2″	18 x 20°	25,000	Phenolic Silicone Glass	335 ma @ 115 VAC; 1.1 A. @ 28 VDC	—
Miniature Series 600	1-9/32″	6 x 60° 12 x 30°	25,000	Ceramic Mycalex Phenolic Glass Silicone	450 ma @ 115 VAC; 2.6 A. @ 28 VDC	SR 03
Series 240-290 and Series 010 Spring return	1-7/8″	2 x 180° 4 x 90° 6 x 60° 8 x 45° 12 x 30°	175,000 20,000 or 10,000	Ceramic Phenolic KEL-F	3.9 A. @ 28 VDC; 675 ma @ 115 VAC	SR 01
Series 300	1-7/8″		25,000	Ceramic Phenolic KEL-F	675 ma @ 115 VAC; 3.9 A. @ 28 VDC	SR 01
Series 650	2-5/16″	18 x 20°	25,000	Phenolic Glass Silicone	675 ma @ 115 VAC; 3.9 A. @ 28 VDC	SR 10
Series 670	2-5/16″	24 x 15°	25,000	Phenolic Glass Silicone	450 ma @ 115 VAC; 2.6 A. @ 28 VDC	SR 09
Series 230	2-13/16″	9 x 40° 18 x 20° 24 x 15°	25,000	Ceramic Durez	11 A. @ 28 VDC; 9 A. @ 115 VAC	—
ECONOMY SWITCHES Series 200	1-1/32″	2, 3, 4 x 30° 9 clips max.	10,000	Phenolic	450 ma @ 115 VAC; 2.6 A. @ 28 VDC	—
LEVER ACTION SWITCHES Series 222	1-1/2″	2, 3 x 30° 12 clips max.	25,000 Pos. or Spring return	Phenolic	450 ma @ 155 VAC; 2.6 A. @ 28 VDC	—

PUSH BUTTON SWITCHES*
BRAND NEW!

Ask for Centralab's all new 22 page catalog on this completely new product line.

SLIDE SWITCHES	Approximate Length (2 positions)	No. of Positions	Maximum No. of Clips	Index	Insulation	Current Rating (make & break)
Series 001, 002	1.4 to 5.7″	2, 3 or 4	3-20/side	Positive or none	Phenolic	675 ma @ 115 VAC; 3.9 A. @ 28 VDC
Series 003	1.3″	2	6/side	Spring return or none	Phenolic	450 ma @ 115 VAC; 2.6 A. @ 28 VDC
Series 005	1.4 to 5.8″	2	22	Spring return or none	Phenolic	450 ma @ 115 VAC; 2.6 A. @ 28 VDC
Series 125	3.6″	2	7/side	Spring return or none	Phenolic	335 ma @ 115 VAC; 1.1 A. @ 28 VDC

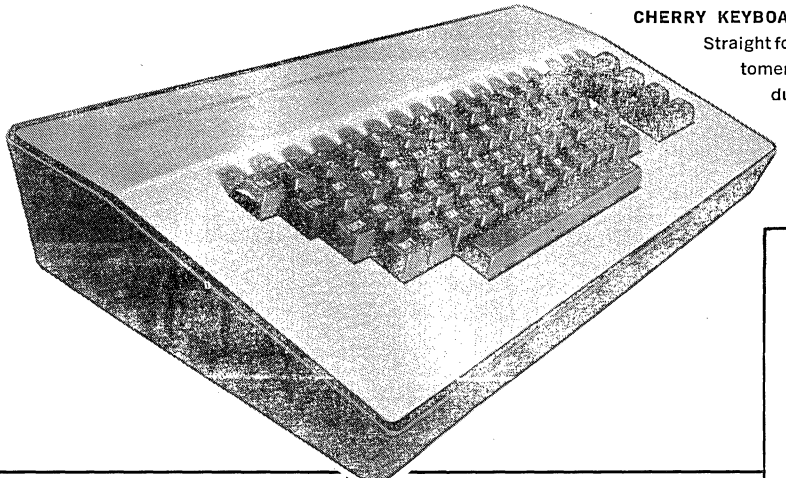
PRINTED CIRCUIT SWITCH Series 020-090. Series 001, 002, 003, 005	Eliminate expensive wiring and possibility of wiring error; these switches are designed for printed circuit board insertion. Electrical and mechanical characteristics similar to 1-1/2″ switches (Series 020, etc. above). Slide switches above available for printed circuits.

FOR IMMEDIATE DELIVERY
— many types are available from stock from Centralab Industrial Distributors.

CENTRALAB Electronics Division • GLOBE-UNION INC.
5757 NORTH GREEN BAY AVENUE • MILWAUKEE, WISCONSIN 53201

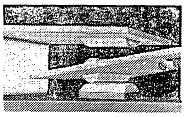
CHERRY®

COIL SPRING SNAP-ACTION SWITCHES — THUMBWHEEL AND LEVERWHEEL SWITCHES — MATRIX SELECTOR SWITCHES — ELECTRONIC DATA ENTRY KEYBOARDS . . . and for low energy solid state circuits, Cherry's unique gold crosspoint switches.



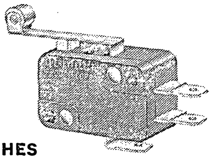
CHERRY KEYBOARD

Straightforward electronics adapt reliably to customer specifications. Timed repeat keys and dual strobe are available. Two key rollover is built in and "N" key rollover costs very little extra. Key caps are available in broad range of ABS colors.



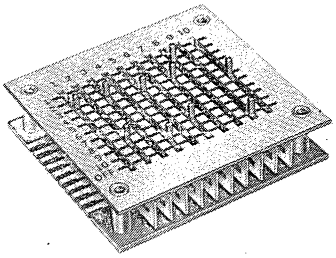
GOLD CROSSPOINT CONTACT SWITCHES

Gold alloy contact prisms at right angles virtually end foreign particle interference in signal level circuitry. Available on Miniature, Subminiature, Rotary Action, Open and Panel Mount Pushbutton configuration.



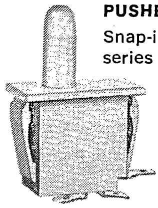
MINIATURE SWITCHES

In light or standard force. Series E22 (3 amp), E23 (5 amp), E33 (10 amp), E34 (15 amp).



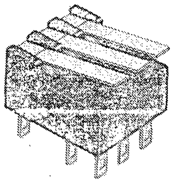
MATRIX SELECTOR SWITCHES

Offering manual programming and switching for complex control equipment. Two standard types (10 and 20 position) expandable up to 5 modules providing from 500 to 1000 crosspoints. Custom designs available up to 2784 crosspoints.



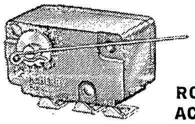
PANEL MOUNT PUSHBUTTON SWITCHES

Snap-in 10 amp. Single pole series E69, double pole E79. Momentary action, Push-Pull (reset), Push-Push (alternate), Pull-to-Override (interlock). Auxiliary button designs.



SUBMINIATURE SWITCHES

Individually or ganged in space saving modules. E61 light force (5 amp) series, E62 standard (10.1 amp).

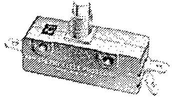


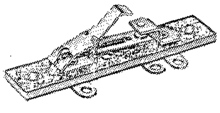
ROTARY ACTION SWITCHES

E51 series for low force actuation in photocopy and vending equipment.

GENERAL PURPOSE SWITCHES

Standard E13 single pole, E19 double pole (15 amp). High capacity series E14 single pole (25 amp), E20 double pole (20 amp).

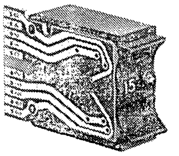




OPEN SWITCHES

In two series: S23 light force (5 amp) and S25 standard force (10 amp).

THUMBWHEEL AND LEVERWHEEL



Switches with inline readout, coded electric outputs, modular construction. Choice of legends, codes, sizes and finishes.

TWX 910-235-1572 OR DIAL DIRECT FOR COMPLETE CATALOG

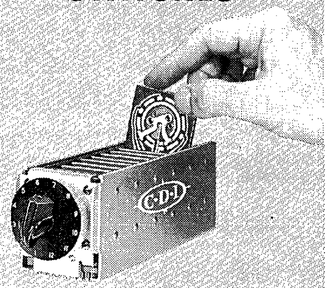
Phone (312) 689-7600 — Ext. 7703 and ask for Walter L. Cherry, Jr.

CHERRY® **CHERRY ELECTRICAL PRODUCTS CORP.**, 3623 SUNSET AVENUE, WAUKEGAN, ILLINOIS 60085

Makers of patented Leverwheel/Thumbwheel Switches, Matrix Selector Switches, Snap-Action Switches and Keyboards.

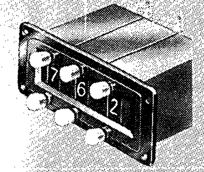
precious metals; aluminum; and stainless-steel make C·D·I switches uniquely reliable

ROTARY SWITCHES



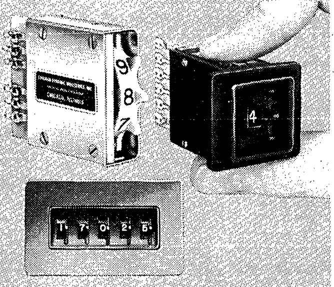
Virtually eliminate downtime—5 second snap-in, snap-out wafer replacement—No disassembly, no wire removal

PUSHBUTTON SWITCHES

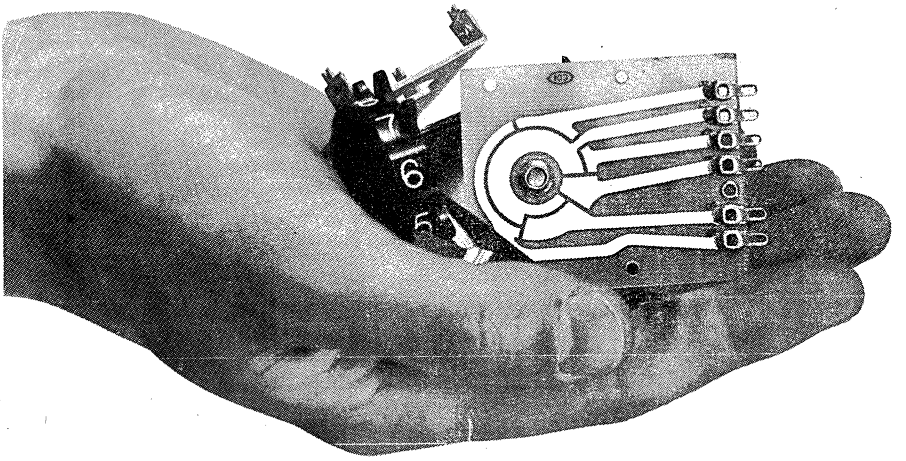


Push one button to add, other to subtract. Retrofits most thumbwheel panel switch openings. Mount on ½ inch centers.

THUMBWHEEL SWITCHES



Combine binary and digital wafers. Up to 16 decks operate on one wheel.



Rhodium-gold printed circuits and precious metal contacts assure high reliability and low contact resistance.

Aluminum frames and cases for many applications.

Stainless-steel ball and circular spring for a more positive detent.

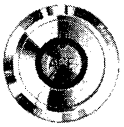
Engraved alpha numerical characters don't rub out—read easier

Mfd. under Tabet U.S. Patents 2,841,660, 2,971,066, 3,015,000, 2,956,131, 2,988,607

C·D·I **CHICAGO DYNAMIC INDUSTRIES, INC.**

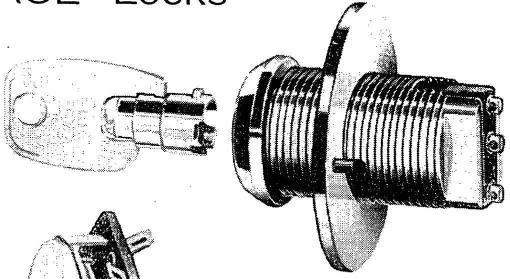
PRECISION PRODUCTS DIVISION 1725 Diversey Blvd., Chicago, Illinois 60614 Phone 312, 935-4600

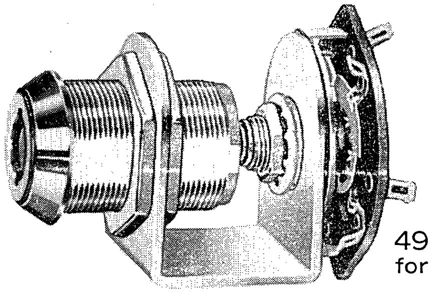
CHICAGO LOCK... Your Complete Source For Switch Locks



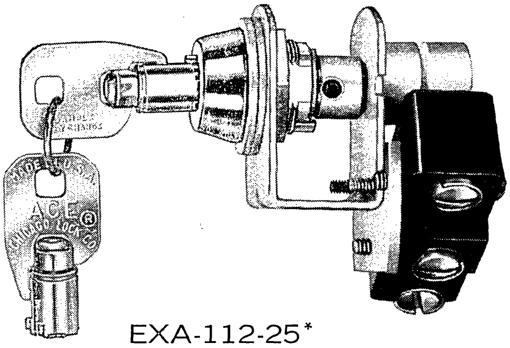
4900 SERIES
Underwriters Listed ACE® Locks

No. 4901
SPDT Switch Lock



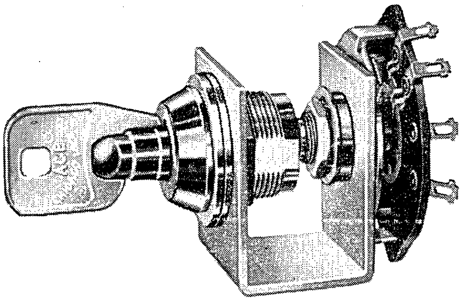


4903 Wafer switch lock for complex circuits



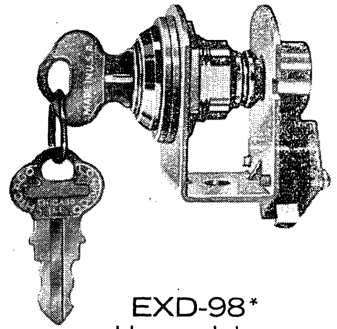
EXA-112-25*
Heavy duty switch lock
Switch SPDT; 25 amps; 125, 250 or 480 VAC; UL and CSA listed.

Chicago ACE® Locks provide maximum security with registered key series if desired.

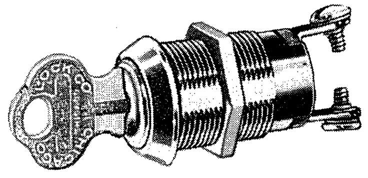


*4188 ACE® lock and wafer switch, can be furnished with double bitted lock Spec. 2242

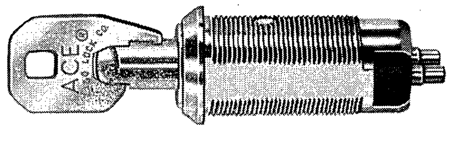
*Wafer switches will permit various circuit combinations



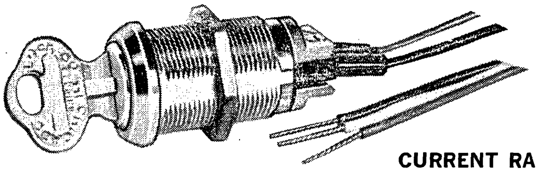
EXD-98*
Heavy duty switch lock



2174 (SPST)
Double bitted lock with screw terminals
For momentary contact, spring return, specify 2174-70



4073 Basic ACE® (SPST) switch lock



3535 Double bitted lock with UL listed SPDT switch
Also furnish with ACE LOCK—Part No. 4235

SWITCH CONTACT RATINGS

CURRENT RATINGS		LOCK NUMBER
125-250V AC— 5 AMP	30V DC— 3 AMP	4901—4902
125-250V AC— 7 AMP	28V DC— 7 AMP	3535—3535A—4235
110-120V AC—10 AMP	10V DC—10 AMP	2174—2174-70—3039—4101—4073—4079
125-250V AC—10 AMP	125V DC—½ AMP	EXD-98—EXA-112

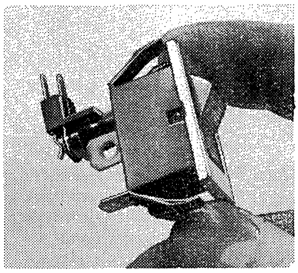
*When ordering, specify if for appliance requiring T.V. approved switches. Only available on EXD-98 or EXA-112 series.

CHICAGO LOCK CO.
4275 W. Belmont Ave. • Chicago, Ill. 60641

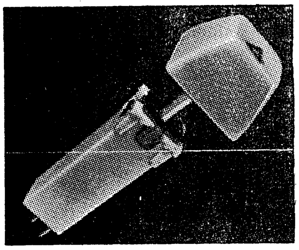
For further data on the above locks, write for catalog.

CHICAGO SWITCH, INC. 2035 WABANSIA CHICAGO, ILLINOIS 60647 312-489-5500

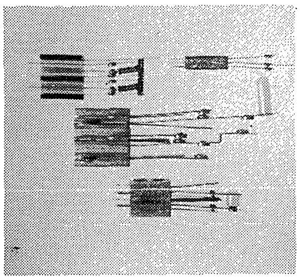
SWITCHES THAT MASTER JOB REQUIREMENTS STANDARDS OR SPECIALS – YOUR DESIGN OR OURS



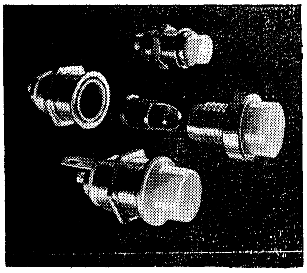
SNAP-IN SNAP ACTION ROCKER SWITCHES. Available in single and double pole, lighted and unlighted, maintained and momentary, 2 and 3-position. The momentary-lighted versions are the industry's lowest cost "lighted pushbutton" switches. Snap-in assembly saves labor, as well as material costs. Ask for data sheets on the 26 & 27 Series.



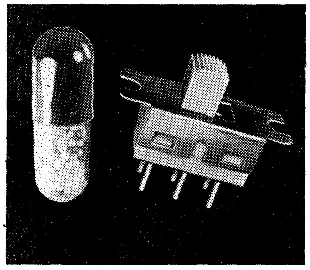
HALF-BY-HALF KEYBOARD SWITCHES. For printed circuit mounting. Available in SPST-NO, SPST-NC, SPDT and alternate circuit variations. Low bounce, low cost, and in the two-terminal versions, bifurcation provides extra high reliability. A variety of standard pushbuttons fit on the plunger. Ask for data sheets on the 34-Series.



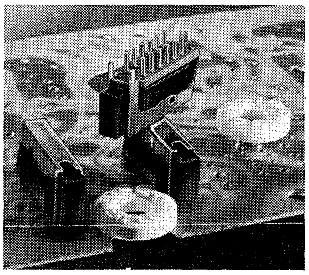
LEAF SWITCHES designed to customer specs if desired, or quoted on existing customer design. Reliable delivery dates (customer references supplied on request). Versatile in-house tooling – will produce 90% of all existing leaf switches with no tooling charge. Ask for the "Leaf Switch Design Guide."



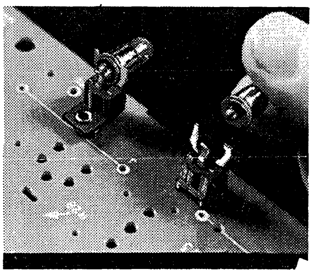
DELUXE INDICATOR LIGHTS. Lamp and lens replaceable from panel front. Two-terminal versions are standard. Midget and sub-midget flange-based lamps used. Many options, lens shapes, colors, and variations available. Ask for data sheets on the 33 Series.



SUBMINIATURE SLIDE SWITCHES. World's longest-life slide switches with true snap action in some of the SPDT and DPDT versions . . . in switch bodies measuring only .25" high x .50" long x .30" wide. The SPST versions handle 2.5 amp inductive loads at 120V 60 Hz. New hybrids are continually being born. Ask for data sheets No. 23-021.



HI-DENSITY MULTI-POLE MODULAR SLIDE SWITCHES can be used in p.c. boards as is or in combination; e.g., to make 3P3T 3-position switches. 4PDT and 6PDT switches are available in push-on push-off versions, momentary versions, pushbutton, half-rocker button, choice of any make-before-break or break-before-make combination of poles. These are so reliable, they're used in the latest fighter-bombers. Ask for data sheets on the 23-004 Series.



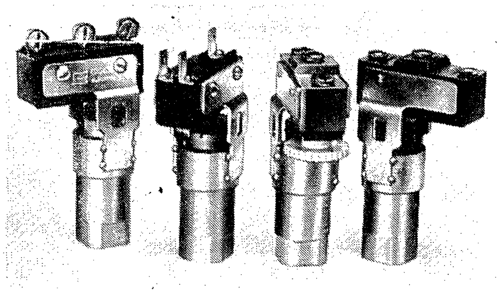
KLIPSOCKET™ FOR MIDGET-FLANGE - BASED LAMPS. Finally – a commercial connector for the T-1 3/4 M.F. based incandescent lamp and the NE2J neon lamp. Klipsocket™ (pat. pending). engages and disengages from the lamp base with a snap. Terminals are designed for both soldering and quick-connectors. The newest version No. 40-000-005, for p.c. mounting, is shown on the right. Ask for data on the 40-Series.

CHICAGO SWITCH, INC.
2035 Wabansia Avenue
Chicago, Illinois 60647 • (312) 489-5500

COOK ELECTRIC • PRESSURE SWITCHES

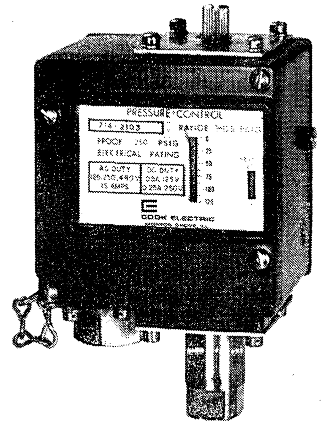
Model 714

AVAILABLE IN OPEN TYPE OR OIL RESISTANT ENCLOSURES FOR 0 TO 500 PSIG SYSTEMS



714-1000 SERIES

The open rugged construction of the 714-1000 series, combined with field adjustability, gives compact size for pressure controls in protected environments. Long life is assured by the precision built bellows sensor.

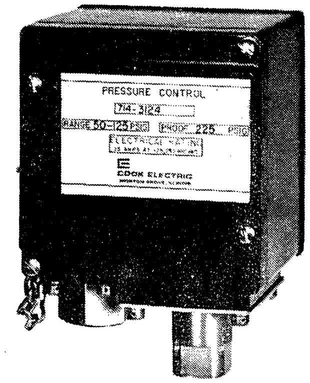


714-2000 SERIES

The 714-2000 series pressure control settings are externally adjusted with a screw driver. The adjusted setting is visually displayed by a pressure range scale on the front cover and an indicator displays the level of applied pressure. Deadband of the pressure control is adjusted internally by removing the front cover.

714 SERIES—FEATURES

- Field Adjustability:
  - External for 714-2000 Series
  - Internal for 714-3000 Series
- Oil Resistant Enclosure
- 15 Ampere UL Switch Rating
- Pressure Setting Adjust
- Long Life



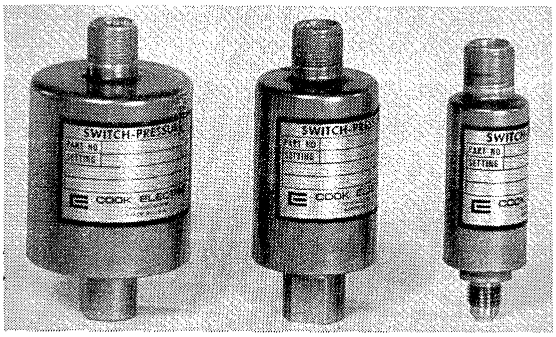
714-3000 SERIES

The 714-3000 series pressure control offers economy for those applications that do not require external adjustability. Adjustment of pressure setting is made internally with knurled thumb screws after removal of the front cover.

DIAPHRAGM PRESSURE SWITCHES

FEATURES
- Military Reliability in Accuracy and Repeatability of Setting
- Zero Leakage
- Corrosion Protection
- Long System Life
- Versatility in Your System Design
- New Economy
- Fast Delivery

718 717 716



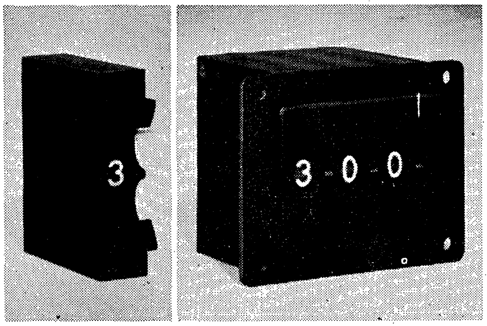
	Type 716	Type 717	Type 718
Pressure Range of Setting	100 To 3000 PSIA	3 To 10 PSIA 20 To 500 PSIA	10 To 100 PSIA
Setting Tolerance	±3% at a specific temperature ±10% over ambient temperature range		
Dead Band Average		20% of setting	
Proof Pressure	4500 PSIA	2.5 x setting minimum	2.5 x setting minimum
Burst Pressure	7500 PSIA	5 x setting minimum	5 x setting minimum
Ambient Temperature		−65°F To 275°F	
Switch Contact Form		SPDT	
Current Rating	5 amp resistative at 28 VDC or 115 VAC		
Vibration	10G at 55 to 2000 CPS		
Shock	15G—11 MS MIL-E-5272C Procedure V		
Cycling Life	50,000 cycles minimum at .25 amp 25,000 cycles minimum at 5 amp		
Weight	0.3 lb.	0.3 lb.	0.5 lb.

COOK ELECTRIC
6201 OAKTON STREET
MORTON GROVE, ILLINOIS 60053

For further information,
write COOK ELECTRIC
or contact your
local representative.

DIGISWITCH®

Converts directly from dial setting to coded electrical outputs.

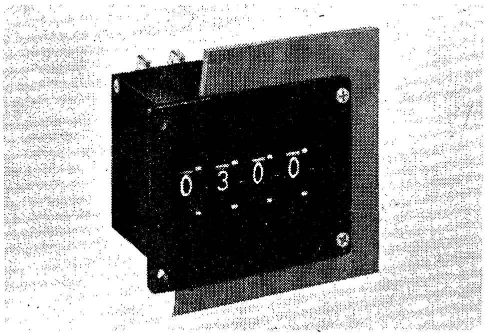


Series 300 general purpose DIGISWITCH

This is a compact, finger-actuated module only ½" wide, with 8, 10, 12 or 16 dial positions. Stops may be specified to limit rotation. More than 200 standard types of outputs are available, covering a wide range of capabilities such as the following:

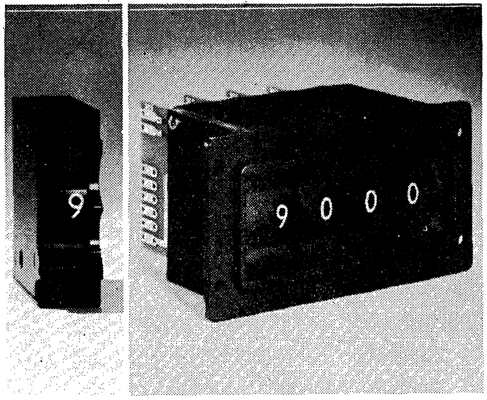
- ☐ Octal-to-binary conversion
- ☐ Decimal-to-binary conversion
- ☐ Conversion to binary with complement and provision for diodes
- ☐ Voltage divider
- ☐ Capacitance decade
- ☐ Resistance decade
- ☐ 8, 10, 12, 16 position switches
- ☐ Shorting and non-shorting

As many individual switch modules as required may be grouped into a single assembly for simplicity of mounting. No separate escutcheon plate, secondary brackets or other special hardware is required—only four screws.



Series 13000 front-mounted DIGISWITCH

The Series 13000 DIGISWITCH is identical in every way to the Series 300 except that the case is designed so that an entire assembly can be mounted from the front of the panel, completely covering the panel cut-out. No separate escutcheon plate or other hardware is required for mounting. The same codes, dial positions and other features available in the standard Series 300 Back-Mounted configuration are also available in the Series 13000 DIGISWITCH.



Series 9000 sealed and Series 19000 dust-sealed DIGISWITCHES for industrial environments

The Series 9000 and Series 19000 DIGISWITCHES are designed for trouble-free operation in severe environment. The Series 9000 is sealed per MIL-S-22710, Method I for operation near heavy cutting oil or water concentrations, airborne contaminants and dust, salt spray and extreme humidity.

The Series 9000 DIGISWITCH has the switch elements contained in a separate chamber within the switch case. An "O" Ring around the drive shaft and potting around the printed circuit board in the rear of the switch case completes the seal.

Output terminals can be directly soldered or will mate with standard printed circuit board connectors. Some modules in the Series 9000 and 19000 are available with wire-wrap or other special terminals.

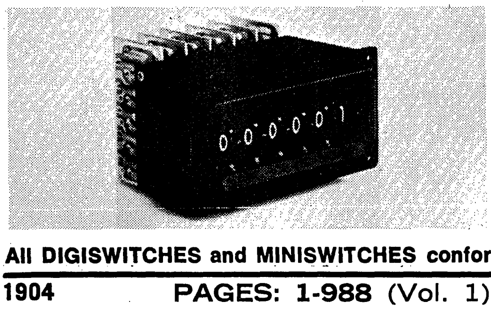
The construction of the Series 19000 is exactly the same except the potting of the printed circuit board at the rear of the case and in the "O" Ring seal are left out. The Series 19000 provides an excellent dust seal in applications where total sealing is not important. Most of the codes available in the Series 300 are also available in the Series 9000 and 19000.

Series	Dial Character Height
300, 13000	0.235 (8, 10, or 12 position)
9000, 19000	0.160 (16 position)

Life: Over 1,000,000 detent operations—all switches.

DIGIVIDERS/DIGIDECADES

Thumbwheel operated voltage dividers and resistance decades.



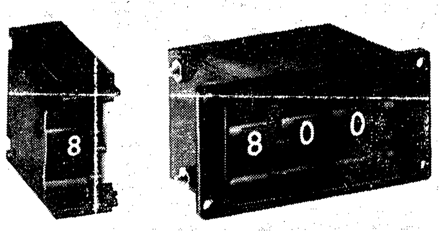
Digividers and Digidecades are specifically designed for applications where precise digital setting of resistance or voltages are required. They are easy-to-read and operate, require little panel space, and give 10 times more accuracy than a potentiometer—at little added cost. In addition, the new units provide reliability, low contact resistance and repeatability of setting. For example, a change from 13 ohms to 913 ohms is made with one flick of a finger. Digividers are available with either Kelvin-Varley or Poggendorff circuits, a wide range of input impedances, and an accuracy of 0.1% of full scale. Digidecades resistance decades provide an accuracy at 25°C of 1% of setting.

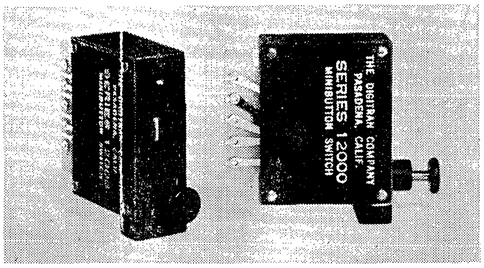
All DIGISWITCHES and MINISWITCHES conform to the requirements of MIL-S-22710

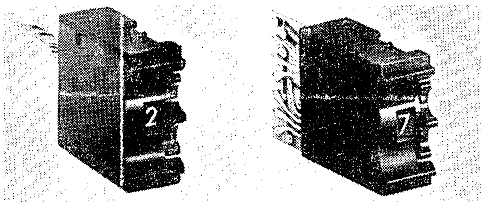
MINISWITCH®

Where limited space presents a problem.

✻ MINISWITCH dial character height: 0.200 (8 or 10 position)
0.150 (12 position)







Series 8000 MINISWITCH✻—Miniature, non-sealed

Compact and versatile, the Series 8000 provides substantial savings in panel space. Each switch module requires a panel cut-out only 0.96" high x 0.5" wide. Modular construction permits the grouping of any combination of switch modules into a single assembly. No separate escutcheon plates, special mounting brackets, or other hardware is required to mount an entire assembly.

All Miniswitches are available in eight or ten dial positions—decimal or coded electrical output. Dial stops can be provided to limit the number of dial positions. Internal replaceable lighting is also available as an option in all MINISWITCH Series. Some models in the Series 8000 MINISWITCH have provisions for mounting components directly onto the printed circuit board.

Series 12000 Miniature Pushbutton rotary switch

Series 12000 is a miniature pushbutton rotary switch which permits panel sealing to prevent contamination of switch and panel interior. Individual modules can be sealed from dust and moisture. Recommended for military communications and to meet requirements of MIL-S-22710A.

The case is metal. When properly grounded to the panel, this feature provides effective shielding against radiated electromagnetic interference.

Series 12000 is available in all 8- and 10-position standard Octal and BCD Codes including complement and "true, not-true" functions. Width: .480 inch. Height: 1.30 inch. Weight: less than 0.4 oz. Low profile; button extends only 3/16" beyond the panel. Modules can be mounted on 0.5 inch centers. Metal case, sealed glass window, optional replaceable internal lighting, diodes may be mounted on PCB.

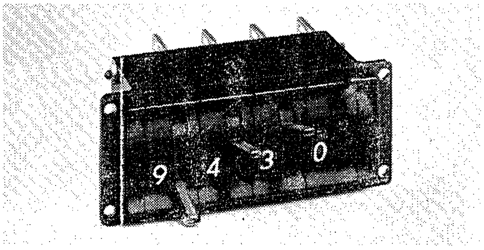
Series 200 and 700 MINISWITCH✻—Miniature sealed

The Series 200 and 700 are the same miniature size and mounting conformity as the Series 8000 MINISWITCH but are specifically designed for use in equipment which must operate in severe environments (sands, dust, salt spray, high humidity, temperature extremes, explosive atmosphere, etc.). All switching elements are enclosed in a sealed chamber within the switch case. Sealing is per MIL-S-22710, Method I.

Series 200 contains wire leads as output terminals and no part of the printed circuit board is exposed. Series 700 has printed circuit board output terminations potted at the entry point of the case.

MINILEVER®

A New Lever-Actuated Rotary Switch



Series 28000—Rapid Setting

The Series 28000 MINILEVER® rapid setting, lever switch is an innovation in thumbwheel type switches. It is designed to increase operator efficiency where frequent, rapid switch settings are required.

By employing a setting lever which actuates an internal gear, the operator can rotate the dial a complete revolution by moving the lever in an arc of only 90 degrees. The operator has the advantage of being able to make up or down decisions quickly in applications that require frequent, rapid changes of switch settings.

The MINILEVER assembly is interchangeable with other assemblies of Digitran's miniature, thumbwheel switches. MINILEVER is available in 8, 10 and 12 positions with dial characters .200" high.

Features and options available in the various series.

Description / Series	300	13000	200	700	8000	9000	19000	12000	28000
Dial Positions (without stops)									
8, or 10	✻	✻	✻	✻	✻	✻	✻	✻	✻
(●) 12, or 16 ✻	✻	✻	●	●		✻	✻		⊛
Up to 40									
Dial Stops to Limit Dial Positions	✻	✻	✻	✻	✻	✻	✻		✻
Assembly Spacers (Width)									
.400"						✻	✻		
.500"	✻	✻			✻				✻
.250"	✻		✻	✻	✻				
Marking of Symbols, Letter or Line on Spacer or Switch	✻	✻	✻	✻	✻	✻	✻		✻
Special Dial Characters	✻	✻	✻	✻	✻	✻	✻	✻	✻
Sealed			✻	✻		✻		✻	
R.F.I. Shielding	✻		✻	✻	✻	✻	✻	✻	
Double Modules (One Thumbwheel)	✻	✻	✻	✻					
Message Units	✻	✻	✻	✻	✻	✻	✻		
Replaceable Lighting (For standard MS-lamps)	✻		✻	✻	✻	✻		✻	
Lighted Decimal Point on Case	✻	✻			✻				
Lighted Decimal Point on Spacer	✻	✻	✻	✻	✻	✻	✻		✻
Provision for Mounting Components in Output Terminals	✻	✻		✻	✻	✻	✻	✻	✻
Wire-Wrap Terminals	✻	✻			✻	✻	✻		✻
Taper-Tab Terminals	✻	✻				✻	✻		
Back Mounting (No separate Escutcheon Plate)	✻		✻	✻	✻	✻	✻	✻	✻
Front Mounting (No separate Escutcheon Plate)		✻							

Send for new DIGISWITCH-MINISWITCH Catalog

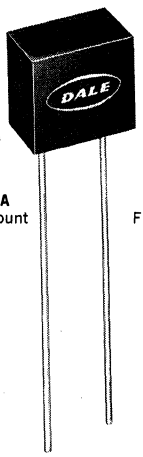
THE
DIGITRAN
COMPANY

A Division of Becton, Dickinson and Co. B-D
855 So. Arroyo Pkwy., Pasadena, Calif. 91105
Phone (213) 449-3110 TWX 910-588-3794

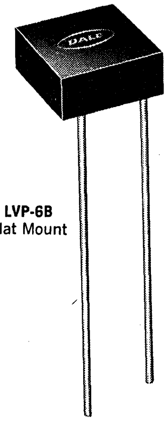
DALE® for Optimum Value in Surge Arrestors

■ SERIES LVP-6 *Low Voltage Protector*

Designed to mount on printed circuit boards to protect solid state circuitry from transients appearing on low voltage DC circuits. Nanosecond response. Automatically restores circuit to normal when transient has passed. Transients substantially above rated surge current would cause failure of the LVP-6 in a shorted condition—still safeguarding the valuable circuit components.



LVP-6A
Edge Mount



LVP-6B
Flat Mount

PROTECTIVE CAPABILITIES

Clamping Voltage: 6.2, 6.8, 7.5, 8.2, 9.1, 10, 11, 12, 13, 15 volts.
Shunt Capacity: 15 µf.
Operating Temperature: −55° C to 85° C
Storage Temperature: −55° C to 125° C

PHYSICAL SPECIFICATIONS

Designed for edge or base mounting. Body Dimensions = .500" L x .500" W x .312 H. Lead Dimensions = 1" ± 1/32" L x .032" dia.

■ SERIES SPA *Secondary Power Arrester*

Designed for fuse or junction box mounting to protect against direct or indirect lightning and other transient voltages. Unit has hermetically sealed pre-ionized spark gap for increased sensitivity and stable breakdown voltage level. Exceeds all applicable NEMA, USAS, and IEEE standards.

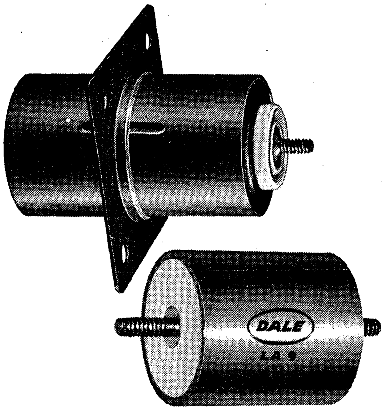
PROTECTIVE CAPABILITIES

DC Arc-Over Voltage: SPA-100 (120 VAC) 500-700 volts; SPA-200 (277 VAC) 600-900 volts. **Fast Rise Arc-Over Characteristics:** Typically 1500 volts with 10KV µsec. pulse applied; **Bypass Capability:** Will withstand repeated 10KA (10x20 µsec.) current surges. Power follow current extinguished in 1/2 cycle or less. Voltage between terminals less than 2000 volts when conducting 10,000 amps of surge current. **Insulation Resistance:** Greater than 100 megohms. **Shunt Capacity:** Less than 25 pf.

PHYSICAL SPECIFICATIONS

Spark gap hermetically sealed with soft solder. Overall dimensions: 1-3/4"Dx3"L. Two 18" leads provided for circuit connection. Has 1/2"-14 NPSL conduit fitting with nut for mounting in any position indoors or outdoors.

■ SERIES LA *Miniature Size—Maximum Circuit Protection*



Patented design insures much greater reliability and repeatability than standard spark gap designs. Widely used to protect communications equipment from lightning and to guard industrial controls and radios from heavy transient spikes.

PROTECTIVE CAPABILITIES

Spark-Gap Arc-Over Voltage: LA20 = Factory adjustable from 500 to 6000 VDC ± 20% or 10%; LA9 = Factory adjustable from 500 to 5000 VDC ± 20% (10% available). **Bypass Capability:** LA20 = 50 current surges of 2000 amps peak 1x2 microsecond wave shape (2 coulombs), greater than 40 joules/stroke. Derate to 50% below 250 V. LA9 = 100 current surges of 300 amps peak 2x4 millisecond wave shape. Derate to 10% when set below 750 V. Both types will perform as stated without damage to arrester or equipment attached and with less than 20% change in original DC breakdown voltage. **Insulation Resistance:** Greater than 1000 megohms initially and greater than 10 megohms after rated current surges. **Shunt Capacity:** LA20 = 8 mmfd, LA9 = 3.5 mmfd.

PHYSICAL SPECIFICATIONS

LA20 = 3-3/8" outside length. Body 2-1/16" L x 1-1/4" D. Weight: 5 oz. LA9 = 1-5/8" outside length. Body: 1" L x 3/4" D. Weight: 2 oz. **Mounting:** Clip, stud or flange. **Terminal:** LA20=6-32, 8-32, 10-32 stud or wire; LA9=4-40 stud or wire. **Seal:** LA20 and LA9 hermetic.

■ ADDITIONAL MODELS

- Aircraft lightning arresters of all types
- Arresters for high voltage circuits
- Miniature transient suppressors for circuit board mounting.

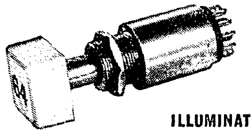
Submit your specifications to
DALE ELECTRONICS, INC.
Box 180, Yankton, South Dakota 57078 • Phone: 605—665-9301

Complete lightning laboratory facilities and engineering assistance available to develop your applications.

electro-mech *illuminated*

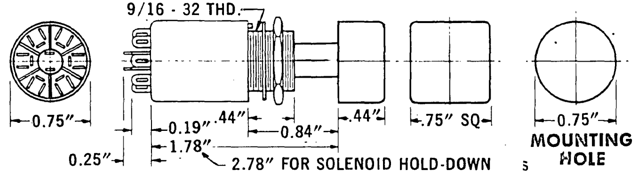
PUSHBUTTON SWITCHES

"switchline" STANDARD 6-POLE DOUBLE THROW



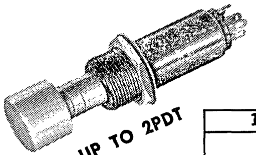
- Ratings: 30 volts DC or 115 volts AC 2 amps resistive; 1 amp inductive
- Weight: 0.8 oz. (approx.)
- Operating Pressure: 2 lbs. ±1 lb.
- Plunger Travel: 3/16" (approx.)
- Actuations: 100,000
- Accommodates all "**switchline**" standard lenses
- Uses one T1¾, AN3140-327, 328, 330 bulb or neon lamp. 3 actuation modes standard also in 2, 3, 4 and 5-pole configuration.

	ILLUMINATED				NONILLUMINATED			
	Mom.	Push On Push Off	Push On Remain In Push Off	Snap Feel Mom.	Mom.	Push On Push Off	Push On Remain In Push Off	Snap Feel Mom.
2 PDT	2650	2750	2850	2550	1650	1750	1850	1550
3 PDT	2651	2751	2851	2551	1651	1751	1851	1551
4 PDT	2652	2752	2852	2552	1652	1752	1852	1552
5 PDT	2653	2753	2853	2553	1653	1753	1853	1553
6 PDT	2654	2754	2854	2554	1654	1754	1854	1554



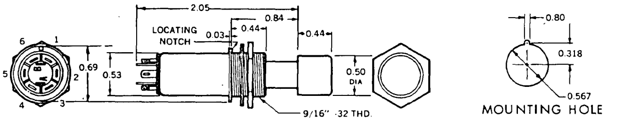
LENSES: Available in ½", ¾", 1" dia., ½", ⅜", ¾" square. Translucent Lexan in white, red, green, blue and yellow.

NEW Slimline by "switchline"

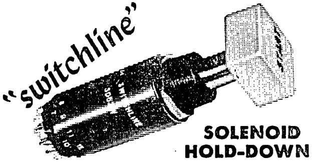


A new 2100 series Slimline version of our standard Illuminated Pushbutton Switch featuring silver slide bar action. Add BR after part number for mounting on ⅝" centers. Utilizes AN3140-T 1-¾ or ALC-100 bulb. All other specifications same as standard.

	1 PST		2 PST				
	N.O.	N.C.	2 N.O.	2 N.C.	1 N.O. 1 N.C.	1 PDT	2 PDT
MOMENTARY	2128	2129	2130	2131	2132	2149	2150
PUSH ON/PUSH OFF	2228	2229	2230	2231	2232	2249	2250

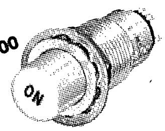


"switchline" SOLENOID HOLD-DOWN



Switchline Illuminated Pushbutton switches with an integral hold-down coil which is activated with switch. Holds the pushbutton in the depressed position until coil is de-energized returning it to relaxed position. Available in all circuit configurations up to 6 PDT. Same secifications as standard model.

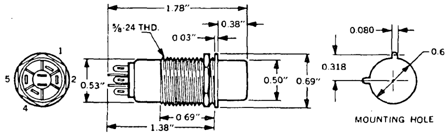
NEW SERIES 5000



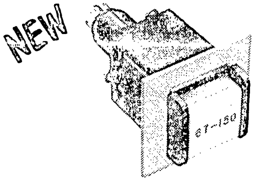
FRONT PANEL MOUNT MINIATURE MOMENTARY SWITCHES

An exceptionally short momentary switch available in circuit configurations up to 2 PDT. Clear anodized case. All specifications same as standard model except plunger travel which is 3/32".

	1 PST		2 PST				
	N.O.	N.C.	2 N.O.	2 N.C.	1 N.O. 1 N.C.	1 PDT	2 PDT
MOMENTARY	5128	5129	5130	5131	5132	5149	5150

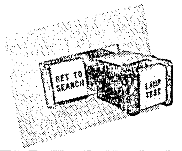


NEW 60 SERIES LOW COST SELF MOUNTING SWITCH ASSEMBLY

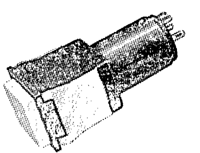


This series features our 2100 switch incorporated as an integral part of the mounting hardware. All plastic, front mounting case with barriers. "U" shaped channel bracket is easily attached to back of panel and switch is installed with two screws. Same circuitry and specifications as 2100 series.

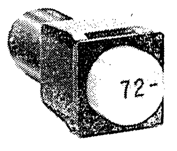
"switchline" MOUNTING ADAPTERS



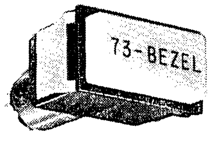
- Snaps in from front panel
- Mounts in panel thickness up to ⅛"; for thicker panel mounting add "Z" to Model No.
- Fingernail groove in lens for easy removal
- Bezel available in white, gray or black Lexan.



Model 65
0.94" sq. flange
0.75" sq. Lens

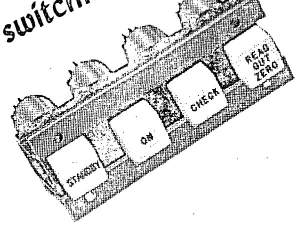


Model 72
0.75" dia.
Lens



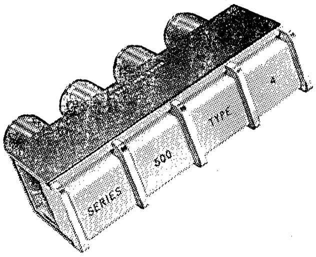
Model 73
0.75" x 1.50"
Lens

"switchline" MULTI-STATION ASSEMBLIES



SERIES 400

Multi-station switch assemblies designed for sub-panel mounting by means of a flanged "U" channel. All standard Switchline switches can be incorporated with several types of mechanical interlocking/lockout actions between stations. Up to 12 stations in one or two row configurations.

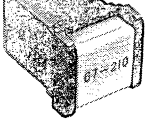


SERIES 500

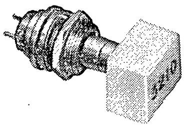
A new line of front panel mounting assemblies featuring long-lasting chrome barriers between each switch. All standard Switchline switches in ten types of tracking action and switching sequences. Up to 12 switches in single or dual row on ⅞" or 1" centers.

TYPE I — Mounting frame only.
TYPE II — Momentary and lockout.
TYPE III — Independently maintain and locked out.
TYPE IV — Interlock and lockout.
TYPE V — Maintained with master release.
TYPE VI — Maintained with remote master release.
TYPE VII — Maintained with remote master release and master release lockout.
TYPE VIII — Interlock and lockout with master release.
TYPE IX — Interlock and lockout with remote master release.
TYPE X — Interlock and lockout with remote master release and master release lockout.

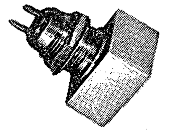
"switchline" INDICATOR LIGHTS



60 SERIES-210
1.57" length
0.75" sq. Lens
Channel mount



Model 3210
1.84" length
0.33" dia. shaft
0.75" dia. Lens
9/16 -32 THD.



Model 3220
1.81" length
0.75" sq. Lens
15/32 -32 THD.

Accommodates all "**switchline**" lenses. Utilizes AN3140-T 1-¾ or ALC-100 bulb.

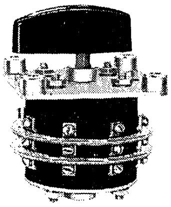
Write, wire or phone for complete literature. We invite your inquiries regarding our capabilities in custom switch design and production.

electro-mech
1826 NO. FLORADALE AVE. • SOUTH EL MONTE, CALIF. 91733
TELEPHONE (213) 442-7180

MULTIPOLE ROTARY SWITCHES

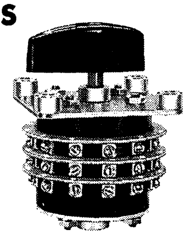
5 amperes to 200 amperes • 4, 8, 12, and 16 positions

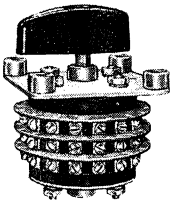
INDUSTRIAL TYPES



◄ **Type JR**–10 amperes
Two to eight positions;
up to 30 sections.
Catalog E-1000.

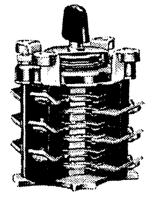
Type JM–7½ amperes ►
Two to twelve positions;
up to 25 sections.
Catalog E-1000.

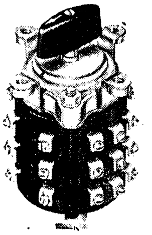




◄ **Type JK**–5 amperes
Two to sixteen positions;
up to 15 sections.
Catalog E-1000.

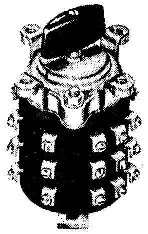
Type P–10 to 200 amp. ►
Two to four positions;
up to 13 sections.
Catalog E-5000.

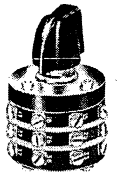




◄ **Type JD**–30 amperes
Two to eight positions;
up to six sections.
Catalog E-7000.

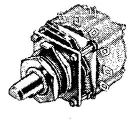
Type JS–30 amperes ►
Two to eight positions;
up to five sections.
Catalog E-7000.



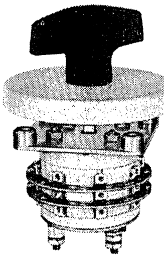


◄ **Type A**–5 amperes
Two to eight positions;
up to 10 sections.
Catalog E-3000.

Series 38– ½ ampere ►
Two to twelve positions;
up to five sections.
Catalog E-4000.

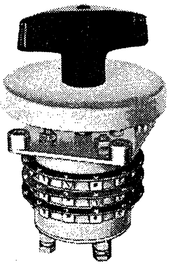


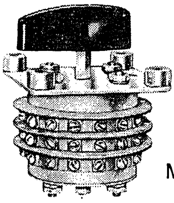
MILITARY TYPES



◄ **Type SJR**–10 amperes
Two to eight positions;
up to 30 sections.
MIL-S-21604 • **Cat. E-2000.**

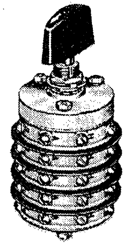
Type SJM–7½ amperes ►
Two to twelve positions;
up to 25 sections.
MIL-S-21604 • **Cat. E-2000.**

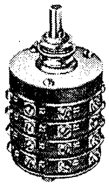




◄ **Type SJK**–5 amperes
Two to sixteen positions;
up to 15 sections.
MIL-S-21604 • **Cat. E-2000.**

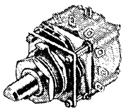
Type SJL–5 amperes ►
Two to eight positions;
up to 10 sections.
MIL-S-21604 • **Cat. E-3000.**

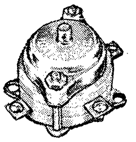




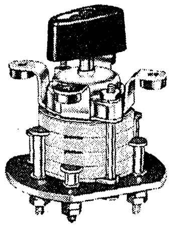
◄ **Type AF**–5 amperes
Two to eight positions;
up to ten sections.
MIL-S-6807 • **Cat. E-3000.**

Series 38 – ½ ampere ►
Two to twelve positions;
up to five sections.
MIL-S-3786 • **Cat. E-4000.**

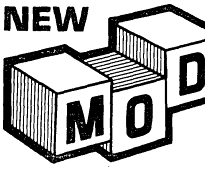




◄ **Type SR**–10 to 200 amp. ►
Two to four positions;
up to twelve sections.
MIL-S-15291 • **Cat. E-6000.**



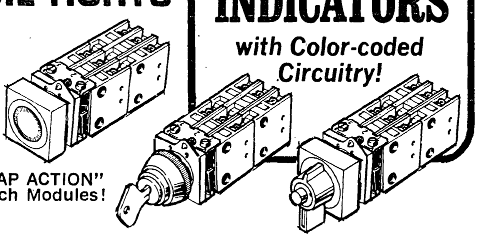
NEW



OIL TIGHTS

MODULAR SWITCHES and INDICATORS

with Color-coded Circuitry!

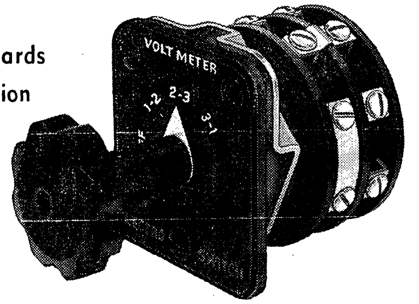


With "SNAP ACTION" Switch Modules!

Specify literally millions of different units from a few basic parts! Up to six color-coded modules per component. Switches may be activated by pushbuttons (flush or mushroom heads) or by selectors (knobs, levers, wings or keys) . . . with or without indicator light or auxiliary pushbutton for test conditions. Ratings: 10A-300V continuous . . . 6A-300VAC interrupt . . . ½A-125VDC resistive interrupt. Max. making current 60A . . . dielectric withstanding voltage 2500VAC. Mech. life over 1,000,000 operations. Available as finished components or modules or sub-assemblies. Write for Bulletin 32.

INSTRUMENT and CONTROL SWITCHES

- pre-wired
- for switchboards
- for distribution panels
- for engine-generator sets
- for machine controls



Pre-wired for easiest installation—you connect only the instrument and line wires—these dependable switches meet highest public-utility and military standards, yet cost far less than you'd expect.

Fit standard three-point panel-drilling for replacement service and original-equipment uses. Furnished with escutcheon plate, mounting hardware, wiring diagram, and round, oval, or pistol-grip handle.

Series 24 includes voltmeter, ammeter, ammeter-voltmeter, wattmeter, synchroscope, power-factor meter, circuit-breaker, motor-control, and special transfer switches. Write for catalog.

ELECTRO SWITCH CORP.

WEYMOUTH (Boston), MASSACHUSETTS 02188
Tel: 617-335-5200 TWX: 710-388-0377

EECoSWITCH
ROTARY THUMBWHEEL SWITCHES

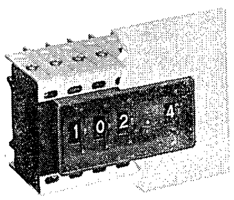
Revolutionary 1776 Switch Series
Widest Line — Lowest Cost

1 7 7 6
THE REVOLUTIONARY SWITCH
SERIES OF 1776

- **$3.00 IN SINGLE QUANTITIES**
- Less than $2.00 in large quantities
- Large, easily read, dial characters
- Plastic window readout protection
- Sealed against dust
- Back of panel mounting
- Up to 34 station assemblies
- Solder tab termination
- Diode provisions
- Double width switches — triple legend area
- Current Carrying Capacity 10 microamps to 3 amps
- Operating Range −20°C to +75°C
- Two Year Warranty.

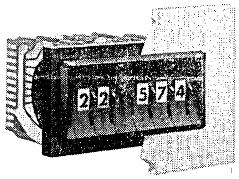
PARTIAL LIST OF CODES AVAILABLE
- Decimal ◦ BCD ◦ BCO with complement
- 9's complement with complement
- Excess 3 ◦ BCD with complement
- 7 bar indicator ◦ 12 position BCD
- 12 position BCD with complement
- 2 pole, double throw

200 SERIES
GENERAL PURPOSE



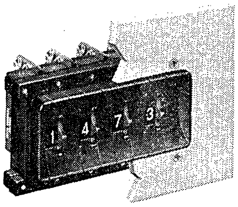
- Universal dimensions
- Wide selection of codes
- Large, easily read dial characters
- 2, 8, 10, 12 or 16 positions
- Switches individually replaceable in mounted assemblies
- Positive detent action
- 1-34 station assemblies

300/400 SERIES
GENERAL PURPOSE, SEALED AND LIGHTED



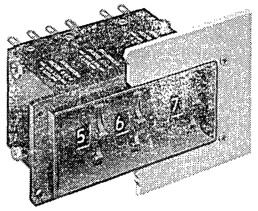
- Sealed — 300 Series
- Unsealed — 400 Series
- Large, easily read dial characters
- Replaceable lamp
- Double width switches — triple legend area
- Switches individually replaceable in mounted assemblies
- Reverse field lighting option

700/800 SERIES
MINIATURE, SEALED AND LIGHTED

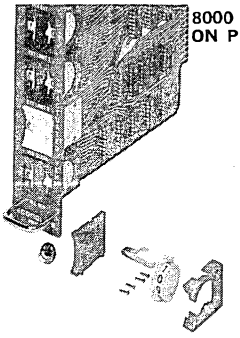


- Sealed — 700 Series
- Unsealed — 800 series
- Unlighted or lighted with long life permanent lamp
- Double width switches —triple legend area
- Switches individually replaceable in mounted assemblies
- Circuit board terminations

5000/6000 SERIES
MINIATURE, SEALED AND LIGHTED



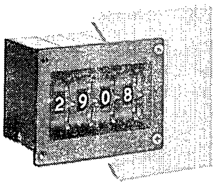
- Sealed — 6000 Series
- Unsealed — 5000 Series
- Replaceable lamp
- Cable, circuit board or wire loop terminations
- Plastic window readout protection
- Numerous codes/options



8000 SERIES FOR DIRECT MOUNTING ON PRINTED CIRCUIT CARDS

- **Mounts directly on user's motherboard**
- Reduces wiring costs
- Eliminates switch mounting hardware
- Provides for fast replaceability of both switch and PC card
- Sealed against dust
- Service life of over 1,000,000 detent operations
- 6 optional colors for coding switch functions

9000 SERIES
FRONT PANEL MOUNTING



- Large, easily read dial characters
- Through-bolt assembly
- Taper tab, wire wrap or circuit board terminals
- Reduces wiring costs
- Well proven on machine tool control panels
- Positive detent action

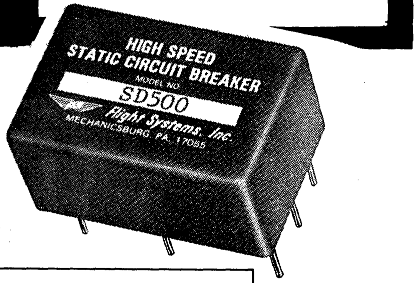
ELECTRONIC ENGINEERING COMPANY of California

ELECTRONIC PRODUCTS DIVISION • 1441 E. Chestnut Avenue • Santa Ana, California 92701 • Phone: (714) 547-5651
TWX 910-595-1550 TELEX 67-8420
Distributors: Hall-Mark Electronics • G. S. Marshall Company • Schweber Electronics

SOLID STATE CIRCUIT BREAKERS

PROTECT YOUR SOLID-STATE CIRCUITRY WITH THE FASTEST CIRCUIT BREAKERS MADE

FLIGHT SYSTEMS, INC. OFFERS THE MOST COMPLETE SELECTION OF ALL SOLID STATE CIRCUIT BREAKERS IN THE RANGE OF 12MA TO 10 AMPS OFFERED ANYWHERE. CHECK THESE PERFORMANCE FEATURES!

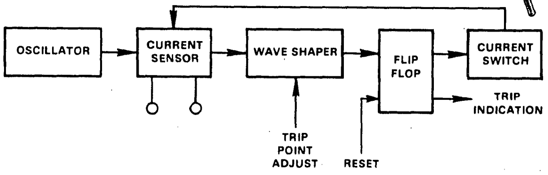


HIGH SPEED DC STATIC CIRCUIT BREAKER The ultimate in circuit protection, the Static Circuit Breaker gives a clean, arc-free bounceless break at 50 microseconds after current overload. The Static Circuit Breaker is insensitive to heat, shock, vibration and will operate in any explosive or corrosive atmosphere. With its logic level control of all functions and wide range of available modifications, the Static Circuit Breaker will adapt to most existing systems at very low cost. Since the current sensor is completely isolated from the switch portion of the Static Circuit Breaker, it is possible to monitor the current in a circuit different from the one being protected. The current sensor responds to D.C. or peak A.C. currents, regardless of polarity. Remote sensing is also possible.

12 MA TO 1.5 AMP DC

PERFORMANCE SPECIFICATIONS:

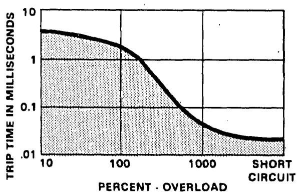
When used as an Over-Current Circuit Breaker.
Sensitivity: Units will operate continuously at 100% of set current, and will trip at 105% of this value.
Trip time: 50 microseconds after overload appears. (See Chart) Unit not damaged by direct short-circuit.
Current Switch Voltage Drop: 0.2 V max. at rated load current.
Current Sensor Voltage Drop: 5 millivolts max. at rated load current.
When used as an Over-Voltage Circuit Breaker
Sensitivity: Can be Programmed to trip on as little as 5 % over voltage.
Trip Time: 100 microseconds after over-voltage appears. (see chart)
Trip-Point: Adjustable by external resistor from 50% to 150% rated current, or voltage.
Load Voltage: (min-max): 8 to 35 VDC.
External Trip-Reset: By a momentary pulse or contact closure, the Static Circuit Breaker may be locally or remotely tripped or reset.
Note: With this trip-reset feature, the unit functions as a latching on-off switch in addition to its protection feature.
Reset Time: 10 microseconds or less.
Circuit Breaker Internal Power Requirements: 35 ma. @ load voltage. External bias can also be used instead of sampling load voltage.
Trip Indication: Logic level outputs of 0.2 VDC when tripped, 5 VDC when reset.
Operating Temperature Range: – 20°C to + 71°C



STATIC CIRCUIT BREAKER - BLOCK DIAGRAM

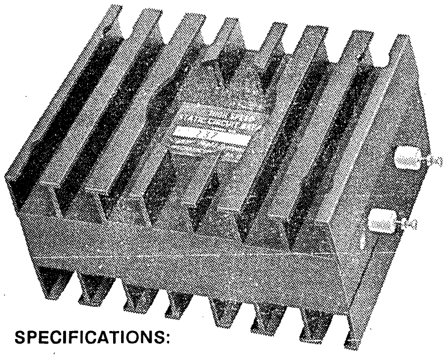
TRIP POINT	MODEL NO.
25 ma.	SD 25
50 ma.	SD 50
100 ma.	SD 100
500 ma.	SD 500
1 Amp.	SD 1000

CURRENT & VOLTAGE.
TRIP TIME VS % OVERLOAD



UNIT PRICE (All Models)

1 - 3	4 - 10	11 - 25	26 - 50
$36.70	$33.20	$31.29	$28.90



SPECIFICATIONS:

Size: 3.00" x 4.00" x 2.00" tall (OD)
Operating Voltage: 12VDC min., 65VDC max.
Trip Current Level Accuracy: ± 5%
Trip Time: 500 microseconds typ at 100% overload
Voltage Drop: 2.0VDC max.
Leakage Current at 65VDC: 30 ma max.
Operating Temperature Range: – 20°C to + 70°C
Minimum Operating Current: 200 ma.
Reset Method: By interrupting DC supply
Construction: Potted module in a heat sink assembly.
Delivery: 2 to 3 weeks ARO.

2.5, 5 AND 10 AMP SOLID STATE DC CIRCUIT BREAKER

FEATURES

- TOTALLY SOLID STATE – NOTHING TO WEAR OUT
- RUGGED – WILL WITHSTAND SEVERE SHOCK & VIBRATION
- SIMPLE, EASY INSTALLATION – ONLY 2 CONNECTIONS
- MOUNTS ANYWHERE, IN ANY PLANE – NO HEATSINK REQUIRED
- COMPLETELY SEALED – IDEAL FOR CORROSIVE OR EXPLOSIVE ENVIRONMENTS

TRIP POINT	MODEL NO.	PRICE			
		1 - 3	4 - 10	11 - 25	26 - 50
2.5 AMPS	144	66.75	59.50	54.75	48.80
5.0 AMPS	141	72.50	68.90	62.15	57.35
10 AMPS	137	79.75	76.30	68.10	61.50

Automatic Reset Available.

DELIVERY FROM STOCK

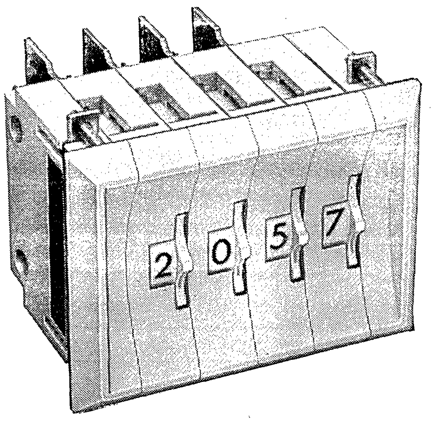
NEED A SPECIAL UNIT? Flight Systems, Inc. will design and manufacture an all Solid State Circuit Breaker to your Exact Specifications. Contact us with your requirements. 24 hour quote, 2 to 3 week delivery.

SEE ALSO EEM PAGE SHOWING OUR SOLID STATE RELAYS. SEE INDEX FOR PAGE NUMBER.
WRITE OR CALL FOR OUR COMPLETE CATALOG.

FS Flight Systems, Inc.
P. O. BOX 25, MECHANICSBURG, PA. 17055
PHONE (717) 697-0333

SWITCHES

CR103 TYPE F THUMBWHEEL SWITCHES



General Electric's CR103 Type F Thumbwheel Switch can save you panel space by replacing old "wafer"-type switches. It can be used wherever data are manually inserted into a machine or process — such as welding control, computer systems, and numerical control.

Each switch module is only ½-inch wide, 1¾-inches deep and 2-inches high. An assembly with 24 switch modules takes up only 12¹³⁄₁₆-inches in panel width.

The Switch is rated 3-amperes carrry, 150-volt a-c/d-c and is available in standard-duty and oiltight forms. Phenolic printed circuit boards are available in decimal, binary coded decimal, binary with complement, binary with oddbit parity and binary complement forms. Switch assemblies can be factory-assembled with up to 24 modules — up to 7 modules for oiltight forms.

FEATURES

- **True Oiltightness** — both for switch **and** for panel integrity. Never before offered in the industry!
- **Ordering Flexibility** — order the switches factory-assembled or purchase modules as individual units to be mounted and replaced separately. If you want to make up your own Standard-duty switches, you can order end blocks, spacers, shafts, and switch modules. Your choice of termination — plug-in, wire wrap, or taper tab/solder. Oiltight forms are available factory-assembled only.
- **Appearance Flexibilty** — GE Thumbwheel Switches offer a wide selection of numeral color combinations. Wheels are also available with plus-minus coding. Housings are offered in grey, black, white or beige.
- **Durable Construction** — tough, unbrekable Lexan® switch bodies, wear-resistant Delrin* wheel and Fairprene* gaskets (on oiltight forms) give this switch maximum operating life with low maintenance. The switch is easy to operate, even with a gloved hand.
- **Easy Mounting and Installation** — entire unit is assembled with four mounting shafts and eight screws at end of shafts — no matter how many switches in line. The Assembly is held snug to panel front by a simple bracket-screw design and can be mounted on any panel thickness up to ⅜-inch.
- **Neat Appearance** — large, easy-to-read numerals or symbols provide in-line visual readout of switch position. Modern switch design presents clean panel face — no screw heads on outside of panel. Spacers with solid front can be inserted to permit easy numeral or symbol series separation.

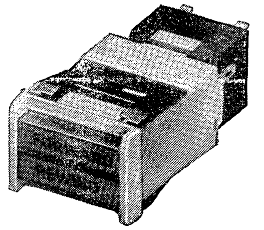
* Reg. trademark of Du Pont Company

CONTACT RATINGS

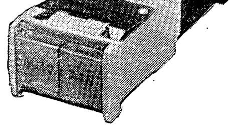
Carry continuously	3 ampere max., a-c/d-c
Voltage	150 volts max., a-c/d-c
Make	30 va a-c inductive 7.5 va d-c inductive 30 va a-c/d-c resistive
Break	15 va a-c inductive 7.5 va d-c inductive 30 va a-c/d-c resistive
Contact Resistance	100 milli-ohms max.

Write for Bulletin GEA-8124

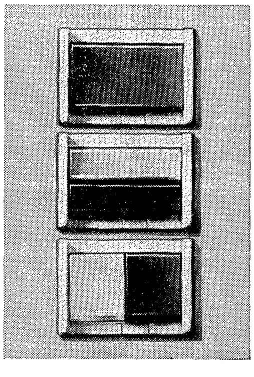
CR103 TYPE D ILLUMINATED PUSH-BUTTON SWITCHES



Illuminated push button/light with horizontal lens caps installed



Illuminated magnetically-held push button with vertical lens caps installed



Solid or split color fields give added flexibility. Colors can be mixed in the split field forms for even more combinations.

General Electric's new line of CR103 Type D illuminated push buttons are designed for a wide variety of applications such as control and instrument panels, office machines, laboratory instruments, computers and other data processing equipment. Matching indicating lights are shown in Section 3900 on page of General Electric indicating lights.

Push buttons are rated 5 amp carry, 30 amp make at 125 volts a-c; 3 amp inductive at 30 volts d-c; 0.55 amp inductive at 125 volts d-c. Lamps are rated 28 volts maximum.

FEATURES

- Units snap into panels from front without tools, and can be gang-mounted horizontally to save space or for group functions.
- Convenient slide-on lens caps in five colors; four housing colors. Units are single button only, and have solid, horizontally- or vertically-split color fields.
- Legend inserts for all forms can be printed or engraved on acetate or similar material of 10 mils or less thickness.
- Three types of contact action are available: momentary contact with or without audible indication, maintained contact (push-on, push-off), and magnetically held contact with or without audible indication. Terminals are designed for either quick-connect or solder connections.
- Miniature flange-base incandescent lamps such as GE No. 327 (28 volts) or GE No. 328 (6 volts) are easily replaced without tools; without removing housing from panel. Lamps are supplied by customer.
- 2-lamp and 4-lamp forms are available.

Write for Bulletin GEA-7390

For complete information contact your nearby GE Sales Office, or write to General Electric Co., Section 998-80. Schenectady, N. Y. 12305.

GENERAL ELECTRIC

GORDOS
CORPORATION 250 GLENWOOD AVENUE • BLOOMFIELD, NEW JERSEY 07003 U.S.A. • 201-743-6800

REPRESENTATIVES THROUGHOUT THE WORLD

SUB-MINIATURE AND MINIATURE REED SWITCHES

• GENERAL SPECIFICATIONS

MOUNTING POSITION: Any Plane (WR-126 mercury wetted contacts limited to ±30° from vertical)

INTERNAL ATMOSPHERE: Inert gas (WR-126, MR-138 pressurized)

INSULATION RESISTANCE: (Higher values attained by special treatment)
SPST Form A — 1 x 10^{12} ohms Typical
SPDT Form C — 1 x 10^{9} ohms Typical
Mercury Wetted Form A — 1 x 10^{10} ohms Typical

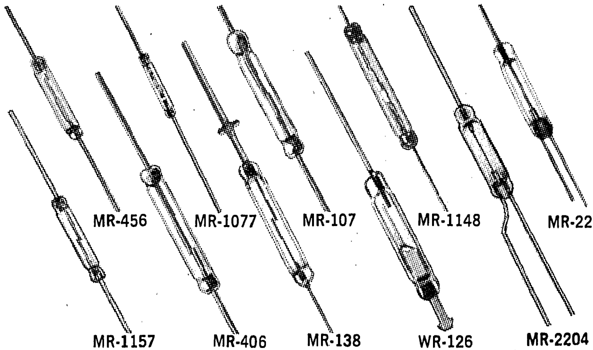
CAPACITANCE: SPST Form A — 0.2 picofarad Typical
SPDT Form C — 1.2 picofarad Typical

SHOCK: 50 g's @ 11ms

VIBRATION: 35 g's from 50 to 2000 Hz

STANDARD TEST COIL: R — 5105

AVAILABLE SENSITIVITY: 15/70 ampere turns
40/80 ampere turns (WR-126)



Part #	A — Maximum Glass Diameter (Inches)	B — Maximum Glass Length (Inches)	C — Nominal Uncut Switch Length (Inches)	D — Minimum Trim Length (Inches) (1)	E — Nominal Uncut Armature Length (Inches)	F — Lead Configuration (Inches)	Maximum Current (Amps)	Maximum Switching Voltage (VDC)	Maximum Contact Rating (Watts)	Minimum Breakdown Voltage (VRMS)	Maximum Initial Contact Resistance (Ohms)	Typical Operate Time Including Bounce (Milliseconds)	Contact Material (2)
SUB-MINIATURE SPST — FORM A OFFSET GAP													
*MR-456	.090	.560	1.90	0.810	1.045	.023 Dia.	.250	100	7	250	.150	0.6	D
MR-450	.090	.560	1.90	0.810	1.045	.023 Dia.	.250	100	7	250	.150	0.6	G
MR-458	.090	.560	1.90	0.810	1.045	.023 Dia.	.250	100	7	250	.150	0.6	R
CENTER GAP													
*MR-1157 (Modern Milli)	.100	.673	1.98	.923	.992	.023 Dia.	.125	28	3	100	.150	0.75	D
*MR-1077 (Tiny Tina)	.070	.455	1.71	.705	.855	.020 Dia.	.250	28	3	200	.150	0.25	D
MINIATURE SPST — FORM A OFFSET GAP						**Pole**							
*MR-406	.105	.885	2.75	1.13	1.238	.028 Dia.	.500	200	10	250	.100	1.0	D
MR-400	.105	.885	2.75	1.13	1.238	**Arm.**	.500	200	10	250	.100	1.0	G
MR-408	.105	.885	2.75	1.13	1.238	.015 x .030	.500	200	10	250	.100	1.0	R
CENTER GAP													
*MR-087	.090	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	D
MR-081	.090	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	G
MR-086	.090	.785	2.10	1.03	1.043	.015 x .030	.500	200	10	250	.100	0.75	D
MR-088	.090	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	R
*MR-107	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	D
*MR-108	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	R
MR-101	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	G
MR-106	.105	.785	2.10	1.03	1.043	.015 x .030	.500	200	10	250	.100	0.75	D
MR-117	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.150	0.75	P
*MR-138	.105	.785	2.10	1.25	1.043	.023 Dia.(3)	.500(4)	1000	10	1200	.100	0.75	R
*MR-306	.125	.785	2.10	1.03	1.043	.015 x .030	.500	200	10	250	.100	0.75	D
*MR-307	.125	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	D
MR-301	.125	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	G
MR-308	.125	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.75	R
*MR-1148 } Tiny Twisters	.105	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.6	R
MR-1048 } Tiny Twisters	.090	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.6	R
MR-1348 } Tiny Twisters	.125	.785	2.10	1.03	1.043	.023 Dia.	.500	200	10	250	.100	0.6	R
MERCURY WETTED						**Pole**						**No Bounce**	
*WR-126-1	.125	.690	1.62	1.08	.740	.023 Dia.	1.0(4)	1000	50	1500	.050	1.75	Hg
*WR-126-20	.125	.690	2.10	1.08	1.240	**Arm.** (3)	1.0(4)	1000	50	1500	.050	1.75	Hg
SPDT — FORM C (5)											**N.O./N.C.**	**N.O./N.C.**	**N.O./ARM./N.C.**
*MR-2203-1	.125	.600	2.10	.850	1.048	.023 Dia.	.100	28	4	200	.15/.2	0.5/0.4	R/R/P
*MR-2204	.125	.600	2.10	.850	1.048	.023 Dia.	.100	28	4	200	.15/.2	0.5/0.4	R/R/P

(*) **Design Standard:** The high volume, readily available, lowest priced switch(es) of any series.

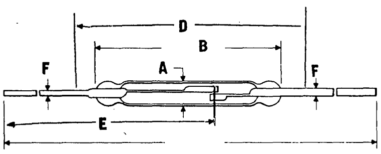
(1) Consult factory before exceeding minimum.

(2) D-Dimet — dropout normal; G-Diffused Gold — dropout low; R-Rhodium — dropout normal; Hg-Mercury — dropout normal; P-Precious Metal — dropout high.

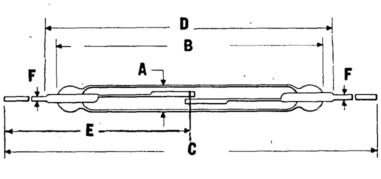
(3) WR-126 Hollow Tube: .040″ Dia.; WR-126-20 Solid Lead: .023″ Dia.; MR-138 Hollow Tube: .040″ Dia.

(4) Derate to .010 amp. @ 1000 VDC.

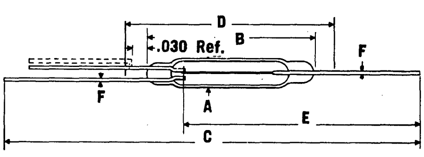
(5) N.C. contact designated by shorter lead on MR-2203-1 and bent lead on MR-2204.



SPST — Form A Offset Gap
SPST — Form A Mercury Wetted



SPST — Form A
Center Gap



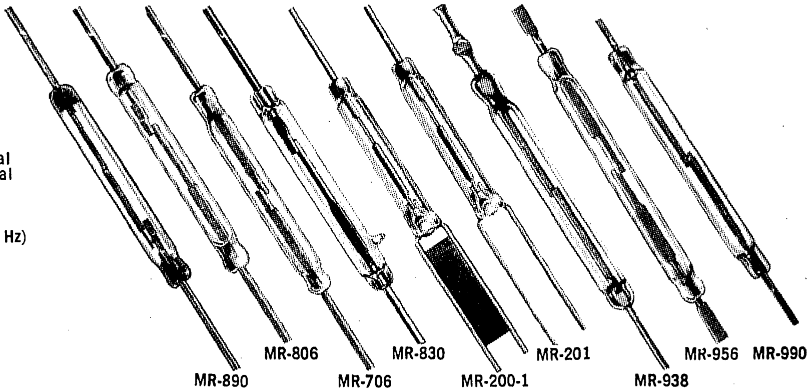
SPDT — Form C

GORDOS
250 GLENWOOD AVENUE • BLOOMFIELD, NEW JERSEY 07003 U.S.A. • 201-743-6800 CORPORATION

COMPACT/STANDARD/LARGE REED SWITCHES

• GENERAL SPECIFICATIONS

MOUNTING POSITION: Any Plane
INTERNAL ATMOSPHERE: Inert Gas: (MR-207, 893, 938, 2208: Pressurized)
(MR-830: Vacuum)
INSULATION RESISTANCE: (Higher values attained by special treatment)
SPST Form A — 1 x 10^{12} ohms Typical
SPDT Form C — 1 x 10^{10} ohms Typical
CAPACITANCE: SPST Form A — 0.8 picofarad Typical
SPDT Form C — 4.0 picofarad Typical
SHOCK: 50 g's @ 11ms (MR-990: 30 g's @ 11ms)
VIBRATION: 35 g's 50 to 2000 Hz (MR-990: 20 g's 50 to 2000 Hz)
STANDARD TEST COIL: COMPACT — R-580
STANDARD — R-580
LARGE — R-584
AVAILABLE SENSITIVITY: COMPACT 30/80
STANDARD 30/80
(Except MR-890, 830, 893, 60/100
MR-200-1, 200-2) 20/50
LARGE 40/100



Part #	A — Maximum Glass Diameter (Inches)	B — Maximum Glass Length (Inches)	C — Nominal Uncut Switch Length (Inches)	D — Minimum Trim Length (Inches)[1]	E — Nominal Uncut Armature Length (Inches)	F — Lead Configuration (Inches)	Maximum Current (Amps)	Maximum Switching Voltage (VDC)	Maximum Contact Rating (Watts)	Minimum Breakdown Voltage (VRMS)	Maximum Initial Contact Resistance (Ohms)	Typical Operate Time Including Bounce (Milliseconds)	Contact Material[2]
COMPACT													
SPST — FORM A													
OFFSET GAP						**Pole**							
*MR-606	.190	1.45	3.20	1.70	1.79	.055 Dia.	1.0	250	15	300	.050	2.0	D
MR-600	.190	1.45	3.20	1.70	1.79	**Arm.**	1.0	250	15	300	.050	2.0	G
MR-608	.190	1.45	3.20	1.70	1.79	.035 x .061	1.0	250	15	300	.050	2.0	R
CENTER GAP													
*MR-506	.190	1.40	3.12	1.65	1.56	.022 x .061	1.0	250	15	300	.050	2.0	D
MR-500	.190	1.40	3.12	1.65	1.56	.022 x .061	1.0	250	15	300	.050	2.0	G
MR-508	.190	1.40	3.12	1.65	1.56	.022 x .061	1.0	250	15	300	.050	2.0	R
STANDARD													
SPST — FORM A													
OFFSET GAP													
*MR-806	.195	1.70	3.20	1.95	1.79	**Pole**	1.0	250	15	500	.050	2.0	D
MR-800	.195	1.70	3.20	1.95	1.79	.055 Dia.	1.0	250	15	500	.050	2.0	G
MR-808	.195	1.70	3.20	1.95	1.79	**Arm.**	1.0	250	15	500	.050	2.0	R
*MR-890	.195	1.70	3.20	1.95	1.79	.035 x .061	3.0	200	100	400	.500	2.5	W
MR-830	.215	1.70	3.20	1.95	1.79		3.0[3]	3500	50	5000	.500	2.5	M
*MR-893	.195	1.70	3.20	2.50	1.79	[4]	3.0[3]	1500	100	1500	.500	2.5	W
CENTER GAP													
*MR-706	.190	1.65	3.40	1.90	1.70	.035 x .061	1.0	250	15	300	.050	2.0	D
MR-700	.190	1.65	3.40	1.90	1.70	.035 x .061	1.0	250	15	300	.050	2.0	G
MR-708	.190	1.65	3.40	1.90	1.70	.035 x .061	1.0	250	15	300	.050	2.0	R
MR-710	.190	1.65	3.40	1.90	1.70	.035 x .061	1.0	250	15	300	.100	2.0	P
SPDT — FORM C[5]												**N.O./N.C.**	**N.O./ARM./N.C.**
*MR-2208	.230	1.50	3.50	2.10	2.093	.045 Dia.[4]	.500	250	10	1000	.100	2.5/3.5	R/R/P
*MR-201	.190	1.20	3.15	1.45	1.923	**Pole**	.250	100	10	250	.200	2.5/3.5	G/D/P
*MR-200-1	.190	1.20	3.15	1.45	1.923	.030 x .055	.250	100	10	250	.200	3.5/2.5	G/D/G
*MR-200-2 (Latcher)	.190	1.20	3.15	1.45	1.923	**Arm.**	.250	100	10	250	.200	3.5/3.5	G/D/G
MR-207	.190	1.20	3.15	1.90	1.923	.045 Dia. [4]	.250	250	10	1000	.200	2.5/3.5	G/D/P
LARGE													
SPST — FORM A													
CENTER GAP													
MR-900	.210	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	G
MR-906	.210	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	D
MR-908	.210	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	R
*MR-956	.195	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	D
MR-950	.195	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	G
MR-958	.195	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	15	500	.050	2.5	R
MR-920	.210	2.07	3.20	2.32	1.60	.021 x .100	1.0	250	25	500	.035	2.5	S
MR-938	.210	2.07	3.20	2.50	1.60	.021 x .100[4]	1.0[3]	1200	25	1200	.050	2.5	R
MR-990	.210	2.07	3.20	2.32	1.60	.021 x .100	3.0	250	100	250	.050	3.0	D-W

(*) **Design Standard:** The high volume, readily available, lowest priced switch(es) of any series.

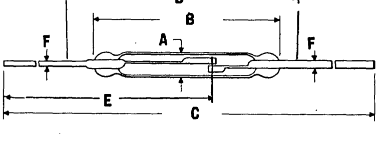
[1] Consult factory before exceeding minimum.

[2] D-Dimet — dropout normal; G-Diffused Gold — dropout low; R-Rhodium — dropout normal; P-Precious Metal — dropout high; M-Molybdenum — dropout high; W-Tungsten — dropout high; S-Silver — dropout high.

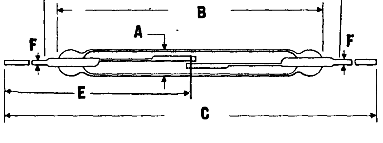
[3] Derate to .010 amp. @ 1000 VDC.

[4] Hollow Tube: .075″ Dia.

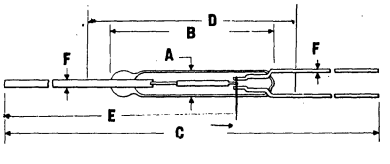
[5] N.C. contact designated by color dot. MR-200-1, 200-2 are magnet biased and polarity sensitive.



SPST — Form A
Offset Gap



SPST — Form A
Center Gap



SPDT — Form C

GORDOS
CORPORATION 250 GLENWOOD AVENUE • BLOOMFIELD, NEW JERSEY 07003 U.S.A. • 201-743-6800
Representatives Throughout The World

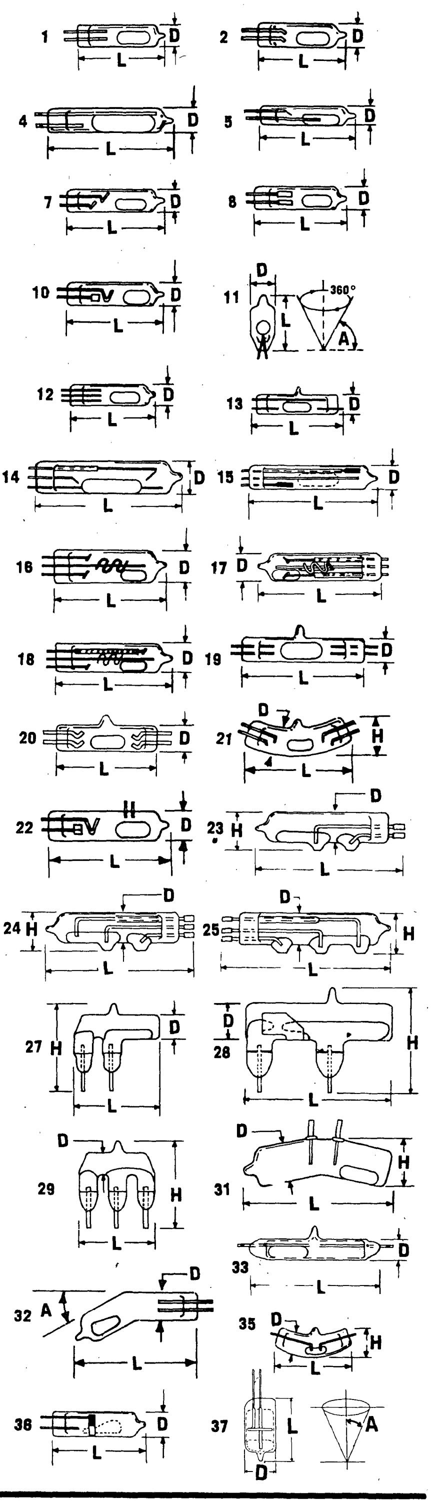
GORDOS MERCURY SWITCHES

- SEALED CONTACTS
- RELIABLE OPERATION
- ANY OPERATING ANGLE
- POSITION SENSING
- LOW CONTACT RESISTANCE
- HEAVY OVERLOAD
- LONG LIFE
- MINIATURIZATION

Abbreviations:

MBB — Make Before Break Action
PtE — Platinum Electrodes
PtTE — Platinum Tipped Electrodes

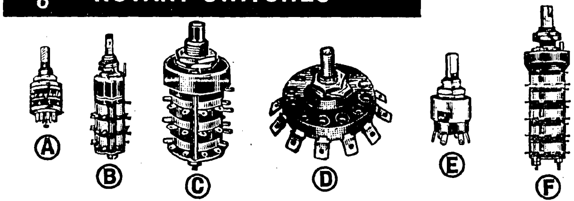
Switch Part No. Without Lead Wire	Nominal Load Current Amps At 115 V AC Resistive	Differential Angle (Degrees) Max.	Differential Angle (Degrees) Min.	Sketch Number	Nominal Dimensions (Inches) D	L	H	Type of Contract: MM — Mercury to Mercury MWM — Merc. to Wet Metal MDM — Merc. to Dry Metal	Suitable for Low Voltage Application	NOTES
SPST										
HG 325 LO	mA	12	8	35	.495	1¾	11/16	MWM	√	PtTE, N.C. Contacts
HG 414 LO	0.1	5	—	8	.350	1 3/16	—	MWM	√	PtTE
HG 220 LO	0.1	10	—	4	.155	½	—	MDM	—	Under 6 volts HG 520LO is Recommended.
HG 520 LO	0.1	10	—	4	.155	½	—	MDM	√	—
HG 221 LO	0.1	15	—	4	.155	⅞	—	MWM	√	PtTE
HG 242 LO	0.1	25	15	11	.275	⅞	—	MDM	—	N.C. Conical Tipover Series. Angles are Measured from Horizontal (A° on Sketch No. 11)
HG 245 LO	0.3	50	10	11	.275	¾	—	MDM	—	Contact is Open at Min. Degree Angle and Closed at Max. Degree Angle Shown in Table.
HG 244 LO	0.5	See Note	See Note	37	.495	1½	—	MDM	√	N.O. Conical Tipover Series. Angles are Measured from Vertical (A° on Sketch No. 37) Min. Angle: 20° ±5°, Max. Angle: 65° ±5°.
HG 253 LO	0.3	3	—	8	.325	1 5/16	—	MWM	√	PtTE
HG 260 LO	0.3	180	—	1	.325	2¾	—	MWM	√	PtE. Nonmagnetic
HG 261 LO	0.3	15	—	1	.325	1¼	—	MWM	√	PtE. Nonmagnetic
HG 402 LO	0.3	.25	—	2	.400	1¼	—	MDM	—	Slow Tilting Action
HG 251 LO	1	2	—	1	.325	1	—	MDM	—	—
HG 252 LO	2	14	—	1	.325	1	—	MWM	√	General Purpose Switch
HG 407 LO	2	5	—	1	.325	1½	—	MDM	—	—
HG 256 LO	2	15	—	12	.325	1	—	MWM	—	Make 2 Ckts. to Common
HG 217 LO	3	10	—	8	.325	1⅜	—	MDM	√	—
HG 707 LO	3	40	30	36	.495	2	—	MDM	√	Time Delay 6-12 Seconds N.C.
HG 566 LO	4	10	—	16	.495	2	—	MDM	—	N.C. 2 Ckts. to Common Lead End Down
HG 567 LO	4	10	—	17	.495	2	—	MDM	—	N.C. 2 Ckts. to Common Lead End Up
HG 431 LO	5	4	—	7	.495	2	—	MDM	√	—
HG 447 LO	7	1.5	—	10	.600	2⅝	—	MDM	√	Slow Tilting Action
HG 457 LO	10	See Note	—	32	.435	See Note	—	MDM	—	High Diff. Angle Switch Make to Customer Specifications
HG 445 LO	10	8	—	10	.600	2	—	MDM	√	—
HG 455 LO	10	5	—	1	.435	1 11/16	—	MDM	√	General Purpose Switch
HG 454 LO	10	5	—	10	.600	2¼	—	MDM	√	—
HG 412 LO	15	8	—	23	.520	2¼	—	MM	√	—
HG 421 LO	15	10	—	27	.450	1⅜	1½	MM	√	High Load Reliability
HG 721 LO	25	8	—	27	.520	2⅛	1 11/16	MM	√	—
HG 482 LO	45	5	—	28	.675	2⅛	2	MM	√	—
HG 803 LO	0.2	1.4	—	5	.325	1⅜	—	MWM	√	PtTE. Thermostat Control Switch
SPDT										
HG 804 LO	0.2	2	—	14	.350	1 9/16	—	MWM	√	PtTE. Thermostat Control Switch
HG 564 LO	1.5	12	—	15	.325	1⅜	—	MDM	—	MBBr
HG 569 LO	4	10	—	18	.495	2	—	MDM	—	—
HG 621 LO	8	7	—	13	.435	2¼	—	MDM	√	—
HG 427 LO	10	14	—	25	.520	2¼	—	MM	√	MBBr
HG 420 LO	15	10	—	24	.520	2	⅝	MM MDM	√	MBBr, MDM Contact Rating 5 Amp at 115 VAC
HG 461 LO	15	14	9	29	.450	1⅜	1½	MM	√	Momentary MBBr
HG 719 LO	25	15	—	29	.520	2⅜	1 11/16	MM	√	MBBr
TWO CKT.										
HG 209 LO	1	6	—	19	.230	1	—	MDM	—	—
HG 628 LO	5	6	—	20	.530	2⅝	—	MDM	√	MBBr
HG 322 LO	5	13	7	21	.495	2¼	11/16	MDM	√	MBBr Pilot Ckt. 2 Amp 115V
HG 638 LO	10	10	—	22	.600	2¼	—	MDM	—	Overlap Angle 3° to 6°
PULSE										
HG 381 LO	1	—	8	33	.225	1	—	MDM	—	Duty Cycle 20 to 50 Milliseconds
HG 702 LO	3	20	15	31	.495	1½	⅝	MDM	—	Duty Cycle 30 to 70 Milliseconds



Grayhill miniaturized switches

rotary switches — push button switches — electronic hardware

ROTARY SWITCHES

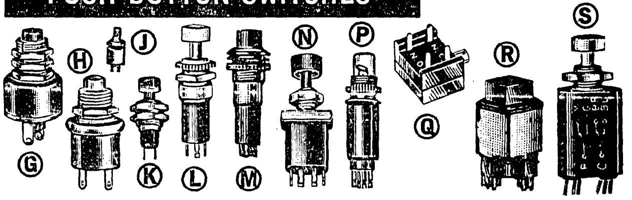


Style	O.D. (in.)	Rating 115 VAC Res.	Angle(s) of Throw	Pole(s) Per Deck	Deck(s)	Series
A	.500	200 MA	36°, 45° or 60°	1 or 2	1	50
A	.562	200 MA	30°	1, 2, 3 or 4	1	51
E	.640	1 Amp	60°	1	1	45
B	.687	¼ Amp	36°	1 or 2	1-12	8
B	.750	¼ Amp	30°, 45° or 60°	1-6	1-12	9
C	1.015	1 Amp	36°	1 or 2	1-10	24
F	1.015	1 Amp	36°	1 or 2	1-12	42
C	1.015	1 Amp	36°	1	1-10	5000
F	1.125	½ Amp	22½°	1-8	1-12	57
F	1.125	½ Amp	18°	1-10	1-12	59
F	1.170	1 Amp	30°, 45°, 60° or 90°	1-6	1-12	44
F	1.350	¼ Amp	15°	1-12	1-12	53
D	2.280	15 Amps	30°	1	1	19

The features listed below are found in many Grayhill Rotary Switches. The column to the right indicates the Series in which they may be found.

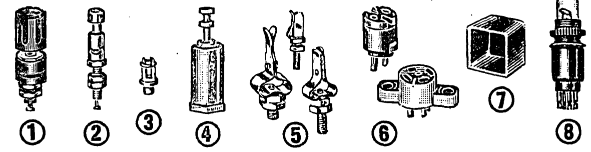
	Series No.
Adjustable Stop — switches have stops which can be set and reset for any number of active positions	42, 43, 44, 50, 51 or 54
Coded — switches convert decimal (10) inputs to computer codes	42
Concentric Shafts — two switches in one: both rotary; one rotary and one push button, or one rotary and an add-a-pot adapter	43 and 54
Homing Rotor — switches positions are all shorted except one	44
Isolated Positions — one or more switch positions can be isolated from contact by normal rotation of shaft	9, 42 or 44
Keylock — using adapter, switches can only be operated with key acting as shaft knob	8, 42, 44, 50 or 51
Military Type — switches have been tested and qualified to MIL-S-3786/4, /13, /20 and /35	8, 9, 42, 44, 50 or 51
Panel Sealed — switches have shaft seals and panel seals to prevent moisture reaching behind panel	8, 9, 42, 44, 50, 51, 53, 57 or 59
Power — 30° angle rated at 15 amps at 125 VAC resistive	19
Printed Circuit Terminals — switch positions have printed circuit terminal for PC board mounting	8, 9, 24, 42, 50 or 51
Progressively Shorting — each additional switch position is shorted as shaft is rotated 1 thru 6 positions	44
Spring Return — a rotational force is required to maintain contact at one or more switch positions	8, 9, 24, 42 or 44
Unidirectional — switch shafts may be rotated in one direction only	24, 42 or 44

PUSH BUTTON SWITCHES



Style	Features	Amp Rating @ 115 VAC Res.	Circuitry	Series
G	Momentary	10	SPST and SPDT	2000
H	Momentary	1	SPST	4000
H	Momentary	½	DPST	35
H	Momentary	¼	SPST	23
L and M	Momentary or Alternate Action (push on—push off) Standard Bushing, Sub-panel or Bezel Mount	¼	SPDT	46
N	Sealed and Unsealed Momentary	¼	DPDT	46
R	Momentary or Alternate Action (push on—push off) Square Bezel Mounting	¼	DPDT	46
S	Environmentally Sealed—Momentary	¼	DPDT	46
P	Lighted Push Button Momentary	1	SPST	40
H	Sealed and Unsealed Momentary	1	SPST	30
K	Positive Feel Momentary	1	SPST	30
J	Standard or Limit Switch Momentary	½	SPST	39
Q	Printed Circuit Right Angle Actuation Momentary	½	SPDT (2 circuit)	39

ELECTRONIC HARDWARE



Style	Item	Series
1	Binding Post	29
2	Push Post Terminals	29
3	Test Jacks	31
4	Stand-Off Insulators	18
5	Test Clips	2
6	Sockets—Transistor, Pencil Tube, Bi-Pin Lamp, and Printed Circuit	22
7	Module Cases, Headers and Terminal Boards	3
8	Indicator Lamp	41

Write for Grayhill's Engineering Catalog for complete specifications.

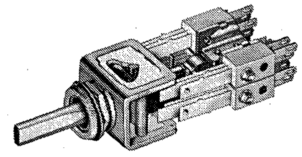
Grayhill Inc.

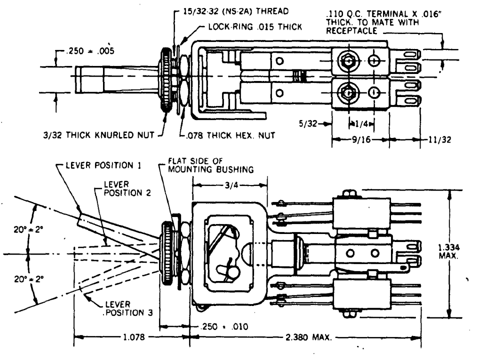
...THE DIFFERENCE BETWEEN EXCELLENT AND ADEQUATE.

569 Hillgrove Avenue • La Grange, Illinois 60525 • 312-354-1040

GUARDIAN® ELECTRIC LEVER & LEAF BLADE SWITCHES

ILLUMINATED LEVER SWITCHES WITH SNAP-IN CAM INSERTS





Bushing mounted illuminated lever switches with snap-in cam inserts that permit changing actuator functions instantly — to any combination of off, momentary or locked positions. Mount vertically on 1⅜″ centers or side-by-side on ¾″ centers. Supplied with 28 volt lamp and red and green insertable color filters. (Center position remains clear.)

Combinations: Any specified switch combination up to 4 pole, double throw, per station with switches arranged in any desired form to provide needed circuitry.

Blade Materials: Guardian bronze (similar to phosphor bronze).

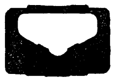
Contact Ratings: 1½, 4 or 10 amps at 120 VAC resistive.

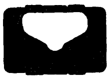
Contact Materials: Fine silver.

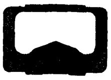
Terminals: .110″ quick connect for .016″ female standard. Solder lug available.

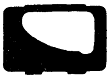
Mounting: Standard ½″ mounting hole.

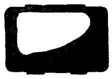
Interchangeable Cams: Kit of 12 inserts for 9 switching positions available. Complete data in catalog described below.

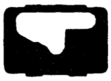

LOCKED-OFF-LOCKED

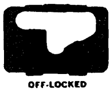

MOMENTARY-OFF-MOMENTARY

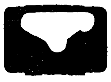

LOCKED-LOCKED

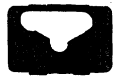

MOMENTARY-LOCKED


LOCKED-MOMENTARY

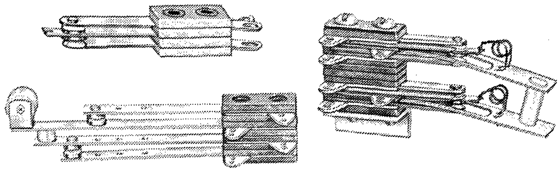

LOCKED-OFF


OFF-LOCKED


MOMENTARY-OFF-LOCKED


LOCKED-OFF-MOMENTARY

STACKED SWITCH ASSEMBLIES



Applications for Guardian switch assemblies are practically unlimited. Designed for mounting on ¼″ or ⅜″ centers and available as leaf, blade, stack, roller, cam, snap-action, bifurcated, push-button, feather rub, multiple coin and a wide variety of special assemblies. Complete data in catalog described below.

Combinations: ¼″ mounting centers with up to 10 blades; ⅜″ mounting centers with up to 15 blades.

Blade Materials: Tinned phosphorous-bronze standard.

Blade Lengths: From center of inward mounting hole: ¼″ mounting centers — up to 1⅞″ max.; ⅜″ — up to 2⅝″.

Contact Ratings: 1½, 4, 8 and 10 amps @ 120 VAC non-inductive standard.

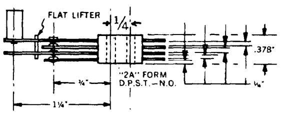
Contact Materials: Fine silver standard.

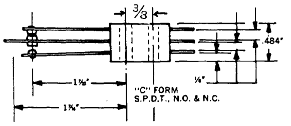
Separators: XP bakelite standard. Others, including U/L, available.

Lifters: Molded nylon up to ½″ in length.

Terminals: Tinned solder lug standard. Quick connect and printed circuit types available.

MOLDED SWITCH ASSEMBLIES





These switch assemblies can be used anywhere in place of conventional stacked switches with ¼″ or ⅜″ mounting centers. Contact blades precisely positioned at factory, locked in alignment and held in adjustment by solid polyester-glass molded insulation material. Extreme dimensional stability regardless of temperature and moisture conditions. Complete data in catalog described below.

Combinations: Specified switch combinations up to 4 or 5 blades.

Blade Materials: Tinned phosphorous-bronze standard.

Blade Lengths: Up to 1⅞″ max. from center of inward mounting hole.

Contact Ratings: 1½, 4, 8 or 10 amps @ 120 VAC non-inductive with ¼″ mounting center switch; up to 12½ amps with ⅜″.

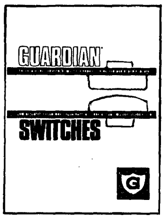
Contact Materials: Fine silver standard.

Lifters: Molded nylon up to ½″ in length.

Terminals: Tinned solder lug standard.

TEST A SAMPLE SWITCH: ***Call your Guardian rep.***

CALL OR WRITE FOR COMPLETE GUARDIAN SWITCH CATALOGS



Get complete technical data on the complete line of Guardian switches: Molded, stacked, push button banks and lever. Yours free for the asking.

GUARDIAN® ELECTRIC
1562 WEST CARROLL AVENUE
CHICAGO, ILLINOIS 60607 — 312/243-1100

RELAYS • SOLENOIDS
SWITCHES • STEPPERS
SOLID STATE CONTROLS

HAMLIN INC

670 LAKE STREET
LAKE MILLS, WISCONSIN 53551
Phone Sales: 414/648-2361 • TWX: 910-260-3740

SWITCH PART NO.	FORM	MAX. D.C. CONTACT RATING	MAXIMUM AMPS	MAXIMUM D.C. VOLTS	MAX. INITIAL CONTACT RESISTANCE	MIN. D.C. BREAKDOWN VOLTAGE	STOCK AMPERE TURN PULL-IN RANGE	NORMAL STOCKING TOLERANCE ± A.T.	OVERALL LENGTH NOMINAL	GLASS LENGTH MAXIMUM	GLASS DIAMETER MAXIMUM	ACTUATING MAGNET	SPECIAL FEATURES
HAMLIN MINIATURE MAGNETIC REED SWITCHES													
MRR-2	A	10W	.500	200	.100	300	17.5-52.5	±7.5	2.230	.800	.130	H-33	Moderate Current and Voltage
MRH-15	A	10W	.500	50	.150	300	17.5-52.5	±7.5	2.230	.800	.130	H-33	10^{15} Insulation Resistance
MRMF-2	A	3W	.010	28	.100	250	27.5-62.5	±10	2.230	.830	.130	H-33	Low Thermal EMF 5uv/°C
MRR-5	A	10W	.500	500	.100	1000	27.5-62.5	±7.5	2.230	.800	.130	H-33	Breakdown Voltage to 1,000VDC
MARK-2	A	10W	.500	28	.100	300	17.5-52.5	±7.5	2.230	.800	.105	H-33	High Reliability Reed Switch
MARK-3	A	.1W	.010	10	.150	300	17.5-52.5	±7.5	1.775	.750	.105	H-33	Reed Switch Designed for Keyboard Applications
MARK-4	A	.1W	.010	10	.150	200	17.5-52.5	±7.5	1.240	.600	.105	H-33	Low Profile Reed Switch for Keyboards
MRHG-2	A	1W	.100	10	.100	500	55	±15	1.764	.800	.130	H-33	Stable Contact Resistance
HAMLIN SUB-MINIATURE MAGNETIC REED SWITCHES													
MSRH-2	A	10W	.500	28	.100	300	17.5-52.5	±7.5	2.250	.800	.090	H-33	Instrument Grade—Premium Performance
MSRR-2	A	10W	.500	200	.100	300	17.5-52.5	±7.5	2.250	.800	.090	H-33	Moderate Current and Voltage
MSRR-2CD	A	3W	.500	200	.200	300	17.5-52.5	±7.5	2.250	.800	.090	H-33	Close Differential
MSRR-2WD	A	10W	.500	200	.100	300	17.5-52.5	±7.5	2.250	.800	.090	H-33	Width Differential
MLC-2	A	10W	.500	28	.150	300	20-50	±10	2.230	.800	.105	H-33	Low Cost — Reliable Operation
MSRF-2	A	.3W	.010	28	.150	250	20-50	±10	2.230	.830	1.02	H-33	Low R.F. Losses
HAMLIN TINY MAGNETIC REED SWITCHES													
MTRR-2	A	10W	.250	100	.150	300	17.5-52.5	±7.5	2.125	.560	.092	H-33	Moderate Current and Voltage
MTHG-2	A	1W	.100	10	.100	500	55	±15	1.750	.560	.090	H-33	No Contact Bounce Reed Switch
MTRF-2	A	3W	.010	28	.150	250	27.5-62.5	±10	2.125	.635	.092	H-33	Low Resistive Losses to 100Mc
MRH-DT	C	3W	.250	28	.150	250	20-60	±7.5	2.125	.610	.130	H-33	Instrument Grade—Premium Performance
MRG-DT	C	3W	.250	28	.150	250	20-60	±7.5	2.125	.610	.130	H-33	Moderate Current and Voltage
MLC-DT	C	3W	.110	28	.500	250	27.5, 32.5 & 37.5	±10	2.125	.610	.130	H-33	Low Cost — Reliable Operation
HAMLIN MICRO and MINI MAGNETIC REED SWITCHES													
MMRR-2	A	.3W	.010	28	.200	250	17.5-52.5	±7.5	2.000	.375	.090	H-31	"Grain of Wheat"
MINI-2	A	3W	.110	28	.200	200	7.5-32.5	±7.5	2.000	.500	.070	H-31	The MINI-REED
MINI-DT	C	.1W	.010	10	.200	200	25	±10	1.385	.475	*	H-31	Low Profile
HAMLIN STANDARD MAGNETIC REED SWITCHES													
DRG-2	A	15W	1.0	250	.075	500	42.5-132.5	±7.5	3.250	2.100	.215	H-34	Low Cost Standard
DRR-1	A	15W	1.0	400	.060	500	42.5-132.5	±7.5	3.250	2.100	.215	H-34	Moderate Current and Voltage
DRS-2	A	25W	1.0	250	.050	500	52.5-132.5	±7.5	3.250	1.950	.207	H-34	Hi Inrush Type Contacts
DRR-5	A	25W	1.0	1,000	.060	1,500	52.5-132.5	±7.5	3.250	1.950	.210	H-34	Breakdown Voltage to 1,500VDC
DRT-5	A	50W	3.0	1,000	.100	1,500	52.5-132.5	±7.5	3.250	1.950	.210	H-34	Inductive Load Type Contacts
DRS-5	A	50W	3.0	500	.035	1,200	52.5-132.5	±7.5	3.250	1.950	.210	H-34	Hi Inrush and Hi Breakdown Voltage
HAMLIN COMPACT MAGNETIC REED SWITCHES													
SRR-2	A	15W	1.0	400	.060	500	35-115	±7.5	3.375	1.425	.210	H-32	Moderate Current and Voltage
SRT-2	A	100W	3.0	250	.500	300	57.5-130.5	±7.5	3.375	1.610	.195	H-32	Hi-Power — Inductive Loads
SRR-3	A	10W	.5	250	.075	1,000	110 Max.	—	3.185	1.562	.218	H-34	Hi Impedance
DRR-DT	C	3W	.5	100	.075	350	55-100	±7.5	3.375	1.562	.218	H-32	Low Cost Form C
DLC-DT	C	10W	.500	200	.100	350	50, 70 & 90	±15	3.375	1.562	.218	H-34	Low Cost — Reliable Operation
DRR-DTH	C	10W	.5	250	.075	1,000	55-100	±7.5	3.375	1.562	.218	H-32	Hi Breakdown Form C
DRT-DTH	C	20W	1.5	500	.150	1,000	55-100	±7.5	3.375	1.562	.218	H-32	Inductive Load Type Contacts
HAMLIN HIGH VOLTAGE MAGNETIC REED SWITCHES													
MRO-2	A	1W	.001	1,000	.100	2,000	32.5-62.5	±10	2.250	.850	.130	H-33	Breakdown Voltage to 2,000VDC
DRVT-5	A	50W	3.0	3,500	.080	5,000	90-150	±10	3.250	1.950	.218	H-34	Breakdown Voltage to 5,000VDC
DRVT-10	A	50W	3.0	7,500	.080	10,000	90-150	±10	3.250	1.950	.218	H-34	Breakdown Voltage to 10,000VDC
DRVT-15	A	50W	.004	12,500	.100	15,000	250 Max.	—	3.195	1.950	.218	H-34	Breakdown Voltage to 15,000VDC
DRVT-20	A	50W	.004	17,500	.100	20,000	250 Max.	—	3.195	1.950	.218	H-34	Breakdown Voltage to 20,000VDC
DRVT-25	A	50W	.004	22,500	.100	25,000	500 Max.	—	3.550	2.295	.460	—	Breakdown Voltage to 25,000VDC
DRVT-30	A	50W	.004	27,500	.100	30,000	500 Max.	—	3.550	2.295	.460	—	Breakdown Voltage to 30,000VDC
HAMLIN MERCURY-WETTED MAGNETIC REED SWITCHES													
MRC-3	A	28W	1.0	100	.050	1,000	65 ±15	—	2.250	.710	.130	H-33	Miniature Size Mercury Wetted
HRC-1	A	50W	3.0	400	.050	1,000	57.5-132.5	±7.5	3.250	1.950	.218	H-34	Standard Size Mercury Wetted
HAMLIN HIGH CURRENT MAGNETIC REED SWITCHES													
DRAC-5**	A	700VA	3.0	240	—	700	250 Max.	—	3.465	1.640	.212	H-34	3 Amp AC Power Switch
DRDC-6***	A	85W	3.0	110	—	2,000	250 Max.	—	3.465	1.640	.212	H-34	3 Amp DC Power Switch

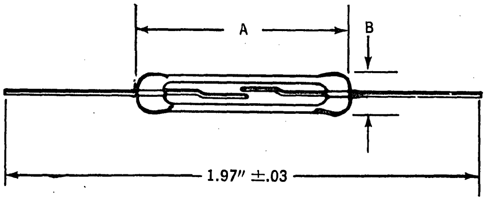
* OVAL ENVELOPE .110 x .072 ** AC ONLY *** DC ONLY

HATHAWAY
components

5250 E. EVANS AVENUE • DENVER, COLORADO 80222
(303) 756-8301 • TWX 910-931-0568

DRIREED SWITCHES

MINIATURE SPST (Form A)



Hathaway Part No.		
Gold	**Rhodium**	**A B**
68262	330-0007	.800 x .090 Inches Max.
59128	65375	.800 x .135 Inches Max.
59636	64668	.850 x .106 Inches Max.

Standard Magnet: P/N 62139

0.125 AMPERES — GOLD ALLOY
1.0 AMPERES RHODIUM

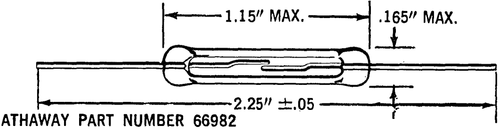
GUARANTEED LIFE — Rhodium

Volts	6 V d-c	12 V d-c	12 V d-c
Amps	0.5	0.125	1.00
Miss Level (Dynamic)**	2.0 Ohms	2.0 Ohms	2.0 Ohms
Mean Time to First Miss	5.0 x 10^6 Min.	100 x 10^6 Min.	1.0 x 10^6 Min.
Mean Time to Failure***	10.0 x 10^6 Min.	200 x 10^6 Min.	2.0 x 10^6 Min.
Rate of Drive	100 Hz	100 Hz	100 Hz

GUARANTEED LIFE — Gold Alloy

Volts	.012 V d-c	.05 V d-c	12 V d-c	28 V d-c
Amps	.00002	.01	.125	.125
Miss Level (Dynamic)**	50.0 Ohms	2.0 Ohms	2.0 Ohms	2.0 Ohms
Mean Time to First Miss	500 x 10^6 Min.	50 x 10^6 Min.	5.0 x 10^6 Min.	2.5 x 10^6 Min.
Mean Time to Failure***	750 x 10^6 Min.	100 x 10^6 Min.	10 x 10^6 Min.	5.0 x 10^6 Min.
Rate of Drive	100 Hz	100 Hz	100 Hz	100 Hz

INTERMEDIATE SPST NO (Form A)



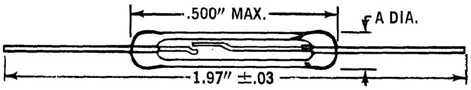
HATHAWAY PART NUMBER 66982
Standard Magnet: P/N 61007

2.0 AMPERES — RHODIUM

GUARANTEED LIFE

Volts	150 V d-c	12 V d-c	28 V d-c	12 V d-c
Amps	.100	.125	1.0	2.0
Miss Level (Dynamic)**	2.0 Ohms	2.0 Ohms	2.0 Ohms	2.0 Ohms
Mean Time to First Miss	2.5 x 10^6 Min.	50.0 x 10^6 Min.	10.0 x 10^6 Min.	.5 x 10^6 Min.
Mean Time to Failure****	5.0 x 10^6 Min.	80.0 x 10^6 Min.	20.0 x 10^6 Min.	1.0 x 10^6 Min.
Rate of Drive	50 Hz	50 Hz	50 Hz	50 Hz

SUB MINIATURE SPST (Form A)



Hathaway Part No.		
Gold	**Rhodium**	**A (Max.)**
63300	0330005	.106″
0330001	0330015	.090″

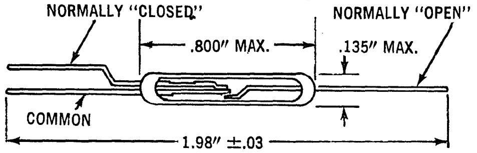
Standard Magnet:
P/N 62139

DRY CIRCUIT SWITCHING — GOLD ALLOY
SUSTAINED HIGH LEVEL — RHODIUM

GUARANTEED LIFE

Volts	.012 V d-c	.05 V d-c	12 V d-c	28 V d-c
Amps	.00002	.01	.125	.125
Miss Level (Dynamic)**	50.0 Ohms	2.0 Ohms	2.0 Ohms	2.0 Ohms
Mean Time to First Miss	20 x 10^6 Min.	10 x 10^6 Min.	5.0 x 10^6 Min.	2.0 x 10^6 Min.
Mean Time to Failure***	50 x 10^6 Min.	20 x 10^6 Min.	10.0 x 10^6 Min.	4.0 x 10^6 Min.
Rate of Drive	100 Hz	100 Hz	100 Hz	100 Hz

MINIATURE SPDT (Form C)



HATHAWAY PART NUMBER 64068 Standard Magnet: P/N 62139

0.125 AMPERES RATING — GOLD ALLOY

GUARANTEED LIFE

Volts	.012 V d-c	.05 V d-c	12 V d-c	12 V d-c
Amps	.00002	.01	.01	.125
Miss Level (Dynamic)**	50.0 Ohms	2.0 Ohms	2.0 Ohms	2.0 Ohms
Mean Time to First Miss	20 x 10^6 Min.	10 x 10^6 Min.	10 x 10^6 Min.	5.0 x 10^6 Min.
Mean Time to Failure***	50 x 10^6 Min.	20 x 10^6 Min.	20 x 10^6 Min.	10.0 x 10^6 Min.
Rate of Drive	100 Hz	100 Hz	100 Hz	100 Hz

ELECTRICAL & ENVIRONMENTAL CHARACTERISTICS

OPERATING TEMPERATURE RANGE (ALL SWITCHES): −65°C TO +150°C

Characteristic		Max. DC Current Switching	Max. DC Current Carry Only	Initial Contact Resistance‡	Dielectric Strength	Insulation Resistance	Operate Time	Release Time	Shock	Vibration
Unit		Amperes, Watts	Amperes	Milliohms, Max.	Volts, 60 Hz RMS	Megohms, Min. @ 85°C	Milliseconds Max. (Inc. Bounce)	Milliseconds Max. (Inc. Bounce)	G Duration of 11 ±1 ms	See Note 1
Miniature SPST (Form A)	Gold	.125A, 4W	1.5	200	250 (P/N0330022-600 VDC)	10,000	1.0	0.5	50	B
	Rhodium	1.0A, 10W	1.5							
Intermediate SPST (Form A)		2.0A, 25W	3.0	100	350	10,000	1.5	0.5	35	A
Subminiature SPST (Form A)		.125A, 2W	1.0	200	200	5000	1.0	0.5	50	B
Miniature SPDT (Form C)		.125A, 2W	1.0	200	200	500	1.0	1.5	35	B

‡ Measured with 10 mA d-c thru contact

Note 1 — "A" Designates: Meets MIL-STD-202C, Method 204A, Test Condition A. (10G, 10-500 Hz)

"B" Designates: Meets MIL-STD-202C, Method 204A, Test Condition B. (15G, 10-2000 Hz)

GENERAL CHARACTERISTICS

TERMINAL FINISH (ALL SWITCHES): TIN PLATE

	Terminal Cross Section Inches Max.	Pull-In Ampere-Turns (AT) Standard	Drop Out Ampere-Turns (AT) % of Pull-In
Miniature SPST (Form A)	.028″ x .018″	41 ±14	Rhodium 30 to 95% Gold 30 to 75%
Intermediate SPST (Form A)	.045″ x .025″	65 ±15	30 to 75%
Subminiature SPST (Form A)	.028″ x .018″	30 ±10	30 to 75%
Miniature SPST (Form C)	.028″ x .018″	41 ±14	10% Min.

* **MEASURED** in a coil of 10,000 turns of #48 AWG magnet wire with a length of .76 ±.01 and an ID of .170 maximum.

** **MISS LEVEL** is defined as a contact resistance greater than specified for any closure, or failure to open after any closure.

*** **FAILURE** is defined as five (5) or more misses in 100,000 consecutive operations.

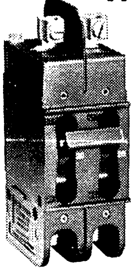
**** **MEASURED** in a coil of 10,000 turns of #41 AWG magnet wire with a length of 1.03 ±.01 and an ID of .210 maximum.

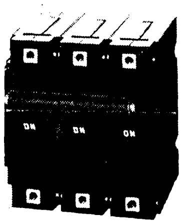
ORDER BY HATHAWAY PART NUMBER

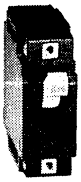
This page includes only a portion of our Drireed Switch Line. For switches with other characteristics (size, configuration, rating) contact the factory.

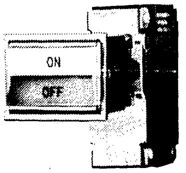
HEINEMANN

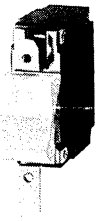
HYDRAULIC-MAGNETIC CIRCUIT BREAKERS


E-FRAME


SERIES AM1


SERIES JA


SERIES JL


SERIES JC

Heinemann breakers offer almost unlimited options: integral or fractional ratings from 10 milliamp to 100 amp, and in steps to 225 amp; single and multipole models; breakers for 60 or 400 Hz AC, or DC service; breakers that meet Mil Specs; and models with special internal circuits like relay-trip and calibrating-tap for control functions. Hydraulic-magnetic actuation assures that ratings and trip points are unaffected by ambient temperature changes. A wide selection of time-delay characteristics permits close match of breaker to equipment requirements. Request the Heinemann Engineering Guide (Bulletin 202), or the Condensed Guide (303), or contact your Heinemann representative. Individual product bulletins listed below.

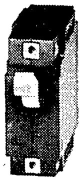
E-FRAME: Smaller than other E-Frame breakers, competitively priced. Approx. 5¾h x 2w x 2⅝"d (2-pole). Available in 1 to 4 poles.

SERIES AM1: 1, 2, 3 poles. UL-component-recognized. Special circuits available. Approx. 2.5h x 2.5d, .75w per pole.

SERIES JA: Compact OEM breaker. Only 2.5 oz/pole. 1, 2, or 3 pole. Approx. 2h x 1.875d, .75w per pole.

JA VARIANTS: Series JC (1, 2, 3 poles—single-pole shown) substitutes attractive white or gray rocker handle for standard toggle (Bull. 3381). Single-pole Series JL has pushbutton actuator that lights in both "on" and "off" modes (Bull. 3351). Snap-In Model JB1 installs in rectangular panel cutout without screws (Bull. 3360).

CROWBAR IN A CIRCUIT-BREAKER PACKAGE


SERIES JA/Q

The newest **Heinemann JA/Q™ Electronics Protector** is nearly all-encompassing in its ability to prevent damage to solid-state components. In one standard Series JA package it provides:

- transient/overvoltage crowbar protection, response time 500 nanoseconds;
- electromechanical equipment disconnect (protection for the crowbar) in 10 milliseconds;
- normal overcurrent protection

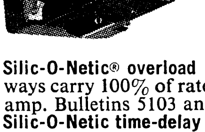
A thick-film hybrid SCR crowbar microcircuit is packaged into the rear of a Series JA hydraulic-magnetic circuit breaker. A transient or overvoltage on the AC or DC supply line will cause the SCR to fire, placing a dead short across the load to common. The short opens the breaker, removing the equipment from the line. Current ratings 0.020-20 amp DC, 0.020-10 amp AC, firing voltages 4.5-38 volts DC, 28 and 200 peak volts AC. Undervoltage models available. 2h x .75w x 1.8d. Bulletin 3371.

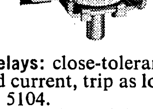
CONDENSED GUIDE TO HEINEMANN CIRCUIT BREAKERS

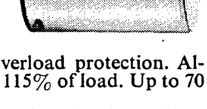
Type	Series	Bulletin	Poles	Maximum* Voltages	Interrupting Cap. (amp)	Current (amp)
PANEL MOUNTING	E-Frame	3104	1,2,3,4	240 AC 480 AC 240 AC (400~) 125 DC	5,000 5,000 5,000 5,000	0.01 to 100 0.01 to 100 0.15 to 100 0.05 to 50
	EH-Frame	3441	2,3	480 AC	15,000	0.5 to 100
	CJ	3111	2	120/240 AC	10,000	125 to 200
			3	240 AC	10.000	100 to 225
GENERAL PURPOSE	1163	3412	1,2,3	250 AC 125 DC	5,000 5,000	0.01 to 100 0.016 to 100
AUXILIARY	0111	3201	1	250 AC	1,500	0.01 to 50
AM SERIES	AM1,2,3	3306	1,2,3	250 AC 250 AC (400~) 65 DC	1,000 1,000 1,000	0.02 to 50 0.02 to 50 0.02 to 30
	AM1000	3305	1,2,3	250 AC 250 AC (400~) 125 DC	1,500 1,500 2,000	0.01 to 70 0.15 to 65 0.015 to 100
MINIATURE	JA	3350	1,2,3	250 AC 250 AC (400~) 65 DC	1,000 1,000 1,000	0.020 to 30 0.100 to 30 0.020 to 20
SUBMINIATURE	SM	3504	1,2,3	250 AC 250 AC (400~) 50 DC	300 300 500	0.05 to 20 0.05 to 20 0.05 to 20

*AC voltages are 60 Hz unless marked with (400~).

TIME-DELAY AND OVERLOAD RELAYS



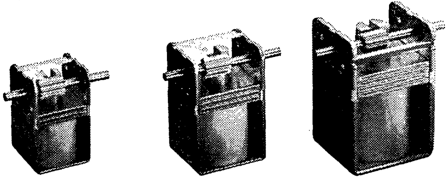




Silic-O-Netic® overload relays: close-tolerance overload protection. Always carry 100% of rated current, trip as low as 115% of load. Up to 70 amp. Bulletins 5103 and 5104.

Silic-O-Netic time-delay relays: dependable, economical, for delays from ¼ to 120 seconds. Five models: open or enclosed contacts, dust-proof covers, hermetic, or trip-indication. Continuous-duty coils, DPDT contacts eliminate slave circuits, reduce equipment costs. Bulletin 5006.

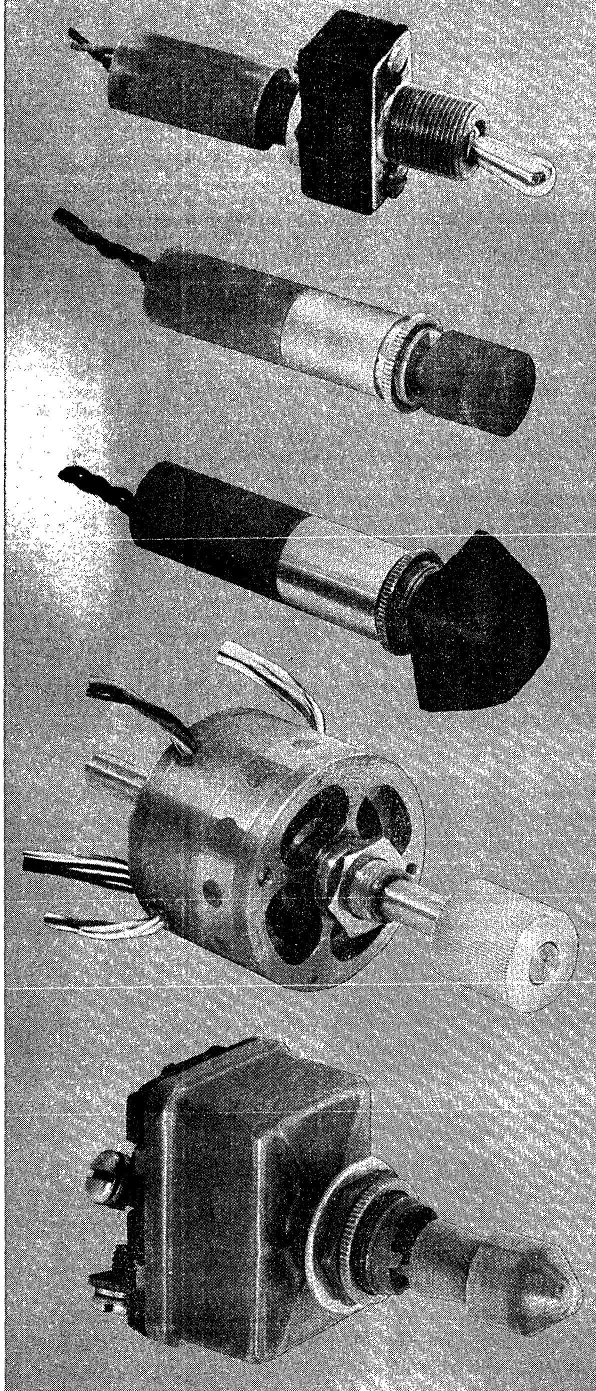
STEPPING MOTORS



Roto-Netic® stepping motors operate on a totally new principle: simple linear force (solenoid-actuated) converted to discrete rotary motion. Starting torque from 1.4 to 25 oz-in. with avg. power consumption less than 12 watts. Eight, ten, or twelve steps per shaft revolution with no cumulative error. Minimum life 10 million steps, typical life 30 million steps. Priced substantially below motors of comparable performance. Bulletin 702.

HEINEMANN ELECTRIC COMPANY 2636 Brunswick Pike, Trenton, N.J. 08602 4685

NEW from ISC ✱ MAGNETICS SOLID-STATE SWITCHES



ISC*Magnetics Solid-State Switches are a new trouble-free line of contactless switches in toggle, rotary and pushbutton designs. These switches are designed to meet military requirements and can be supplied to operate with all existing types of digital logic. Reliable performance in explosive and corrosive environments is ensured by the design of these switches, many of which have only one moving part. The bounce-free action of the switches is ideal for use in digital logic interface.

Solid-State Switches designed by ISC*Magnetics can be supplied with either a conventional or magnetic detent (or snap) action. The magnetic action eliminates the need for a ball detent (in the case of rotary switches) or springs and levers or other mechanical arrangements thereby increasing the reliability of the total assembly to virtually that of the sensor/circuit. Elimination of mechanical parts also allows the design of a switch that is not dependent on a seal or boot gasket that will rapidly deteriorate in extreme environments.

Applications for ISC*Magnetics contactless Solid-State Switches include marine radios and other installations directly exposed to the weather (or corrosive fumes in industrial control systems) and all high reliability applications.

Ideally suitable for digital systems now under design, ISC*Magnetics Solid-State Switches will not degrade the very high reliability expected of such systems, as would be the case with mechanical switches.

ALL SWITCHES
AND
LOAD CONTROLLERS
ARE SHOWN ACTUAL SIZE

PATENTS PENDING

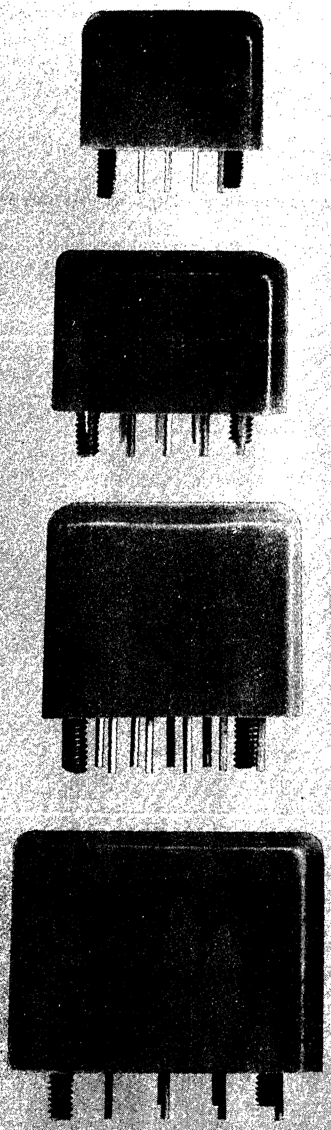
SOLID-STATE LOAD CONTROLLERS

ISC*Magnetics currently is developing a line of Solid-State Controllers in the 2 through 50 ampere DC range and the 1 through 10 ampere AC range for 115/230 volt, 60 and 400 Hz use. Each design will have the unique advantages afforded by contactless switching; very high reliability and low noise generation (due to controlled turn-on and off slopes in the DC units and zero crossing control in the AC units). Logic level turn-on command facilitates use in process control systems.

Typical applications for ISC*Magnetics Solid-State Load Controllers range from computer controlled (or sequenced) electrical subsystems, high turn-on rate circuits and low EMI circuits. In addition to the standard current limiting characteristics of these devices, two level limiting, for circuits with high in rush and low steady state currents, is available.

ISC*Magnetics staff of engineers is ready to discuss your particular requirements.

For technical assistance or further information regarding any of ISC*Magnetics product line of Solid-State Switches, Solid-State Load Controllers, Magnetic Pick-Ups, Hall Effect Devices, Magnetoresistors, Fluxmeters or Gaussmeters, contact:



ISC * MAGNETICS

Division of INSTRUMENT SYSTEMS CORPORATION
770 PARK AVENUE, HUNTINGTON, NEW YORK 11743
TWX: 510-226-6983 / Telephone: (516) 423-6200 / Cable Address: INSSYSTHTGH

BUILDING BLOCK UNITIZED MODULAR PUSH BUTTON SWITCH SERIES C, CL

New

Completely New and Revolutionary Unitized Construction

A Start with basic momentary switch.
B Add wire staple to convert to push-push action.
C Add release bar unit for interlocking action.
D Add lamp contact unit for illumination.
E Choice of four different snap fit buttons.
F Add blocking discs and pins for blocking action.

STANDARD FEATURES

Disengage plastic lock bar to remove plunger and bridging contacts from front for servicing or replacing, without disturbing position or connections. Solder lugs on top — PC terminals on bottom (2 amp. rating). Bifurcated, coil spring load, center pivoting, contact bridges for each PDT.

Non shorting contacts.

OPTIONAL FEATURES

Blocking action—no 2 buttons depressed at the same time.
Shorting contacts.
Timing contacts either leading or lagging.
Gold plated contacts.
Auxiliary solder lug switching contacts on top of switch module (1 amp.).

CONTACT SURFACES

Standard = Hard silver plating .0004 inches.
Special = Silver plated .0004 inches plus hard gold covering .00012 inches.

CONTACT TYPES

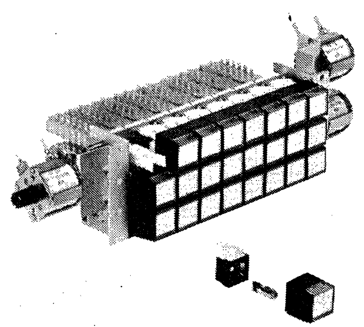
Standard = Non shorting
Shorting = ks
Leading V
Lagging N

CHASSIS AND STATION DATA

Model number	17.5	22.5
Center to center spacing	.690	.886
Number of stations	1-15	2-12
Standard buttons	CB CJ CQ* CR*	CH CT

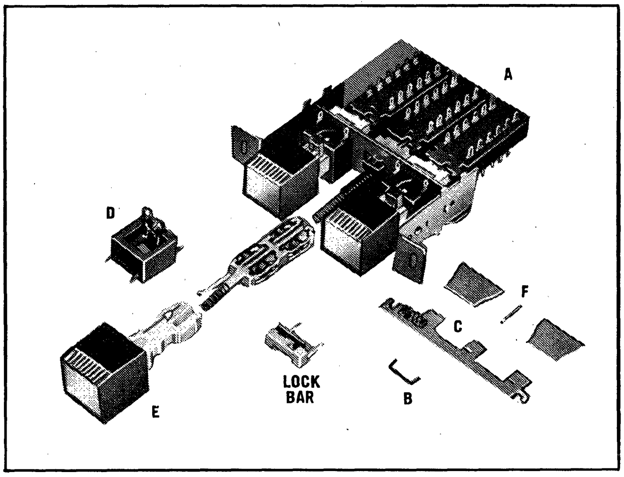
*Can also be used as illuminated buttons.

TABLEAU CL-SERIES



3 x T 8 CL 17.5-CRB/BLK-CL-4U-GR + SP with 24V DC Solenoid Release Each Row.

IEE® WELCOMES YOUR INQUIRIES. Dimensional drawings and quotes on request.



Contact Arrangement:

2 PDT (+1 a) 6 PDT (+2 u/1 a)
4 PDT (+1 u/1 a) 8 PDT (+3 u/1 a)

The 2PDT & 4PDT Power Switch 6A/250V AC values in parentheses above show extra auxilliary contacts available only upon request.

MECHANICAL ACTION

Gr = Interlocking.
Gr₁ Gr₂ = Two or more independent interlocking groups.
oA = Momentary.
AoR = Central release key Momentary action.
EE = Push to make push to break.
Z = Central release for independent interlocking groups, or individual latching.
Sp = Blocking action only one key down. Switching is delayed to increase margin of safety.

Tableau or stacked switches available either C or CL Series 15 per chassis x 10 high.

Series CL is illuminated. Slip on lamp holder (D in illus. above) uses Type 5522 or 4622 lamp. See Lamp Table.

ELECTRICAL DATA

Max. voltage 1000V
Max. current 2 A cos ϕ = 1.0 Aux. contacts 1A
Max. rating 200W AC
Max. rating 100W DC
Test voltage between contacts and chassis 3000V AC
Test voltage between contacts 2000V AC
Insulation resistance $10^{13}\ \Omega$
Contact resistance 5 mΩ
Loss factor: tg 4 x 10^{-3} (300 kHz)

MECHANICAL DATA

Key travel = .315″
Contact travel = .197″
Life cycles = 500,000 cycles under load.

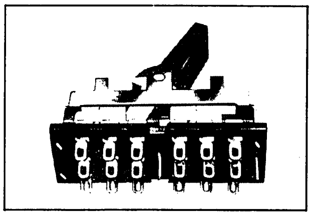
Key Pressure —
2 & 4PDT = 35 oz.
6 & 8PDT = 49 oz.

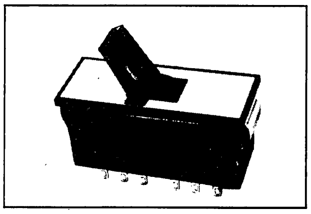
New

SPECIAL LEVER SWITCH SERIES Y

With two independent two or three P.D.T. contacts and three lever positions.

SCHADOW





Type of Contacts

	Standard: Non-shorting.
ks	Shorting.
V	Timing contacts, leading.
N	Timing contacts, lagging.

Contact Arrangements

2u	Two independent DPDT.
3u	Two independent 3 PDT.

Contact Material

	Standard: Fixed terminals .0004". Silver-coated bridging contacts .0004". Solid silver plated.
3Au	Additional SELREX with gold plating .00012".

Mounting Facilities

YA	For twist — tab mounting.
YB	For screw mounting.
YC	Multiple sets (standard for screw mounting).
YD	Flush fitting switch for quick mounting in high impact — 1/8" thick panel plastic case hole size 1.582" x .578".

Level-stop Positions

3R	Maintaining Zero, left and right.
1R	Zero, momentary left and right.
2R	Zero, combination of maintaining one side, momentary other side.

Terminals

L	Soldering lugs.
S	PC terminals.

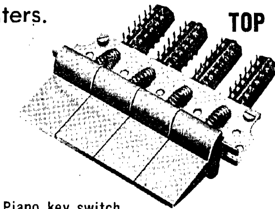
Electrical Data

Voltage Max.:	300 volts
Current Max.:	1 amp
Load Max.:	100 watts (cos ϕ = 1.0)
Test Voltage between Ground and Terminals:	1500 volts
Insulation Resistance:	>5 x 10^{11} Ω
Contact Resistance:	<10 milli Ω

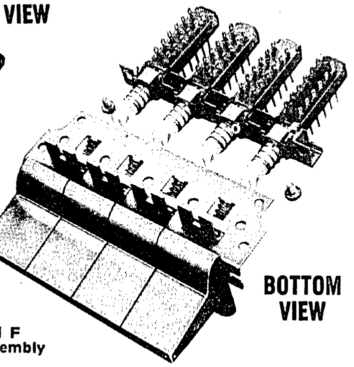
PIANO KEY SWITCHES SERIES KD AND KF

Features: Retains all the advantages of Series D&F switches. Key switch mechanism secures to switch chassis with only 2 screws. Switch terminals may be flow soldered to PC Board prior to assembly. Easy to service since the key can be withdrawn by simply disengaging a catch. The switch contact plungers are then removable from the front without disturbing the remainder of the assembly. Available .689" and .787 centers.

TOP VIEW



Piano key switch
4 x KD 20 DKB—4PDT
consisting of mechanism with
button type DKB and push
button switch 4 x D 20—4PDT

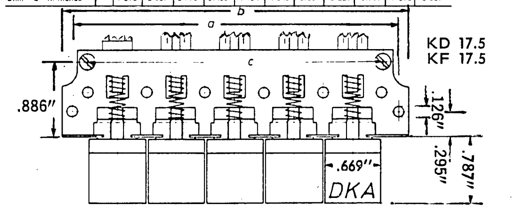


BOTTOM VIEW

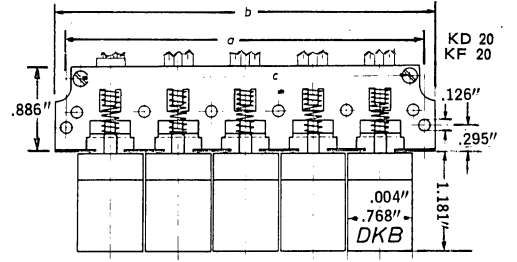
Piano key mechanism separated from push button switch.

Additional cost to D and F prices for piano key assembly are (including buttons):
KD-KF 17.5 17¢ per station
KD-KF 20 21¢ per station

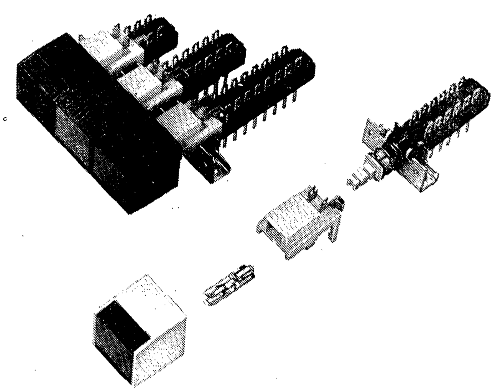
No. of Buttons	1	2	3	4	5	6	7	8	9	10	11	12
Dim. "A" in Inches	–	1.752	2.441	3.130	3.819	4.508	5.197	5.886	6.575	7.264	7.953	8.642
Dim. "B" in Inches	–	1.988	2.677	3.366	4.055	4.744	5.433	6.122	6.811	7.500	8.189	8.387
Dim. "C" in Inches	–	1.398	2.087	2.776	3.465	4.154	4.843	5.531	6.220	6.909	7.598	8.387



No. of Buttons	1	2	3	4	5	6	7	8
Dim. "A" in Inches	–	1.850	2.638	3.425	4.213	5.000	5.787	6.575
Dim. "B" in Inches	–	2.087	2.874	3.661	4.449	5.236	6.024	6.811
Dim. "C" in Inches	–	1.496	2.283	3.071	3.858	4.646	5.433	6.220

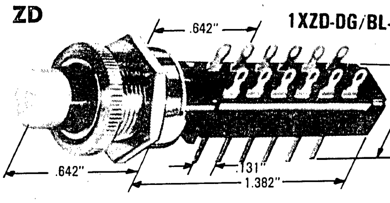


MINIATURE ILLUMINATED SWITCHES SERIES FL



SERIES ZD, ZPF SINGLE HOLE MOUNT PUSH BUTTON SWITCHES

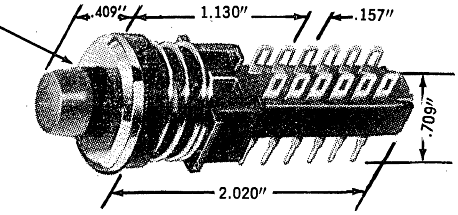
ZD **1XZD-DG/BL-4U**



Req. .551" HOLE MAX. PANEL THICKNESS .125".

ZPF

"VISI-STRIPE" tells at a glance if the switch is on or off.

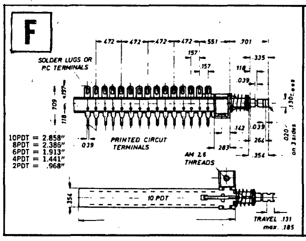


● Mount in .600" dia. hole ● .197" maximum panel thickness

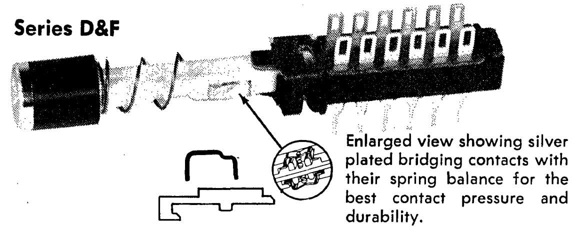
New

MINIATURE MODULAR PUSH BUTTON SWITCH
SERIES F

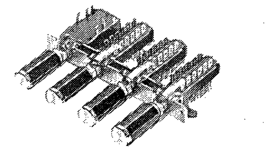
Uniquely designed to improve versatility and serviceability.


F
.472
.472
.472
.472
.551
.701
.157
.157
.335
.118
.039
SOLDER LUGS OR
P.C TERMINALS
.709
.197
.118
.142
.039
.264
.283
.354
.130±.005
.020 on 3 sides
10PDT = 2.858″
8PDT = 2.386″
6PDT = 1.913″
4PDT = 1.441″
2PDT = .968″
.039
PRINTED CIRCUIT TERMINALS
AM 2.6 THREADS
.354
10 PDT
TRAVEL .131
max. .185

Series D&F



Enlarged view showing silver plated bridging contacts with their spring balance for the best contact pressure and durability.



5 x D12.5-DG/WH-2U-EE
4 x F17.5-F1.21 + H4-4U-GR
Sta. #1 = NE15/F-2U-EE
(4A/250V AC Power Switch)

Compress return spring and lift out locking staple or plastic bar to remove plunger and bridging contacts from front of switch without disturbing switch position or electrical connections. Replacing the wire staple with a plastic bar converts switch from push-push to momentary and interlocking action.

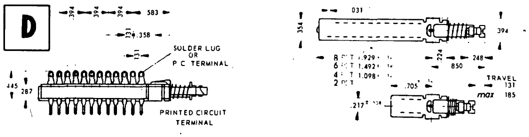
Features: Inexpensive. Proven dependability. Modular design. Versatile. Completely enclosed. Up to 10 PDT.

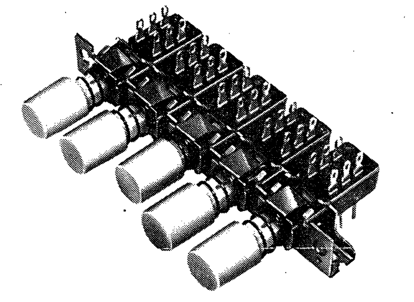
Infinite combinations. Solder lugs or PC terminals. Smooth slide action. Largest selection of chassis spacing, button styles and colors. UL and CSA approved 4A 250 VAC power switch. Positive action coil spring loaded bridging contacts. Flat stator contacts. Stand-offs molded on bottom to hold switch parallel to PC board.

Available 2, 4, 6, 8 and 10 PDT
Power Switch Available with 2 and 4 PDT Integrated

MINIATURE PUSH BUTTON SWITCH

Series D
Available 2, 4, 6 and 8 PDT
Power Switch Available with 2 and 4 PDT Integrated


D
.394
.394
.394
.583
.131
.358
.131
SOLDER LUG OR P C TERMINAL
.689
.445
.287
PRINTED CIRCUIT TERMINAL
.031
.354
.394
8 PDT 1.929
6 PDT 1.492
4 PDT 1.098
2 PDT
.224
.248
.850
.705
TRAVEL .131
max .185
.217



5 x D12.5-DG/WH-2V-EE

CONTACT MATERIAL:

Fixed contact surfaces silver coated .0002″
Moving contact surfaces silver coated .0004″

TYPES OF CONTACTS AVAILABLE:

SERIES D Solder lugs or PC terminals; top, .197 — PC terminals bottom, .256
SERIES F Solder lugs; top .197 — PC terminals bottom .264
SERIES F PC terminals top .197 — PC terminals bottom .291

SPECIAL TYPES:

oA	= Momentary (spring return).
Gr	= Interlocking.
Gr₁ Gr₂	= Divided into independent interlocking groups.
AoR	= Operation without latching but releasing interlocking.
EE	= Push to make — push to break.
NE15/	= Power switch 4A/250VAC DPDT (D Series)
NE15/F	= Power switch 4A/250VAC DPDT (F Series)

TECHNICAL DATA:	Series D	Series F
Max. current	1A	1A
Max. voltage	250V	300V
Max. rating	50W	50W
Contact resistance	4-10mΩ	4-10mΩ
Key pressure with 2 PDT	28 oz.	28 oz.
Key pressure with 4 PDT	28 oz.	32 oz.
Key pressure with 6 PDT	42 oz.	35 oz.
Key pressure with 8 PDT	53 oz.	42 oz.
Key pressure with 10 PDT		46 oz.
Key pressure with Power Switch	42 oz.	42 oz.
Cap. between contacts of a row	<0.7pF	<0.6pF
Cap. between moving contacts of adjacent rows	<0.9pF	<0.9pF

CHASSIS D & F

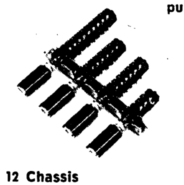
Chassis model	10	12.5	15	17.5	¾″	20
Center to Center	.394″	.492″	.591″	.689″	.750″	.787″
Number of Stations	2-18	2-11	2-12	2-12	2-12	2-10

MINIATURE SERIES F PUSH BUTTON SWITCH KIT LIST PRICE $22.94

KIT CONTENTS

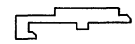
23 Switches
Non-shorting contacts
16 - 2PDT
4 - 4PDT
2 - 6PDT
1 - 8PDT

40 Assorted Buttons

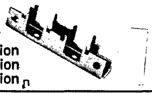


12 Chassis
2 - Single Station
2 - 2 Station
2 - 4 Station
2 - 6 Station
2 - 8 Station
2 - 10 Station

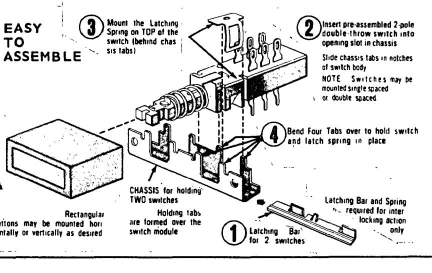
23 Plastic Bars to convert push-push to momentary



10 Assorted Latching and Release Bars
10 Latching Springs



EASY TO ASSEMBLE


③ Mount the Latching Spring on TOP of the switch (behind chassis tabs)
② Insert pre-assembled 2-pole double-throw switch into opening slot in chassis
Slide chassis tabs in notches of switch body
NOTE Switches may be mounted single spaced or double spaced
④ Bend Four Tabs over to hold switch and latch spring in place
CHASSIS for holding TWO switches
Holding tabs are formed over the switch module
⑤ Rectangular Buttons may be mounted horizontally or vertically as desired
① Latching Bar for 2 switches
Latching Bar and Spring required for interlocking action only

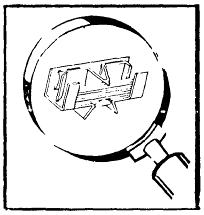
IEE® WELCOMES YOUR INQUIRIES. Dimensional drawings and quotes on request.

INTERNATIONAL ELECTRO EXCHANGE CORP. 6851 Oxford St., Minneapolis, Minn. 55426 PHONE: (612) 929-7875 TWX: 910-576-2469

STANDARD PUSH BUTTON SWITCHES TYPE M, MM, ML

Features: Novel patented design sliding contacts. Contacts silver plated. Unique design positive action. Small dimension 500V rating. All standard action operations. Up to 4 PDT on wafer .79" deep. Up to 8 PDT on wafer 1.54" deep. Use double button to double capacity of contact per station. 15 stations maximum in one row. IEE fluorescent type button also available. Series MM provides double deck up to 30 stations. Wide selection of buttons. ML Series provides illumination.

Floating Contact Principle—Use short double sided solid contact plates with balanced steel spring. Guarantees: equal pressure at all contact points, extremely low resistance and self inductance plus smooth movement of keys.



Available 2, 4, 6 and 8 PDT

MECHANICAL ACTION

Momentary (oA). Push push (EE). Interlocking (Gr). Individual latching with central release key or solenoid (E+Z). Blocking (SP) delayed switching to provide safety margin. Power switch* N 10/2a 2A/250VAC. Power switch available with 2 PDT integrated.

DIMENSIONS

Height (without contacts) .472". Depth 2 & 4 PDT includes travel 1.063". Depth 6 & 8 PDT includes travel 1.858".

CHASSIS GROUPING DATA

Model 17.5. Center to center .689. No. of stations 1-15. MM Series up to 30 stations.

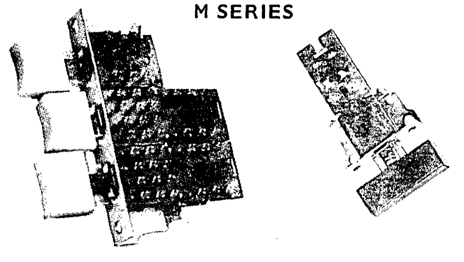
TYPES OF CONTACTS (STANDARD)

Solder lugs (non shorting). PC Terminals (non shorting). Short types available on request. Rhodinated and gold plated also available.

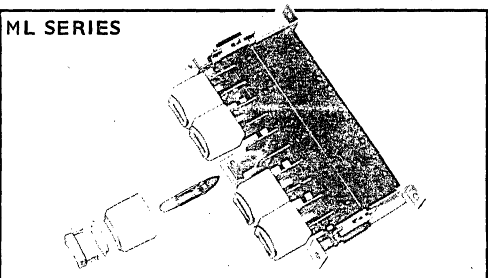
TECHNICAL DATA

Max. current 1A. Max. voltage 500VAC. Max. rating 100W. Contact resistance 3-6MΩ.

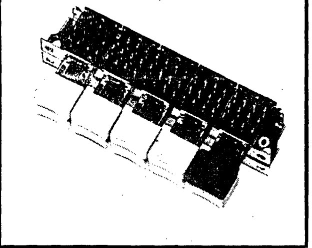
M SERIES



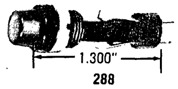
ML SERIES



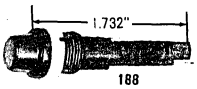
MM SERIES



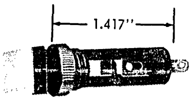
IEE PILOT LAMP SOCKETS AND LENS



288



188



389

288.1 Single round pilot lamp socket uses #288-4 lens.

288.4 Round flat top plastic lens.

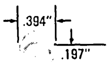
188.2 Single round pilot lamp socket uses #184.1.1, #79.2 or #288.4 lens.

184.1 Round flat top glass lens.

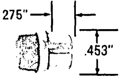
79.2 Same as above but convex top. (Both with plated metal ferrule).

389.1 Single square pilot lamp socket uses 388.3 lens.

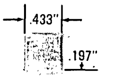
388.3 Square flat top, plastic lens.



#288.4



#184.1



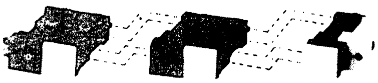
#388.3

All lens available in red, green, blue, yellow, clear and white.

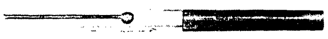
All lamp sockets require .402" mounting hole. Use Type 5530 lamps as shown in miniature switchboard lamps table below.

LAMP EXTRACTORS
#110 for Type 5530, 5522 & 4622 lamps
#153 for Type 6844 lamps

PANEL LAMP INDICATOR ASSEMBLY MODEL 388

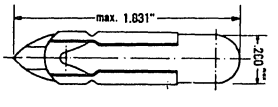


Features:
- **Modernistic building block design.**
- **Removable colored lenses, square or round.**
- **Up to 10 modules may be locked together into one bank.**
- **Small space requires only 7/16" x 5" x 1½" (depth) for 10 lamp bank.**



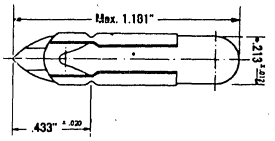
STANDARD SWITCHBOARD (TELECOMMUNICATION) LAMPS — Type 6844

6V - 20, 40, 80, 200 .... mA
12V - 20, 40, 50, 120 .... mA
18V - 20, 40, 100 .... mA
24V - 25, 40, 50, 60, 80, 100 ...... mA
30V - 20, 50 .... mA
36V - 20, 50, 60 .... mA
48V - 20, 40, 50, 60 .... mA
50V - 20, 50, 60 .... mA
60V - 20, 40, 50, 60 .... mA



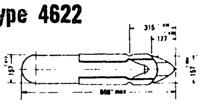
MINIATURE TELECOMMUNICATION "LILIPUT" — Type 5530

6V - 20, 40, 200 .... mA
12V - 20, 50, 100 .... mA
18V - 25 .... mA
24V - 20, 30, 50 .... mA
30V - 20, 40 .... mA
36V - 20 .... mA
48V - 20, 30 .... mA
60V - 20 .... mA



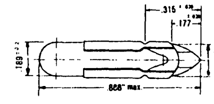
MINIATRE "LILIPUT" LAMPS — Type 4622

6V - 20, 50 .... mA
12V - 20, 40 .... mA
24V - 20 .... mA



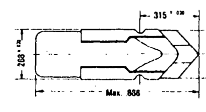
MINIATURE TELECOMMUNICATION LAMPS — Type 5522

6V - 40 .... mA
12V - 20, 50 .... mA
24V - 20 .... mA
30V - 20 .... mA



STANDARD SWITCHBOARD LAMPS — Type 6822

6V - 20, 40 .... mA
12V - 20, 40, 50 .... mA
24V - 25, 40, 50, 60 .... mA
36V - 20, 50 .... mA
48V - 20, 40, 50 .... mA
60V - 20, 40 .... mA



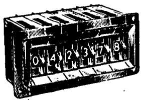
INTERNATIONAL ELECTRO EXCHANGE CORP. 6851 Oxford St., Minneapolis, Minn. 55426 PHONE: (612) 929-7875 TWX: 910-576-2469

INTER-MARKET INCORPORATED
1920 WAUKEGAN ROAD / GLENVIEW, ILLINOIS 60025 / (312) 729-5330

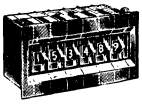
THUMBWHEEL SWITCHES

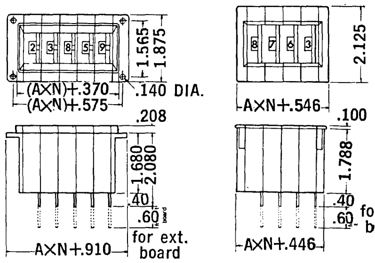
INTERMEDIATE RANGE

REAR MOUNTING TYPE



FRONT MOUNTING TYPE

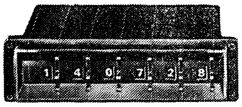




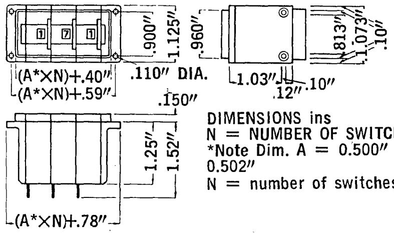
DIM A =0.500 — 0.503
12.7 — 12.8mm
N = 1 for binarys & S.P.s.
N = ½ for half body
N = NUMBER OF SWITCHES

The dimensions of the Intermediate Series of Switches lie between those of the Standard and Miniature ranges. Large character read-out is prominent in this range. The basic version is a 10 or 16 position unit, giving either decimal or binary read-out. The switch is manufactured from the highest grade materials, which include polycarbonate moldings. Illumination of character, by means of a T-1 sub-miniature lamp replaceable from the top of the switch, is an optional feature.

MINIATURE RANGE



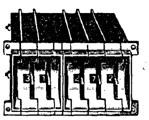
Nominal
Character
Height: .188



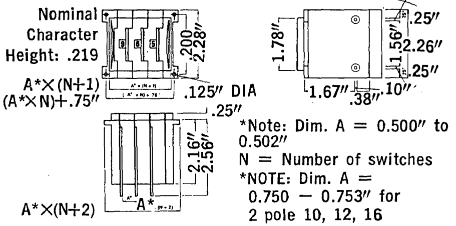
DIMENSIONS ins
N = NUMBER OF SWITCHES
*Note Dim. A = 0.500" to 0.502"
N = number of switches

The Miniature range consists of both low cost models specially designed for applications where adverse environmental conditions are not usually met ("E" Series) and also economic types for more stringent temperatures ("M" Series). They are available with either decimal or BCD outputs and are manufactured from high quality materials to ensure long operational life. They offer the added facility of legend illumination by means of a rear mounted miniature flanged based lamp.

STANDARD RANGE



Nominal
Character
Height: .219



*Note: Dim. A = 0.500" to 0.502"
N = Number of switches
*NOTE: Dim. A = 0.750 — 0.753" for 2 pole 10, 12, 16 position switches

The Standard size "S" and "SE" Series of Thumbwheel Switches have been designed to provide a choice of a large number of decimal and BCD outputs. The larger thumbwheel offers convenient operation where panel space is not at a premium. Special legends and illumination of the legend by a lamp soldered into the case are available. The "SE" range of switches is dimensionally identical to the "S" range, and was introduced on request by large volume users, wanting a low priced decimal switch, to replace the rotary type switch, thereby obtaining a more modernistic appearance and finger tip control.

MANUFACTURED IN ENGLAND BY BIRCH-STOLEC, LTD.

Specifications	Unit	"S" Standard	"SE" Std. Economy	"IF" & "IR" Intermediate	"E" & "M" Miniature
Voltage	Volts DC or RMS max.	200	200	200	200
Current	amps. max. per switch	0.5	0.5	0.5	0.5
Power Rating	watts max. per switch with 12 w. max. per energized output	24	24	24	24
Insulation Resistance	megohms. typ.	1000	1000	1000	1000
Contact Material	—	Gold on Copper	Tin on Copper	Gold on Copper	Gold on Copper
Contact Resistance	ohms max.	0.1	0.1	0.1	0.1
Life	detent operations	1,000,000	250,000	1,000,000	1,000,000
Color	Body	Semi-Gloss, Black	Dark Gray	Gloss or Matte Blk.	Semi-Gloss Black
	Wheel	Black or White	Dark Gray	Black or White	Gloss or Blk. Matte
Outputs	—	Decimal, BCD, BCD & Complements			
Illumination	—	Available	Not Available	Available	Available
Temperature	°C	−10° to 90°	−10° to 90°	−65° to +100°	−65° to +100°
Stops	—	Available	Not Available	Available	Available
Special Legends	—	Available	Not Available	Available	Available
Extended Boards	—	Available	Not Available	Available	Available
Special Codes	—	Available	Not Available	Available	Available
P.C. Connectors	—	Available	Available	Available	Available

PRICES

Catalog No.	Description	"S"	"SE"	"IR"	"IF"	"E" or "M"
*110ND	10 position decimal, single pole	$2.75	$2.00	$2.75	$2.75	$2.75
*112ND	12 position decimal	3.25	N/A	N/A	N/A	N/A
*116ND	16 position decimal	3.25	N/A	3.00	3.00	N/A
*205ND	5 position decimal, double pole	4.50	N/A	N/A	N/A	N/A
*210ND	10 position decimal, double pole	5.25	N/A	N/A	N/A	N/A
*B10N1248	10 position BCD, single pole	4.25	N/A	3.75	3.75	3.50
*B10N1248E	10 position BCD/ext. board	4.50	N/A	5.00	5.00	4.00
*B12N1248	12 position BCD	4.75	N/A	N/A	N/A	N/A
*B12N1248E	12 position BCD/ext. board	[1]	N/A	N/A	N/A	N/A
*B16N1248	16 position BCD	5.00	N/A	[1]	[1]	N/A
*B16N1248E	16 position BCD/ext. board	[1]	N/A	[1]	[2]	N/A
*BC10N1248	10 position BCD/complements, single pole	4.75	N/A	3.75	3.75	4.00
*BC10N1248E	10 position BCD/ext. board/complements	5.25	N/A	5.00	5.00	4.50
*BC12N1248	12 position BCD/complements	5.25	N/A	N/A	N/A	N/A
*BC12N1248E	12 position BCD/ext. board/complements	[1]	N/A	N/A	N/A	N/A
*BC16N1248	16 position BCD/complements	5.50	N/A	[1]	[1]	N/A
*BC16N1248E	16 position BCD/ext. board/complements	[1]	N/A	[1]	[1]	N/A
*EP	End Plates	.75	.75	.75	1.50	.50
*DP	Divider Plates	.75	N/A	N/A	N/A	.50
*HB	Blank Body, ¼" (spacer)	.75	N/A	.75	.75	N/A
*BB	Blank Body, ½" (spacer)	.75	N/A	.75	.75	.50
*LBB	Illumination of legend	1.50	.75	.75	.75	1.50
*SBB	Stopping of switch	.50	.25	.25	.25	.25
*DBB	Decimal point (on switches or spacer)	.50	.50	.50	.50	.50
*GBB	Ganging shaft	.50	.50	N/A	N/A	N/A
*HBB	Hardware (S & E Series)	.75	.75	—	—	.75
*IHBB	Hardware (I Series)	—	—	1.50	1.50	—
*ABB	Assembly of bank	.50	.50	.50	.50	.50
*CNBB	Connectors	[1]	[1]	[1]	[1]	[1]
*MBB	Matte Finish	N/A	N/A	.50	.50	.50

Notes

* Insert Series letter as required, ie. "S", "SE", "IR", "IF", "E", or "M".

[1] Consult Inter-Market for price and delivery.

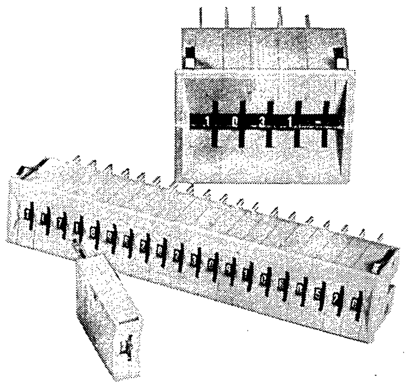
[2] All switches are manufactured with "Break before Make" contacts. Contact Inter-Market if "Make before Break" required.

[3] Prices shown are for 1-24 units. For 25-99 pieces, deduct 5%, 100-249 pieces, deduct 10%, 250-499, deduct 15%, 500-999, deduct 20%.

[4] Many other switches available from stock or to special order, request Catalog S-701 for complete specifications.

FOR INFORMATION ON IMLEC LAMPS AND LIGHTED DEVICES SEE EEM PAGE 1473

INTERSWITCH



Thumbwheel switches that are really *fingerwheel* switches.

THUMBWHEEL SWITCHES

- 8 basic types (including thinnest thumbwheel switch made)
- 2-16 positions
- 158 standard codes
- 6 coding colors
- all standard terminations
- unlimited custom characters
- up to 50-section stacks standard (more if needed)
- countless options and accessories
- multi-character legends acceptable

SPECIFY EXACTLY THE SWITCH YOU NEED...
FROM OVER ONE MILLION STANDARD DESIGNS...
ALL ASSEMBLED & DELIVERED FROM GENERAL STOCKS...

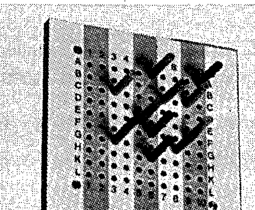
The unique mechanical design of Interswitch Thumbwheel Switches provides *optimum performance* in only a fraction of the space formerly required . . .
UP TO 46% LESS PANEL AREA. . . UP TO 62% LESS VOLUME. . .UP TO 140% MORE FUNCTIONAL CAPACITY. Connections are easily accessible at the rear of each module and may be made by any conventional method. The various switch and auxiliary modules can be mixed and matched in endless permutations and combinations, to provide any desired set or series of functions, and can be modified at any time, yet the assembled units always present a finished, professional, integrated appearance. Bezel and thumbwheel colors can be combined in unlimited variety, for identification, optimum visibility, or styling.

Despite their compact size and easy action, these switches provide dependable operation and unequalled stability of electrical characteristics, through millions of steps, year after year. The logic designer and packaging expert enjoy an almost unlimited choice of electrical and mechanical configurations, switching logic, and circuit capacity.

Simplification of the basic design makes it practical to stock **parts and subassemblies for over a million switches at all times** — from which to assemble any one of over *five* million different switch types at the factory and at leading electronics distributors around the country. For standard or custom designs, call your nearest Interswitch field engineering representative, or the factory, directly.

SPECIFICATIONS

Working Voltage: 0.5 to 50 Volts DC or AC RMS.
Contact Rating: 0.1 Ampere, resistance switching.
Current Capacity: 1 Ampere, maximum.
Contact Resistance: 0.07 ohms (including printed circuitry).
Insulation Resistance: 100K Megohms (per MIL-STD-202, Method 302).
Dielectric Strength: 500 VAC RMS for 2 minutes at 25°C.
Operating Temperature: −40°C to +85°C.
Humidity: 96 hours at 95% RH (per MIL-STD-202, Method 101 B).
Shock: 15G (per MIL-STD-202, Method 202B).
Vibration: Withstands MIL-STD-202, Method 204A.
Rated Operating Life: In excess of 1,000,000 detent operations.



MATRIX BOARDS

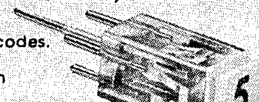
Interswitch Matrix Boards are available in nine standard 2-level models, three and four-level models, and with split busses (program input at two board edges, outputs from two board edges). Appropriate nomenclature, symbols, programming stripes, etc. (multi-color or monocrhomatic) can be provided on the boards or panels.

All standard programming elements (shorting pins, plugs, lamps, etc.) are available.

Hole Patterns:
6mm spacing: 8 std. styles
3mm spacing: 20 x 20
Terminals: all conventional
Working Voltage: 220 VDC or AC RMS.
Current Rating/Contact Bar:
6mm: 10A; **3mm:** 5A
Contact Resistance: 7 milliohms (short-circuit pin installed)

DATA MODULES FOR PROGRAMMING

Each data-input logic module consists of a programming plug, and a switch body available for plug-in to 3mm program boards or printed-circuit boards. Diodes in the switch body set up the coding logic. Numerical characters are available in various key colors and sizes. For quick, error-free programming, use flexible-plastic program-storing templates, with which a complete set of plugs may be inserted or removed simultaneously.



Codes Available: 8-4-2-1; Excess 3; Aiken 2-4-2-1, plus many special codes.
Operating Voltage: 50V maximum
Operating Current: 500mA maximum
Maximum Working Current: 1A.
Operating Life: 10^4 Switching cycles (min.)
Initial Contact Resistance: 5 milliohms.
Test Voltage: 1000V

770 AIRPORT BOULEVARD, BURLINGAME, CALIFORNIA 94010
PHONE: (415) 347-8217
TWX: (910) 374-2353
TELEX: 34-9373

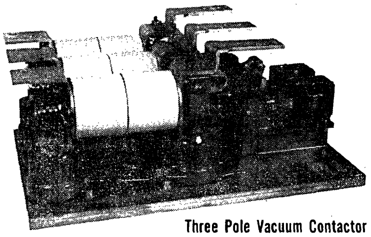
INTERSWITCH

vacuum contactors

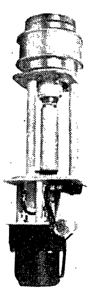
INTRODUCTION: Vacuum contactors offer the most reliable means available to control large amounts of power at high voltage. Units designed for dc, power frequency, and rf currents are available in voltage ratings to 50 kv and current ratings to 900 amperes continuous.

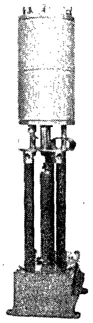
ADVANTAGES: The advantages of this type of unit include a high voltage capability, small physical size, high speed quiet operation, long life with minimum maintenance, non-exposed high voltage arcs, and low stable internal losses.

APPLICATIONS: Contactor applications include primary control of power supplies, industrial control of motors, switching in induction heating and mining equipment, tap changing in rf systems, and fault protection of transmitters.


Three Pole Vacuum Contactor

RF Contactor




AC or DC Contactor

Alternating and Direct Current Contactors— For industrial control applications.

MODEL NUMBER	Test Voltage (Pk KV)	Operate Voltage (Fk KV)	Continuous Current (Amps)	Max. Interrupt AC Current (Amps RMS)	Max. Interrupt DC Power (KW)	Capacitor Discharge Decaying to 0 in 200 μs	Contact Arrange-ment	Actuator Voltage (Volts)	Time to Close (Ms)	Break Time (Ms)	Weight (Lbs.)
RP101F4903D21B20 RP101F4904D21B20	50	30	200 DC	N/A	300 (10 A Max.)	N/A	N/O N/C	115 60 Hz	60	50	8¾
RP101F4302D26B20 RP101F4304D26B20	50	30	200 DC	N/A	300 (10 A Max.)	N/A	N/O N/C	100 DC	75 55	17 42	8¾
RP110F4903D21B20 RP110F4904D21B20	50	30	200 RMS	2000	N/A	50 K Amps	N/O N/C	115 60 Hz	60	50	8¾
RP110F4302D26B20 RP110F4304D26B20	50	30	200 RMS	2000	N/A	50 K Amps	N/O N/C	100 DC	75 55	17 42	8¾
RP901K4903D21B30 RP901K4904D21B30	70	50	400 DC	N/A	500 (10 A Max.)	N/A	N/O N/C	115 60 Hz	60	50	15
RP901K4601D26B30 RP901K4602D26B30	70	50	400 DC	N/A	500 (10 A Max.)	N/A	N/O N/C	100 DC	34 27	11 17	15
RP900K4903D21B30 RP900K4904D21B30	70	50	400 RMS	4000 at 13 KV RMS	N/A	100 K Amps	N/O N/C	115 60 Hz	60	50	15
RP900K4601D26B30 RP900K4602D26B30	70	50	400 RMS	4000 at 13 KV RMS	N/A	100 K Amps	N/O N/C	100 DC	34 27	11 17	15

High Voltage RF Contactors— For high power rf load control.

UNIT	Peak Operate Voltage 32 MHz	Continuous Current 32 MHz RMS	Contact Resistance Ohms Max.	Contact Capacitance Pf	Contact Inductance Nh	Contact Arrangement	Open Time	Close Time	Pull-in Current RMS	Hold Current RMS	Hold Power Watts	Actuating Voltage	Motor Current 60 Hz	Weight	Life	Auxiliary Contacts Ratings
																Volt RMS Current RMS
RP233X4513006M00	25	35	.0005	2	25	N/O	17 Ms.	75 Ms.	.7	.09	10	100 VDC	N/A	3 lbs.	1 x 10^5	Form C 230/7
RH3C4319D31G00	15	55	.0001	4	5	latching	7 Sec.	7 Sec.	N/A	N/A	N/A	115 VAC	.11A	4 lbs. 10 oz.	1 x 10^5	Form C 230/7
RF20A4319D31G00	25	200	.0001	10	2.5	latching	7 Sec.	·7 Sec.	N/A	N/A	N/A	115 VAC	.11A	5 lbs. 6 oz.	1 x 10^5	Form C 230/7

Three Pole Vacuum Contactors— For three-phase and multi-pole power control applications.

MODEL NUMBER	Operate Voltage 50/60/400 Hz	Operate Current 60 Hz	Interrupt Current Amps RMS	Mech. Life (Min.)	Actuator Voltage	Approx. Pull-in Current Amps RMS	Approx. Hold Current Amps RMS	Interrupt Time	Auxiliary Contacts	Weight
RP151B4541X24R20	600	250	3000	1 x 10^6	26.5 VDC	2.8	.4	Less than 1 Cycle	2 SPDT 230 VAC/10 A	16 lbs.
RP154B4549X41TX0 (60 Hz) RP154B4549X4KTX0 (50 Hz)	1500	300	3000	1 x 10^6	115 VAC	22.0	1.9	Less than 2 Cycles	4 SPDT 230 VAC/5 A	25 lbs.
RP951B5427X41DX0	1500	600	6000	250,000	115 VAC 60 Hz	44.0	3.8	4 Cycles Max.	4 SPDT	85 lbs.

ITT JENNINGS

Post Office Box 1278 • 970 McLaughlin Ave. • San Jose, Calif. 95108
Telephone: (408) 292-4025 • TWX: 910-338-0159

DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

32nd Year ®

SWITCHES*

J-B-T INSTRUMENTS, INC.

32nd Year ®

TOGGLE SWITCHES

20 AMP. RATING AT 125VAC — GENERAL PURPOSE AND MIL TYPES, INCLUDING MS25068, MS35058, MS35059, ST40, 42, 50, 52 SERIES

MIL-S-3950C MS35058 models with suffix -21 and above, similar MS35059 types, and outstanding **4-POLE SERIES** exceed the rigorous electrical requirements of MIL-S-3950C, and are recommended for maximum performance. All MS models have bushing seal to meet sand and dust test and latest toggle seal splash test, also 15-foot head of water submersion test stipulated in former MIL-S-3950B. Also, U.L. listed General Purpose types available with many options in levers, bushings, terminals and finishes... **Catalog TS-7.**

6 AMP. RATING AT 125VAC — GENERAL PURPOSE AND MIL TYPES, INCLUDING MS25098 AND MS25100 SERIES

Popular for communication circuits and many other medium duty uses. All MS models use bushing seal plus case-to-terminal seal in meeting sand, dust, splash, and submersion tests described above. Many options also available... **Catalog TS-7.**

NEW SUB-MINIATURE TYPES — THE ONLY COMPLETE LINE OF SPDT, DPDT TOGGLES U.L. LISTED WITH FULL 5 AMP. RATING AT 125VAC, INDUCTIVE.

More than 100 standard models with distinctive green body, manufactured by J-B-T in Connnecticut. Drastic reduction of size and weight. SP types are ¼″ x ½″ and weigh only 0.19 oz. Other models correspondingly compact and light. Also made in 3- and 4-pole models... **Catalog MT-40.**

ROTARY AND LEVER SWITCHES

STANDARD 14- AND 20-POSITION, AND A REMARKABLE NEW 12-POSITION

For dependable performance in instruments and test equipment, J-B-T makes space saving 14- and 20-position switches in both laminated and molded constructions. **NOMINAL RATING:** 1 Amp. inductive load at 125 VAC, 5 Amp. momentary (not make and break) **MULTIPOLE SERIES 20M** increases circuit versatility with up to 4 poles per deck. **MOLDED LEVER SWITCHES** in this series provide up to 5 live positions, 2 circuits per deck... **Catalog 170B.**

NEW V/M SERIES fully enclosed 1$^{13}/_{16}$″ dia. switches, 12-position, carries 5 Amp. and breaks 2 Amp. at 115 VAC. Features of this remarkable switch include adjustable torque, initial contact resistance under .002 ohms, and parasitic thermal emf under one microvolt... **Catalog VM-68.**

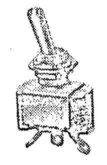
SUB-MINIATURE, MIL-S-3786C, TYPE SR05 AND SR31

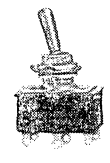
Made to many performance levels of MIL-S-3786C, the 1″ dia. Style SR05 switches are precision built for low-current usage where size, weight and reliability are important. With patented wafer design, Series 7000, 1-6 decks can have full 12 live switching positions per deck; Series 5000, 1-4 decks, can have up to 11 live switching contacts on each side of each dual duty deck with a maximum of 8 poles per deck. Lever types, panel sealed, and general purpose variations available . . . **Catalog SM-33.**

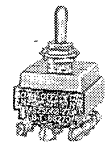
QUICK GUIDE TO TYPICAL J-B-T PRODUCTS

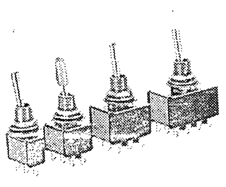
To supplement the J-B-T catalogs listed below, typical prices, mechanical and electrical characteristics and other data have been included for your convenience, in Sections 2900 and 5100 of the Radio-Electronic MASTER. To save time...

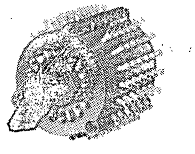
See J-B-T Catalog Pages in The Radio-Electronic MASTER

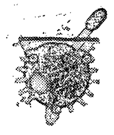

ST42D
SPDT, Solder Lug

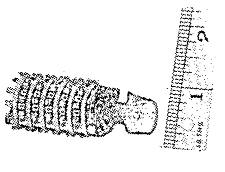

MS25100-23
DPDT, Lever Seal

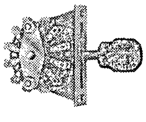

MS25068-27
4-PDT, Screw Term.


Series JMT
Sub-Miniature


Series 20M
Enclosed, Ruggedized


MS-20-1L5A
5-Position Lever

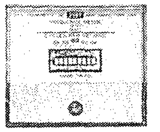

Series 7000, 6 Deck
Sub-Miniature

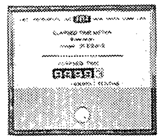

VL Lever
Sub-Miniature

*J-B-T ALSO MANUFACTURES

VIBRATING REED FREQUENCY METERS AND ELAPSED TIME METERS

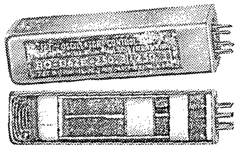
J-B-T Vibrating Reed Frequency Meters are made in a wide variety of case styles and sizes, standard and sealed, panel and portable; in many frequency ranges and reed groupings. Permanently accurate within ±0.3%, or better if required. Elapsed Time Meters are made in case styles compatible with other panel instruments, in 5- or 6-digit models, reading in hours and tenths at 60 cps. 110-125 volts. Variations for other frequencies and voltages available... **Catalog 170B.**


Model 34-FG
9-Reeds, 60 cps.


Model 31-EGW-5
0-9,999.9 hours

REED RELAYS AND OSCILLATOR CONTROLS

For selective calling mobile communication equipment, remote data transmission, or simultaneous sequential coding, the J-B-T D type illustrated has its operating mechanism isolated in all planes, and is designed for fast-starting and excellent response-time factor... **Bulletin D-664A.**

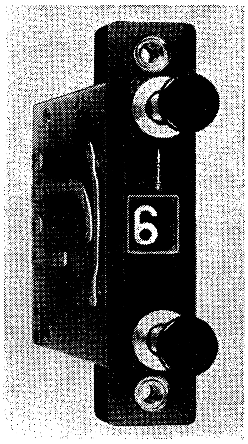

RO-D Type
Oscillator Control

J-B-T INSTRUMENTS, INC. • P. O. BOX 1818 • NEW HAVEN, CONN. 06508
(203) 772-2220 or 787-5824

JANCO

DESIGN VERSATILITY SOLVES APPLICATIONS PROBLEMS

SPACE-SAVER PUSH-BUTTON ROTARY SWITCH



Series 2800B

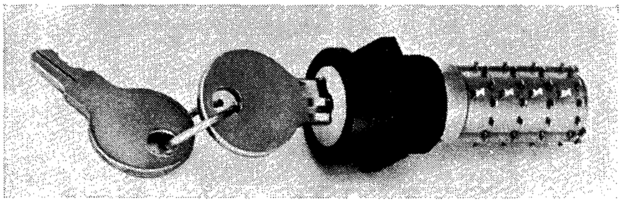
This new Push-Button Rotary Switch is available as BI-DIRECTIONAL (Series 2800B) and UNI-DIRECTIONAL (Series 2800U).

SPECIFICATIONS:

- Totally enclosed explosion-proof construction.
- Designed to meet the requirements of MIL-S-22710.
- Printed circuit construction.
- Available in 8, 10, or 12 positions and in all standard codes.
- Electrical rating: make and break .125 amp. res. at 28 VDC and 115 AC .05 amp. ind. at 28 VDC.
- Life characteristics: 50,000 cycles.
- Weight 1 oz. approx.

WRITE FOR COMPLETE TECHNICAL DATA

KEY OPERATED MICRO-MINIATURE ROTARY SWITCH



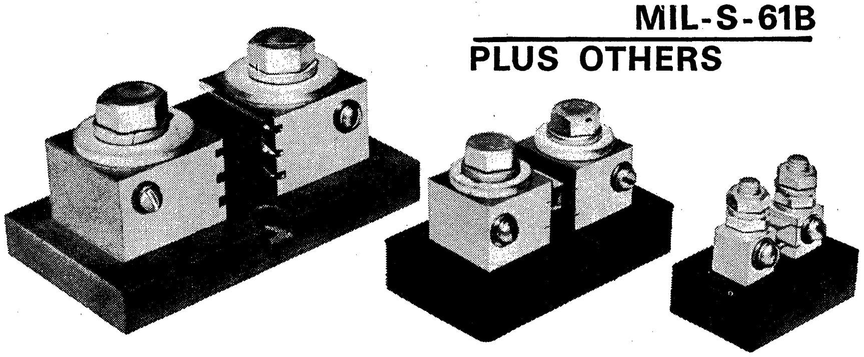
This new Key Operated Micro-Miniature Rotary Switch is available with 30° (7-2511), 36° (1-2543), and 45° (2-2525) indexing. Totally enclosed design provides high security. A variety of lock-safe combinations are available. A single key can operate several switches, allowing one person to control a multiple switch installation. Broad selection of poles, positions, and indexing, affords a flexibility that meets your security switching requirements.

For complete technical data,
see Micro-Miniature Rotary Switches 2500 Series on opposite page.

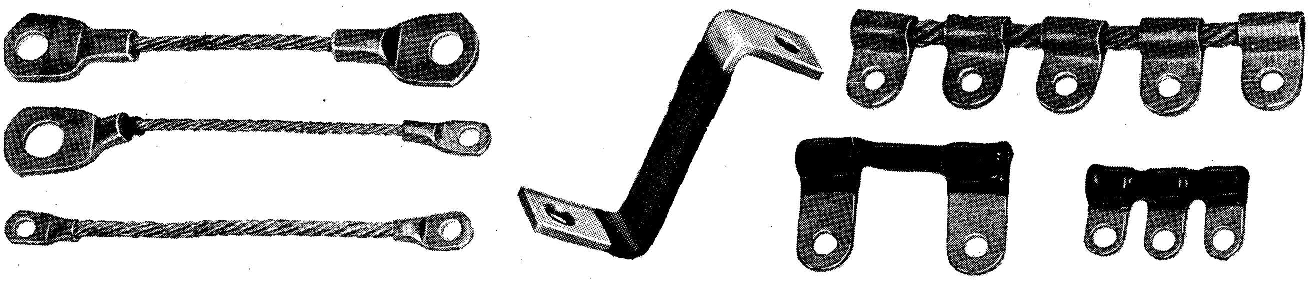
OTHER JANCO PRODUCTS

FOR AIRCRAFT AND MISSILE INDUSTRY

MIL-S-61B
PLUS OTHERS



EXTERNAL AMMETER SHUNTS • MSA • MSB • MSC



BONDING JUMPERS • FLEXIBLE ASSYS • BUS BARS

JANCO
CORPORATION

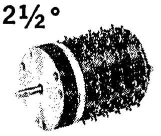
Phones: (213) 845-7473 • (213) 849-2107
3111 Winona Ave. • P.O. Box 3038 • Glenoaks Station
Burbank, California 91504 • TWX 910-498-2701

PLUS: VARIOUS ELECTRO-MECHANICAL DEVICES TO MEET YOUR SPECIFIC REQUIREMENTS

ROTARY SELECTOR SWITCHES BY JANCO

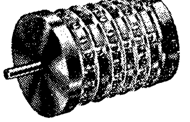
ROTARY SELECTOR SWITCHES MIL-S-6807B / MIL-S-3786B

SERIES 1211
22½°



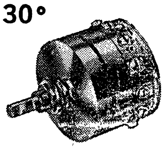
Max. Pos.: 16
Body Dia.: 3"
Electrical Rating:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
6 amps 28 v dc Ind.
Available in single pole per deck construction.
Solder lugs only.

SERIES 1272
22½°



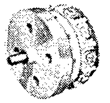
Max. Pos.: 16
Body Dia.: 3"
Electrical Rating:
10 amps 115 v ac Res.
10 amps 28 v dc Res.
6 amps 28 v dc Ind.
Available in single pole only per deck construction.
Screw terminals only.

SERIES 1315
30°



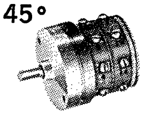
Max. Pos.: 12
Body Dia.: 2.180"
Electrical Rating:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.
Available in 1 and 3 poles per deck construction.

SERIES 1246
36°



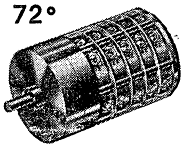
Max. Pos.: 10
Body Dia.: 2.375"
Electrical Rating:
6 amps 115 v ac Res.
6 amps 28 v dc Res.
3 amps 28 v dc Ind.
Available in single pole only per deck construction.

SERIES 1262
45°



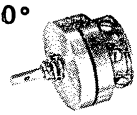
Max. Pos.: 8
Body Dia.: 1.93"
Electrical Rating:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.
Available in 1 and 2 poles per deck construction.

SERIES 1244
72°



Max. Pos.: 5
Body Dia.: 2.125"
Electrical Rating:
15 amps 115 v ac Res.
15 amps 28 v dc Res.
10 amps 28 v dc Ind.
Available in single pole only per deck construction.

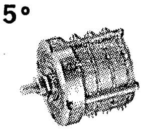
SERIES 1302
90°



Max. Pos.: 4
Body Dia.: 2.125"
Electrical Rating:
15 amps Ind. 30 v dc
Available in 1 and 2 poles per deck construction.

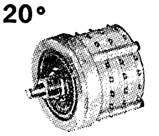
MINIATURE ROTARY SELECTOR SWITCHES / 1900 SERIES

SERIES 6-1900
15°



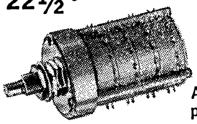
Max. Pos.: 24
Body Dia.: 2"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in 1, 2, 3, 4 and 6 poles per deck construction.

SERIES 12-1900
20°



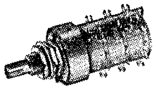
Max. Pos.: 18
Body Dia.: 2"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in single pole per deck construction.

SERIES 3-1900
22½°



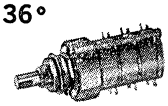
Max. Pos.: 16
Body Dia.: 1.5"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in 1, 2 and 4 poles per deck construction.

SERIES 1905
30°



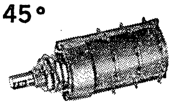
Max. Pos.: 12
Body Dia.: 1.036"
Electrical Rating:
2 amps 115 v ac Res.
1 amp 28 v dc Res.
0.5 amp 28 v dc Ind.
Available in 1, 2, 3, 4 and 6 poles per deck construction.

SERIES 1900
36°



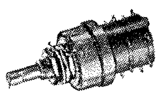
Max. Pos.: 10
Body Dia.: 1.036"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in 1 and 2 poles per deck construction.

SERIES 1906
45°



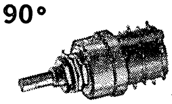
Max. Pos.: 8
Body Dia.: 1.036"
Electrical Rating:
5 amps 115 v ac Res.
5 amps 28 v dc Res.
2.5 amps 28 v dc Ind.
Available in 1 and 2 poles per deck construction.

SERIES 1-1957
60°



Max. Pos.: 6
Body Dia.: 1.13"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in single pole only per deck construction.

SERIES 1-1966
90°



Max. Pos.: 4
Body Dia.: 1.13"
Electrical Rating:
5 amps 115 v ac Res.
3 amps 28 v dc Res.
2 amps 28 v dc Ind.
Available in single pole only per deck construction.

MODIFICATIONS AVAILABLE

The following modifications can be supplied on any of the basic switches shown on this page.

1. Shorting or non-shorting contacts
2. Bridging of contacts (miniature only)
3. Momentary positions, whereby, the rotor contact, when released, returns to a predetermined position
4. Isolated or guarded positions, whereby, the knob must be depressed or pulled out to enter or leave a particular position or positions
5. Single or multi-pole construction
6. Continuous rotation or the use of stops
7. The use of a solenoid for remote switching applications
8. The use of a key-lock feature
9. The possibility of ganging various switches to be gear driven for an application requiring an unusual number of poles

GENERAL SPECIFICATIONS/1900 series

ELECTRIC RATING: carry 10 amps continuous. Make & Break—see individual switch data

VOLTAGE DROP: 0.1 volt or less at rated amperage. Initial Contact Resistance .003 OHM

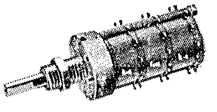
LIFE: 10,000 double cycles make and break rated amperage

TORQUE: 1 to 3 inch lbs.

SWITCHES DESIGNED AND BUILT IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
MIL-S-6807B (rotary switches enclosed)
MIL-S-3786B (rotary switches)
MIL-E-5272C (environmental testing)

MICRO-MINIATURE ROTARY SELECTOR SWITCH / 2500 SERIES

With unitized construction



Available in 30°, 36° and 45° indexing, with 12—10 and 8 pos. max.
Body Diameter: .623 inch.
Electrical rating continuous: 8 amps at 28 v dc.
Switching rate:
0 to 0.25 amp resistive 0 to 28 v dc.
0 to 0.25 amp resistive 0 to 115 v ac.
0 to 0.12 amp inductive 0 to 28 v dc.

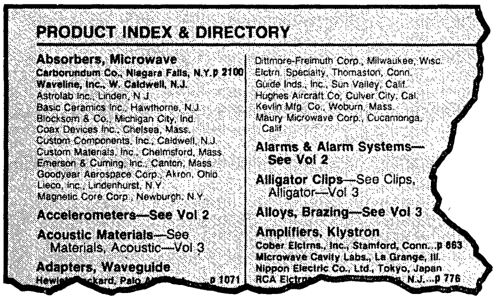
Available in 1, 2, and 3 pole construction.
TORQUE: 5 to 9 inch ounces.
CONTACT RESISTANCE: .005 ohms average.
INSULATION RESISTANCE:
100,000 megohms minimum at 100 volts.
10,000 megohms minimum at 500 volts.
DESIGNED AND BUILT to meet the environmental and functional requirements of MIL-S-3786B.

JANCO CORPORATION
Phones: (213) 845-7473 • (213) 849-2107
3111 Winona Ave. • P.O. Box 3038 • Glenoaks Station
Burbank, California 91504 • TWX 910-498-2701

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y. p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N.J.
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass.
Emerson & Cuming, Inc., Canton, Mass.
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.
Accelerometers—See Vol 2
Acoustic Materials—See Materials, Acoustic—Vol 3
Adapters, Waveguide
Hewl ckard, Palo A p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co, Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif
Alarms & Alarm Systems—See Vol 2
Alligator Clips—See Clips, Alligator—Vol 3
Alloys, Brazing—See Vol 3
Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. p 863
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctr N.J. p 776

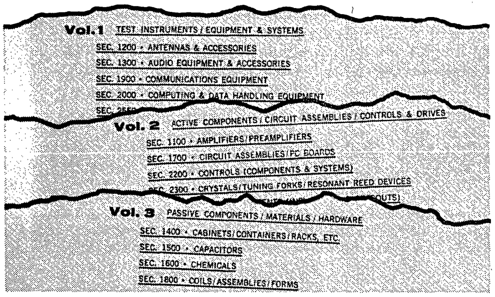
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT
Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
SEC. 2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES
Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

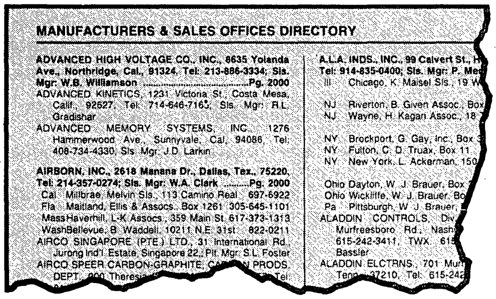
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



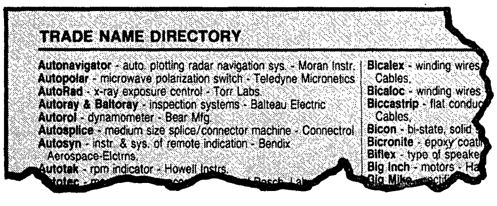
MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165, Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal. 94086, Tel: 408-734-4330, Sls. Mgr. J.D. Larkin
AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St. 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE.) LTD., 31 International Rd., Jurong Ind'l Estate, Singapore 22, Plt. Mgr: S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C N PRODS. DEPT., 800 Theresi Tel:
A.L.A. INDS., INC., 99 Calvert St., H
Tel: 914-835-0400; Sls. Mgr: P. Me
Ill Chicago, K. Maisel Sls., 19 W
NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18
NY Brockport, G. Gay, Inc., Box 3
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150
Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer, Bo
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-3411, TWX 61 Bassler
ALADDIN ELCTRNS., 701 Mur Tenn. 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires
Cables.
Bicaloc - winding wires
Biccastrip - flat condu
Cables.
Bicon - bi-state, solid
Bicronite - epoxy coati
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

BE JOSLYN-SURE ABOUT SURGE PROTECTION

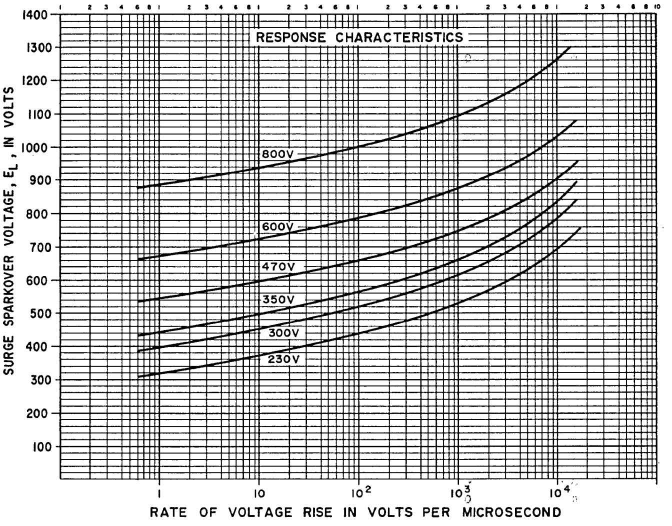
6 complete lines* that protect electrical/electronic equipment from: ■ voltage & current transients ■ direct lightning ■ overillumination

*Precision Spark Gaps

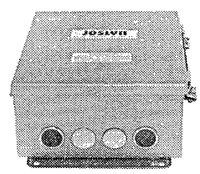
◻ Voltage breakdown ratings from 145V to 3,000V DC ■ Fast nanosecond response ■ Discharge current rating of 10 operations at 10,000 amp (10 x 20 μs) ■ Insulation resistance > 10^6 mΩ @ 150V DC ■ Interelectrode capacitance to < 0.5 pf (basic body)

Typical applications: use them to protect against surges due to switching, breakers closing-opening, static, reflected waves, capacitive discharge, corona, system faults, contact with foreign circuits, EMP, fuse blowing, lightning (induced or conducted), ionization, motor starting, arc welding. They protect solid state circuitry, computers, carrier circuits, relay coils, telephone circuits, microwave and radio equipment, sensitive equipment, open wire carriers, fire alarms, traffic controllers, rectifiers, modulators, traveling wave tubes, pyrotechnic devices. They may be used as activation devices in pyrotechnic devices, lamp starting circuits, and laser pulsers.

Response Curves for Typical MSP® Gaps



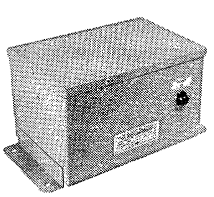
*DC Surgitron® Protectors



◻ Input voltage range from 12V to 130V DC ■ With max. load current of 20 amp & max. surge current of 5,000 amp ■ System polarity available — neg. gnd., pos. gnd. or floating.

Typical applications: use them to eliminate transients on battery circuits; protect critical equipment on railroads, in telephone communications and control systems, at microwave sites, public utilities, and weapons systems command and control installations.

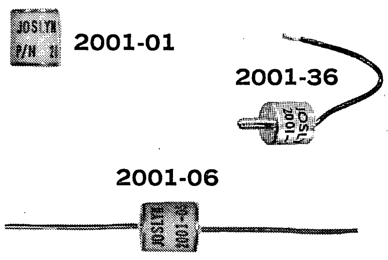
*AC Surgitron® Protectors (1 & 3ϕ, 60 Hz)



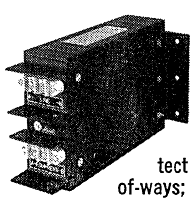
■ Covering power systems of any kva rating ■ With line voltages up to 650V rms max. ■ for grounded or ungrounded AC circuits.

Typical applications: use them to protect critical equipment operating from commercial power such as at missile installations, industrial plants, microwave repeater sites, telemetry stations, pipeline data logging stations and computer installations. Three phase, 60 Hz units will limit voltage rise on power distribution systems counteracting effects of lightning and EMP.

Typical MSP® Miniature Surge Protectors



*Communication Protectors



■ Frequency range from DC to 1 mHz ■ for coax, balanced, unbalanced, and open wire line protection ■ surge current up to 40,000 amp (10 x 20μs) ■ insertion loss @ max. signal level <0.5 db.

Typical applications: use them to protect sensitive circuitry along railroad right-of-ways; in process control, laboratory and test instrumentation; in pipeline data link, telephone and computer applications.

*Antenna Arresters (receive)

■ Signal operating range from 10 kHz to 300 mHz ■ Use them in conjunction with Precision Spark Gaps on receivers to attentuate voltage spikes to negligible levels.

*Antenna Lightning Arresters (receive and/or transmit)

■ Frequency range from 40 kHz to 36 mHz ■ Use them on commercial and military aircraft for direct lightning diversion ■ qualified per Mil-A-9094 (as amended)

CONSULT FACTORY for complete information including applicable model numbers as well as for information on other ratings, configurations, terminal mountings, etc., in each of the above product lines.

When you can't afford a failure . . .

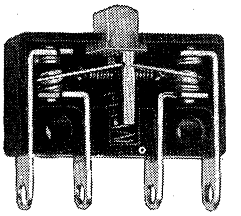
JOSLYN
ELECTRONIC SYSTEMS

Santa Barbara Research Park ◻ P.O. Box 817 ■ Goleta, Cal. 93017 ■ Ph. (805) 968-3551

LICON

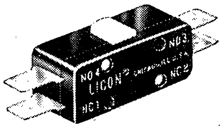
DIVISION ILLINOIS TOOL WORKS INC.
6615 WEST IRVING PARK ROAD • CHICAGO, ILLINOIS 60634
Phone (312) 282-4040 • TWX: 910-221-0275

LOOK TO LICON FOR A COMPLETE, QUALITY SWITCH LINE



BUTTERFLY® DOUBLE-BREAK SWITCHES

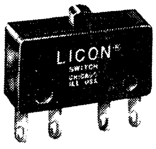
The unique Licon® Butterfly double-break switch design is built around two blades that move simultaneously, then actuate with a positive snap. A full line of 2, 4 and 6-circuit miniature, subminiature and heavy-duty Butterfly switches meet every basic switch need.



TYPE II

High electrical rating and long mechanical life in one compact package. Ideal for a wide range of applications.

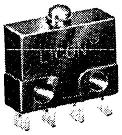
ELECTRICAL RATING U.L. & CSA Listed
125/250 v AC: 10 Amps
125 v AC: ½ HP
250 v AC: ¾ HP Sea Level
28 v DC: Form X or Y—15 Amps Res.
Form X or Y—10 Amps Ind.
Meets MIL-S-8805/11



TYPE 16

Features two circuit control, plus high shock and vibration resistance. Meets MIL-S-8805/7.

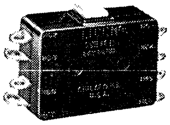
ELECTRICAL RATING U.L. & CSA Listed
125/250 v AC: 10 Amps Sea Level
28 v DC: Form X or Y—10 Amps Res.
Form X or Y—7.5 Amps Ind.
Form Z— 10 Amps Res.
Form Z— 5 Amps Ind.



TYPE 18

Big switch rating in the smallest double-break switch—.200″ x .500″ x .350″. Meets MIL-S-8805/76

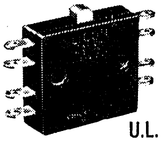
ELECTRICAL RATING U.L. Listed
125/250 v. AC: 7 Amps
28 v DC:
Form X or Y—8 Amps Res. Sea Level
Form X or Y—5 Amps Ind.



TYPE 22

Reliable double pole double break switch permitting simplified control of multiple circuit applications. Meets MIL-S-8805/15

ELECTRICAL RATING U.L. & CSA Listed
125/250 v AC: 10 Amps
125 v AC: ½ HP
250 v AC: ¾ HP
28 v DC: Form XX or YY—15 Amps Res.
Form XX or YY—10 Amps Ind.
Form ZZ— 10 Amps Res.
Form ZZ— 7 Amps Ind.

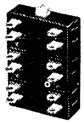


TYPE 26

U.L. Listed

Provides simultaneous operation of two Licon Butterfly double-break mechanisms in one case. Eliminates the need for dual components and complicated actuators.

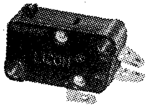
ELECTRICAL RATING Meets
125/250 v AC: 8 Amps MIL-S-8805/77
28 v DC: Form XX or YY—10 Amps Res.
Form XX or YY—7.5 Amps Ind.
Form ZZ— 10 Amps Res.
Form ZZ— 5 Amps Ind.



TYPE 36

Subminiature triple pole switch which can eliminate the need for three independent switches and complimenting actuators.

ELECTRICAL RATING
125/250 v AC: 8 Amps Res. MIL-S-8805/78
28 v DC: Form XXX or YYY—10 Amps Res.
Form XXX or YYY—7.5 Amps Ind.
Form ZZZ— 10 Amps Res.
Form ZZZ— 5 Amps Ind.



TYPE 23

High capacity, low cost, miniature snap action switch.
U.L. Listed

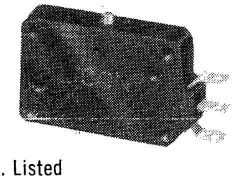
TYPE 73 ACTUATOR

Low cost momentary push-button series utilizing the Type 23 basic switch. Available in 1, 2, or 3 poles.

TYPE 25 THIN SWITCH

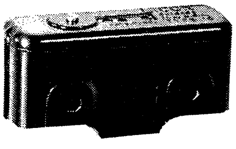
The thin switch is designed for commercial applications which require utmost reliability at low price. Typical applications include coin and vending machines, timers and counters.

ELECTRICAL RATING
On-Center 12 Amps Res. 7 Amps Ind.
Off-Center 6 Amps Res. 3 Amps Ind.

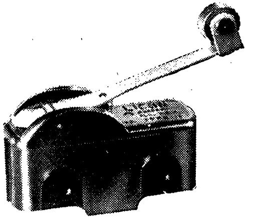


U.L. Listed

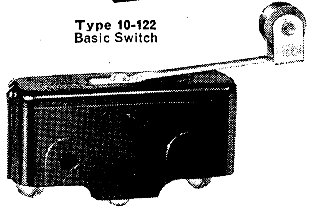
LICON TYPE 10 BASIC SWITCHES



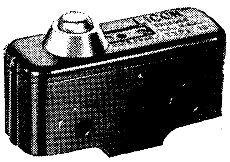
Type 10-122
Basic Switch



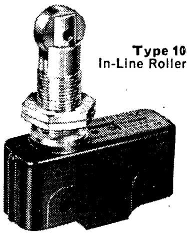
Type 10-722
Roller Lever Actuator



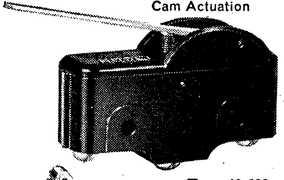
Type 10-522
Roller Leaf Actuator



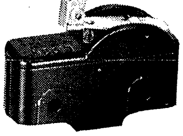
Type 10-822
Cam Actuation



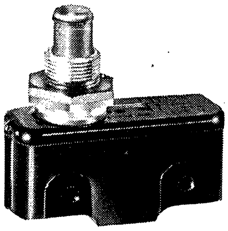
Type 10-922
In-Line Roller Actuator



Type 10-622
Hinge-Type Lever



Type 10-72207
One Way Actuator



Type 10-322
Panel Mounting

CHARACTERISTICS

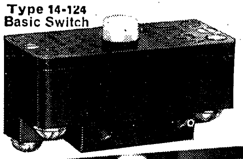
Electrical Rating 15A, 125/250 V a-c, 460 V a-c
15A Res 5A Ind. 5A motor, 30 V d-c

UL APPROVED CSA APPROVED

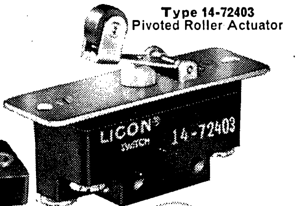
Splash-proof sealing against moisture, dirt, dust and other harmful elements can be provided for most models. Preloaded reverse action actuator available.

TYPE 14 HEAVY DUTY BASIC SWITCHES

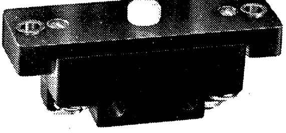
The LICON Type 14 series has been tested to over 20 million cycles of mechanical life. The Type 14 is specially designed for heavy duty use on high current applications. Now reliable switch performance is available in a compact unit rated at 20 amps, 250 VAC.



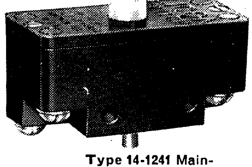
Type 14-124
Basic Switch



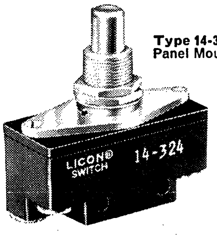
Type 14-72403
Pivoted Roller Actuator



Type 14-128040
Interchangeable and economical



Type 14-1241 Maintained Contact, Reset.



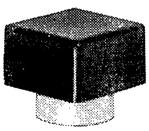
Type 14-324
Panel Mount

ELECTRICAL RATING

	A.C.		D.C.	
Volts	Steady	In-Rush	D.T.	S.T.
28	20	80	10	25
125	20	80	.5	2.0
250	20	80	.2	.5
480	15	50		
600	5	10		

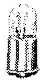
U.L. & CSA Listed

LIGHTED SWITCHES



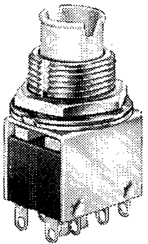
Widely used on computers, machine tools, office machines, guidance control and a wide variety of applications. Heart of Licon lighted switches are the ultra-reliable Butterfly® Double-breaks for long life and dependable performance. Wide selection of colors, sizes, mounts and actuators.

U.L. LISTED

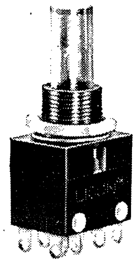


TYPE 01

LIGHTED PUSHBUTTON SWITCHES →

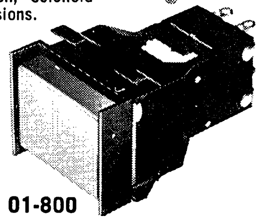


This single light series combines the Licon Type 16 Double-Break switch with a lamp assembly and removable lens cap. Combining lighting and switching functions in one compact package, conserves panel space and cuts installation time. The 01 series is designed to meet the requirements of MIL-S-22885-27, and provides up to 10 Amp switching capacity for commercial use. The series includes four different stationary lamp base styles, a wide choice of lens cap sizes, shapes and colors, servicing without tools from front of panel and a choice of projected color or colored lens illumination. Available in momentary alternate action, solenoid held and indicator versions.



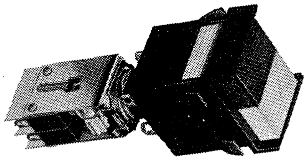
TYPE 01-700

Low cost momentary alternate or indicator action one-light, stationary bulb in one-piece molded housing. Cylindrical, square or round lens caps. Front-of-panel bulb servicing.



TYPE 01-800

Styled for maximum in function/appearance criteria. Has integral plastic housing that snaps in from front panel. Available in one thru six pole, momentary and alternate action.

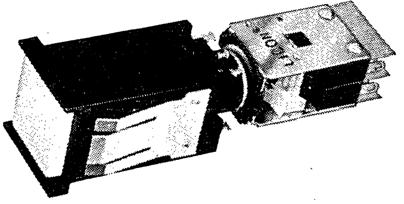


← TYPE 02-800

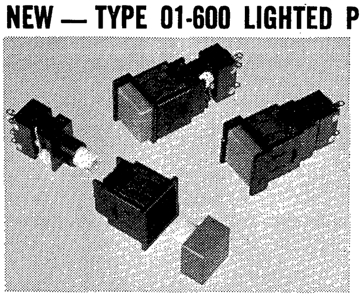
For two-light, two-circuit, split-screen indication and the same fine appearance as the 01-800, this series features snap-on switch modules containing sub-miniature Type 16 double break switches. Gives the designer that much more switching flexibility. With all the same wide range of features to meet your specific application. This series combines nicely with 01-800 series for display versatility.

TYPE 04

Dressy panel appearance w/four bulb illumination. Simple snap-on switch module, front-of-panel bulb service. Standard in black or clear anodizing. Other housing styles available.



NEW — TYPE 01-600 LIGHTED PUSHBUTTON SWITCHES



An attractive new snap-in one light switch offering bezel, single barrier, or double barrier housing. Employs the 01-748 series basic unit and mounts in a .875″ square panel cutout, panel thickness $\frac{1}{16}$-$\frac{1}{8}$″. Momentary, alterate & indicator versions available.

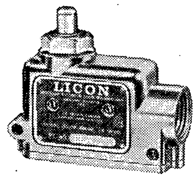
U.L. LISTED

INDUSTRIAL SWITCHES

TYPE 30

Rugged diecast endorsed limit switch for industrial applications. Available in wide variety of actuators, sealed or unsealed. U.L. Listed

30-100 OVERTRAVEL PLUNGER SWITCH

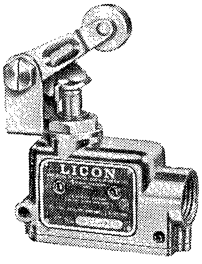


General purpose limit or push button switch for circuit controls of heavy duty applications. The overtravel plunger provides added switch protection and also permits greater flexibility of application. Since these switches are not sealed, it is recommended they be used for applications where environment is not a troublesome factor.

Uses Basic Switch 10-322

Operating Force	10 oz. ±4 oz
Release Force	3 oz. min.
Pretravel	.030 max.
Overtravel	.219 min.
Movement Differential	.002 max.

30-300 ROLLER ARM SWITCH



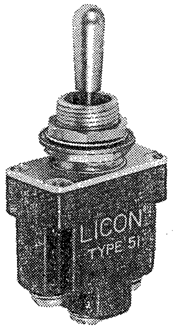
Identical to the dependable performance of the 30-400 switch. These switches are not sealed, however, and must be used in applications where environment is not a factor. Excellent for both slow and fast moving cams and slides. It is horizontally adjusted, in the field, to accept actuation from eight positions. It is vertically set for desired actuating thru 225°.

Uses Basic Switch 10-322

Operating Force	10-18 oz.
Release Force	6 oz. min.
Pretravel	.141 max.
Overtravel	.219 min.
Movement Differential	.006 max.

AIRCRAFT TOGGLE SWITCHES

TYPE 51

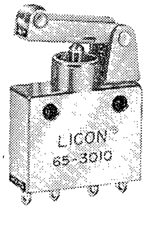


Heavy duty sealed toggle switch designed to meet the requirements of MIL-S-3950, MS24523, MS24524 and MS24525. 1, 2, and 4 pole versions. Also available: Lift lock versions. MS24658, 59, 60 and solder terminal MS27734, 35, 36.

SEALED SWITCHES

TYPE 63

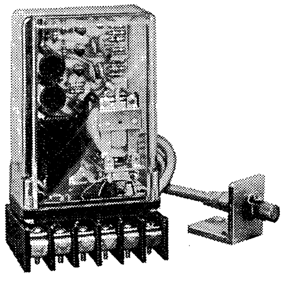
Environment free sealed limit switch. Meets MIL-S-8805.



TYPE 65

Subminiature environment free snap-action switching.

TYPE 70-700 PROXIMITY SWITCH



The 70-700 consists of two basic modules, a control module and a remote potted sensor. The control module contains a 10 amp relay and a transistor oscillator, both housing in a plastic plug-in case which mates with a 12 terminal heavy duty JIC style socket (supplied). A NEMA Class 1 metal enclosure is also available for housing both the control module and heavy duty socket.

For complete information about the full line of Licon switches, write for G106 catalog.
For information on the Licon® Series 550 Solid State Electronic Keyboard see EEM page 357

itw LICON
DIVISION ILLINOIS TOOL WORKS INC.
6615 WEST IRVING PARK ROAD • CHICAGO, ILLINOIS 60634
Phone (312) 282-4040 • TWX: 910-221-0275

LEDEX

LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891

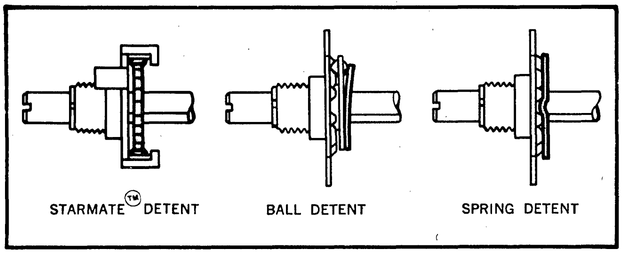
ROTARY SWITCHES

When it comes to selecting a source for rotary switches, you'll find LEDEX fully equipped to service you in these important areas: (1) quick, competent response to engineering requirements, (2) fast prototype delivery, (3) dependable production scheduling, and (4) consistent quality levels.

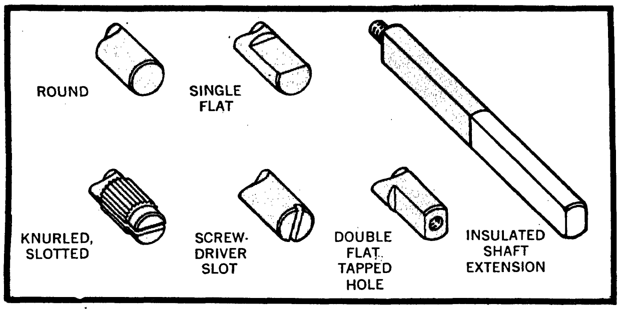
Our switch engineering experience dates back to 1947, when rotary switches were first applied with Ledex rotary solenoids to perform remote stepping and complex circuit programming functions. Over the years we have helped many customers to simplify their circuitry, reduce wiring requirements, and cut system costs. This experience we gladly share with you.

To meet your requirements for rapid delivery service, we stock a wide variety of standard parts which can be quickly modified. Our tooling is designed for quick setup and fast change-over, to further add to our ability to give you short delivery cycles. And to assure consistent quality, random production samples are regularly routed to automated test instrumentation for vigorous life and other quality verification tests.

From the early design stages on through production runs we are geared to produce quality switches . . . **fast.** Whether you're concerned with new switching applications, or investigating new sources for existing ones, we welcome the opportunity to work with you.



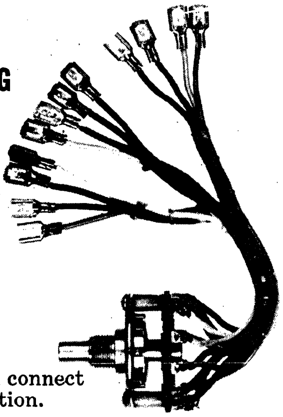
1. *Starmate™ detent:* Two bearing balls are spring loaded to operate against a precision indexing cam. The balls oppose each other with balanced pressure to eliminate side loading and extend switch life. This superior detenting concept is time-proven in Ledex long-life stepping motors.
2. *Ball detent:* A spring loaded ball bearing rides in and out of the "hill and valley" positions in the front plate. The ball detent has a crisp detenting feel even more positive than that of the spring detent.
3. *Spring detent:* a formed stainless steel spring with a coined spherical surface rides in and out of "hill and valley" positions in the front plate. It combines a positive index feel with economy.



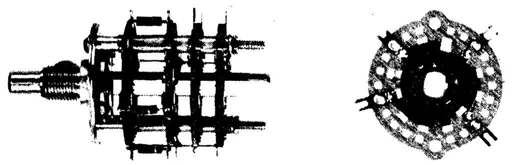
Commonly used shaft designs for commercial and military applications. Others made to specifications.

IDEAS IN SWITCH ENGINEERING

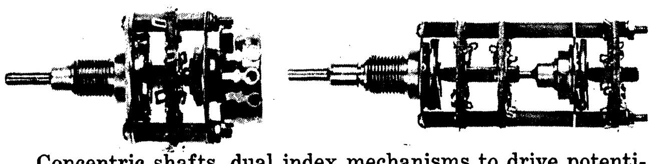
Supplying quality switch hardware is just one phase of our business. We take a special pride in our time-proven ability to simplify circuitry, upgrade the switch, and hold costs down. In most cases we can supply pre-wired assemblies with external components installed for less than it might cost you to purchase parts and assemble them in your plant.



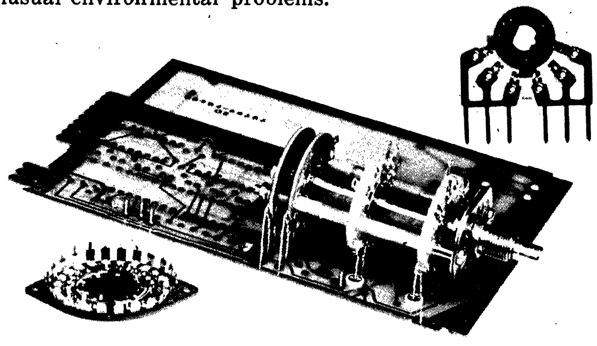
Switch pre-wired with quick connect terminals for simplified installation.



Slotted terminals permit resistors and other components to be inserted in place. They eliminate need for jumper wires, reduce soldering time, keep size down.



Concentric shafts, dual index mechanisms to drive potentiometers, snap switches and other loads. Special bushings, shields, brackets also engineered to solve unusual environmental problems.



Printed circuit terminals, available for perpendicular or parallel mounting (to PC board) expand switching versatility.

LEDEX
LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891

ROTARY SWITCHES

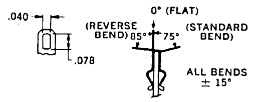
STANDARD SPECIFICATIONS

	206, 208, 212	306, 312	406, 412	506, 512	524
CONSTRUCTION	Throughbolts				
SHAFT— Military*	¼" steel, cadmium plated, chromated per QQ-P-416, class 2, type II (50 hour salt spray).				
Commercial	¼" steel, cadmium plated.				
MOUNTING	Steel bushing, ⅜-32 thread, optional ¼ or ⅜ inch, standard length.				
SPACERS	Ceramic, Grade L-5	Glass filled nylon, grade G 1/30.			
LOCATING LUG	Standard fixed at .375" radius; or can be deleted.	Standard fixed at 17/32" radius; or can be deleted.	Variable at 15° increments except 75°, 90°, 105°, 255°, 270°, 285°.	Standard fixed at 17/32" radius; or can be deleted.	Variable at any angle ±2° at 17/32" radius, or can be deleted.
METAL PARTS	All metal parts cold rolled steel with cadmium plating for commercial applications. Chromate dip for 50 to 100 hour salt spray per MIL-S-3786 for military applications. Special materials such as passivated stainless steel or nickel plated brass parts are also available.				
INDEX MECHANISM	Dual ball Starmate detent or single ball (hill and valley.	Dual ball Starmate, spring or single ball detent (Hill and Valley)			Single or dual ball detent.
STOPS	Fixed or adjustable.				Fixed at positions specified
INSULATION MATERIALS	Diallyl phthalate stator and rotor; phenolic, epoxy glass or silicone glass with KEL-F rotors.	Stator and rotor: Phenolic, Kel-F, Epoxy Glass, Ceramic, Mycalex†	Stator and rotor: Phenolic, Epoxy glass.	Stator and rotor: Phenolic, Kel-F Epoxy glass.	Stator and rotor: Phenolic, Epoxy Glass.
CONTACT RATINGS Make/Break					
	Brass—Silver plated .5 ampere at 28 VDC, resistive; .25 ampere at 110 VAC, resistive.	**Brass—Silver plated** 1 ampere at 28 vdc, resistive; .5 ampere at 110 vac.	**Brass—Silver plated** 1 ampere at 28 vdc, resistive; .5 ampere at 110 vac.	**Brass—Silver plated** 1 ampere at 28 vdc, resistive; .5 ampere at 110 vac.	**Brass—Silver plated** 1 ampere at 28 vdc, resistive; .5 ampere at 110 vac.
	Solid Silver 1 ampere at 28 VDC, resistive; .5 ampere. at 110 VAC, resistive.	**Solid Silver** 2 amperes at 28 vdc, resistive; 1 ampere at 110 vac.	**Solid Silver** 2 amperes at 28 vdc, resistive; 1 ampere at 110 vac.	**Solid Silver** 2 amperes at 28 vdc, resistive; 1 ampere at 110 vac.	**Solid Silver** 2 amperes at 28 vdc, resistive; 1 ampere at 110 vac.
	Carry—5 amperes.	Carry—5 amperes.	Carry—5 amperes.	Carry—10 amperes.	Carry—5 amperes.
	Dielectric—750 volts, contact to contact.	Dielectric—1,000 volts, contact to contact; 500 volts when contacts are insulated back to back.			
	Contact resistance, in accordance with MIL-S-3786, will not exceed .010 ohms initially nor .020 ohms after rotational life tests.				

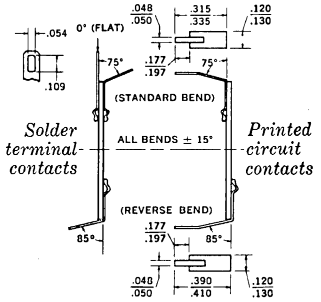
†Mycalex sections supplied with Kel-F rotors.

contacts

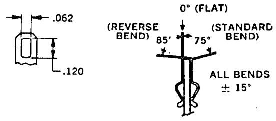
series 206 208 212


.040
.078
0° (FLAT)
(REVERSE BEND) 85°
75° (STANDARD BEND)
ALL BENDS ± 15°

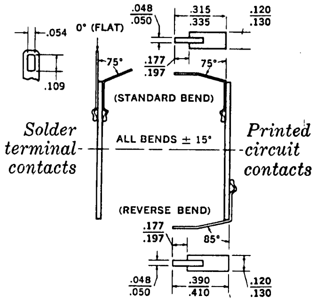
series 306 312 524


.054
.109
0° (FLAT)
.048 / .050
.315 / .335
.120 / .130
75°
.177 / .197
75°
(STANDARD BEND)
Solder terminal-contacts
ALL BENDS ± 15°
Printed circuit contacts
(REVERSE BEND)
85°
.177 / .197
85°
.048 / .050
.390 / .410
.120 / .130

series 506 512

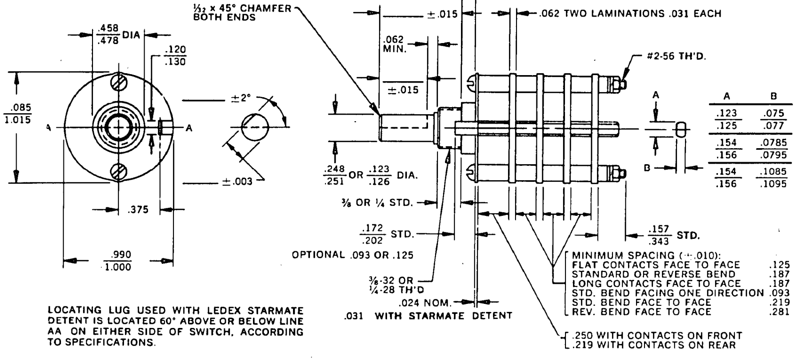

.062
.120
0° (FLAT)
(REVERSE BEND) 85°
75° (STANDARD BEND)
ALL BENDS ± 15°

series 406 412


.054
.109
0° (FLAT)
.048 / .050
.315 / .335
.120 / .130
75°
.177 / .197
75°
(STANDARD BEND)
Solder terminal-contacts
ALL BENDS ± 15°
Printed circuit contacts
(REVERSE BEND)
.177 / .197
85°
.048 / .050
.390 / .410
.120 / .130

series 206 / 6 POSITION 60° THROW *208* / 8 POSITION 45 THROW *212* / 12 POSITION 30° THROW

dimensional data

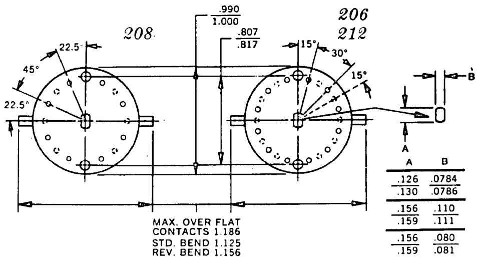

.458 / .478 DIA
.120 / .130
.085 / 1.015
A
A
±2°
±.003
.375
.990 / 1.000
1/32 x 45° CHAMFER BOTH ENDS
±.015
.062 MIN.
±.015
.120 / .130 STD & MIN.
.062 TWO LAMINATIONS .031 EACH
#2-56 TH'D.
.248 / .251 OR .123 / .126 DIA.
⅜ OR ¼ STD.
.172 / .202 STD.
OPTIONAL .093 OR .125
⅜-32 OR ¼-28 TH'D
.024 NOM.
.031 WITH STARMATE DETENT
.157 / .343 STD.
A
B

A	B
.123 / .125	.075 / .077
.154 / .156	.0785 / .0795
.154 / .156	.1085 / .1095

MINIMUM SPACING (±.010):
FLAT CONTACTS FACE TO FACE .125
STANDARD OR REVERSE BEND .187
LONG CONTACTS FACE TO FACE .187
STD. BEND FACING ONE DIRECTION .093
STD. BEND FACE TO FACE .219
REV. BEND FACE TO FACE .281

.250 WITH CONTACTS ON FRONT
.219 WITH CONTACTS ON REAR

LOCATING LUG USED WITH LEDEX STARMATE DETENT IS LOCATED 60° ABOVE OR BELOW LINE AA ON EITHER SIDE OF SWITCH, ACCORDING TO SPECIFICATIONS.


208
206
212
.990 / 1.000
.807 / .817
22.5°
45°
22.5°
15°
30°
15°
A
B
MAX. OVER FLAT CONTACTS 1.186
STD. BEND 1.125
REV. BEND 1.156

A	B
.126 / .130	.0784 / .0786
.156 / .159	.110 / .111
.156 / .159	.080 / .081

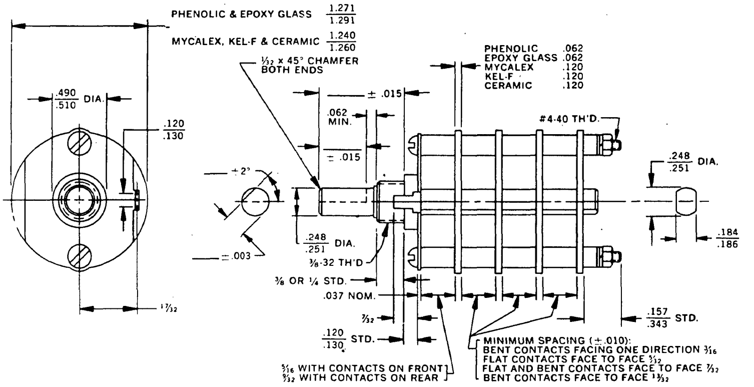
NOTE: DOTTED LINES INDICATE OFFSET CONTACT POSITIONS.
AVAILABLE FRONT OR REAR.

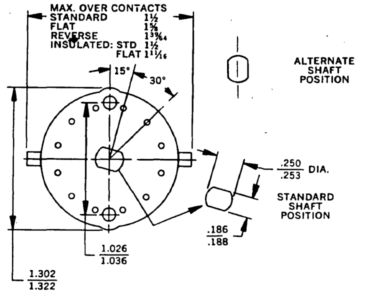
LEDEX

LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891

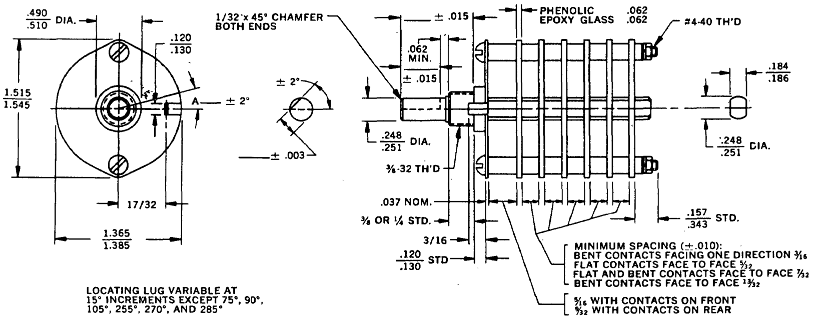
ROTARY SWITCHES *dimensional data*

series 306 / 6 POSITION 60° THROW *312* / 12 POSITION 30° THROW

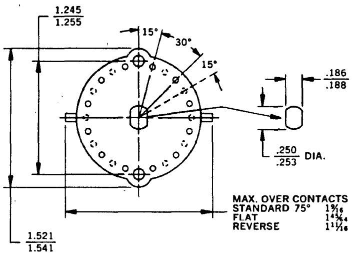

PHENOLIC & EPOXY GLASS 1.271/1.291
MYCALEX, KEL-F & CERAMIC 1.240/1.260
1/32 x 45° CHAMFER BOTH ENDS
.490/.510 DIA.
.120/.130
1 7/32
± .015
.062 MIN.
± .015
± 2°
± .003
.248/.251 DIA.
3/8-32 TH'D
3/8 OR 1/4 STD.
.037 NOM.
7/32
.120/.130 STD.
5/16 WITH CONTACTS ON FRONT
9/32 WITH CONTACTS ON REAR
PHENOLIC .062
EPOXY GLASS .062
MYCALEX .120
KEL-F .120
CERAMIC .120
#4-40 TH'D.
.248/.251 DIA.
.184/.186
.157/.343 STD.
MINIMUM SPACING (±.010):
BENT CONTACTS FACING ONE DIRECTION 3/16
FLAT CONTACTS FACE TO FACE 5/32
FLAT AND BENT CONTACTS FACE TO FACE 7/32
BENT CONTACTS FACE TO FACE 13/32


MAX. OVER CONTACTS
STANDARD 1 1/2
FLAT 1 5/8
REVERSE 1 39/64
INSULATED: STD 1 1/2
FLAT 1 11/16
15°
30°
ALTERNATE SHAFT POSITION
.250/.253 DIA.
STANDARD SHAFT POSITION
.186/.188
1.026/1.036
1.302/1.322

series 406 / 6 POSITION 60° THROW *412* / 12 POSITION 30° THROW


.490/.510 DIA.
.120/.130
1.515/1.545
A
± 2°
17/32
1.365/1.385
1/32 x 45° CHAMFER BOTH ENDS
± 2°
± .003
± .015
.062 MIN.
± .015
.248/.251 DIA.
3/8-32 TH'D
.037 NOM.
3/8 OR 1/4 STD.
3/16
.120/.130 STD
PHENOLIC .062
EPOXY GLASS .062
#4-40 TH'D
.184/.186
.248/.251 DIA.
.157/.343 STD.
MINIMUM SPACING (±.010):
BENT CONTACTS FACING ONE DIRECTION 3/16
FLAT CONTACTS FACE TO FACE 5/32
FLAT AND BENT CONTACTS FACE TO FACE 7/32
BENT CONTACTS FACE TO FACE 13/32
5/16 WITH CONTACTS ON FRONT
9/32 WITH CONTACTS ON REAR

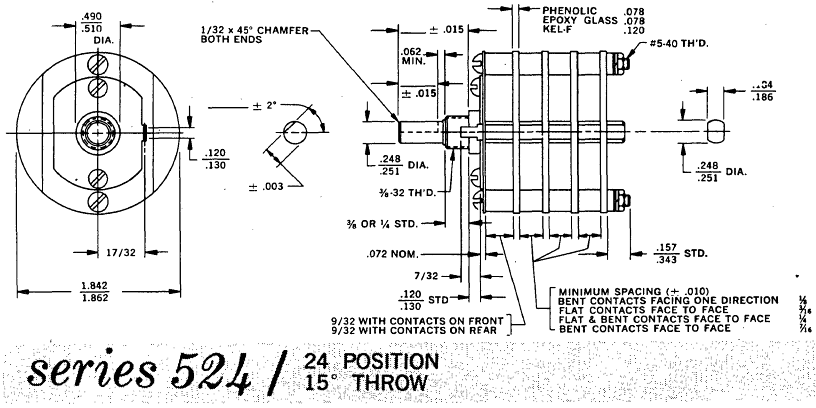
LOCATING LUG VARIABLE AT 15° INCREMENTS EXCEPT 75°, 90°, 105°, 255°, 270°, AND 285°

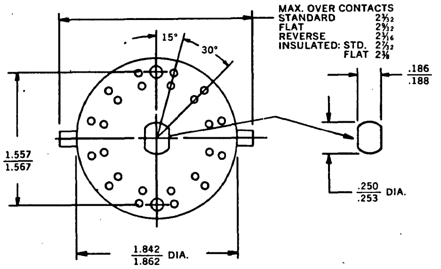

1.245/1.255
15°
30°
15°
.186/.188
.250/.253 DIA.
MAX. OVER CONTACTS
STANDARD 75° 1 9/16
FLAT 1 45/64
REVERSE 1 11/16
1.521/1.541

NOTE: DOTTED LINES INDICATE OFFSET CONTACT POSITIONS.

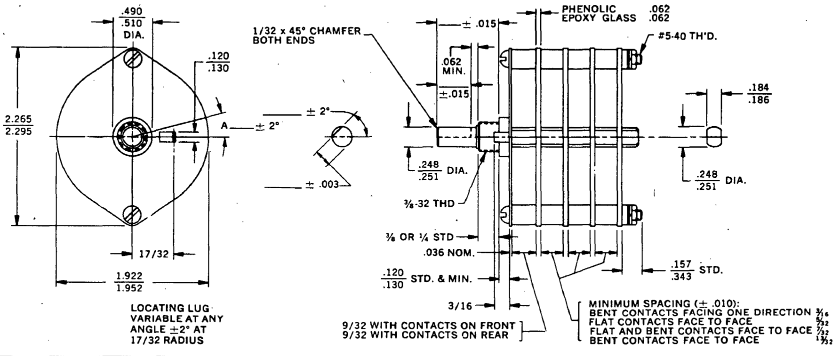
.AVAILABLE FRONT OR REAR.

series 506 / 6 POSITION 60° THROW *512* / 12 POSITION 30° THROW

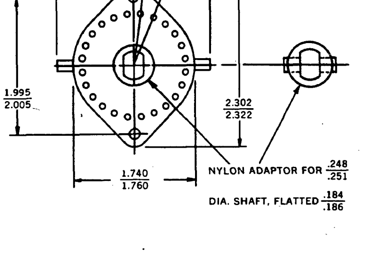

.490/.510 DIA.
.120/.130
17/32
1.842/1.862
1/32 x 45° CHAMFER BOTH ENDS
± 2°
± .003
± .015
.062 MIN.
± .015
.248/.251 DIA.
3/8-32 TH'D.
3/8 OR 1/4 STD.
.072 NOM.
7/32
.120/.130 STD
9/32 WITH CONTACTS ON FRONT
9/32 WITH CONTACTS ON REAR
PHENOLIC .078
EPOXY GLASS .078
KEL-F .120
#5-40 TH'D.
.184/.186
.248/.251 DIA.
.157/.343 STD.
MINIMUM SPACING (± .010)
BENT CONTACTS FACING ONE DIRECTION 1/8
FLAT CONTACTS FACE TO FACE 3/16
FLAT & BENT CONTACTS FACE TO FACE 1/4
BENT CONTACTS FACE TO FACE 7/16


MAX. OVER CONTACTS
STANDARD 2 3/32
FLAT 2 9/32
REVERSE 2 1/16
INSULATED: STD. 2 7/32
FLAT 2 3/8
15°
30°
.186/.188
1.557/1.567
.250/.253 DIA.
1.842/1.862 DIA.

series 524 / 24 POSITION 15° THROW


.490/.510 DIA.
.120/.130
2.265/2.295
A
± 2°
17/32
1.922/1.952
1/32 x 45° CHAMFER BOTH ENDS
± 2°
± .003
± .015
.062 MIN.
±.015
.248/.251 DIA.
3/8-32 THD
3/8 OR 1/4 STD
.036 NOM.
.120/.130 STD. & MIN.
3/16
9/32 WITH CONTACTS ON FRONT
9/32 WITH CONTACTS ON REAR
PHENOLIC .062
EPOXY GLASS .062
#5-40 TH'D.
.184/.186
.248/.251 DIA.
.157/.343 STD.
MINIMUM SPACING (± .010):
BENT CONTACTS FACING ONE DIRECTION 3/16
FLAT CONTACTS FACE TO FACE 5/32
FLAT AND BENT CONTACTS FACE TO FACE 7/32
BENT CONTACTS FACE TO FACE 13/32

LOCATING LUG VARIABLE AT ANY ANGLE ±2° AT 17/32 RADIUS


MAX. OVER CONTACTS
STANDARD 1 7/8
FLAT 2 1/32
INSULATED: FLAT 2 3/16
REVERSE NOT AVAILABLE
7.5°
15°
1.995/2.005
2.302/2.322
1.740/1.760
NYLON ADAPTOR FOR .248/.251
DIA. SHAFT, FLATTED .184/.186

SWITCH SECTION HIGHLIGHTS

contact and rotor blade materials

silver plated brass

Most economical. Has .0001″ minimum silver to assure silver-to-silver contact (low contact resistance) throughout life of most applications.

silver alloy

Used when consistent low contact resistance is required for minimum life expectancy of 200,000 contact flexures.

gold plated silver alloy

(a) .00003″ minimum gold; an economical way to assure positive solder contacts and prevent tarnish during long storage life.

(b) .0002″ minimum hard gold; assures gold-to-gold contact for over 50,000 contact flexures and then silver-to-silver contact for 150,000 additional contact flexures.

SILVER PROTECTION PROCESS	WHERE APPLIED	COMMENTS
Water Dip Lacquer	*On Contacts*	*Applied as standard on all silver alloy and silver plated brass contacts to retard tarnishing for soldering ease.*
.00003″ Gold Plate	*a) On Contacts and Rotors*	*An economical means to assure positive circuit make after extended shelf life; also offers soldering ease. Meets MIL specs.*
	b) On Contacts only	*Primarily used for soldering ease after extended shelf life. Meets MIL specs.*
Hot Tin Dip	*On terminal end of contacts only*	*Primarily to assure good contact solderability after extended shelf life. Meets MIL specs.*

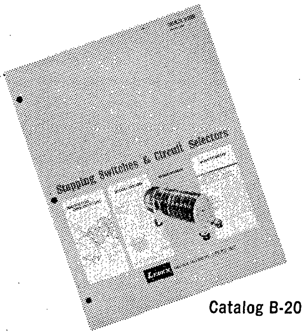
STATOR INSULATION GUIDE

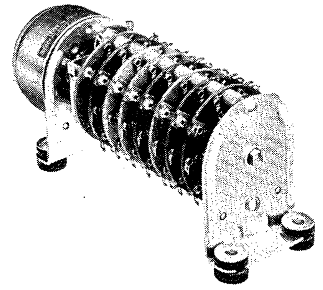
STATOR INSULATION	MIL SPEC.	USABLE TEMPERATURE LIMIT (°C)	MINIMUM INSULATION RESISTANCE (MEGOHMS)	
diallyl phathalate	*MIL-M-14F type SDG*	*125*	*10,000*	*Most recent material, combines best combinations of desirable dielectric, low moisture, and structural characteristics at prices competitive to phenolic.*
Phenolic	*MIL-P-3115, type PBE-P*	*100*	*1,000*	*Most economical, most commonly used. Though non-nutrient to fungi, varnish impregnation per MIL-V-173 is available. Meets most military and commercial application requirements.*
Epoxy-Glass	*MIL-P-18177, type GEB*	*125*	*10,000*	*Economical, excellent structural and dielectric strength. Lower moisture absorption rate than phenolic.*
Silicone Glass	*MIL-P-997C, type GSG*	*125*	*10,000*	*Good RF characteristics. Lower structural strength than epoxy glass, and slightly higher in cost.*
*Mycalex**	*MIL-I-10A, Grade L-411*	*150*	*10,000*	*Good structural and dielectric strength, lowest moisture absorption.*
Kel-F	*MIL-M-55028-A, Grade 3*	*125*	*20,000*	*Excellent structural and dielectric strength. Low moisture absorption.*
Ceramic	*MIL-I-10A, Grade L-422*	*150*	*10,000*	*Very low dielectric loss and moisture absorption.*

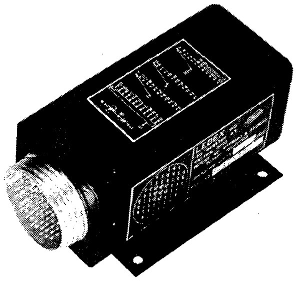
*Mycalex sections supplied with Kel-F rotors.

LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891

LEDEX STEPPING SWITCHES/CIRCUIT SELECTORS


Catalog B-2000





38 Off-The-Shelf Models
Choose from 36 stock models, 2, 4, 6, 8, 10, 12, 18, 20 and 24 positions; 28 and 100 VDC. "Stepping Switches and Circuit Selector" catalog lists complete specs on stock models plus useful engineering information on basic control switching and application of basics to solve complex problems. Also includes simplified building block approach to specifying pre-engineered stepping switches and circuit selectors.

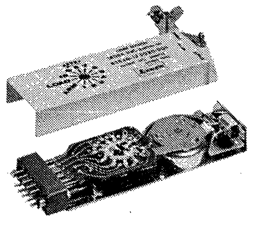
Ledex Stepping Switches are used for transfer switching, remote control of predetermined circuit patterns, remote sequencing of complex switching arrangements, or in programming checkout and sequential operations. They are known best for their ability to perform multiple switching functions reliably, in limited space, and under severe operating and environmental conditions. Available in open construction, pre-wired modules or as packaged control solutions.

Ledex Hermetically Sealed Switches are engineered to withstand severe shock and vibration, such as encountered in aircraft, missile and military applications, and to provide added switching reliability in adverse environments. Used extensively in aero/space and underwater guidance controls, as mode selectors, in rocket firing devices, and in a variety of military control functions that demand a high degree of reliability. There are 19 models available from the shelf.

LEDEX PACKAGED CONTROL SOLUTIONS

Here are examples of Ledex Stepping Switches designed into compact, reliable control packages that combine the best characteristics of solid state and electromechanical technologies.

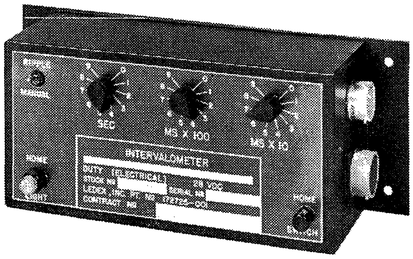
Whether your problem involves armament controls or commercial control functions, there's a good chance Ledex has already solved a similar problem. Our Packaged Switches Catalog, B-3252, shows several more detailed examples and also includes specifications for 19 hermetically sealed switches available from the shelf.



Miniaturized Armament Control Intervalometer
Flat, compact, 12-position stepping switch measures only ½" x 1¼" x 4¼", fires 19 rockets, sequentially in pairs. It includes a Ledex pulser to control time intervals over mil-spec. temperature and voltage ranges.

PULSE RATE
(SECONDS)

40-position Intervalometer with single or optional 5-speed ripple fire control
40-position intervalometer has 5 adjustable control speeds for rocket firing at intervals of 100, 200, 300, 400 or 500 milliseconds. Hybrid design combines best characteristics of solid state and electromechanical products for optimum performance, minimum weight, maximum reliability and lowest cost. Firing time intervals are maintained at ±5% through a voltage range of 22 to 31 vdc.



Universal Stores Dispenser Intervals Variable on Digital Basis

All solid state and among the most flexible of Ledex intervalometer designs, this one permits the pilot to vary release intervals to any rate ranging from 30 ms to 9.99 seconds in increments of 10 ms. It includes a stepping switch to distribute sequential fire commands. Timing tolerance is ±10% over a voltage range of 22 to 32 volts and temperature to −55°C to +85°C. The package includes built-in suppression to protect solid state circuitry when switching inductive loads.

For engineering assistance and technical literature, write or phone:

LEDEX INC., 126 WEBSTER STREET, DAYTON, OHIO 45401
phone (513) 224-9891

Maxi-SWITCH

KEYSTRIPS AND KEYBOARDS

The Maxi-Switch Company is a leading producer of push button switch components and switch assemblies for the computer, photo-copy, business machine, automation and peripheral equipment industries.

Maxi-Switch Keystrips present a unique approach to switch construction. These modular units offer long mechanical life and high quality in readily available, off-the-shelf assemblies. Combinations of different contact types, contact forms and plunger actions may be used within a single Keystrip. Up to 20 or more stations may be accommodated per Keystrip with standard spacing of 5/8 or 3/4 inch between stations. Other spacings are optionally available. Standard Series 1600 and 1800 Keystrips are equipped with glass reed contacts. (Write for Keystrip Bulletin 1600/1800 KS.)

Maxi-Switch Keyboards are constructed using Keystrips mounted on a precision-fabricated steel frame. Spacing is precise, with no possibility of cocked or twisted buttons, or switch misalignment. Keyboard orientation may be flat, stepped or sloped.

The Maxi-Switch Keystrip construction technique facilitates the design and production of custom keyboards. Individual push button stations may be purchased singly, in Keystrips, or as completed Keyboards, with or without encoding circuitry. The wide range of features, options and accessories complement Keyboard adaptability. (Ask for Maxi-Switch Bulletin 1600/1800.)

SPECIFICATIONS

Contacts:

Glass Reed, form A or B, single or dual station. 28 VDC @ 250 Ma.

Cross-Bar Palladium leaf contacts. 3 Ampere @ 28 VDC, 3 Ampere @ 115 VAC.

Snap-Action Power Contacts. 10 Ampere @ 250 VAC, 1/2 Ampere @ 125 VDC; or 15 Ampere @ 250 VAC, 1/2 Ampere @ 125 VDC.

Plunger Actions:

Momentary Contact (standard)

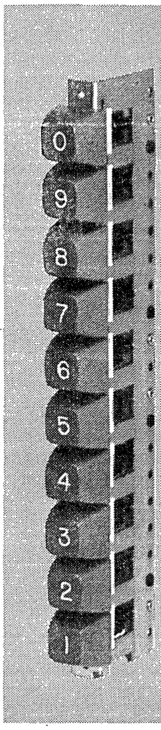
Alternate Action (push-push)

Interlatch and Lockout

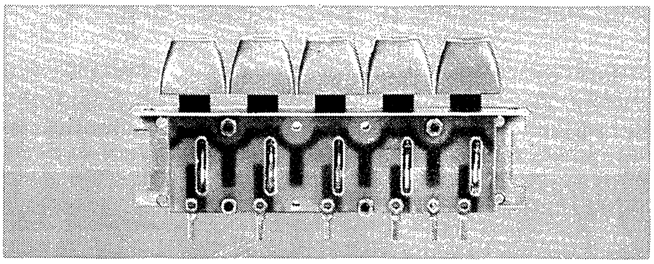
Lockout Only

Key Motion Sensing

Cross-Bank Interlatch and Lockout (between keystrips)



1600 KEYSTRIP



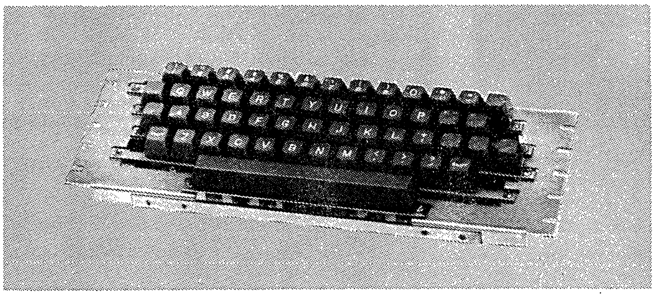
1800 KEYSTRIP

Buttons:

A variety of lighted and unlighted buttons available in several colors. Ask for Maxi-Switch Bulletin MS 2500 for information on buttons and Keystrip/Keyboard illumination.

Terminals:

Printed circuit, pierced solder lug, plug-in male/female contacts, or wire-wrap terminations.



KEYBOARD ASSEMBLY

Reed Bussing:

Individual reeds may be tied to a common bus on one side, or brought out to separate terminals, depending on the requirements of the application. The common bus feature saves component and mother-board space, and requires fewer solder connections.

Encoding:

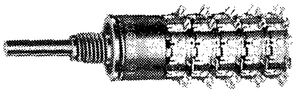
Maxi-Switch encoded Keyboards may be ordered with either USASCII or EBCDIC standard formats. Encoding may be modified to meet special customer requirements. Output is compatible with DTL/TTL or MOS logic circuits, and is transmitted in up to 9 data bits.

Other Maxi-Switch Products

Binary Switches (Series 1400) Push Button Switch Assemblies (Series 1200, 1600, 1800) Lighted Push Button Switches (Series 1200, 1600, 1800) Keyboards (Series 1600, 1800) Flat-pack Push Button Assemblies (Series 2100, 2311) Indicators Switch Panels Matrix Switches Keyboard Test Instruments

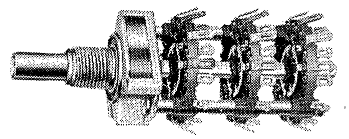
THE Maxi-SWITCH CO.

3121 WASHINGTON AVE. NO. • MINNEAPOLIS, MINNESOTA 55411
612-529-7601



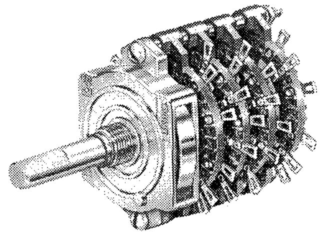
SUBMINIATURE ½″ SWITCH

...also provides superior insulation and dimensional stability—even under severe environments, where small size is essential.



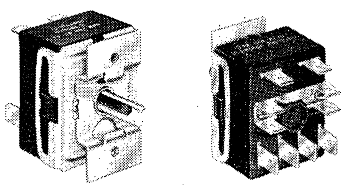
AND THE 1″ ACORN SWITCH

...an engineered combination of molded diallyl phthalate stators and Oak's exclusive Unidex™indexing.



MULTIDEX® ROTARIES

...these universal rotary switches will put a lot of the older and bigger ones out of business. They're smaller, more economical and still offer all of the features and options of expensive custom-made OEM switches. What's more, they cut engineering design expenses.

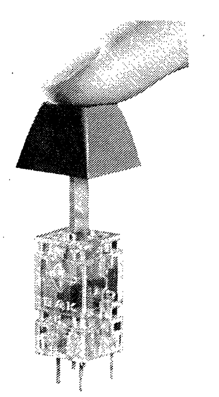


HEAVY-DUTY SWITCHES

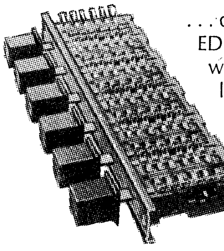
...U.L. approved. For appliances, air conditioners, ranges, medical and lab equipment, ovens, etc. Three-wire or two, up to 35 amps., 240 volts and 250°F. Many positions, SP or DP.

KEYBOARD SWITCHES FOR PRINTED-CIRCUIT BOARDS

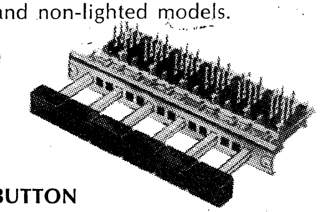
Enjoy the inherent reliability of Oak electro-mechanical operation plus the cost-savings of a switch that sells for less than 40¢ each in quantity. CHOOSE: **SPST–N.O. • SPST–N.O. + Dummy • SPST–N.C. • SPST–N.C. + Dummy • SPST–N.O. + SPST–N.C. • DPST–N.O. • DPST–N.C.** (Equivalent to SPDT)



MOLDED PUSHBUTTONS

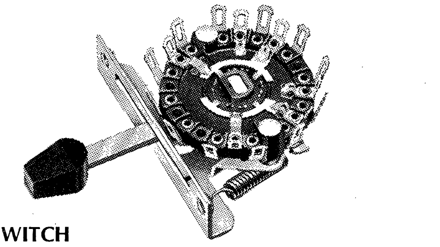


...designed especially for peripheral EDP, data entry and instrumentation, where fast response, short stroke and light touch are required. High reliability, optional actions. Lighted and non-lighted models.



ECONO-LINE™ PUSHBUTTON

One of the most versatile, low-cost pushbuttons available anywhere. More switching and more contacts in less space... direct panel mounting... rugged "U" shaped frame provides extra switching capability.



LEVER SWITCH

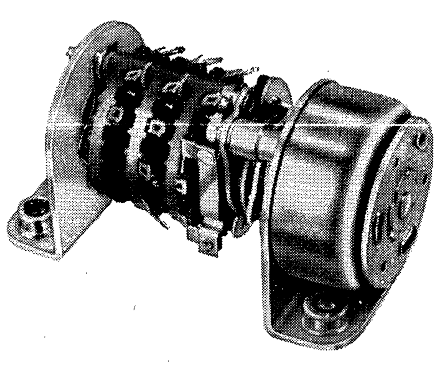
Oak's #184 lever switch gives you versatile miniaturization, with molded diallyl phthalate stator for improved dielectric properties and more clips. Many options available.

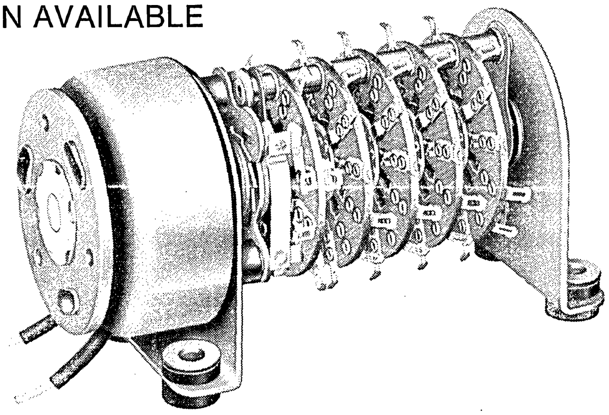
Oak Engineered Custom OEM Switches

Oak offers you the broadest line of custom OEM switches available... engineered to give you the best switch that can be assembled to meet your design problems. Here are the customized variables—tailored to your needs: Insulations include phenolic, silicone-glass, ceramic, Mycalex, Kel-F and diallyl phthalate. Temperature ranges from Standard Commercial (−25° to +85°C.) to Military (−65° to +85°C.) Contacts are Oak-pioneered double-wiping to provide self-cleaning, long life. Five choices fit each application best, shorting and non-shorting, rated from 10,000 to 200,000 cycles. Finishes are Standard Commercial, 50- or 200-hour salt spray. Electrically, these switches break 1 amp. @ 28 vdc or 0.5 amp. @ 110 vac.

OAK HAS MORE SWITCHES THAT MEET MIL-S-3786 (latest issue)

WIDE SELECTION AVAILABLE





SUBMINIATURE TO **EXTRA HEAVY-DUTY**

SUBMINIATURE
... for use where space and weight of components are of prime importance such as aerospace use. Small, but rugged and dependable at only 3.8 oz. weight. (as shown)

EXTRA HEAVY-DUTY
... produces high torque capable of driving standard switch sections (stepping switches) plus other external loads. Available in foot or flange mounting.

Oak Rotary Solenoids and Stepping Switches

compact, rugged, reliable for remote actuation

Oak Solenoids are compact and lightweight as compared to the high actuating torques and flexibility they provide for remote switching. Virtually solid metal, their low residual flux means fast response and most efficient conversion of electrical to mechanical energy. Armature is supported by three ball bearings in inclined races to provide stable mechanical balance. Thus axial thrust from the energized solenoid coil is converted into rotary thrust with negligible friction.

Typical uses: master-slave circuits, sequential timing circuits, counting applications.

Our engineers will help you design them into missiles, satellites, machine tools, scoreboards, computers, communications equipment and many other applications. Hermetically-sealed assemblies made to order for service in extremely adverse environments.

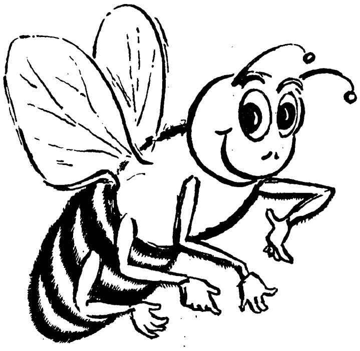
SUB-ASSEMBLY SERVICE... time-saving, money-saving

Ease the load on your production facilities by letting Oak fabricate your rotary solenoid and switch subassemblies. These can be completely mounted and/or pre-wired. Components or leads can be added, plugs and sockets incorporated... all to your specs. These package units simplify assembly and maintenance. Let Oak engineers smooth out your production operations and save you time and money at the same time.

Immediate action

Oak distributors stock the broadest switch line available. Hundreds of rotary, pushbutton, lever and slide switches! All immediately available from your closest Oak distributor. Every switch has Oak-pioneered double-wiping contacts—self-cleaning, longer lasting; brass, silver-plated with additional gold plating. Widest choice of insulations. Electrical rating: break 1 amp. at 28 vdc, or 0.5 amp. at 110 vac, resistive; carry 5 amps; slide switches rated 3 amps. Write for catalog for complete information, then get your choice fast from your Oak Distributor.

OAK MANUFACTURING CO.
A Division of OAK ELECTRO/NETICS CORP
Dept. EL, Crystal Lake, Illinois 60014
PHONE: 815-459-5000 TWX: 910-634-3353



BEE-LINE S.O.S.*

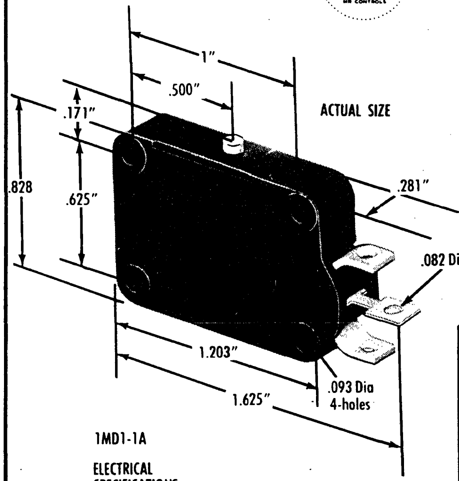
*switches on the shelf

Robertshaw

CONTROLS COMPANY
P.O. BOX 449 • COLUMBUS, OHIO 43216

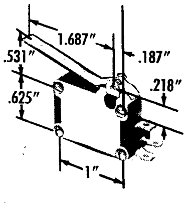
Write for our complete catalog

Robertshaw MINIATURE SWITCHES

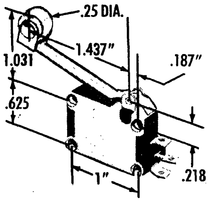

1"
.500"
.171"
ACTUAL SIZE
.828
.625"
.281"
.082 Dia.
1.203"
1.625"
.093 Dia
4-holes

1MD1-1A

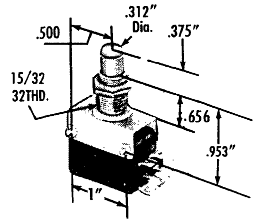
ELECTRICAL
SPECIFICATIONS
UL LISTED
10 Amps. 125-250 VAC
5 AMPS 250 VAC


1.687"
.531"
.187"
.218"
.625"
1"

HINGED LEAF
ACTUATOR NO. A18


.25 DIA.
1.437"
1.031
.187"
.625
1"
.218

ROLLER LEAF
ACTUATOR NO. A18M


.312"
Dia.
.500
.375"
15/32
32THD.
.656
.953"
1"

PANEL MOUNT PLUNGER
ACTUATOR NO. A14

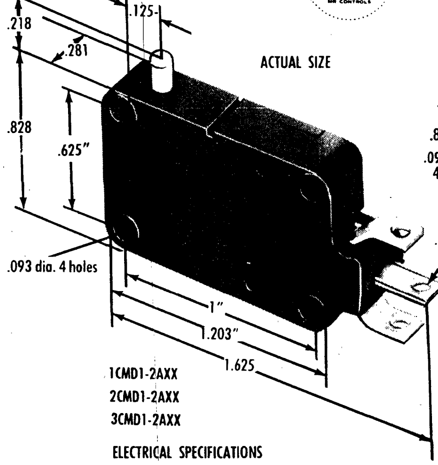
MECHANICAL SPECIFICATIONS

Model No.	Actuator Kit Model No.*	Maximum Operating Force	Minimum Release Force	Maximum Pretravel	Overtravel	Maximum Movement Differential
1MD1-1A	—	6 oz.	1.5 oz.	1/32 in.	.025 in. Max.	.007 in.
1MD1-1A	A18	2 oz.	.5 oz.	5/32 in.	1/16 in. Min.	.050 in.
1MD1-1A	A18M	2 oz.	.5 oz.	5/32 in.	1/16 in. Min.	.050 in.
1MD1-1A	A14	12 oz.	3.0 oz.	1/32 in.	7/32 in. Min.	.050 in.
2MD1-1A	—	10 oz.	3.0 oz.	1/32 in.	.025 in. Max.	.007 in.
2MD3-1A	—	10 oz.	3.0 oz.	1/32 in.	.025 in. Max.	.015 in.
3MD3-1A	—	16 oz.	4.0 oz.	1/32 in.	.025 in. Max.	.015 in.

* Switch and actuator are ordered and shipped separately.
All switches have solder terminals.

ORDER BY MODEL NUMBER ONLY

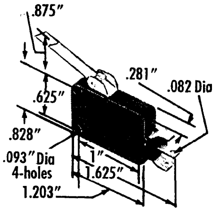
Robertshaw MINIATURE SWITCHES (LIGHT OPERATING FORCE)


.125
.218
.281
ACTUAL SIZE
.828
.625"
.082 Dia
.093 dia. 4 holes
1"
1.203"
1.625

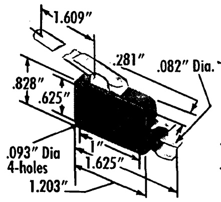
1CMD1-2AXX
2CMD1-2AXX
3CMD1-2AXX

ELECTRICAL SPECIFICATIONS
3 Amp. 125-250 VAC
3 Amp. 28VDC

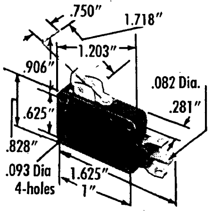
U.L. LISTING
3 Amp. 125-250 VAC


.875"
.281"
.082 Dia
.625"
.828"
.093" Dia
4-holes
1"
1.625"
1.203"

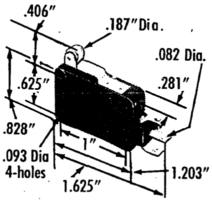
FLAT LEAF
ACTUATOR
1CMD1-2AXX-A24
2CMD1-2AXX-A24


1.609"
.281"
.082" Dia.
.828"
.625"
.093" Dia
4-holes
1"
1.625"
1.203"

NYLON LEAF
ACTUATOR
1CMD1-18AXX-A27


.750"
1.718"
1.203"
.906"
.082 Dia.
.281"
.625"
.828"
.093 Dia
4-holes
1.625"
1"

WIRE LEAF
ACTUATOR
1CMD1-2AXX-A22
2CMD1-2AXX-A22


.406"
.187"Dia.
.082 Dia.
.281"
.625"
.828"
1"
.093 Dia
4-holes
1.625"
1.203"

ROLLER LEAF
ACTUATOR
1CMD1-1AXX-A23M

MECHANICAL SPECIFICATIONS

Model No.	Actuator	Maximum Operating Force	Minimum Release Force	Maximum Pretravel	Maximum Overtravel	Maximum Movement Differential
1CMD1-2AXX	—	20-27 gms.	12 gms.	.040 in.	.062 in.	.030 in.
2CMD1-2AXX	—	33-44 gms.	15 gms.	.040 in.	.062 in.	.030 in.
3CMD1-2AXX	—	45-60 gms.	20 gms.	.040 in.	.062 in.	.030 in.
1CMD1-1AXX-A23M	Roller Leaf	5-8 ozs.	2 ozs.	.040 in.	.050 in.	.030 in.
1CMD1-2AXX-A22	Wire Leaf	2.5 gms.	Above characteristics are not applicable to these switches			.500 in.
2CMD1-2AXX-A22	Wire Leaf	4 gms.				.500 in.
1CMD1-2AXX-A24	Flat Leaf	2.5 gms.				.500 in.
2CMD1-2AXX-A24	Flat Leaf	4 gms.				.500 in.
1CMD1-18AXX-A27	Nylon Leaf	6 gms.				.233 in.

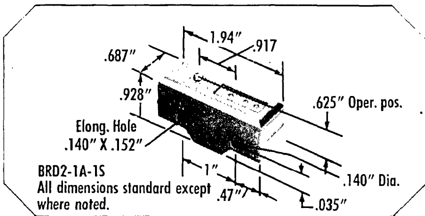
All switches have solder terminals.

ORDER BY MODEL NUMBER ONLY

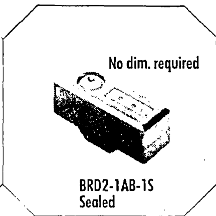
Robertshaw BASIC GENERAL PURPOSE SWITCHES

ELECTRICAL SPECIFICATIONS

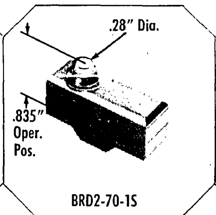
15 Amps, 120-240-480 volts A.C.
⅛ HP, 120 VAC
¼ HP, 250 VAC
½ Amp, 120 VDC
¼ Amp, 240 VDC
Listed by U.L. and C.S.A.


1.94"
.917
.687"
.928"
.625" Oper. pos.
Elong. Hole
.140" X .152"
1"
.47"
.140" Dia.
.035"

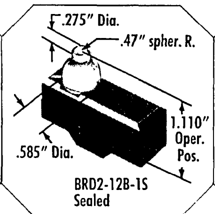
BRD2-1A-1S
All dimensions standard except where noted.


No dim. required

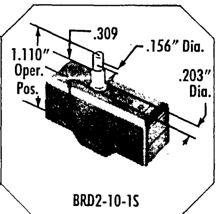
BRD2-1AB-1S
Sealed


.28" Dia.
.835"
Oper.
Pos.

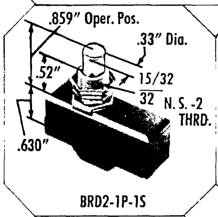
BRD2-70-1S


.275" Dia.
.47" spher. R.
1.110"
Oper.
Pos.
.585" Dia.

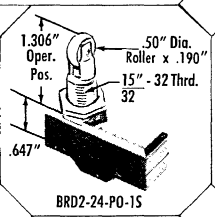
BRD2-12B-1S
Sealed


.309
.156" Dia.
1.110"
Oper.
Pos.
.203"
Dia.

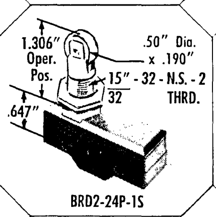
BRD2-10-1S


.859" Oper. Pos.
.33" Dia.
.52"
15/32
32 N.S. -2
THRD.
.630"

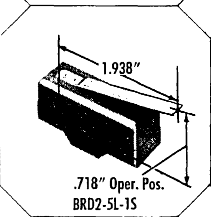
BRD2-1P-1S


1.306"
Oper.
Pos.
.50" Dia.
Roller x .190"
15" - 32 Thrd.
32
.647"

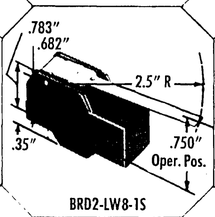
BRD2-24-PO-1S


1.306"
Oper.
Pos.
.50" Dia.
x .190"
15" - 32 - N.S. - 2
32
THRD.
.647"

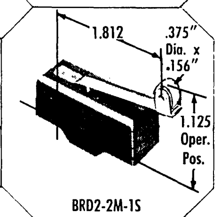
BRD2-24P-1S


1.938"
.718" Oper. Pos.

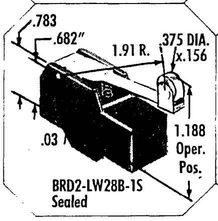
BRD2-5L-1S


.783"
.682"
2.5" R
.35"
.750"
Oper. Pos.

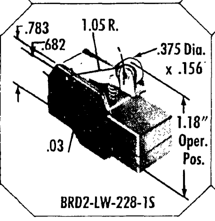
BRD2-LW8-1S


1.812
.375"
Dia. x
.156"
1.125
Oper.
Pos.

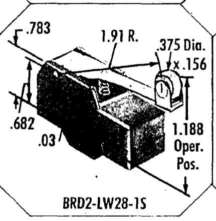
BRD2-2M-1S


.783
.682"
1.91 R.
.375 DIA.
x.156
.03
1.188
Oper.
Pos.

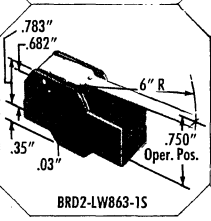
BRD2-LW28B-1S
Sealed


.783
.682
1.05 R.
.375 Dia.
x .156
.03
1.18"
Oper.
Pos.

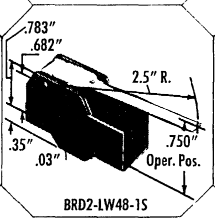
BRD2-LW-228-1S


.783
1.91 R.
.375 Dia.
x .156
.682
.03
1.188
Oper.
Pos.

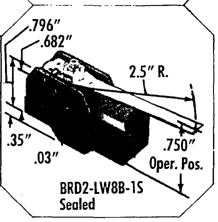
BRD2-LW28-1S


.783"
.682"
6" R
.35"
.03"
.750"
Oper. Pos.

BRD2-LW863-1S


.783"
.682"
2.5" R.
.35"
.03"
.750"
Oper. Pos.

BRD2-LW48-1S


.796"
.682"
2.5" R.
.35"
.03"
.750"
Oper. Pos.

BRD2-LW8B-1S
Sealed

MECHANICAL SPECIFICATIONS

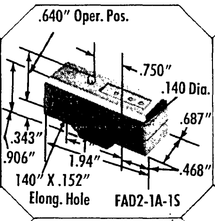
*Model No.	Operating Force	Minimum Release Force	Maximum Pretravel	Minimum Overtravel	Movement-Differential
BRD2-1A-1S	9-13 oz.	4 oz.	.020 in. Max.	.005 in.	.0004 to .002 in.
BRD2-1AB-1S	9-15 oz.	4 oz.	.090 in. Max.	.005 in.	.0004 to .002 in.
BRD2-1P-1S	9-13 oz.	4 oz.	.010-.025 in.	7/32 in.	.0004 to .002 in.
BRD2-2M-1S	5 oz. Max.	½ oz.	.156 in. Max.	1/32 in.	.050 in. Max.
BRD2-5L-1S	5 oz. Max.	½ oz.	.156 in. Max.	1/32 in.	.050 in. Max.
BRD2-10-1S	9-13 oz.	4 oz.	.010-.025 in.	1/16 in.	.003 in. Max.
BRD2-12B-1S	13-19 oz.	4 oz.	.005-.095 in.	.062 in.	.003 in. Max.
BRD2-24P-1S	9-13 oz.	4 oz.	.010-.025 in.	.140 in.	.0004 to .002 in.
BRD2-24PO-1S	9-13 oz.	4 oz.	.010-.025 in.	.140 in.	.003 in. Max.

*Model No.	Operating Force	Minimum Release Force	Maximum Pretravel	Minimum Overtravel	Movement Differential
BRD2-70-1S	9-13 oz.	4 oz.	.010-.025 in.	1/16 in.	.003 in. Max.
BRD2-LW8-1S	2½ oz. Max.	½ oz.	9/32-13/32 in.	.187 in.	.016-.078 in.
BRD2-LW8B-1S	2½ oz. Max.	½ oz.	.156 in. Max.	.187 in.	.016-.078 in.
BRD2-LW28-1S	3½ oz. Max.	¾ oz.	.125-.281 in.	.156 in.	.012-.062 in.
BRD2-LW28B-1S	3½ oz. Max.	¾ oz.	.125-.281 in.	.156 in.	.012-.062 in.
BRD2-LW48-1S	1 oz. Max.	⅛ oz.	.156-.328 in.	.187 in.	.016-.078 in.
BRD2-LW228-1S	6 oz. Max.	1½ oz.	.045-.140 Min.	.080 in.	.006-.031 in.
BRD2-LW863-1S	1 oz. Max.	⅛ oz.	½-1 in.	½ in.	.187 in. Max.

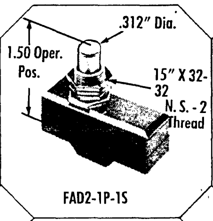
* Switches listed have 6-32 x 7/32 Binder Hd. Screw w/cup washer. Switches are also available with solder, or quick disconnect or side facing terminals. **ORDER BY MODEL NUMBER ONLY**

Robertshaw HEAVY DUTY GENERAL PURPOSE SWITCHES

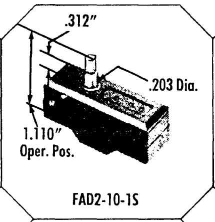
All dimensions standard except where noted.


.640" Oper. Pos.
.750"
.140 Dia.
.687"
.343"
.906"
1.94"
.468"
140" X .152"
Elong. Hole

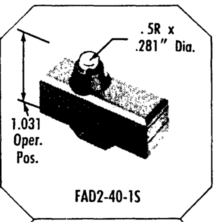
FAD2-1A-1S


.312" Dia.
1.50 Oper.
Pos.
15" X 32-
32
N.S. - 2
Thread

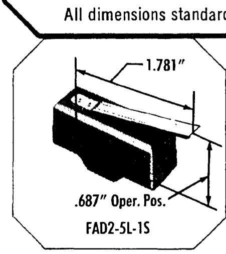
FAD2-1P-1S


.312"
.203 Dia.
1.110"
Oper. Pos.

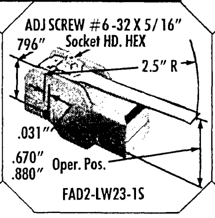
FAD2-10-1S


.5R x
.281" Dia.
1.031
Oper.
Pos.

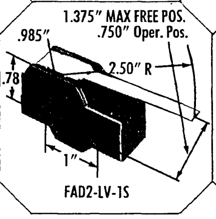
FAD2-40-1S


1.781"
.687" Oper. Pos.

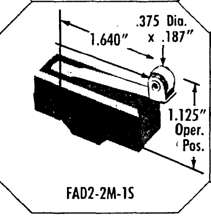
FAD2-5L-1S


ADJ SCREW #6-32 X 5/16"
796"
Socket HD. HEX
2.5" R
.031"
.670"
.880"
Oper. Pos.

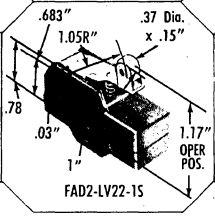
FAD2-LW23-1S


1.375" MAX FREE POS.
.750" Oper. Pos.
.985"
.78
2.50" R
1"

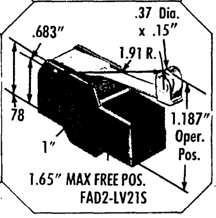
FAD2-LV-1S


.375 Dia.
1.640"
x .187"
1.125"
Oper.
Pos.

FAD2-2M-1S


.683"
.37 Dia.
1.05R"
x .15"
.78
.03"
1"
1.17"
OPER
POS.

FAD2-LV22-1S


.37 Dia.
x .15"
.683"
1.91 R.
78
1"
1.187"
Oper.
Pos.
1.65" MAX FREE POS.

FAD2-LV21S

ELECTRICAL SPECIFICATIONS

21 Amps 120-240-480 VAC
1 HP, 120 VAC
2 HP, 240 VAC
Listed by U.L. and C.S.A.

MECHANICAL SPECIFICATIONS

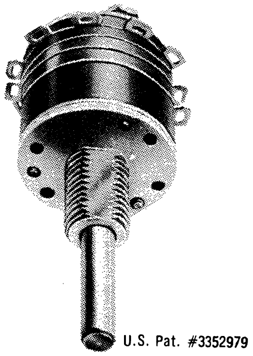
Model No.*	Maximum Operating Force	Minimum Release Force	Maximum Pretravel	Minimum Overtravel	Maximum Movement Differential
FAD2-1A-1S	14-22 oz.	10 oz.	.050 in.	.005 in.	.0075 in.
FAD2-1P-1S	14-22 oz.	10 oz.	.050 in.	.219 in.	.0075 in.
FAD2-10-1S	14-22 oz.	10 oz.	.050 in.	1/16 in.	.0075 in.
FAD2-40-1S	14-22 oz.	10 oz.	.050 in.	3/32 in.	.0075 in.
FAD2-5L-1S	9 oz.	1 oz.	11/32 in.	1/32 in.	.065 in.
FAD2-LW23-1S	2½ oz.	½ oz.	.375 in.	.093 in.	.007-.050 in.
FAD2-LV-1S	2½ oz.	½ oz.	⅝ in.	.078 in.	.109 in.
FAD2-2M-1S	9 oz.	1 oz.	11/32 in.	1/32 in.	.065 in.
FAD2-LV 22-1S	6 oz.	1 oz.	¼ in.	1/32 in.	3/64 in.
FAD2-LV2-1S	2½ oz.	½ oz.	15/32 in.	1/16 in.	.085 in.

ORDER BY MODEL NUMBER ONLY * Switches listed have 6-32 x 7/32 Binder Hd. Screw w/cup washer. Switches are also available with solder or quick disconnect terminals.

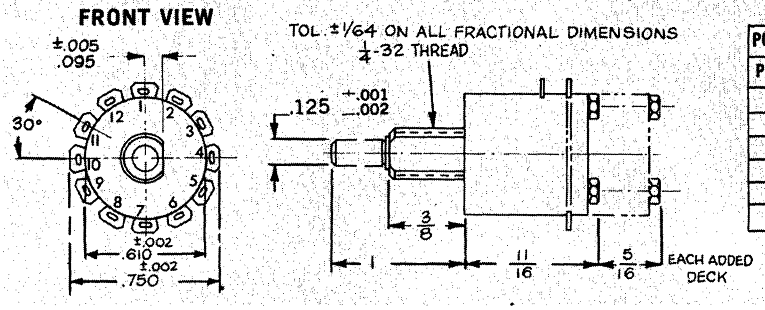
RCL ELECTRONICS, INC.
General Sales Office:
700 South 21st Street, Irvington, N. J. (Area Code 201) 374-3311 • TWX 710-999-5511

series "c" miniature rotary switches

- Up to 12 active positions per deck shorting **or** non-shorting, with 30° spacing.
- Shorting **AND** non-shorting poles may be grouped on one deck in any combination.
- As many as 6 poles per deck.
- All individual deck parts are self-contained, and are permanently molded into place.
- Available with adjustable stops.



U.S. Pat. #3352979



POLE (Common) LOCATION	
POLES	AT TERM. #
1	1
2	1, 7
3	1, 5, 9
4	1, 4, 7, 10
5	1, 3, 5, 7, 9
6	1, 3, 5, 7, 9, 11

"OFF-THE-SHELF DELIVERY"

SERIES "CC" (LOW COST COMMERCIAL VERSION OF SERIES "C")

All specifications and features remain essentially the same as in the Series "C" switch. Electrical specifications are derated by approximately 40%.

Materials and tooling are modified to further reduce cost. Priced at $1.96 each in quantities of 1,000.

Priced at the same level as open frame or wafer switches. Off-the-shelf delivery.

For ordering information see below, but indicate CC. (For example: 11-CCM-2).

ELECTRICAL FEATURES

1. Initial contact resistance — .010Ω max.
2. Current carrying capacity — 5.5 amps.
3. Current breaking capacities
   ¼ amp — 115 V.A.C. resistive
   ¼ amp — 28 V.D.C. resistive
   ⅛ amp — 28 V.D.C. inductive.
4. Dielectric strength (voltage breakdown) —
   a. between any two adjacent positions — 800 v RMs (60 cycles).
   b. between any active position to ground 1500 V (60 cycles).
5. Insulation resistance (measured at 25°C, 50% RH at sea level) — 10^5 megohms.
6. Thermal EMF — 1 microvolt/°C maximum.
7. Capacitance — between adjacent active contacts .5 MMFD Max.
8. Capacitance — between contact and common terminal .9 PFD Max.

MECHANICAL FEATURES

1. Life expectancy — in excess of 50,000 mechanical operations.
2. Detent — positive stainless steel roller-type detent snaps from position to position. Detent housing made of special high-strength plastic, providing positive action and minimal wear.
3. Stop strength — Designed to withstand 10 inch-lbs. rotational force.
4. "Molded in" terminals give exceptional terminal strength.
5. Terminal locations clearly marked on rear cover plate.
6. On any one deck of a multi-pole switch, a variety of combinations of shorting (MBB) and non-shorting (BBM) actions may be obtained.
7. Materials and finishes:
   Rotor — Lexan
   Rotor blade — Beryllium copper (gold plated)
   Contacts & solder terminals — solid silver alloy
   Housing — Diallyl Phthalate
   Stator — Diallyl Phthalate
   Shaft — stainless steel
   All brass parts nickel plated
8. One piece contact terminal construction has holes large enough to accept two #22 AWG wires.
9. Shaft and panel seal at additional cost may be specified by using prefix "S" before switch type numbers.
10. Explosion proof per paragraph 4, p. 12 of MIL-S-3786C.

SINGLE DECK

Spacing: 30° between positions

SHORTING

SINGLE POLE

Positions	Type
2	11-CM-2
3	11-CM-3
4	11-CM-4
5	11-CM-5
6	11-CM-6
7	11-CM-7
8	11-CM-8
9	11-CM-9
10	11-CM-10
11	11-CM-11
12	11-CM-12 (with stops)

2 POLES PER DECK

Positions	Type
2	12-CM-2
3	12-CM-3
4	12-CM-4
5	12-CM-5
6	12-CM-6

3 POLES

Positions	Type
2	13-CM-2
3	13-CM-3
4	13-CM-4

4 POLES

Positions	Type
2	14-CM-2
3	14-CM-3

5 POLES

Positions	Type
2	15-CM-2

6 POLES

Positions	Type
2	16-CM-2

NON-SHORTING

SINGLE POLE

Positions	Type
2	11-CB-2
3	11-CB-3
4	11-CB-4
5	11-CB-5
6	11-CB-6
7	11-CB-7
8	11-CB-8
9	11-CB-9
10	11-CB-10
11	11-CB-11
12	11-CB-12 (with stops)

2 POLES PER DECK

Positions	Type
2	12-CB-2
3	12-CB-3
4	12-CB-4
5	12-CB-5
6	12-CB-6

3 POLES PER DECK

Positions	Type
2	13-CB-2
3	13-CB-3
4	13-CB-4

4 POLES PER DECK

Positions	Type
2	14-CB-2
3	14-CB-3

5 POLES PER DECK

Positions	Type
2	15-CB-2

6 POLES PER DECK

Positions	Type
2	16-CB-2

MULTI-DECK SWITCHES UP TO 9 DECKS AVAILABLE

For multi-deck version of these switches, indicate number of decks as follows. Merely change first number of coding as shown:

Number of decks	
One deck	1 1-CB-4
Two decks	2 1-CB-4
Three decks	3 1-CB-4

*"M" = Shorting action (MBB)
"B" = Non-shorting action (BBM)
* Supplied unless otherwise specified.

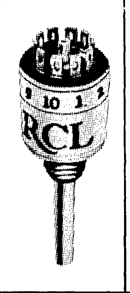
Code: 2 6—CM—2
— Positions per pole
— shorting
— Series
— poles per deck
— number of decks

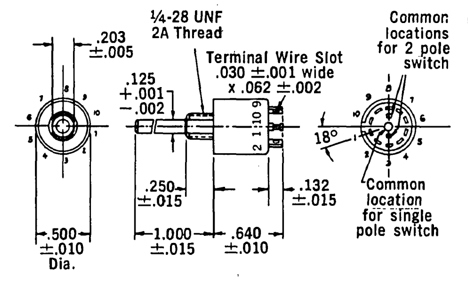
e.g. this is 2 decks, 6 poles per deck, Series "C" shorting action, 2 positions per pole.

RCL ELECTRONICS, INC.
General Sales Office:
700 South 21st Street, Irvington, N. J.   (Area Code 201) 374-3311 ○ TWX 710-999-5511

miniature rotary switches

RCL SERIES "F" 10-POSITION SWITCHES





¼-28 UNF
2A Thread
.203
±.005
.125
+.001
−.002
Terminal Wire Slot
.030 ±.001 wide
x .062 ±.002
Common
locations
for 2 pole
switch
18°
.250
±.015
.132
±.015
Common
location
for single
pole switch
.500
±.010
Dia.
1.000
±.015
.640
±.010

½" MAXIMUM DIAMETER

This new subminiature rotary switch has been designed to offer the features of larger switches in a fraction of the space formerly required.

SPECIFICATIONS FOR BOTH "F" AND "R" SERIES

Contact Resistance: 10 milliohms maximum initial.

Insulation Resistance: 50,000 megohms initial; 10,000 megohms min. between mutually insulated parts.

Voltage Breakdown: 600 VAC min. between mutually insulated parts.

Electrical Rating: Will make and break 50 milliamperes: 115 VAC for 25,000 cycles or 200 milliamperes 115 VAC for 10,000 cycles.

Contacts: Shorting or non-shorting contacts.

Deck and Terminal Arrangement: Available only in one deck with terminals projecting from rear of switch.

Shaft Length, Flat and Orientation: Available in accordance with individual requirements.

Materials and Finishes: In accordance with applicable MIL specs.

Contact Terminals: Solid silver alloy gold plated. Will accept Two #22 AWG wires.

Common: Terminal brass gold plated.

Wipers: Solid silver alloy.

Environmental requirements: Meets or exceeds MIL-S-3786-C. Explosion proof per paragraph 4.8.12 of MIL-S-3786C.

NEW PRODUCT NOTE

NOW AVAILABLE

SERIES "G"   6-POSITION SWITCHES

Specifications are the same as RCL's "F" series, but with 60° throw and non-shorting only. Up to 1 pole-6 position, or 2 pole-3 position.

Available with standard solder lugs or printed circuit terminals.

SERIES "F" SINGLE DECK — 36° BETWEEN POSITIONS

SHORTING

SINGLE POLE

Positions	Type
2	11-FM-2
3	11-FM-3
4	11-FM-4
5	11-FM-5
6	11-FM-6
7	11-FM-7
8	11-FM-8
9	11-FM-9
10	11-FM-10
*10	11-FM-10-CR

2 POLES

Positions	Type
2	12-FM-2
3	12-FM-3
4	12-FM-4
5	12-FM-5

3 POLES

Positions	Type
2	13-FM-2
3	13-FM-3

(*continuous rotation)

NON-SHORTING

SINGLE POLE

Positions	Type
2	11-FB-2
3	11-FB-3
4	11-FB-4
5	11-FB-5
6	11-FB-6
7	11-FB-7
8	11-FB-8
9	11-FB-9
10	11-FB-10
*10	11-FB-10-CR

2 POLES

Positions	Type
2	12-FB-2
3	12-FB-3
4	12-FB-4
5	12-FB-5

3 POLES

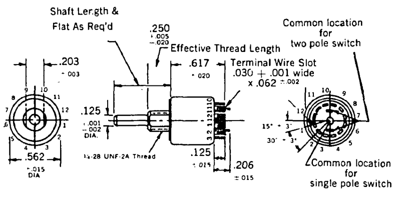
Positions	Type
2	13-FB-2
3	13-FB-3

(*continuous rotation)

ORDERING INFORMATION:
△ Shortened bushing and shaft stick-out available. Contact factory.
△ Shaft and panel seals may be specified by using Prefix "S".
△ Standard terminal with shortened bushing and shaft stick-out available. Contact factory.

SERIES "R" SINGLE DECK — 30° BETWEEN POSITIONS

9⁄16" MAXIMUM DIAMETER



Shaft Length &
Flat As Req'd
.250
+.005
−.020
Effective Thread Length
Common location
for
two pole switch
.203
+.003
.617
+.020
Terminal Wire Slot
.030 + .001 wide
x .062 ±.002
.125
+.001
−.002
DIA.
15° + 3°
30° + 3°
¼-28 UNF-2A Thread
.125
±.015
.206
±.015
.562
+.015
DIA
Common location
for
single pole switch

SHORTING

SINGLE POLE

Positions	Type
2	11-RM-2
3	11-RM-3
4	11-RM-4
5	11-RM-5
6	11-RM-6
7	11-RM-7
8	11-RM-8
9	11-RM-9
10	11-RM-10
11	11-RM-11
12	11-RM-12
*12	11-RM-12-CR

(*continuous rotation)

2 POLES

Positions	Type
2	12-RM-2
3	12-RM-3
4	12-RM-4
5	12-RM-5
6	12-RM-6

3 POLES

Positions	Type
2	13-RM-2
3	13-RM-3
4	13-RM-4

4 POLES

Positions	Type
2	14-RM-2
3	14-RM-3

6 POLES

Positions	Type
2	16-RM-2

NON-SHORTING

SINGLE POLE

Positions	Type
2	11-RB-2
3	11-RB-3
4	11-RB-4
5	11-RB-5
6	11-RB-6
7	11-RB-7
8	11-RB-8
9	11-RB-9
10	11-RB-10
11	11-RB-11
12	11-RB-12
*12	11-RB-12-CR

(*continuous rotation)

2 POLES

Positions	Type
2	12-RB-2
3	12-RB-3
4	12-RB-4
5	12-RB-5
6	12-RB-6

3 POLES

Positions	Type
2	13-RB-2
3	13-RB-3
4	13-RB-4

4 POLES

Positions	Type
2	14-RB-2
3	14-RB-3

6 POLES†

Positions	Type
2	16-RB-2

† 6 POLE SERIES AVAILABLE WITH STANDARD TERMINALS ONLY

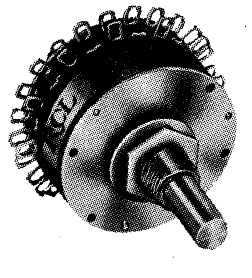
SPECIAL ENGINEERING NOTE
BOTH SERIES ("F" and "R")
AVAILABLE WITH PRINTED CIRCUIT
TERMINALS! (To order specify prefix "PC")

RCL ELECTRONICS, INC.
General Sales Office:
700 South 21st Street, Irvington, N. J. (Area Code 201) 374-3311 • TWX 710-999-5511

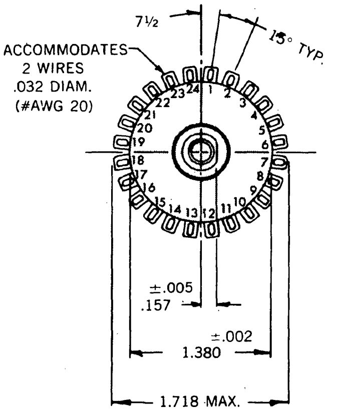
miniature rotary switches

SERIES "E" 1⅜" BODY DIAMETER

- Up to 24 active positions per deck, **shorting or non-shorting**, and up to 12 poles per deck
- Meets all applicable requirements of Mil S-3786-C
- Available with concentric shaft
- Available with adjustable stops

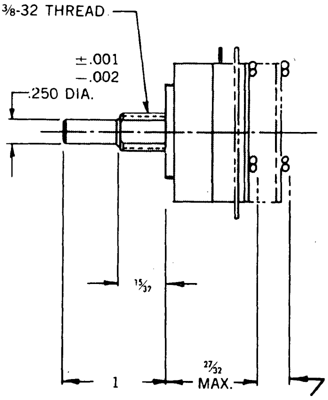


Poles	Pole (Common) Location At Term. #
1	1
2	1, 13
3	1, 9, 17
4	1, 7, 13, 19
5	1, 5, 9, 13, 17
6	1, 5, 9, 13, 17, 21
7	1, 3, 5, 7, 9, 11
8	1, 3, 5, 7, 9, 11, 13
9	1, 3, 5, 7, 9, 11, 13, 15
10	1, 3, 5, 7, 9, 11, 13, 15, 17
11	1, 3, 5, 7, 9, 11, 13, 15, 17, 19
12	1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21



FRONT VIEW

TOL. ±1/64 ON ALL FRACTIONAL DIMENSIONS



5/16 EACH ADDED DECK

SERIES "EC" (LOW COST COMMERCIAL VERSION OF SERIES "E")

OFF-THE-SHELF DELIVERY

All specifications and features remain essentially the same as in the Series "E" switch. Materials and tooling are modified to further reduce cost. Electrical specifications are derated by approximately 40%. Priced at $1.96 each in quantities of 1,000. Priced at the same level as open frame or wafer switches. For ordering information see below but indicate EC. (For example: 11-ECM-2)

ELECTRICAL FEATURES

- Contact resistance: .010 ohms max. initial
- Current carrying capacity: 10 amps
- Current breaking capacity (rated load at 125°C):
  - 2 amps — 115 VAC Resistive
  - 1 amp — 28 VDC Resistive
  - .5 amps — 28 VDC Inductive

MECHANICAL FEATURES

- Life expectancy: in excess of 50,000 mechanical operations.
- Rotational Torque: 20 to 80 ounce-inches depending on number of poles per deck and number of decks.
- Stop Strength: 15 pound-inches.
- Solder terminals will accept two .032 diam. (AWG #20) wires.
- "Molded-in" terminals result in exceptionally high contact stability, completely eliminating movement.
- Shaft and Panel Seals at additional cost may be specified by using Prefix "S" before Switch Type Numbers.
- Explosion Proof per paragraph 4.8.12 of Mil-S-3786B.
- Weight: 1 Deck Switch 1.75 oz. For each additional deck add .500 oz.

SINGLE DECK SPACING 15° BETWEEN POSITIONS

SINGLE POLE

Positions	Shorting Type	Non-Shorting Type
2	11-EM-2	11-EB-2
3	11-EM-3	11-EB-3
4	11-EM-4	11-EB-4
5	11-EM-5	11-EB-5
6	11-EM-6	11-EB-6
7	11-EM-7	11-EB-7
8	11-EM-8	11-EB-8
9	11-EM-9	11-EB-9
10	11-EM-10	11-EB-10
11	11-EM-11	11-EB-11
12	11-EM-12	11-EB-12
13	11-EM-13	11-EB-13
14	11-EM-14	11-EB-14
15	11-EM-15	11-EB-15
16	11-EM-16	11-EB-16
17	11-EM-17	11-EB-17
18	11-EM-18	11-EB-18
19	11-EM-19	11-EB-19
20	11-EM-20	11-EB-20
21	11-EM-21	11-EB-21
22	11-EM-22	11-EB-22
23	11-EM-23	11-EB-23
24	11-EM-24	11-EB-24
*24	11-EM-24CR Continuous Rotation	11-EB-24CR Continuous Rotation

2 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	12-EM-2	12-EB-2
3	12-EM-3	12-EB-3
4	12-EM-4	12-EB-4
5	12-EM-5	12-EB-5
6	12-EM-6	12-EB-6
7	12-EM-7	12-EB-7
8	12-EM-8	12-EB-8
9	12-EM-9	12-EB-9
10	12-EM-10	12-EB-10
11	12-EM-11	12-EB-11
12	12-EM-12	12-EB-12

3 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	13-EM-2	13-EB-2
3	13-EM-3	13-EB-3
4	13-EM-4	13-EB-4
5	13-EM-5	13-EB-5
6	13-EM-6	13-EB-6
7	13-EM-7	13-EB-7
8	13-EM-8	13-EB-8

4 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	14-EM-2	14-EB-2
3	14-EM-3	14-EB-3
4	14-EM-4	14-EB-4
5	14-EM-5	14-EB-5
6	14-EM-6	14-EB-6

5 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	15-EM-2	15-EB-2
3	15-EM-3	15-EB-3
4	15-EM-4	15-EB-4

6 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	16-EM-2	16-EB-2
3	16-EM-3	16-EB-3
4	16-EM-4	16-EB-4

7 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	17-EM-2	17-EB-2
3	17-EM-3	17-EB-3

8 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	18-EM-2	18-EB-2
3	18-EM-3	18-EB-3

9 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	19-EM-2	19-EB-2

10 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	1-10-EM-2	1-10-EB-2

11 POLES PER DECK

Positions	Shorting Type	Non-Shorting Type
2	1-11-EM-2	1-11-EB-2

12 POLES PER DECK

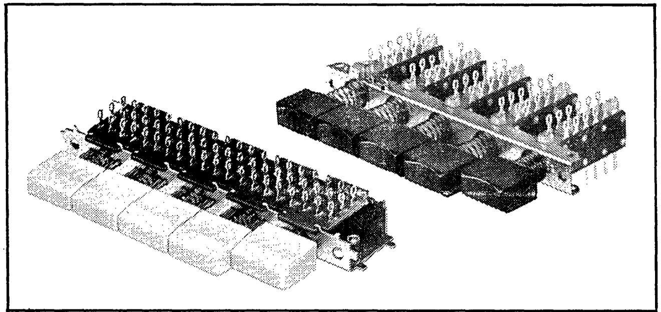
Positions	Shorting Type	Non-Shorting Type
2	1-12-EM-2	1-12-EB-2

ALTHOUGH ONLY 1 DECK IS SHOWN FOR ILLUSTRATIVE PURPOSES, UP TO 9 DECKS ARE AVAILABLE.

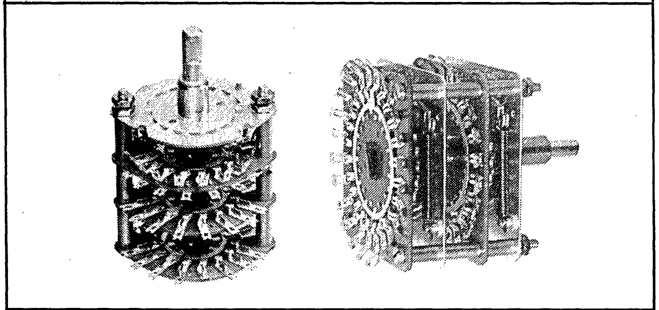
Seacor delivers.

Your best source for your switching needs.

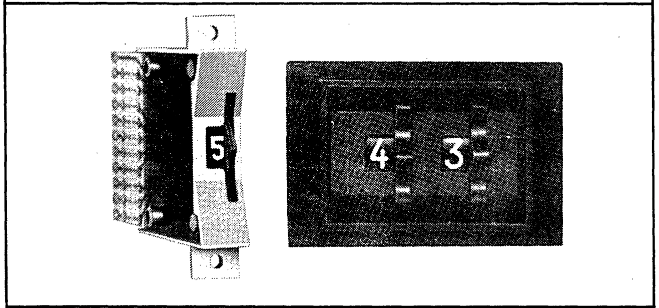
Seacor offers the widest variety of switches available today. With the aid of our engineering consultation service, you may choose the type and design that are most beneficial to your product, at lowest cost. Our proven quality and reliability over the years coupled with excellent delivery records, enhance the value of this switch line. The listing below is a small fraction of our products. Your inquiry on your switching needs is welcome.



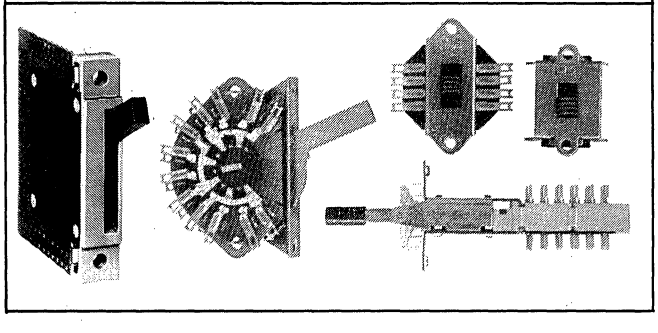
Push Button Switches. A size, shape, characteristic to satisfy all your needs from one to 22 buttons, with button spacings from 10 mm to 20 mm. Up to 8 PDT per button, double wiping contacts with shorting and non-shorting capabilities. U.L. power switches up to 6A-125 VAC, Illumination possible with front loading bulbs. Some types under $0.10 per pole in production quantities. Switch kit available for prototype and small production quantities. All combinations of latching with and without lock-out are available.



Rotary Switches. Available in many varieties. Detent indexing from 7.5° to 30°, in double ball or rachet roller construction. Unique design permits up to 24 contacts per single 12 position wafer. Custom made to your spec — bushing, shaft and wafer spacing. Concentric shaft arrangements available. P.C. lugs parallel to shaft optional. Custom design permits maximum utilization, at lowest cost, commensurate with human engineering and circuit parameters.



Thumbwheel Switches. The thinnest switches in the world for an infinite number of switching combinations, conversion of dial setting to coded electrical output, at a reasonable price. Built of the finest materials and guaranteed for million operations. Outputs available on P.C. board, plus pin connectors or hand wired. Available with space for component mounting. 8-10-12 positions are standard. Sizes vary from the very smallest to all of the contemporary standard sizes.



Other Switches. Slide, up to 8 PDT, double wiping with shorting and non-shorting capability. Lever, all types, from single 2 position, inexpensive version to most sophisticated 4 pole 6 position — guaranteed for million operations.

For engineering assistance and technical literature, write or phone.

598 Broadway, Norwood, New Jersey 07648 • (201) 768-6070

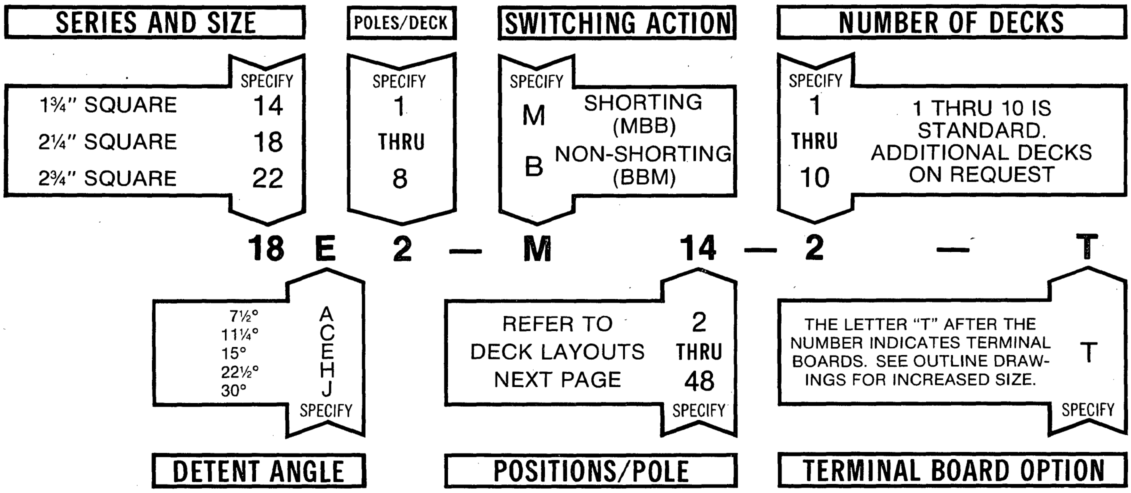
SEACOR INC.

Shallco

14, 18, 22 SERIES ROTARY SWITCHES

DEVELOPING THE TYPE NUMBER

The system below will assist you in specifying the correct part number of the switch required for your application. Submit any special shaft modifications or other desired modifications as separate data. Our Engineering Department can assist you with major variations.



SERIES AND SIZE

SPECIFY
1¾" SQUARE 14
2¼" SQUARE 18
2¾" SQUARE 22

POLES/DECK

SPECIFY
1
THRU
8

SWITCHING ACTION

SPECIFY
M SHORTING (MBB)
B NON-SHORTING (BBM)

NUMBER OF DECKS

SPECIFY
1
THRU
10
1 THRU 10 IS STANDARD. ADDITIONAL DECKS ON REQUEST

18 E 2 — M 14 — 2 — T

7½° A
11¼° C
15° E
22½° H
30° J
SPECIFY

DETENT ANGLE

REFER TO DECK LAYOUTS NEXT PAGE
2
THRU
48
SPECIFY

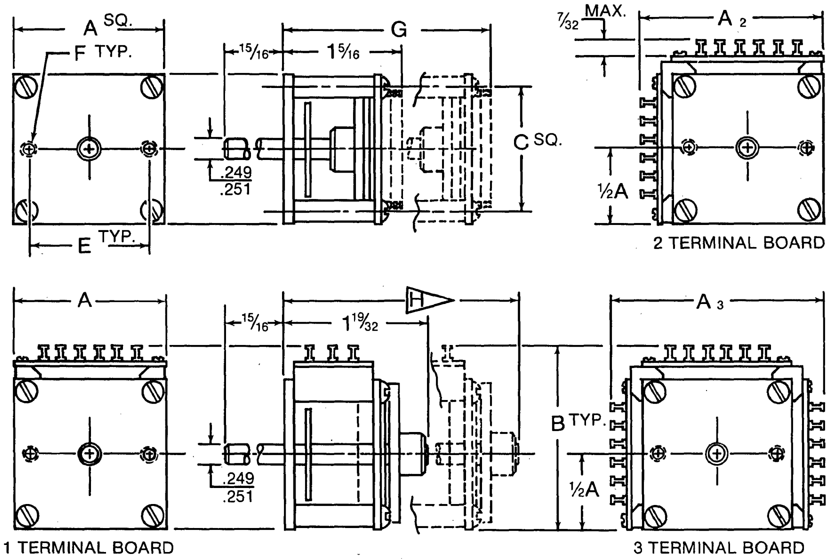
POSITIONS/POLE

THE LETTER "T" AFTER THE NUMBER INDICATES TERMINAL BOARDS. SEE OUTLINE DRAWINGS FOR INCREASED SIZE.
T
SPECIFY

TERMINAL BOARD OPTION

Example: 18E2-M14-2-T is a series 18, 2¼" square, 15° indexing, 2 poles per deck, shorting (make before break), 14 position, 2 deck switch with terminal boards.

OUTLINE DRAWINGS



2 TERMINAL BOARD

1 TERMINAL BOARD

3 TERMINAL BOARD

Back-Panel Depth				
No. of Decks	G		H	
	Series 14	Series 18 & 22	Series 14	Series 18 & 22
2	2¼	2 9/32	2½	2 9/16
3	3 3/16	3¼	3 7/16	3 17/32
4	4⅛	4 7/32	4⅜	4½
5	5 1/16	5 3/16	5 5/16	5 15/32
6	6	6 5/32	6¼	6 7/16
7	6 15/16	7⅛	7 3/16	7 13/32
8	7⅞	8 3/32	8⅛	8⅜
9	8 13/16	9 1/16	9 1/16	9 11/32
10	9¾	10 1/32	10	10 5/16

NOTES:

H The H Dimension for a two and three terminal board switch is the same, for the corresponding number of decks, as the H dimension for the single terminal board switch.

Tolerances:
Decimals ± .010
Fractions ± 1/32

Terminals Per Deck (Max.)			
Series	No. Terminal Boards		
	1	2	3
14	18	36	54
18	24	48	72
22	30	60	90

Standard Dimensions							
Series	A	A_2	A_3	B	C	E	F
14	1¾	2 3/16	2⅝	2 3/16	1.438	1.375	6-32
18	2¼	2⅝	3	2⅝	1.875	1.500	8-32
22	2¾	3 1/16	3⅜	3 1/16	2.250	1.500	8-32

P. O. BOX 1089 SMITHFIELD, N. C. 27577
TEL. 919/934-3135 TWX 510-939-1455

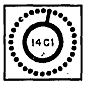
Shallco

14, 18, 22 SERIES ROTARY SWITCHES

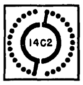
AVAILABLE CIRCUITS

SERIES 14

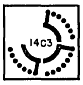
11¼° INDEXING SHORTING



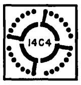
1 POLE
2 to 31 Pos. with Stops
32 Pos. Continuous Rot.



2 POLE
2 to 15 Positions

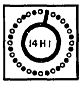


3 POLE
2 to 7 Positions

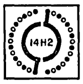


4 POLE
2 to 7 Positions

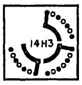
22½° INDEXING NON-SHORTING



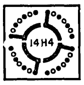
1 POLE
2 to 15 Pos. with Stops
16 Pos. Continuous Rot.



2 POLE
2 to 8 Positions



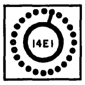
3 POLE
2 to 4 Positions



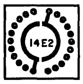
4 POLE
2 to 4 Positions

VIEWS SHOWN ARE EXTREME CCW POSITION AS VIEWED FROM SHAFT END

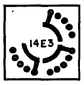
15° INDEXING SHORTING



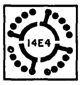
1 POLE
2 to 23 Pos. with Stops
24 Pos. Continuous Rot.



2 POLE .
2 to 11 Positions

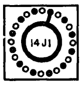


3 POLE
2 to 5 Positions

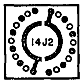


4 POLE
2 to 5 Positions

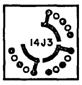
30° INDEXING NON-SHORTING



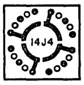
1 POLE
2 to 11 Pos. with Stops
12 Pos. Continuous Rot.



2 POLE
2 to 6 Positions



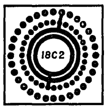
3 POLE
2 to 3 Positions



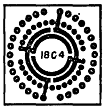
4 POLE
2 to 3 Positions

SERIES 18

11¼° INDEXING SHORTING

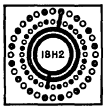


2 POLE
2 to 31 Pos. with Stops
32 Pos. Continuous Rot.

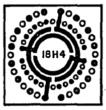


4 POLE
2 to 15 Positions

22½° INDEXING NON-SHORTING

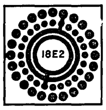


2 POLE
2 to 15 Pos. with Stops
16 Pos. Continuous Rot.

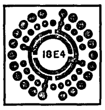


4 POLE
2 to 8 Positions

15° INDEXING SHORTING

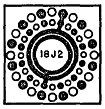


2 POLE
2 to 23 Pos. with Stops
24 Pos. Continuous Rot.

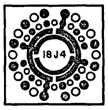


4 POLE
2 to 11 Positions

30° INDEXING NON-SHORTING



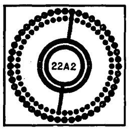
2 POLE
2 to 11 Pos. with Stops
12 Pos. Continuous Rot.



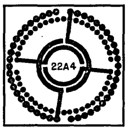
4 POLE
2 to 6 Positions

SERIES 22

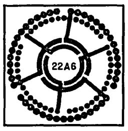
7½° INDEXING SHORTING



2 POLE
2 to 46 Pos. with Stops
48 Pos. Continuous Rot.

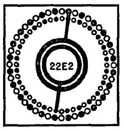


4 POLE
2 to 23 Positions

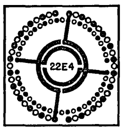


6 POLE
2 to 15 Positions

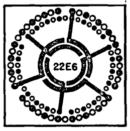
15° INDEXING NON-SHORTING



2 POLE
2 to 23 Pos. with Stops
24 Pos. Continuous Rot.



4 POLE
2 to 12 Positions



6 POLE
2 - 8 Positions

SPECIFICATIONS

ELECTRICAL

Current Ratings: Carry — 10 amps, continuous
Make and Break, 2 amps up to 120 VAC or up to 30 VDC at 10,000 and 20,000 cycles respectively.
Higher loads may be switched with shorter life.

Contact Resistance: .003 ohms max., initial
.010 ohms max., end of life

Insulation Resistance: $> 10^{14}$ ohms

Voltage Breakdown: Between Poles — 2,000 V. RMS
Between Contacts — 1500 V. RMS
Between Decks — 6,000 V. RMS
Circuit to Frame — 3,000 V. RMS

MECHANICAL

Terminal Strength: Withstands 5 lbs. pull.
Detent: Star wheel type
Stop Strength: Withstands 50 in-lbs.
Mounting: 2 hole type, see outline drawings.
Construction: Open frame type

MATERIAL

Current Carrying Parts: Solid Silver-Alloy
Terminals: Turret type capable of attaching two 20 AWG wires. Terminals are integral with contacts.
Decks: Glass Epoxy per Mil-P-18177
Detent and Shaft Assembly: Stainless Steel

ENVIRONMENTAL

Temperature Range: Commercial, —40°C. to +85° C. Military, —65°C. to +125°C.
Other: Designed to meet the general requirements of Mil-S-3786.

SPARK GAPS

Signalite offers a wide range of two electrode and triggered spark gaps to protect your electronic components, transfer high energies, hold off a wide range of voltages, crowbar power supplies, etc.

NEW **Low Voltage Miniature Surge Arresters**

NEW **UNIIMP . . . "Zero" Reaction Time Surge Protectors**

Signalite
300

Signalite "300" Spark Gap Brochure . . . fully details the complete Signalite line of over 300 types of two-electrode spark gaps and triggered spark gaps, includes application notes, characteristics, mounting arrangements, photographs, etc.

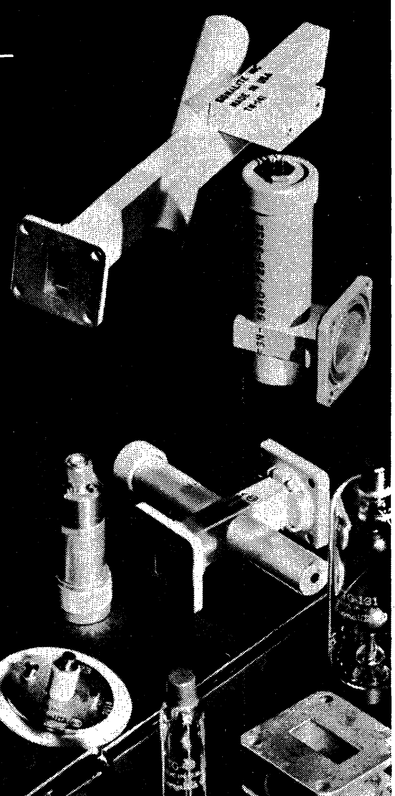
NOISE SOURCES AND MINIATURE NOISE GENERATORS

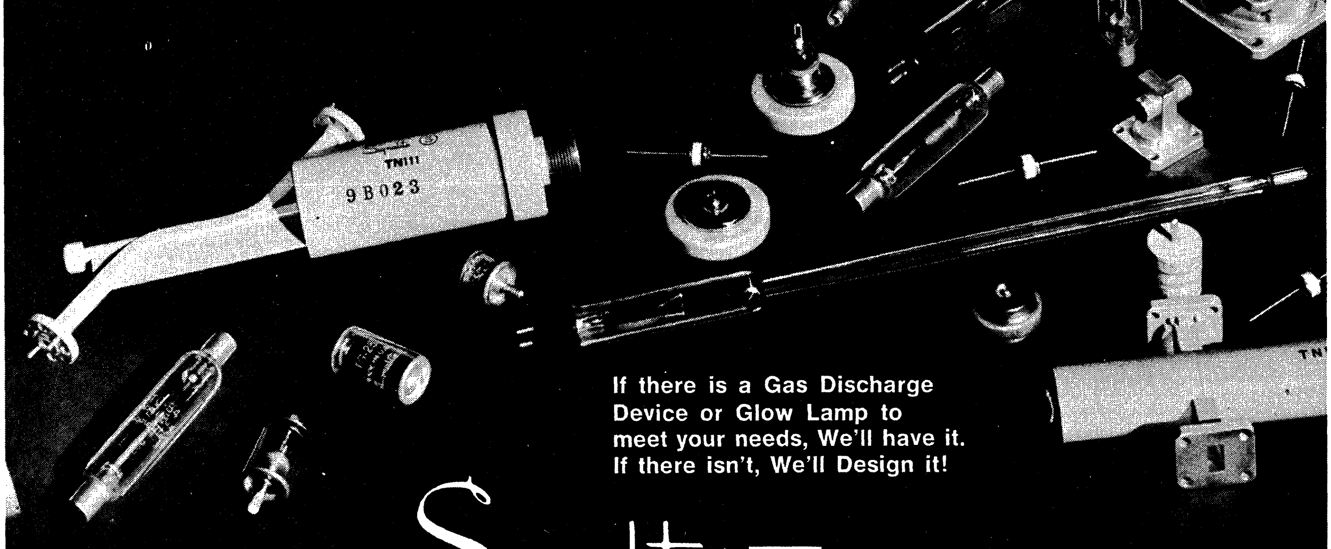
Signalite is the largest source in the world for noise source and noise generator requirements. Signalite offers over 200 different types for use in noise fixture test equipment and for monitoring system receiver sensitivities, from UHF to 90 GHz.

NEW **Solid State NOISE SOURCES**

Signalite
200

Signalite "200" Noise Source Brochure . . . provides a complete dissertation on over 200 types of microwave noise sources and miniature generators available, including fundamental noise measurement discussions, typical applications, detailed characteristics, etc.





If there is a Gas Discharge Device or Glow Lamp to meet your needs, We'll have it. If there isn't, We'll Design it!

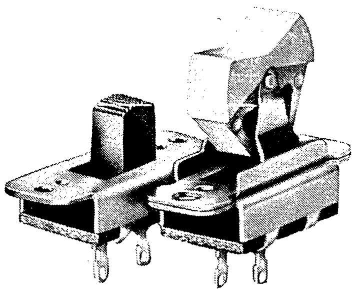
Signalite GI DIVISION OF GENERAL INSTRUMENT

1933 HECK AVENUE, NEPTUNE • NEW JERSEY 07753
(201) 775-2490

322

STACKPOLE

SLIDE, ROCKER, ROTARY SWITCHES



SLIDE SWITCHES

SS-	Action	UL-CSA Listings AC	DC
SINGLE POLE-SINGLE THROW			
26	Slide, with detent	4A 125V 2A 250V	1.0
36	Slide, with detent	6A 125V 3A 250V	1.0
37 *	Slide, with detent	10A 125V 5A 250V	
47	Slide, with detent	10A 125V 5A 250V	
15-1	Push button, momentary contact, normally open, no detent	3.0	0.5
9-2	Slide, spring return, no detent, normally open	6A 125V 3A 250V	1.0
40 *	Slide, spring return, no detent, normally open	3.0	
SINGLE POLE-DOUBLE THROW			
26-1	Slide, with detent	4A 125V 2A 250V	1.0
36-1	Slide, with detent	6A 125V 3A 250V	1.0
37-1 *	Slide, with detent	10A 125V 5A 250V	
40-1 *	Slide, spring return, no detent	3.0	
9-3	Slide, spring return, no detent	6A 125V 3A 250V	1.0
SINGLE POLE-THREE POSITION			
31	Slide, with detent	6A 125V 3A 250V	1.0
43	Slide, with "skid proof" center detent	6A 125V 3A 250V	1.0
44 *	Slide, with detent	6.0	

SS-	Action	UL-CSA Listings AC	DC
DOUBLE POLE-DOUBLE THROW			
50	Slide, with detent	3A 125V 1.5A 250V	0.5
20	Slide, plunger, spring return, with latch	6.0	0.5
5	Slide, momentary contact, spring return, no detent	6.0	0.5
33	Slide, with detent	6A 125V 3A 250V	0.5
DOUBLE POLE-THREE POSITION			
16	Slide, with detent	6.0	0.5
38	Slide, with "skid proof" center detent	6.0	0.5
42	Slide, maintained in two position, spring return to center from third	6.0	0.5
DOUBLE POLE-FOUR POSITION			
18	Slide, with detent	3.0	0.5
TRIPLE POLE-DOUBLE THROW			
76	Slide, with detent		
6	Slide, spring return, no detent	6.0	0.5
34	Slide, with detent	6.0	0.5
DOUBLE POLE-THREE POSITION			
54	Slide, with detent	3.0	0.5
TRIPLE POLE-THREE POSITION			
74	Slide, with detent		
FOUR POLE-DOUBLE THROW			
12	Slide, with detent	6A 125V 3A 250V	1.0
MINIATURE SLIDE SWITCH			
SS-90	Single Pole-Single Throw	1.0 & 3.0	0.5
SS-90-1	Single Pole-Double Throw	1.0 & 3.0	0.5
SS-91	Double Pole-Single Throw	1.0 & 3.0	0.5
SS-91-1	Double Pole-Double Throw	1.0 & 3.0	0.5
SS-92	Single Pole-3-Position	1.0 & 3.0	0.5
SS-93	Double Pole-3-Position	1.0 & 3.0	0.5

ROCKER SWITCHES

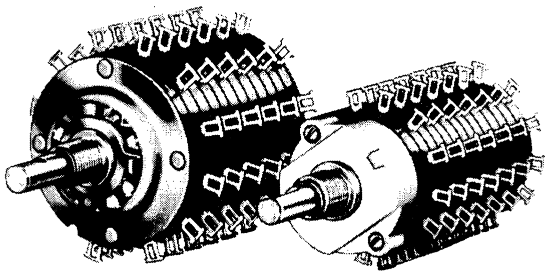
SINGLE POLE-SINGLE THROW			
9-2	Spring return, no detent, normally open	6A 125V 3A 250V	1.0

RS-	Action	UL-CSA Listings AC	DC
SINGLE POLE-SINGLE THROW			
26	With detent	4A 125V 2A 250V	1.0
36	With detent	6A 125V 3A 250V	1.0
37 *	With detent	10A 125V 5A 250V	
47	With detent	10A 125V 5A 250V	
40 *	Spring return, no detent, normally open	3.0	
SINGLE POLE-DOUBLE THROW			
9-3	Spring return, no detent	6A 125V 3A 250V	1.0
26-1	With detent	4A 125V 2A 250V	1.0
36-1	With detent	6A 125V 3A 250V	1.0
37-1 *	With detent	10A 125V 5A 250V	
40-1 *	Spring return, no detent	3.0	
SINGLE POLE-THREE POSITION			
31	With detent	6A 125V 3A 250V	1.0
43	With "skid proof" center detent	6A 125V 3A 250V	1.0
DOUBLE POLE-DOUBLE THROW			
50	With detent	3A 125V 1.5A 250V	0.5
5	Spring return, no detent	6.0	0.5
33	With detent	6A 125V 3A 250V	1.0
DOUBLE POLE-THREE POSITION			
16	With detent	6.0	0.5
38	With detent	6.0	0.5
42	With detent in two positions. Spring return to center from third position. (Flat bracket only)	6.0	0.5
TRIPLE POLE-DOUBLE THROW			
34	With detent	6.0	0.5
6	Spring return, no detent	6.0	0.5
FOUR POLE-DOUBLE THROW			
12	With detent	6A 125V 3A 250V	1.0

*** RS-37 Series available with special quick-connect terminal horizontal to base only.**

***SS-37 Series available with special quick-connect terminal horizontal to base only.**

ROTARY SWITCHES



Series 600 1⅝" Dia. and Series 100 1⅛" Dia.
Environment Proof Rotary Switches

- FEATURES -

COMPLETELY ENCLOSED — Both index mechanism and electrical sections are completely enclosed, providing an environment proof assembly.

EXPOSURE & CONTAMINATION PROOF — Corrosive atmospheres, dust, dirt and moisture are permanently sealed out, while lubricants are sealed in.

PRODUCTION DAMAGE ELIMINATED — Solder and flux cannot get into vital switch parts. Rugged integral terminals and contacts are permanently molded in position and will not loosen or move even under extreme soldering heat. Accidental production damage is eliminated.

FIELD PERFORMANCE ASSURED — Switch assemblies are torsionally rigid and rugged to withstand rough usage. Field tampering is abolished.

UNIQUE MODE OF SWITCHING — Complex switching arrangements, with intermixed shorting and non-shorting functions, are attainable not only on single sections, but also between sections. Standard index angles include 15°, 30°, 36°, 60° and 90°. Special angles available on request.

VERSATILITY — Enclosure maintaining spacers may be incorporated between sections to facilitate hardware mounting and special space requirements. Additional standard variations include electrostatic shields, dual concentric switches with attached line switches or potentiometers, gasket sealed construction, coded output and hi-voltage applications.

EXPLOSION PROOF — Standard enclosed construction is inherently explosion proof in accordance with Mil-S-3786B, paragraph 4.8.12.

STACKPOLE IS ALSO CAPABLE OF MANUFACTURING SPECIALIZED SWITCHING DEVICES TO YOUR OWN SPECIFICATIONS.

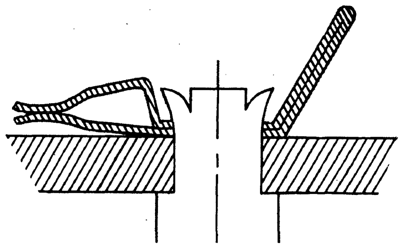
STACKPOLE
COMPONENTS COMPANY
A Subsidiary of Stackpole Carbon Company
P.O. BOX 14466, RALEIGH, N.C. 27610
PHONE (919) 828-6201 • TWX (510) 928-0520

standard grigsby co.

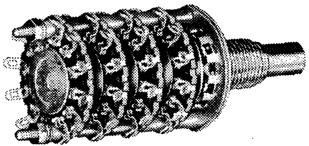
A DIVISION OF **STANDARD KOLLSMAN** INDUSTRIES INC.

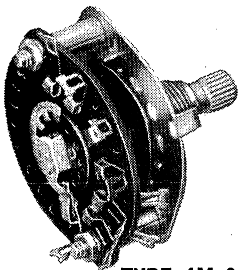
920 Rathbone Ave. • Aurora, Ill. 60507 • Dept. J • Telephone (312) 897-8417 • TWX 910-232-3138

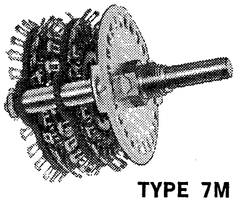
*"Wedgelock" is the exclusive patented construction of Standard Grigsby Switches. All electrical contacts are fastened to the insulating stators or wafers by means of the "T" slug. This forced fit prevents any loosening of the contacts as often happens in conventional rivet construction when solder heat is applied. The unique shape of the "T" slug design also eliminates rotation and twisting of contacts thus assuring maintenance of accurate timing throughout switch life.



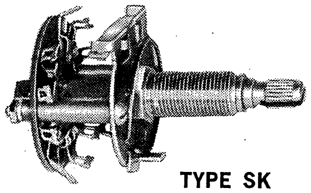
Rotary Switches

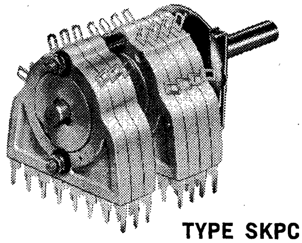

TYPE SM

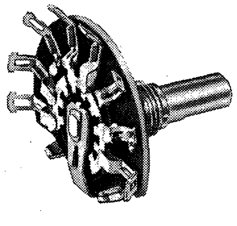

TYPE 4M & 42LR


TYPE 7M

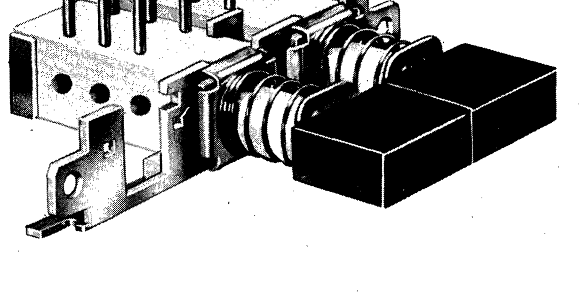
Type	Size	Max. Positions	Detent Angle	Insulation	Mil Designation	Additional Data
SM	15/16 x 7/8″ — 3/4″ Strut Centers	8 10 12	45° 36° 30°	Phenolic and Glass Epoxy	SR0 5	150 ma @ 125 VAC Spring return available. Dual concentric shafts. Rear mounted AC switch or potentiometer.
SK	1 1/4 x 1 7/8″ 1 1/32″ Strut Centers	4 6 8 12	90° 60° 45° 30°	Phenolic and Glass Epoxy	SR0 3	500 ma @ 125 VAC Spring return available. Dual concentric shafts. Rear mounted AC switch or potentiometer.
SKPC	1 17/32 Ht. Above P.C. Boards 1 41/64″ Wide 1 1/32″ Strut Centers	12	30°	Glass Alkyd	None	900 ma @ 125 VAC Spring return available. Dual concentric shafts. Rear mounted AC switch or potentiometer.
4M/42 LR	1 9/16 x 1 1/4″ 1 1/4″ Strut Centers	6 8 10 12 14	60° 45° 36° 30° 25° 42′	Phenolic — Glass Epoxy — Ceramic	SR0 2	500 ma @ 125 VAC Spring return available. Dual concentric shafts. Rear mounted AC switch or potentiometer.
7M	2 5/16 x 1 3/4″ 2″ Strut Centers — 2 17/32 x 1 5/8″ 2 7/32″ Strut Centers	14 18 20 24 28	25° 42′ 20° 18° 15° 12° 51′	Phenolic — Glass Epoxy — Ceramic	SR0 9	500 ma @ 125 VAC Dual concentric shafts. Rear mounted AC switch or potentiometer.
5M	Varied Irregular Shapes From 13/16″ To 1 3/8″	3	30°	Phenolic	None	500 ma @ 125 VAC Spring return available. 2 and 3 post only. Maximum 9 stationary clips.


TYPE SK


TYPE SKPC


TYPE 5M

Pushbutton Switches



Miniaturized, modular pushbutton switches domestically manufactured on popular millimeter button centers. Ideally suited for PC board insertion or available with optional wire-thru terminations. Check these additional features, then request catalog PDS64-A containing full specifications.

PB400

...Choice of three insulation materials: phenolic (standard), glass alkyd or Diallyl Phthalate.

...Individual front-end locking clip for ease of assembly or disassembly of a single module.

...Rugged U-shaped mounting bracket insures rigidity of multi-module assembly.

...Available in modules of 2, 4, 6, or 8 poles, double-thrown, per switch; mount up to twenty per assembly.

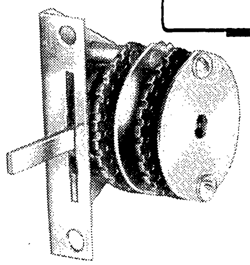
...Full range of switching combinations: push-push, momentary, inter-lock with or without lockout.

standard grigsby co.

A DIVISION OF **STANDARD KOLLSMAN** INDUSTRIES INC.

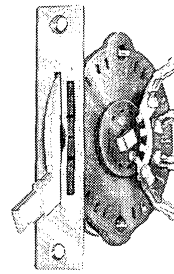
920 Rathbone Ave. • Aurora, Ill. 60507 • Dept. J • Telephone (312) 897-8417 • TWX 910-232-3138

Lever Switches



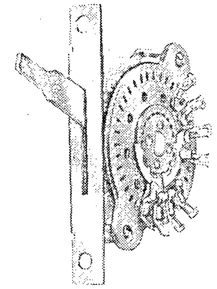
TYPE SMLR

- 1¼" Mounting Centers
- Insulation — phenolic or epoxy glass
- 2 to 4 positions With 30° throw (Max. 3 pos.) or 22½° throw (Max. 4 pos.)
- Spring return available from either side to a center position. Electrostatic shields are available
- A.C. Line Switch available in 30° throw
- Electrical Rating (Resistive) .150 MA. at 125 Volts; Maximum voltage—125 Volts; Maximum Current —2.5 Amps @ 6 V RMS



TYPE 6MLR

- 1⅝" Mtg. Centers
- Insulation—phenolic
- 3 positions
- 30° throw
- Electrical Rating (Resistive) .5 Amps at 125 Volts; Maximum Voltage—450 Volts; Maximum Current —3.5 Amps @ 6 V RMS



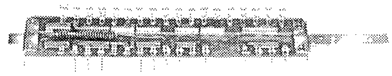
TYPE 6050LR

- 2⅞₂" Mounting Centers
- Insulation—phenolic or epoxy glass
- 5 positions
- 20° Throw
- Electrical Rating (Resistive) .5 Amps @ 125 Volts; Maximum Voltage—450 Volts; Maximum Current —3.5 Amps @ 6 V RMS

Slide Switches

TYPE 150SL

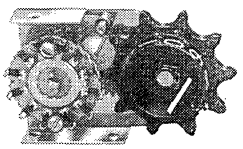
- 2 position with 2 to 12 poles
- Available with 9 to 21 contacts
- Insulation—phenolic
- Solder lug or printed circuit terminals
- Double throw—manual or spring return
- Contacts staked to base with "Wedgelock" construction
- Electrical Ratings (Resistive) .5 Amps at 125 Volts; Maximum Voltage—450 Volts RMS; Maximum Current —3.5 Amps @ 6 V RMS



TYPE 300SL

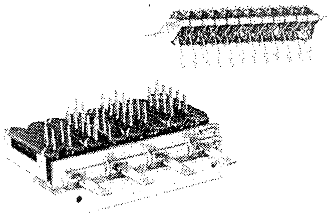
- Two position with 3 to 18 contacts on each side
- Insulation — phenolic
- Solder lug or printed circuit terminals
- Double throw — either manual or spring return
- Contacts staked to stator with "Wedgelock" construction
- Electrical Ratings (Resistive) .5 Amps at 125 Volts
  Maximum Voltage — 450 Volts RMS
  Maximum Current — 3.5 Amps @ 6 V RMS

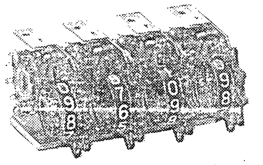
Thumbwheel Switches



SMT switches are the latest of the Standard Grigsby thumbwheel family and are in keeping with the trend towards subminiaturization. These switches utiliz. the sub-miniature SM type stators and may be produced with either one or multi-wafer assemblies driven by a common thumbwheel. T-101 thumbwheel switches are available with either single or double wafer sections, and utilize a stator equivalent in size to the 4M series.

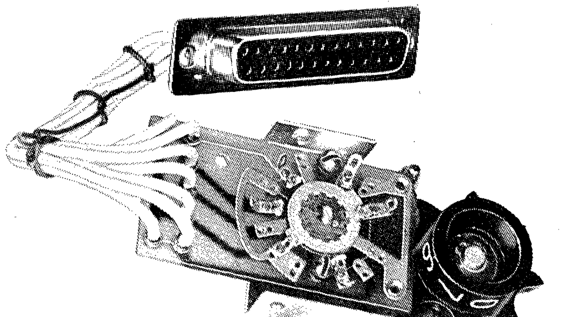
Ganged Switches





Most Standard Grigsby switches may be supplied ganged. Standard and custom made brackets are available. Write or phone for details.

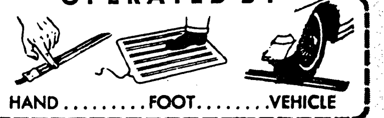
Special Applications



We thrive on the difficult and unusual. We invite you to challenge our engineering ingenuity with your specific switching problem. Need a completely wired assembly? We have the full range of skills to fill your most demanding needs.

TAPESWITCH®

OPERATED BY



PRESS-AT-ANY-POINT RIBBON type & MAT type SENSING SWITCHES

BUY THE RIBBON SWITCH IN THE SIZE YOU NEED!

SUCCESSFULLY PROVEN IN ALL INDUSTRIES. PATENTED CONSTRUCTION WITHSTANDS MANY TONS OF FORCE YET CLOSES ON LIGHT FINGER PRESSURE. TAPESWITCHES ARE UNEXCELLED FOR—SAFETY . . . AUTOMATION . . . ANTIBURGLAR SYSTEMS . . . COUNTING . . . TIMING . . . DOOR CONTROL . . . LIGHT SWITCHING . . . MACHINE CONTROL . . . MATERIAL HANDLING INSTRUMENTATION . . . COMPUTER AND CONSOLE SWITCHING . . . AND MANY OTHER APPLICATIONS.

These versatile sensing switches may be used directly with **electro-mechanical devices** and **solid state devices.**

Pressure at any point from hand, foot, or vehicle will cause contact. These are ideal for instrumentation and control tasks because of their **flat configuration, "Press-at-any-Point" operation,** and **sealed** qualities.

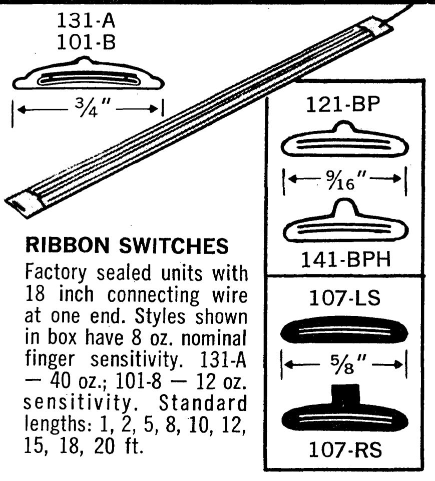
TAPESWITCHES are designed in accordance with the best principles of switch and cable design, with jacketing and insulation meeting the requirements of MIL-C-9154 and MIL-I-631C respectively. Results are exceptional stand-by reliability (required in alarms) as well as excellent contact performance.

Typical life tests with repeated impacts at ONE POINT on a Tapeswitch have given over three million operations without failure. (24 Volt AC relay coil 0.3 Amperes)

RATINGS: All Tapeswitch products are rated 117 VAC, at 1 Ampere. However for floor switching, 30 VAC or less is recommended.

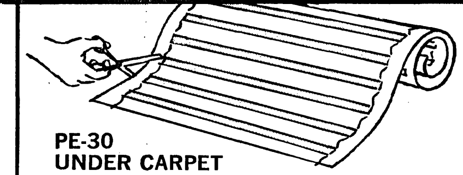
NOTE: U.L. classification for Ribbon Switches does not presently exist.

A FEW TAPESWITCH CONTROL SWITCHES



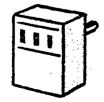
RIBBON SWITCHES

Factory sealed units with 18 inch connecting wire at one end. Styles shown in box have 8 oz. nominal finger sensitivity. 131-A — 40 oz.; 101-8 — 12 oz. sensitivity. Standard lengths: 1, 2, 5, 8, 10, 12, 15, 18, 20 ft.



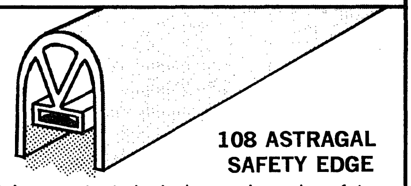
PE-30 UNDER CARPET SWITCHING RUNNER

30 inches wide x 3/32 inches thick and can be cut to any length from 25 ft. or 5 ft. roll. For indoor use under carpeting. Tapeswitches in parallel between Polyethylene sheets. Tinned wires for easy twisting or soldering connections.



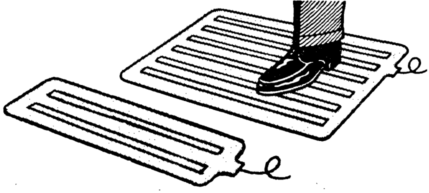
TAPESWITCH RELAY R-1

FOR NORMALLY CLOSED OR NORMALLY OPEN OPERATION OF ANY TAPESWITCH. Plug-in unit gives NC or NO control of 117 Volts AC, 5 Amperes. Built-in low voltage transformer.



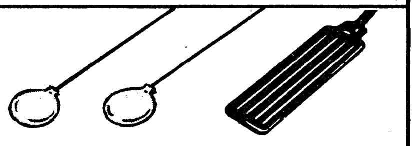
108 ASTRAGAL SAFETY EDGE

Unique patented design universal safety cushion switch for leading edge of doors, machinery, etc. Responds to side thrust and head-on thrust. Std. lengths: 6, 8, 10, 12, 15, 20, 25, 30 ft. OTHER STYLES ALSO AVAILABLE. Mounts on edges 1" to 2½" wide. Cushion depth 1⅞".



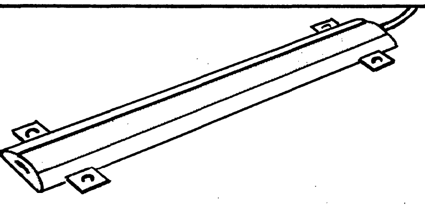
CVP SWITCHING MATS

CVP style mats are durable yet flexible, and only ⅛ inch thick (approx.). Available in sizes 20 x 32 inches, 17 x 23 inches and 6 x 23 inches. Very popular items.



NC-3 NO-1 FOOTSWITCH 111

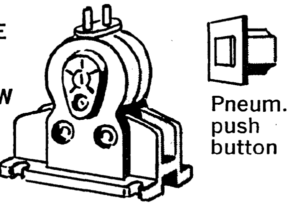
NC-3 is a unique normally closed wafer style switch 1⅛" diameter, by 3/16" thick. Designed to sound alarm when object is lifted off switch. NO-1 similar form but normally open. 20 oz. nominal sensitivity. Footswitch 111 normally open flat rugged, sealed switch, 2" x 5" x ¼" thick.



RBMA ROAD SWITCH

Successful, rugged roadway switch for counting, timing, controlling by vehicles. Replaceable sealed switch element. 2" wide, 7/16" thick. Std. lengths: 2, 3, 5, 8, 10 ft. Cast iron end protectors available.

SENSITIVE AIRWAVE SWITCH MODEL AW



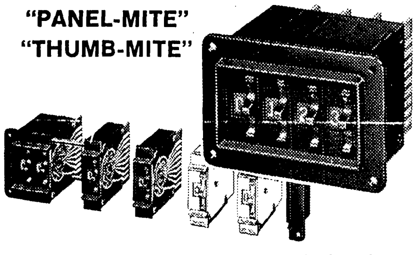
High quality diaphragm switch with adjustable sensitivity. For operation by **tubing squeeze**/impact, air motion, vacuum. Remote push-buttons for explosive environments, etc. Silver contacts operate normally open or normally closed.

TAPESWITCH CORPORATION OF AMERICA

320 BROAD HOLLOW RD., FARMINGDALE, N.Y. 11735 • (516) 694-6312—(212) 895-8713

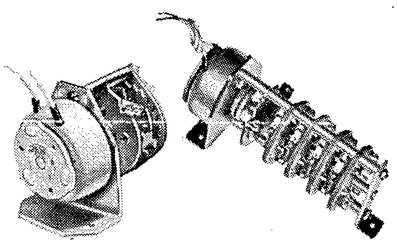
THUMBWHEEL SWITCHES

"PANEL-MITE"
"THUMB-MITE"



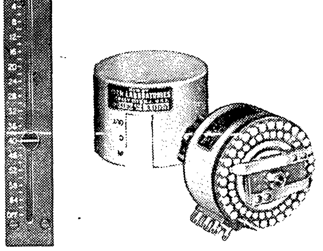
Compact, molded printed-circuit switches for limited space and in-line readout. Modular type for front or back panel mounting. ½″ between center lines, 1″ or 2″ height binary or decimal codes with adjustable stops available.

STEPPING SWITCHES



TECH LABS switches are now standard equipment in missiles as well as in ground controls. Furnished sealed to meet all specs. Solenoid and motor driven models.

ATTENUATORS



A complete line of audio and r.f. attenuators with both manual and REMOTE CONTROL. We will design components to meet your specific requirements, if standard units are inadequate. Please write for catalogue and send us your specs for estimate.

Switch to TECH LABS INC.

FOUNDED 1935

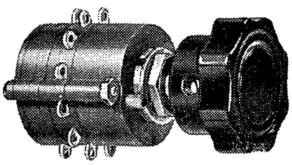
for the most versatile line of precision switches & attenuators

WRITE FOR NEW BULLETINS ON SWITCHES • DECADE RESISTORS • POTENTIOMETERS

Palisades Park, New Jersey

These switches are representative of the many types produced by TECH LABS meeting applicable Government Specs. Wire or teletype for further information.
TEL.: 201-944-2221 TWX: 201-947-0825

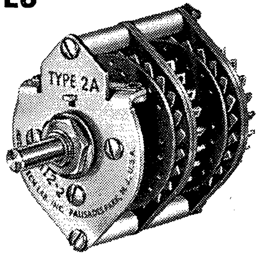
TAP SWITCHES



TYPE 3A MINIATURE TAP SWITCH

Molded from Diallyl Phthalate
Has adjustable stop

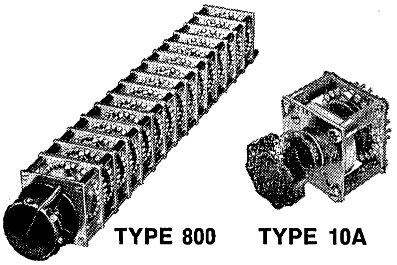
Specifications
Size: 1″ diameter. 1¼″ with terminals. 1 deck, 1-1/16″ long. ½″ for each additional deck.
Rating: 1200 volts rms, 2000 VDC, 5 amps. (carrying) 115 V.
Insulating resistance: 100 megohms minimum at 500 volts DC.
Life: 1.5—2 million revolutions.
Temperature range: —65°C to 100°C.
Mounting: single hole.



TYPE 2A & 2M

The Type 2A, a standard control switch for precision instruments and equipments, comes in 2-24 positions and 1-4 poles per deck, with phenolic insulation. The 2M is identical except for Melamine insulation. Both are rated for 3 AMP and have adjustable stops. Code "S" denotes "shorting" and "N" "non-shorting".

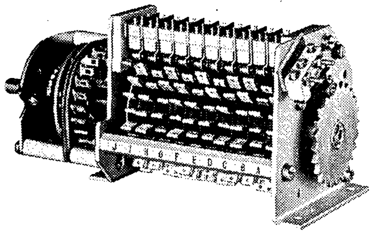
SQUARE SWITCHES



TYPE 800 **TYPE 10A**

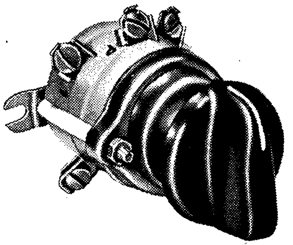
Square switches from 1⁵⁄₁₆″ to 15″ available from stock parts, as standards or assembled to your specifications. Adjustable stops available. Will meet all applicable government specs.

PROGRAMMING SWITCHES

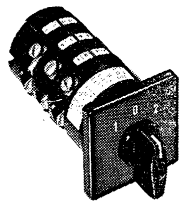


Adjustable programming switches, 24 or more positions. Available in MBB and BBM; manual, motor or solenoid driven. Contact ratings from dry circuit to 20 amps.

POWER CONTROL AND PACKET SWITCHES MILITARY & INDUSTRIAL TYPES



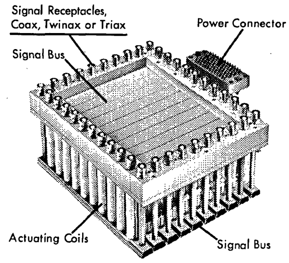
Heavy duty rotary snap-action switches from 10 to 200 amps. Built to withstand severe shocks without momentary interruption.



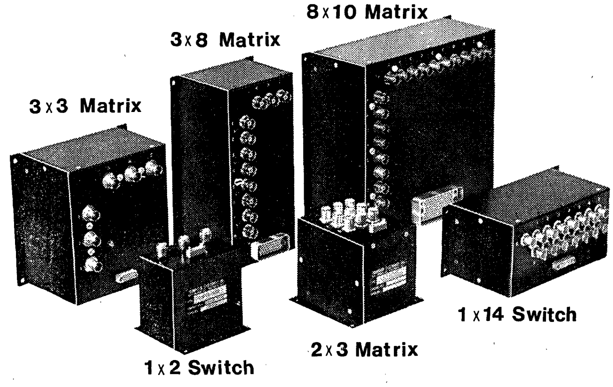
Power control switches for circuit breaking, motor control and transfer application. Current ratings of 10, 16, and 25 amps.

Matrix and Switching Systems

Call or write for your T-8 Catalog!



10x10 Modular Matrix (lessenclosure)



NOTE 1: Isolation is a function of frequency with approx. 6 db per octave roll-off. Isolation values are also a function of unit size and configuration.

NOTE 2: For frequencies above 60 MHz, High Frequency units (shown in Catalog T-8) should be used.

NOTE 3: Due to variation of reed manufacture, isolation and crosstalk may vary 10%.

Electrical Characteristics

			OPEN CROSSPOINT ISOLATION IN dB			
			MHz			
	Type	Version	60*	15	3.5	Closed Contact Resistance Milliohms
Dry Reed	A	Low Isolation	55	67	79	150
	V	Medium Isolation	75	87	99	250
	R	High Isolation	110	122	134	250
Mercury Wetted Reed	F	Medium Isolation	60	72	84	100
	G	High Isolation	90	102	119	150

General Specifications

Maximum Switched Signal Current:	Dry Reed: 0.5 amp, non-inductive. Mercury Wetted: 1 amp, non-inductive.
Control Voltage:	Dry Reed: 18 to 48 volts d.c. For low-voltage transistor driven circuits, dry read cross-points with 5-volt d.c. closure can be provided. Mercury Wetted: 24 to 48 volts d.c.
Control Current:	1 milliamp per applied volt per crosspoint.
VSWR:	1.25:1 at 60 MHz Nominal.
Actuation Time:	1 Millisecond.
Signal Connectors:	BNC (Coax) Concentric Twinax (Video Pair), Triax, other types available on special order. Mating plugs are available and may be ordered as separate item.
Power Connector:	Winchester mated pair are supplied with each unit. Other types are available on special order.
Life Expectancy:	Dry Reed — 20 million closures per contact at full rated current. 100 million for dry circuit switching. Mercury Wetted — 100 million closures at full rated current. (conservative)

Standard Matrices and Switches are supplied with all crosspoints normally open. Normally closed crosspoints can be supplied if required. Specification figures indicated are typical and not maximums.

Part Number and Ordering Information

C M V *Z 10 X 10 A

C T	Coax Twinax/Triax
M S	Matrix Multiple Switch
A V R F G	Low Isolation (Dry Reed) Medium Isolation (Dry Reed) High Isolation (Dry Reed) Medium Isolation (Mercury Wetted) High Isolation (Mercury Wetted)
*Z	Specials
NUMBER	Matrices — Inputs x Outputs
X	
NUMBER	Multiple Switches — Poles x Throws
A B C D E	Control Coil Current (Control Coil Schematics are in our Catalog T-8)

*Z — Terminated and special versions must be accompanied by technical description or prints of desired features.

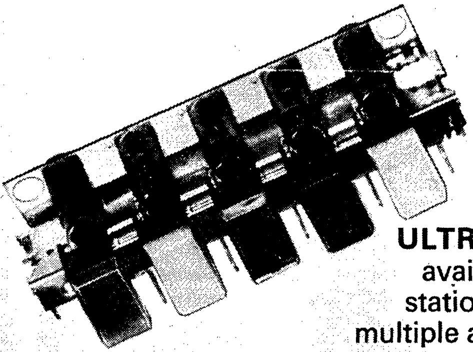
TROMPETER Electronics, Inc.

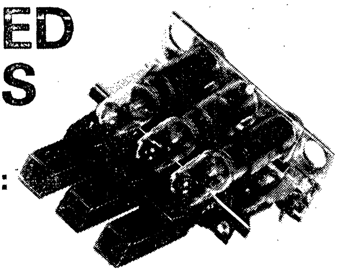
8936 COMANCHE AVE. • CHATSWORTH, CAL. 91311
TEL. (213) 882-1020 TWX: 910-494-1210

For Connector-Patching Information, See Page 2719

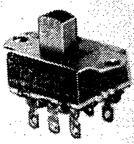
Switches and sockets by UID®

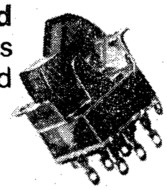
ILLUMINATED SWITCHES





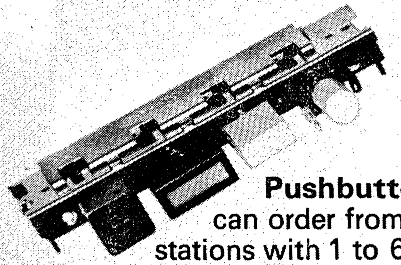
ULTRA-GLOW® pushbutton: available with 1 to 15 stations, 1 to 3 poles and multiple actuations. Basic switch is U.L. listed at 3 or 6 amps at 125v.

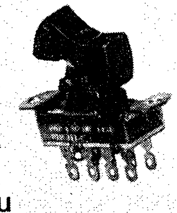


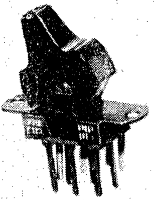


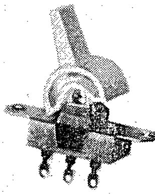
ULTRA-GLOW® slide and rocker: Select from 1 to 3 poles and a variety of colors. U.L. listed from 1 to 10 amps at 125v.

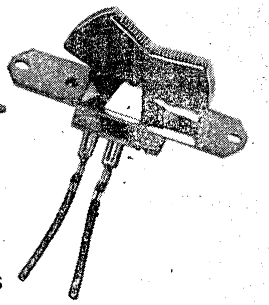
NON-ILLUMINATED SWITCHES



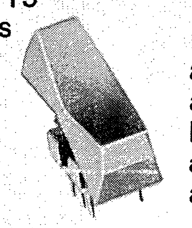




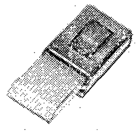




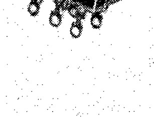
Pushbutton: you can order from 1 to 15 stations with 1 to 6 poles and multiple actuations. U.L. listed at 3 or 6 amps at 125v.

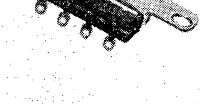


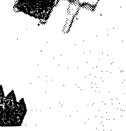
Rocker and slide: available with 1 to 3 positions and 1 to 6 poles. U.L. listed from 1 to 10 amps at 125v. Custom designs available.



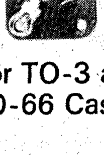
Snap-in: For standard and illuminated slide and rocker switches.

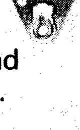






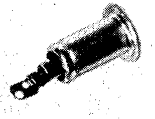
Power transistor sockets:





For TO-3 and TO-66 Case.

Antenna connectors

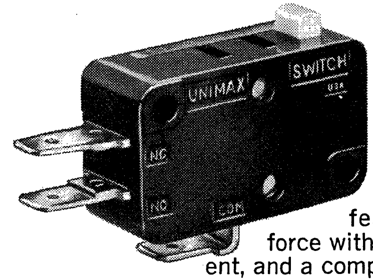


Printed circuit tube sockets: 7 & 9 pin

UID Electronics Corp.
4105 Pembroke Road,
Hollywood, Florida 33021
Phone: (305) 981-1211
TWX 510-954-9810

Unimax Switch®

The complete line of snap-acting Standard, Miniature, Subminiature and Miniature Subminiature switches for commercial and military applications.



Low-Force switches

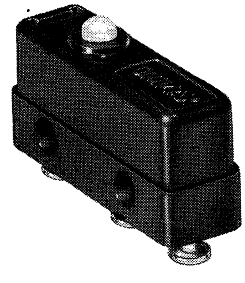
TM Series

17 standard models feature low operating force with negative force gradient, and a complete line of lever and roller lever actuators. Four terminal styles include ¼" quick-connect. Molded-in overtravel stop limits button movement, preventing overstress and shock loading of blade. Mounting holes are independent of cover for improved electrical insulation and high case strength. Two lever pivot locations provide either low actuating motion or forces as low as 8 grams. Ratings up to 15 amps. **Detailed specifications in our Catalog 60.**

Basic precision switches

Type 2HB

The basic switch for close control of electrical circuits requiring combinations of small motions, high repeatability and long life. Switches can be sealed or unsealed and all types of actuators are available. Ratings start at 20 amps to 480 VAC. UL and CSA listed. **Detailed specifications in our Catalog 60.**

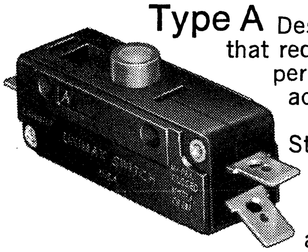


Basic subminiature switches

Type LM

Long life subminiature switches provide reliable switching in limited space. Variations available include integral or auxiliary actuators, ratings to 10 amperes, silver or gold contacts and choice of four terminal styles. **Detailed specifications in our Catalog 60.**

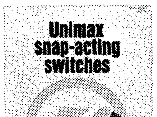
General purpose switches



Type A

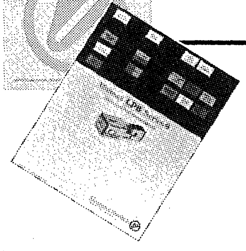
Designed for applications that require fully enclosed, high performance, low-cost, snap-acting switches with quick-connect terminals. Stall free, with high repeatability. Single or double pole, sealed or unsealed with a full range of actuators. Rated 15 or 25 amps at 125/250 VAC. **Detailed specifications in our Catalog 60.**

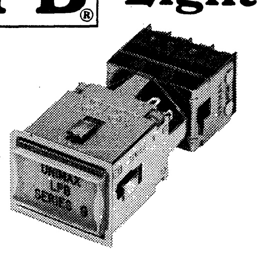
Complete 48 page catalog #60, at your request

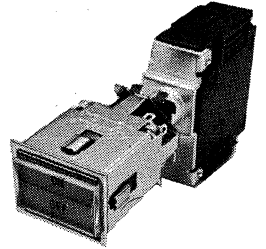


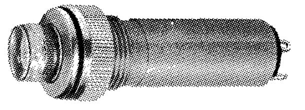
LPB® Lighted Pushbutton Controls

Complete 12 page catalog #50, at your request









LPB Series 9 Lighted Push-Button Switches

Unimax LPB **Series 9** are four lamp lighted pushbutton panel controls designed to meet the requirements of MIL-S-22885/9-12 (for QPL approved controls designate series 9M). They are offered in a wide range of display styles, color coding and customized messages can be easily changed or modified in the field. **For more technical information request our Catalog 50.**

LPB Series 9C Lighted Push-Button Circuit Breakers

Unimax LPB **Series 9C** are lighted pushbutton circuit breakers with a unique combination of four lamp lighted panel controls and snap-on hydraulic-magnetic circuit breakers. The time delay inherent in this line permits relatively high inrush current (common in starting motors, lamps, etc.) without tripping. But it provides full protection from sustained overloads and short circuits. **For more technical information request our Bulletin 511.**

LPB Series 2 Lighted Push-Button Switches

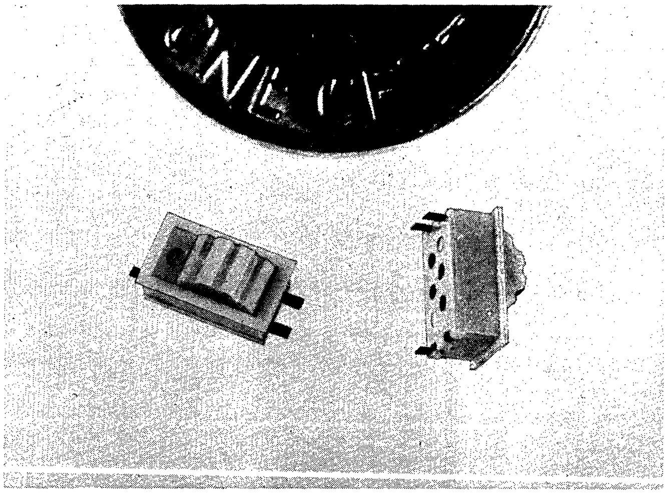
Unimax LPB **Series 2** is a snap-acting pushbutton switch combining the functions of circuit control and pilot light indication in one compact, low-cost unit. It is easy to install, available in alternate or momentary action with red, yellow, green white or clear lenses. Subsequent lamp or lens replacement being accomplished quickly, without special tools from the front of the panel. **For more technical information request our Bulletin 512.**

Unimax Switch® CORPORATION

A Riker-Maxson Subsidiary Ives Road, Wallingford, Connecticut 06492
Phone (203) 269-8701 TWX (710) 476-1397

WILBRECHT ELECTRONICS

SLIDE SWITCH MODEL 2000



The Model 2000 is a quality SPDT slide switch in ultra-miniature size, designed to fill PC board circuit requirements. The ultra-miniature switch size allows high component density designs and is ideal for applications such as filters where a discrete selection of circuit functions is desired, but, in the past, has been awkward to obtain.

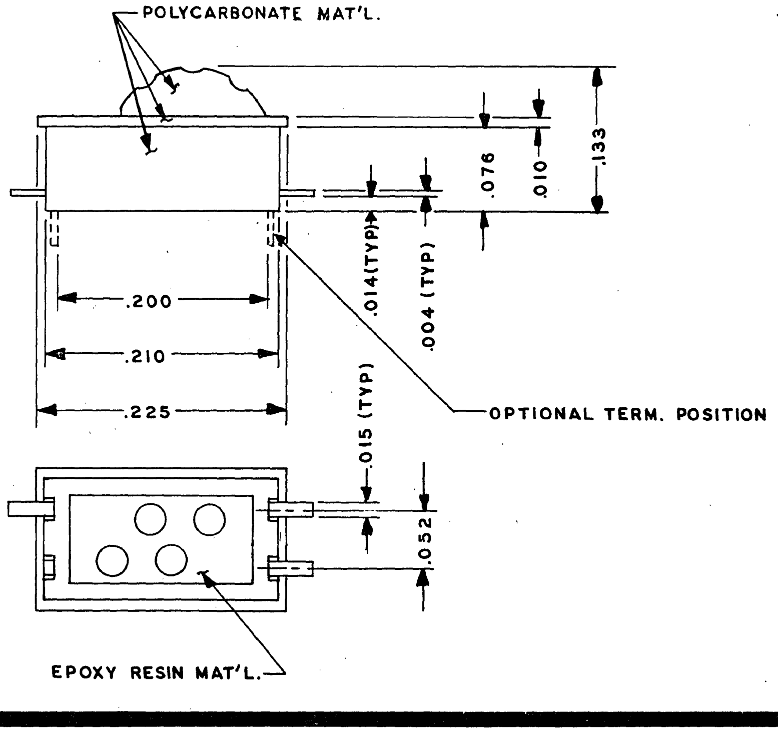
The 2000 has been designed and field tested with emphasis on reliability. The switch housing is enclosed to prevent fouling by foreign materials. Resistance to soldering heat is insured by the use of an epoxy resin base. All metal parts are heavily plated with precious metals to prevent corrosion. Wiping contacts and a positive detent action produce a "large size feel" for over 50,000 cycles.

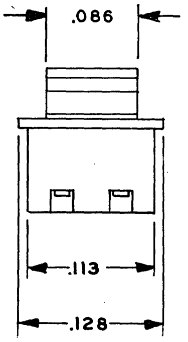
ELECTRICAL CHARACTERISTICS

Contact current rating at 25 V DC	50 ma
Initial contact resistance	0.05Ω max.
Max. operating voltage AC	100 V RMS
SPDT configuration	

MECHANICAL CHARACTERISTICS

Switch action	positive detent action
Detent force	50 gms
Total weight	0 .04 gms
Life expectance	50,000 cycles
Standard colors	black and beige



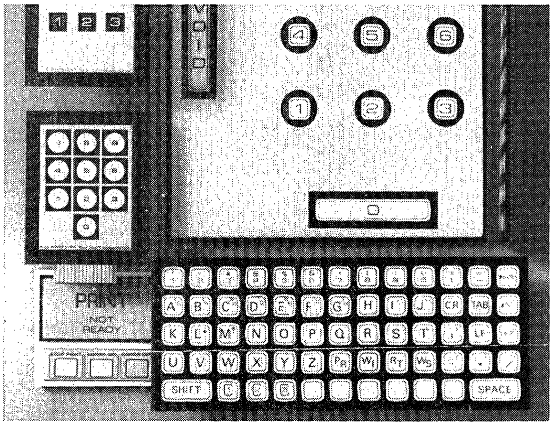


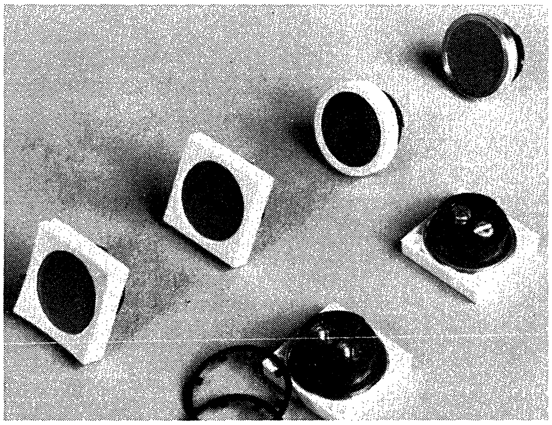
SWITCH TO TOUCH

FOR MOMENTARY-CONTACT, KEYBOARDS AND SWITCH ARRAYS

Three years ago, the Wild Rover Corporation broke the technical and cost barriers for creating touch-activated switch controls. Following that, Wild Rover pioneered the Monolithic™ Touch Keyboard. Now it is possible to bring all the human-engineering benefits and appeals of "touch" to an unlimited variety of functions. The switching principle and unique module which is the "heart" of all Wild Rover units provide outstanding features:

- **All Wild Rover switches are extremely economical. Particularly the Monolithic™ Keyboards which operate as well, or better, and *cost less* than almost any other keyboard around.**
- **All units are exceptionally rugged and reliable. Individual switches and keyboards can survive in almost any environment. Sealed-unit construction preserves integrity and withstands extremes of weather, humidity, temperature, vibration and human abuse.**
- **Wild Rover switches will handle inductive loads and specially engineered units offer touch control for dry-circuit applications.**





TC-K MONOLITHIC™ KEYBOARDS

A ONE-PIECE UNIT IN ANY SIZE OR SHAPE . . . WITH TOUCH AT EACH KEY

Monolithic keyboards are constructed without restriction on overall shape. Designers and engineers are free to choose the best keyboard shape and "look" for each job. No limit on size and units may be as thin as ⅛".

For convenience, standard 12- and 16-key boards are available in the flat surface format, or with recessed surfaces. A mask which creates *finger-guiding* recesses can be incorporated into any Monolithic keyboard.

SPECIFICATIONS:

Switch Ratings: Code A — 115 VAC, 1.6 amp.; 24 VDC, 1 amp*. Code B — 48 VAC, 1.6 amp.; 24 VDC, 1 amp*. Code C — 24 VAC, 1 amp.; 24 VDC, 200 ma*. Code D — 12 VAC, 50 ma.; 12 VDC, 50 ma**.

*Rated for inductive loads.
**Specifically engineered for dry-circuit applications.

Contact Forms: Form A — Normally open. Form B — Normally Closed. Form C — Single pole, double throw.

Equivalent Contact Resistance: 30 Milliohms nominal Same impedance maintained throughout switch life.

Life: In excess of 1,000,000 cycles at high power (Code A, B, C). In excess of 10,000,000 cycles at low power (Code D).

Operating Environment: —65°F. to +167°F. Ideal for outdoor use.

Operating Speed: 2 microsecond nominal TURN-ON; 7 microsecond nominal TURN-OFF.

Construction: Monolithic™ Keyboards are shock and vibration-proof. They are also dustproof, oil and water-resistant. A totally water-proof model is available. Keyboard body is epoxy glass; surface may be Mylar®, polyethylene, or acrylic plastic—or even stainless steel.

Terminal Type: Complete freedom of termination includes (a) edge connector for maximum economy, or (b) wire wrap, (c) solder terminals, (d) mill spec. connectors.

Colors & Legend: Monolithic™ Keyboards can be produced with almost any color, combination of colors, key design "look" and legend. Request for quotation must be accompanied by artwork and color swatches.

Illumination: Keyboards may be illuminated in general, or on a per key basis.

© 1971 Wild Rover Corporation.
U.S. and foreign patents pending.

TC-1™ TOUCH SWITCHES

FOUR ATTRACTIVE STYLES FOR LOW-FORCE TOUCH AND ECONOMY

The TC-1 touch units are a true retrofit for almost any momentary switch. They are available with, or without, illumination and are designed for driving low level logic and high inductive loads.

SPECIFICATIONS:

Switch Ratings: Code A — 115 VAC, 1.6 amp.; 24 VDC, 1 amp*. Code B — 48 VAC, 1.6 amp.; 24 VDC, 1 amp*. Code C — 24 VAC, 1 amp.; 24 VDC, 200 ma*. Code D — 12 VAC, 50 ma.; 12 VDC, 50 ma**.

*Rated for inductive loads.
**Specifically engineered for dry-circuit applications.

Resistance: 30 milliohms nominal. Same impedance maintained after 100,000 cycles at full rated load.

Bounce Suppressed: Extremely low noise—suitable for driving low-level logic directly. First 5 micro-seconds noise free. Total turn-on high loads 2 micro-seconds max.; low level loads (dry circuit) less than 200 nanoseconds.

Life: In excess of 1,000,000 cycles for high loads; in excess of 10,000,000 for low level loads.

Wide Operating Temperatures: —65°F to 167°F.

Rugged Construction: Unbreakable Lexan® case. Units are dust-proof, oil and water resistant. All seams sealed.

Slight Weight and Compact Size: 0.3 oz. nominal weight: 1" x 1" x ½" max.

Terminal Type: Screw-type, recessed 4-40 screw (screw in solder lug available).

Colors: FRAMES—Red, black, blue, white are standard. Other colors on special order.

TOUCH PLATE—red, white, blue, gold and charcoal-grey are standard. However, any color, design or wood grain can be obtained on the touch surface. Any legend.

Styles: (1) Sq. frame contour-face; (2) Sq. frame flat-face; (3) Round frame flat-face; (4) Round metal frame. Styles 1 and 2 are available with illumination.

Illumination: Switches are available with *Bright-Point* illumination . . . a sharp, pin-point of light that is clearly visible even in direct sunlight. It provides positive feedback without exceeding thresholds for visual irritability. Perfect for aircraft.

WILD ROVER CORP.

Herbert Avenue, Closter, N. J. 07624 (201) 768-8393

CAL-R® INC. **THERMONETICS DIVISION**
a subsidiary of CapTech, Inc.

THERMISTORS — Negative Temperature Coefficient

THERMISTOR SPECIFICATIONS

R@ 25°C Ω ±10%	Part Number	NTC %/°C @ 25°C	Nominal D.C.*	Nominal T.C.**	Max. Dimensions A	Max. Dimensions B	Leads AWG#	Type
100,000	2J05	−4.4	3	10	.06	.26	30	Bar
75,000	2J06	−4.4	3	8	.06	.20	30	Bar
50,000	2J07	−4.4	3	7	.06	.15	30	Bar
30,000	2J08	−4.4	2	6	.06	.08	30	Bar
25,000	2J09	−4.4	2	5	.06	.07	30	Bar
20,000	2J10	−4.4	2	5	.06	.06	30	Chip
15,000	2J11	−4.4	2	4	.06	.05	30	Chip
10,000	2J12	−4.4	2	4	.06	.04	30	Chip
10,000	1J112	−4.4	2	4	.08	.05	30	Disc
10,000	1J13	−4.4	4	12	.11	.10	28	Disc
8,000	1J14	−4.4	4	10	.11	.08	28	Disc
7,000	1J145	−4.4	4	10	.11	.07	28	Disc
6,000	1J147	−4.4	3	9	.11	.06	28	Disc
5,000	1J15	−4.4	3	8	.11	.05	28	Disc
5,000	2J15	−4.4	3	8	.10	.04	28	Chip
4,000	1J154	−4.4	5	23	.16	.10	28	Disc
4,000	2J165	−4.4	3	8	.10	.04	28	Chip
3,000	2J16	−4.4	3	—	.12	.04	28	Chip
3,000	1J155	−4.4	6	20	.16	.08	28	Disc
2,500	1J158	−4.4	5	19	.16	.07	28	Disc
2,000	2J17	−4.4	3	5	.10	.03	28	Chip
2,000	1J20	−4.4	7	25	.22	.09	24	Disc
2,000	1D10	−3.9	2	3	.06	.04	30	Disc
2,000	2D10	−3.9	2	4	.06	.04	30	Chip
1,500	1D111	−3.9	2	3	.08	.06	30	Disc
1,000	2J21	−4.4	6	15	.18	.04	24	Chip
1,000	1J24	−4.4	9	48	.32	.09	24	Disc
1,000	1D112	−3.9	2	4	.08	.04	30	Disc
1,000	1D13	−3.9	4	10	.11	.08	28	Disc
1,000	2D13	−3.9	2	3	.08	.04	28	Chip
800	1D14	−3.9	3	8	.11	.06	28	Disc
700	1D145	−3.9	3	7	.11	.05	28	Disc
600	1D147	−3.9	3	7	.11	.04	28	Disc
500	1D15	−3.9	3	6	.11	.04	28	Disc
500	2D15	−3.9	2	4	.10	.04	28	Chip
500	1D153	−3.9	7	20	.16	.08	28	Disc
400	2D165	−3.9	2	4	.11	.04	28	Chip
300	2D16	−3.9	3	5	.10	.03	28	Chip
300	1D19	−3.9	7	25	.22	.09	24	Disc
200	2D20	−3.9	6	—	.15	.04	—	Chip
100	2D21	−3.9	6	—	.18	.04	24	Chip
100	2B13	−3.3	2	4	.07	.04	28	Chip
80	2B14	−3.3	2	4	.08	.04	28	Chip
80	2D211	−3.9	5	—	.20	.04	24	Chip
50	2D24	−3.9	6	—	.32	.04	24	Chip
50	2B15	−3.3	2	4	.10	.04	28	Chip
30	2D31	−3.9	7	—	.35	.04	24	Chip
30	2B16	−3.3	2	4	.10	.03	28	Chip
25	2D33	−3.9	7	—	.36	.04	24	Chip
20	2D34	−3.9	7	—	.36	.04	24	Chip
20	2B17	−3.3	3	4	.16	.04	28	Chip
10	2B21	−3.3	5	—	.18	.04	28	Chip
5	2B24	−3.3	6	—	.30	.04	24	Chip

"INTERCHANGEABLE (±0.2°C 0° To 80°C) THERMISTORS"***

EPOXY COATED

2,000	5J102	—4.4	3	10	.125	.125	30	Spherical
3,000	5J103	—4.4	3	10	.125	.125	30	Spherical
5,000	5J105	—4.4	2	8	.100	.100	30	Spherical
10,000	5J110	—4.4	2	8	.100	.100	30	Spherical
20,000	5J120	—4.4	2	8	.100	.100	30	Spherical

*****INTERCHANGEABLE THERMISTORS**

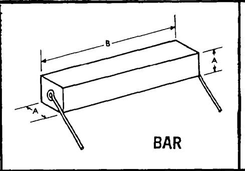
Thermistors designed for interchangability over narrower temperature ranges are available to your specifications at lower cost.

R/T CONVERSION TABLE

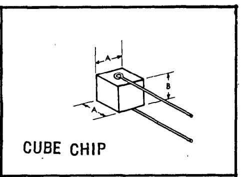
TEMPERATURE °C	TEMPERATURE °F	CURVE B R_t/R_{25}	CURVE D R_t/R_{25}	CURVE J R_t/R_{25}
—60	—76	43.0	73.04	140.5
—50	—58	24.3	38.95	67.0
—40	—40	14.4	21.51	33.7
—30	—22	8.93	12.33	17.7
—21.5	—6.7	6.09	—	10.6
—20	— 4	5.69	7.307	9.71
—10	+14	3.68	4.476	5.53
0	32	2.45	2.825	3.27
10	50	1.68	1.830	1.99
20	68	1.18	1.216	1.25
25	77	1.00	1.000	1.00
30	86	.854	.8267	.806
37.8	100	.671	—	.583
40	104	.628	.5742	.533
50	122	.464	.4067	.360
60	140	.350	.2937	.249
70	158	.267	.2160	.175
75	167	.236	—	.148
80	176	.208	.1615	.126
90	194	.163	.1229	.0916
100	212	.130	.0946	.0679
104.4	220	.118	—	.0598
110	230	.105	.0739	.0511
120	248	.0852	.0584	.0389
125	257	.0771	—	.0342
130	266	.0700	.0470	.0301
140	284	.0579	.0382	.0235
150	302	.0483	.0313	.0185

The alphabetical letter in the part number indicates the curve. To determine the approximate resistance of a thermistor at a specified temperature, multiply the thermistor resistance at 25°C by the ratio factor opposite that temperature on the R/T conversion table.

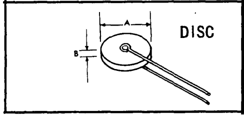
CURVE **B**	Ratio $\frac{R@\ 25°C}{R@\ 125°C} = 12.95 \pm 10\%$
CURVE **D**	Ratio $\frac{R@\ 25°C}{R@\ 125°C} = 19.8 \pm 10\%$
CURVE **J**	Ratio $\frac{R@\ 25°C}{R@\ 125°C} = 29.85 \pm 10\%$



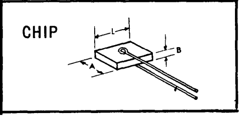
BAR



CUBE CHIP



DISC



CHIP

***DISSIPATION CONSTANT**

Dissipation Constant, expressed in mw/°C, represents the amount of power required to raise the temperature of a thermistor 1°C.

****TIME CONSTANT**

Time Constant, expressed in seconds, is the time required for a thermistor dissipating zero power to change 63% of the difference between its initial temperature value and that of a new temperature environment.

CAL-R thermistors conform to AQL and confidence levels specified in MIL-T-23648, tables V and VI.

Coatings, marking, special leads, probes, resistor/thermistor networks, resistance values from 1 ohm to 150 KΩ, and other product variations are produced to meet your design requirements.

Resistance tolerances of ±1% through ±20% are available and may be specified at 25°C or any temperature within the operating range. Maximum operating temperature with leads 150°C.

CAL-R® INC. / a subsidiary of CapTech, Inc.

THERMISTORS • CAPACITORS • RESISTORS • MICROELECTRONICS
1601 OLYMPIC BOULEVARD, SANTA MONICA, CALIFORNIA 90404 (213) 451-9761 • TWX 910-343-6966

CARBORUNDUM® THERMISTORS
MEDIUM SENSITIVITY, NTC RODS

Carborundum thermistors are non-linear (pos. or neg. temperature coefficient) resistors which offer a wide range of temperature-coefficient characteristics. The coefficients available are approximately .3% per degree C to 10% per degree C at 25°C. Carborundum thermistors are bonded ceramically through a high-temperature firing process into disc and rod-shaped bodies in a wide range of sizes to provide the desired resistance values, thermal time and dissipation constants, and temperature coefficients for a wide variety of electrical and electronic circuits.

Our long experience in the design of special resistance devices, together with wide experience in the field of ceramic technology, assures a stable and uniform product to meet your thermistor requirements. All materials used in the manufacture of Carborundum thermistors are of the highest quality. Strict quality control is maintained over all stages of manufacture and a minimum of two calibrations at the specified reference temperature and/or load current is standard.

SPECIFICATIONS	F-1	F-2	F-3	F-4	F-5	F-6	F-7
Ratio $\frac{R @ 25°C}{R @ 125°C}$, nominal	2.82	3.26	3.64	4.37	5.00	5.95	6.84
"B" value (37.8°C—73.5°C) ±10%	1250	1400	1550	1750	1900	2100	2250
Temperature coefficient @ 25°C, per °C	1.40%	1.56%	1.72%	1.97%	2.11%	2.40%	2.50%

PHYSICAL SPECIFICATIONS

Type	Fig.	Dimensions A	Dimensions B	Dimensions C	Lead Wire Ga.	Dissipation Constant MW°/C	Time Constant Seconds	Remarks
0325F	I	.12	.30	1	24	6.0	10	Coated
0525F	I	.22	.375	1⅛	24	8.0	22	Coated
0550F	I	.22	.63	1⅜	20	11.0	25	Coated
0599F	I	.22	1.125	1⅜	20	15.0	50	Coated
1099F	I	.375	1.125	1⅜	20	24.0	90	Coated
0650F	II	.20	.50	1⅜	20	11.0	27	Uncoated

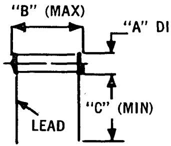


FIGURE I

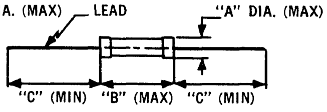


FIGURE II

TYPE "F-1" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
2.0	—	100	—	—	—	—
2.5	—	101	—	—	—	—
3.0	—	102	—	—	—	—
3.5	—	103	—	—	—	—
4.0	—	104	—	—	—	—
4.5	—	105	100	—	—	—
5.0	—	—	**101**	—	—	—
7.5	100	—	—	100	—	—
10.0	**101**	—	—	101	—	—
15.0	102	—	—	102	—	—

Order by Type number and subdesignation. Example: 0550F-100 identifies the 4.5-ohm version of Type 0550F.

TYPE "F-2" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
5.0	—	106	—	—	—	100
7.5	—	107	102	—	—	101
10.0	—	108	**103**	—	100	102
15.0	—	109	104	—	101	—
20.0	103	—	**105**	103	—	—
25.0	**104**	—	—	104	—	—
30.0	105	—	—	105	—	—

Order by Type number and subdesignation. Example: 0550F-102 identifies the 7.5-ohm version of Type 0550F.

▨ Stock Item

TYPE "F-3" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
25	—	110	106	—	102	103
50	—	111	**107**	—	103	104
75	106	—	108	106	—	—
100	**107**	—	—	107	—	—
125	108	—	—	108	—	—
150	109	—	—	109	—	—
200	110	—	—	110	—	—

Order by Type number and subdesignation. Example: 0599F-106 identifies the 75-ohm version of Type 0599F.

TYPE "F-4" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
75	—	112	—	—	104	—
100	—	113	**109**	—	105	105
125	—	114	110	—	106	—
150	—	115	**111**	—	107	—
200	—	116	**112**	—	108	106
250	**111**	117	113	111	109	107
500	**112**	118	**114**	112	110	108
750	113	—	115	113	—	—
1,000	**114**	—	—	114	—	—
1,500	115	—	—	115	—	—
2,000	116	—	—	116	—	—

Order by Type number and subdesignation. Example: 0525F-117 identifies the 250-ohm version of Type 0525F.

TYPE "F-5" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
750	—	119	—	—	111	109
1,000	—	120	**116**	—	112	110
1,500	—	121	117	—	113	—
2,000	—	122	118	—	114	—
2,500	117	123	**119**	117	115	111
5,000	**118**	124	**120**	118	116	112
7,500	119	—	121	119	—	—
10,000	**120**	—	—	120	—	—

Order by Type number and subdesignation. Example: 0525F-123 identifies the 2500-ohm version of Type 0525F.

TYPE "F-6" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
7,500	—	125	—	—	117	113
10,000	—	126	**122**	—	118	114
25,000	**121**	127	123	121	119	115
50,000	122	128	**124**	122	120	116
75,000	123	—	125	123	—	—
100,000	**124**	—	—	124	—	—
125,000	125	—	—	125	—	—
150,000	126	—	—	126	—	—
200,000	127	—	—	127	—	—

Order by Type number and subdesignation. Example: 0599F-122 identifies the 50,000-ohm version of Type 0599F.

TYPE "F-7" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

RESISTANCE OHMS ±10% at 25°C	CARBORUNDUM PART NUMBER 0325F	0525F	0550F	0599F	0650F	1099F
75,000	—	129	—	—	121	—
100,000	—	130	**126**	—	122	—
150,000	—	131	127	—	123	—
200,000	—	132	128	—	124	—
250,000	128	133	**129**	128	125	—
500,000	**129**	134	**130**	129	126	—
750,000	130	135	131	130	127	—
1,000,000	131	—	**132**	131	128	—
1,500,000	132	—	**133**	132	—	—
2,000,000	**133**	—	—	133	—	—

Order by Type number and subdesignation. Example: 0650F-121 identifies the 75,000-ohm version of Type 0650F.

CARBORUNDUM The Carborundum Company, Electronics Plant, Niagara Falls, N. Y. 14302, 716–278-2521

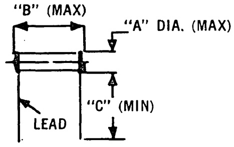
CARBORUNDUM® THERMISTORS

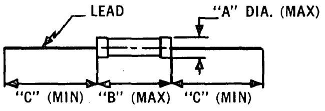
HIGH SENSITIVITY, NTC RODS

Specifications	H-1	H-2	H-3	H-4	H-5	H-6	H-7	H-8
Ratio $\frac{R \text{ at } 25°C}{R \text{ at } 125°C}$	11.5	13.5	18.0	23.0	30.0	36.0	44.0	52
"B" Value (37.8°—73.5°C ±5%	2800	3000	3400	3700	4000	4200	4400	4600
Temperature coefficient @ 25°C per °C	3.1%	3.4%	3.8%	4.1%	4.4%	4.7%	4.9%	5.1%

PHYSICAL SPECIFICATIONS

Type	Dimensions A	Dimensions B	Dimensions C	Lead Wire Gauge	Dissipation Constant MW/°C	Time Constant Seconds	Remarks
0325H	.12	.30	1	24	6.0	10	Coated
0525H	.22	.375	1⅛	24	8.0	22	Coated
0550H	.22	.63	1⅜	20	11.0	25	Coated
0599H	.22	1.125	1⅜	20	15.0	50	Coated
0650H	.20	.50	1⅜	20	11.0	27	Uncoated





0650H ONLY

TYPE "H-1" NEGATIVE TEMPERATURE COEFFICIENT THEMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
750	—	100	—	—	100
1000	—	101	**100**	—	101
1500	—	102	101	—	102
2000	—	—	102	—	—
2500	100	—	**103**	100	—
3750	**101**	—	—	101	—
5000	102	—	—	102	—

Order by Type number and sub-designation. Example: 0650H-101 identifies the 1,000 ohm version of Type 0650H.

TYPE "H-2" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
2000	—	103	—	—	103
2500	—	104	—	—	104
3750	—	105	104	—	105
5000	—	—	**105**	—	—
7500	103	—	—	103	—
10000	104	—	—	104	—
12500	**105**	—	—	105	—

Order by Type number and sub-designation. Example: 0650H-104 identifies the 2,500 ohm version of Type 0650H.

TYPE "H-3" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
7500	—	106	—	—	106
10000	—	107	**106**	—	107
12500	—	108	107	—	108
15000	—	—	108	—	—
25000	**106**	—	—	106	—
35000	107	—	—	107	—
45000	108	—	—	108	—

Order by Type number and sub-designation. Example: 0650H-107 identifies the 10,000 ohm version of Type 0650H.

TYPE "H-4" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
12500	—	—	—	—	—
15000	—	109	—	—	109
25000	—	110	109	—	110
35000	—	—	**110**	—	—
45000	—	—	—	—	—
60000	109	—	—	109	—
75000	**110**	—	—	110	—

Order by Type number and sub-designation. Example: 0650H-110 identifies the 35,000 ohm version of Type 0650H.

TYPE "H-5" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
25000	—	—	—	—	—
35000	—	114	—	—	114
45000	—	115	111	—	115
60000	—	116	**112**	—	116
75000	—	—	113	—	—
100000	111	—	—	111	—
150000	**112**	—	—	112	—
200000	113	—	—	113	—

Order by Type number and sub-designation. Example: 0650H-113 identifies the 25,000 ohm version of Type 0650H.

TYPE "H-6" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
60000	—	—	—	—	—
75000	—	117	—	—	117
100000	—	118	**114**	—	118
150000	—	119	115	—	119
200000	—	—	116	—	—
250000	114	—	**117**	114	—
500000	115	—	—	115	—

Order by Type number and sub-designation. Example: 0650H-119 identifies the 100,000 ohm version of Type 0650H.

TYPE "H-7" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
200000	—	120	—	—	120
250000	—	121	—	—	121
500000	—	—	—	—	—
750000	**116**	—	—	116	—
1000000	117	—	—	117	—

Order by Type number and sub-designation. Example: 0650H-121 identifies the 250,000 ohm version of Type 0650H.

TYPE "H-8" NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

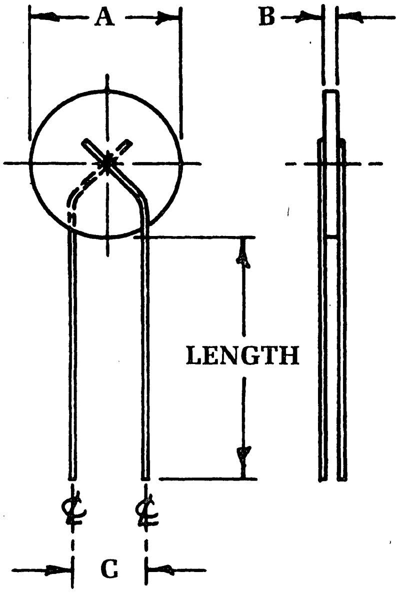
Resistance Ohms at 25°C ±10%	CARBORUNDUM PART NUMBER 0325H	0525H	0550H	0599H	0650H
200000	—	122	—	—	122
250000	—	123	—	—	123
500000	—	124	**119**	—	124
750000	118	125	120	118	125
1000000	119	126	**121**	119	126
1500000	**120**	—	—	120	—
2000000	**121**	—	—	121	—

Order by Type number and sub-designation. Example: 0650H-122 identifies the 200,000 ohm version of Type 0650H.

▨ Stock Item

CARBORUNDUM The Carborundum Company, Electronics Plant, Niagara Falls, N. Y. 14302, 716-278-2521

CARBORUNDUM® THERMISTORS
HIGH SENSITIVITY, NTC DISCS



Specifications	Type A	Type B	Type C	Type D
$\frac{R @ 25^\circ C}{R @ 125^\circ C} \pm 10\%$	28.5	14.2	18.7	35.3
β (°K) between 37.8°C-73.5°C	3980	3070	3415	4200
Temp. Coef. (α) %/°C @ 25°C	−4.4%	−3.4%	−3.8%	−4.7%

Notes:

1. Dielectric coating, marking optional at extra cost.
2. Standard lead length 1½″. Non-standard lengths available from ¼″ through ⅝″, and from 1½″ through 2″. Standard leads are tinned copper.
3. Standard kinked leads (for PC board use) furnished on request.

TYPE "A" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ω at 25°C ±10%	Nominal Dimensions A	B	C	Lead Wire Gage	Dissipation Constant-MW/°C	Time Constant Seconds	Carborundum Part Number
50	.82	.08	.375	18	29.0	150	A3308J
75	.82	.11	.375	18	29.0	150	A3311J
100	.40	.03	.250	22	9.0	35	A1603J
125	.40	.04	.250	22	9.0	35	A1604J
150	.30	.03	.250	24	8.0	35	A1203J
175	.30	.03	.250	24	8.0	35	A1203J
200	.30	.03	.250	24	8.0	35	A1203J
250	.30	.05	.250	24	8.0	40	A1205J
300	.30	.06	.250	24	8.0	40	A1206J
500	.20	.04	.125	24	6.5	12	A0804J
600	.20	.04	.125	24	6.5	12	A0804J
750	.20	.05	.125	24	6.5	12	A0805J
900	.20	.06	.125	24	7.0	24	A0806J
1000	.20	.07	.125	24	7.0	24	A0807J
1250	.20	.08	.125	24	7.5	30	A0808J
1500	.20	.10	.125	24	7.5	30	A0810J

TYPE "B" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ω at 25°C ±10%	Nominal Dimensions A	B	C	Lead Wire Gage	Dissipation Constant-MW/°C	Time Constant Seconds	Carborundum Part Number
2.0	.65	.05	.375	22	17.0	90	B2605J
2.5	.65	.06	.375	22	17.0	90	B2606J
3.0	.65	.07	.375	22	17.0	90	B2607J
5.0	.40	.04	.250	22	9.0	35	B1604J
7.0	.40	.06	.250	22	9.0	35	B1606J
10.0	.30	.05	.125	24	8.5	38	B1205J
15.0	.30	.06	.125	24	8.5	43	B1206J
20.0	.20	.04	.125	24	7.0	22	B0804J
25.0	.20	.04	.125	24	7.0	22	B0804J
50.0	.20	.08	.125	24	7.5	22	B0808J

TYPE "C" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

Resistance Ω at 25°C ±10%	Nominal Dimensions A	B	C	Lead Wire Gage	Dissipation Constant-MW/°C	Time Constant Seconds	Carborundum Part Number
10	.65	.045	.350	22	15.0	90	C2605J
15	.45	.03	.250	22	9.0	35	C1803J
25	.40	.04	.250	22	9.0	35	C1604J
50	.30	.04	.250	24	8.5	40	C1204J
75	.30	.05	.250	24	8.5	40	C1205J
100	.20	.03	.125	24	6.5	12	C0803J
125	.20	.03	.125	24	6.5	12	C0803J
150	.20	.06	.125	24	7.0	22	C0806J
175	.20	.04	.125	24	6.5	12	C0804J
200	.20	.06	.125	24	7.0	22	C0806J
225	.20	.05	.125	24	6.5	12	C0805J
250	.20	.04	.125	24	6.5	12	C0804J
300	.20	.05	.125	24	6.5	12	C0805J

TYPE "D" HIGH NEGATIVE TEMPERATURE COEFFICIENT THERMISTORS STANDARD VALUES

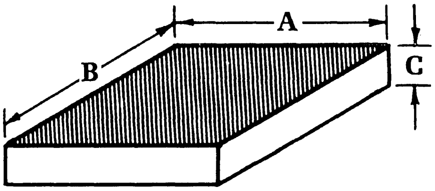
Resistance Ω at 25°C ±10%	Nominal Dimensions A	B	C	Lead Wire Gage	Dissipation Constant-MW/°C	Time Constant Seconds	Carborundum Part Number
125	.82	.08	.375	18	26.0	135	D3308J
150	.82	.09	.375	18	26.0	135	D3309J
200	.40	.03	.250	22	9.0	35	D1603J
250	.40	.03	.250	22	9.0	35	D1603J
300	.40	.04	.250	22	9.0	35	D1604J
500	.30	.04	.250	24	8.0	38	D1204J
750	.30	.05	.250	24	5.0	38	D1205J
1000	.20	.03	.125	24	7.0	18	D0803J
1250	.20	.03	.125	24	7.0	18	D0803J
1500	.20	.03	.125	24	7.0	18	D0803J
2000	.20	.04	.125	24	7.0	18	D0804J
2500	.20	.05	.125	24	7.0	18	D0804J
3000	.20	.06	.125	24	7.0	18	D0806J

CARBORUNDUM

The Carborundum Company, Electronics Plant, Niagara Falls, N.Y. 14302, 716–278-2521

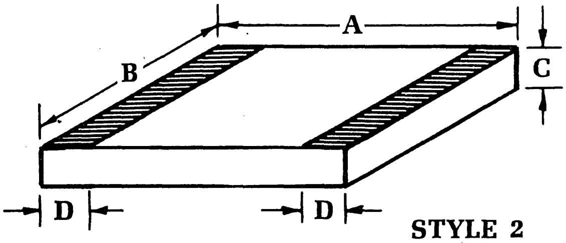
CARBORUNDUM® THERMISTORS

HIGH SENSITIVITY, NTC CHIPS



STYLE 1

Specifications	Type A	Type B	Type C	Type D
R @ 25°C / R @ 125°C ±10%	28.5	14.2	18.7	35.3
β (°K) between 37.8°C-73.5°C	3980	3070	3415	4200
Temp. Coef. (α) %/°C @ 25°C	−4.4%	−3.4%	−3.8%	−4.7%



STYLE 2

Notes:

1. Time & dissipation constants measured using 26 ga. tinned copper leads attached with solder.
2. Standard parts furnished without leads. Leads optional at extra cost.
3. Contacts—8032 DuPont conductive silver.

TYPE A Negative Temperature Coefficient Chip Thermistors

Resistance Ω @ 25° ± 10%	Nominal Dimension A	B	C	D	Style	Relative Dissipation Constant MW/°C	Relative Time Constant	Carborundum Part Number
300	.15	.15	.015		1	4.5	8.5	A1515C-1
680	.10	.10	.015		1	3.0	6.0	A1010C-1
2800	.05	.05	.015		1	1.5	4.0	A0505C-1
53000	.10	.05	.015	.015	2	2.5	5.0	A1005C-1
53000	.20	.10	.015	.03	2	6.0	18.0	A2010C-1

TYPE B Negative Temperature Coefficient Chip Thermistors

Resistance Ω @ 25° ± 10%	Nominal Dimension A	B	C	D	Style	Relative Dissipation Constant MW/°C	Relative Time Constant	Carborundum Part Number
26	.15	.15	.015		1	4.5	8.5	B1515C-1
60	.10	.10	.015		1	3.0	6.0	B1010C-1
240	.05	.05	.015		1	1.5	4.0	B0505C-1
3000	.10	.05	.015	.015	2	2.5	5.0	B1005C-1
3000	.20	.10	.015	.03	2	6.0	18.0	B2010C-1

TYPE C Negative Temperature Coefficient Chip Thermistors

Resistance Ω @ 25° ± 10%	Nominal Dimension A	B	C	D	Style	Relative Dissipation Constant MW/°C	Relative Time Constant	Carborundum Part Number
55	.15	.15	.015		1	4.5	8.5	C1515C-1
130	.10	.10	.015		1	3.0	6.0	C1010C-1
520	.05	.05	.015		1	1.5	4.0	C0505C-1
9200	.10	.05	.015	.015	2	2.5	5.0	C1005C-1
9200	.20	.10	.015	.03	2	6.0	18.0	C2010C-1

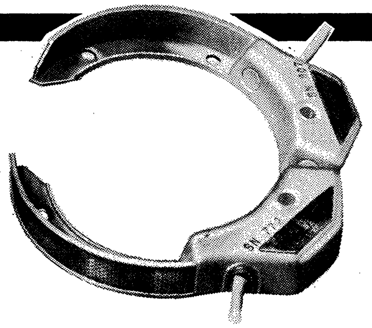
TYPE D Negative Temperature Coefficient Chip Thermistors

Resistance Ω @ 25° ± 10%	Nominal Dimension A	B	C	D	Style	Relative Dissipation Constant MW/°C	Relative Time Constant	Carborundum Part Number
500	.15	.15	.015		1	4.5	8.5	D1515C-1
1100	.10	.10	.015		1	3.0	6.0	D1010C-1
4400	.05	.05	.015		1	1.5	4.0	D0505C-1
88000	.10	.05	.015	.015	2	2.5	5.0	D1005C-1
88000	.20	.10	.015	.03	2	6.0	18.0	D2010C-1

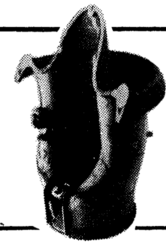
CARBORUNDUM

The Carborundum Company, Electronics Plant, Niagara Falls, N.Y. 14302, 716–278-2521

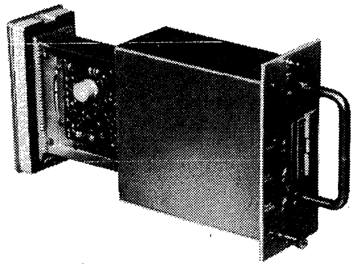
TEMPERATURE CONTROL FOR AEROSPACE



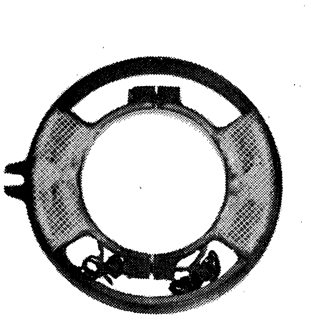
Temperature control system for LM rocket motors: Heater plus solid-state controller built to function over a 365°F. range.



Molded air-inlet duct with integral electrical heaters that provide anti-icing for helicopter engine.



Special oven to hold 60° ± 2°C in any ambient from −5 to +55°C. Warm-up time 20 minutes max. Designed for plug-in service and immediate access to circuit board for repairs.



Gyro supports, mass produced for a critical missile program. The metalwork is also supplied by Cox & Company, Inc. Heater resistance tolerance ±3%. Temperature sensor resistance tolerance ±.064% at 133°F.

In 1947 Cox & Company, Inc. pioneered in producing custom-made electrical heating elements and temperature control systems. In the middle fifties we began to supply electrical ice-protection equipment for aircraft. Today, having produced military and space qualified hardware in over 9,000 different designs, we remain a leader in the aerospace temperature control field. Our design, testing and manufacturing facilities, all devoted exclusively to thermal engineering, are in many respects unequaled in the aerospace industry. We believe that our products have records of performance and reliability that are unrivaled. There have been no reported failures of any of the more than two-and-a-half million Cox Thermopatch ® heating circuits in service, for example, except when there has been mechanical damage.

HEATING ELEMENTS

Cox-designed heating elements can be made to fit virtually any surface, including surfaces with compound curvature; they can be supplied in any suitable watt density distribution, with densities as high as heat transfer conditions permit. Cox heaters are made with a wide variety of materials and processes, the choices depending on the characteristics of the parts to which they will be mounted, environmental requirements and such customer specifications as flammability, toxicity and outgassing.

TEMPERATURE SENSORS AND CONTROLLERS

Cox produces surface-mounting resistance-element temperature sensors that combine mechanical flexibility and unusual ruggedness with high accuracy and stability. They are made flat but can be cemented in place on either flat or curved surfaces; if desired, a sensing element can be combined integrally with a heating element.

Cox has also developed precision mercury-in-glass thermostats which have been tested exhaustively for both durability and performance. These thermostats have been used in series with miniature solid-state amplifiers in a number of temperature control systems that have been qualified for manned space flight.

Solid-state controllers, using either resistance-wire sensors or thermistors as feedback elements, have been designed for many military and aerospace applications.

OVENS FOR CRYSTALS AND COMPONENTS

Cox is a major source for special production-run ovens and frequency standards custom-designed to meet previously unobtainable performance requirements: fast warm-up, with times under 2 minutes for temperature excursions exceeding 150°C and stability within ±.003°C over an ambient range of −65°C to +60°C.

COX & COMPANY, INC.

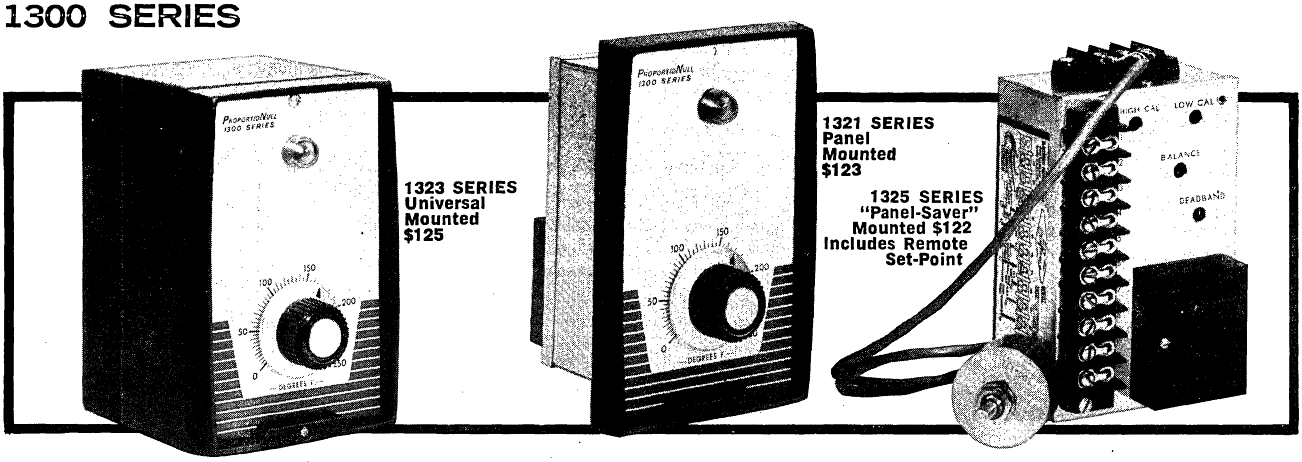
TEMPERATURE CONTROL FOR AEROSPACE
215 Park Avenue South, New York, N.Y. 10003 • (212) 674-4727

DOHRMANN
ENVIROTECH

DOHRMANN
Division of Envirotech Corporation
1062 LINDA VISTA AVENUE, MOUNTAIN VIEW, CALIFORNIA 94040
(415) 968-9710 • TWX 910-379-6972

PRECISION TEMPERATURE CONTROLS

1300 SERIES



1323 SERIES
Universal
Mounted
$125

1321 SERIES
Panel
Mounted
$123

1325 SERIES
"Panel-Saver"
Mounted $122
Includes Remote
Set-Point

1325 SERIES

Panel Saver Mounted	$114.00
A/N 300—500 Remote Set-Point	8.00
Total System Price	122.00
Option:	
A/N 300—501 Ten Turn Remote Set-Point	50.00
Total System Price	$164.00

STANDARD SENSORS

E157—1238 SENSOR	$21.00
E157—2367 AIR SENSOR	32.00

NOTE: Above sensors have an operational temperature limitation and will operate BETWEEN the limits of −100°F to +500°F. (Nickel-Iron Type)

E1057—1696 SENSOR	$35.00

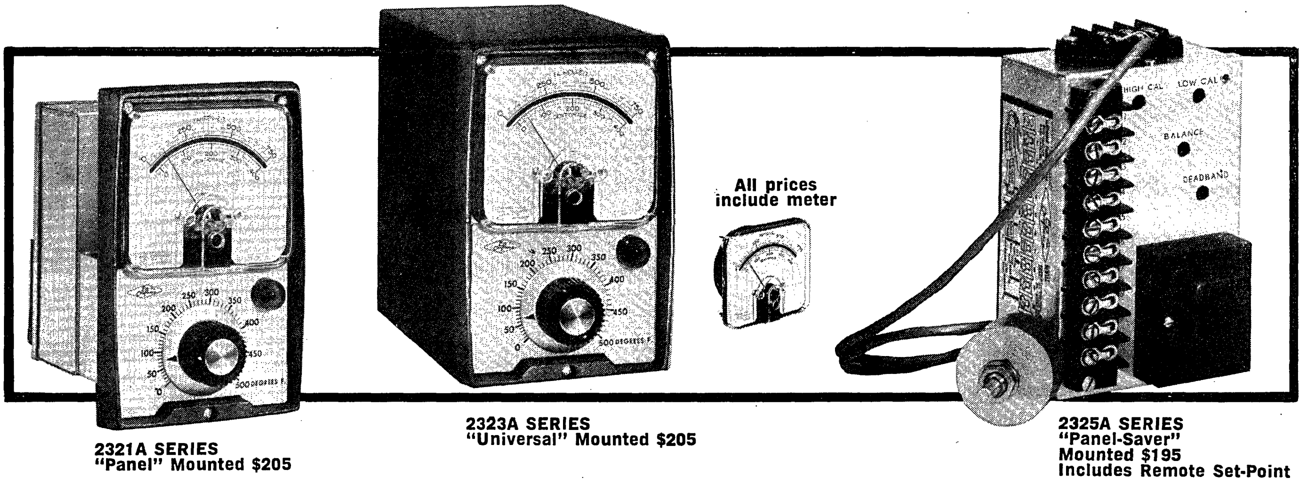
NOTE: The sensor is used for operating temperatures BETWEEN the limits of −350°F to +1200°. (Platinum Type)

DIMENSIONS

"A" Dimension	**"B" Dimension**
Sheath immersion length	Lead wire length
Standard = 4 inches (other lengths available)	Standard = 6 feet (other lengths available)

For other operational ranges, applications, etc. ask for our Sensor Price List.

2300 SERIES



All prices include meter

2321A SERIES
"Panel" Mounted $205

2323A SERIES
"Universal" Mounted $205

2325A SERIES
"Panel-Saver"
Mounted $195
Includes Remote Set-Point

DUPLEX SENSORS

Required with all models of this series.

Ranges within limits of −100°F to +500°F (nickel-iron type).

E157—2542 SENSOR	$27.00

Ranges which exceed 500°F (platinum type)

E1057—2586 SENSOR	$41.00
Option: Special 10 turn Remote Set-Point A/N 300—501	$45
E157—2564 AIR SENSOR	$38.00

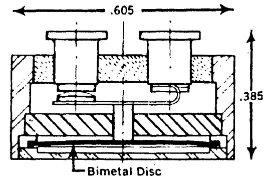
Prices subject to change without notice **Terms: Net 30 days** **F.O.B. Mountain View, California**

ELMWOOD® SUB-MINIATURE SNAP-ACTION THERMOSTATS

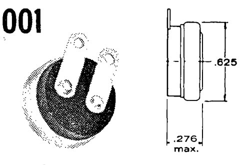
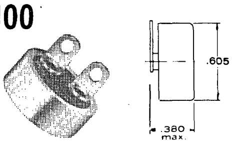
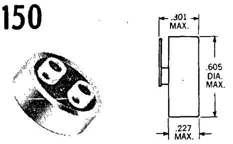
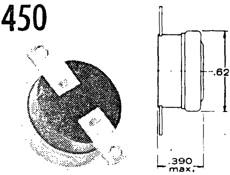
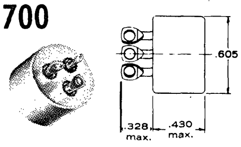
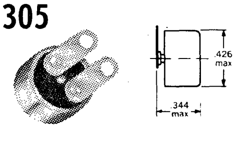
Elmwood thermostats are engineered for quick thermal response. Their heart is the bimetallic snap-acting disc which has proven highly reliable and serviceable over hundreds of thousands of cycles. Elmwood precision thermostats are manufactured and tested to conform to military specifications MIL-E-5272. Nickel plating is standard; other plating available. A variety of brackets and studs, as shown, are standard.

- **Many mounting arrangements**
- **Exposure from —65°F to +550°F**
- **Proven Military and Civilian Performance Record**
- **Narrow or Wide Differential**
- **Rated to 15 Amps.**
- **Immediate Delivery from Stock**
- **Custom Packaging**

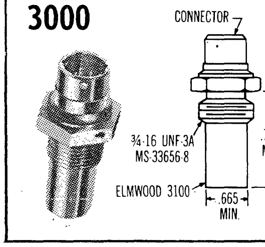
When contacts are closed, current passes from terminal to terminal through the stationary contact to the movable contact, which is actuated by the snap movement of bimetal disc. This disc, which is fully insulated from the switch chamber by the pin and disc retainer, is affected by surface or ambient temperature changes only. Upon reaching the opening temperature, the disc snaps from a concave to a convex shape, releasing the pin which opens the contacts. The open circuit allows the temperature to drop and causes the disc to snap to its original position, closing the contacts. A thermostat which closes on a rise in temperature operates in a similar manner, but in reverse action.



ELMWOOD #3100

DESCRIPTION	ELECTRICAL RESISTIVE		THERMAL		
	VOLTS	AMPS	RANGE	DIFFER-ENTIAL	TOLERANCE
3001  Precise, reliable unit for electronic communications, missile and aircraft controls, heater blanket controls and crystal ovens. This inexpensive unit is factory-calibrated, has the highest quality operating parts, a phenolic base and metal closure. These assure maximum dust protection and high thermal and electrical dependability. It is available with a variety of mountings and terminals. **Terminal T-123**	30 AC/DC	6	+0°F to +350°F	Wide 12°F or more STD	Wide ±5°F STD
	125 AC	6		Narrow 6°F Max.	Narrow ±3°F Min.
	250 AC	3		Avail. 80 to 200°F	
3100  This thermostat is hermetically sealed with high compression glass and heliarc welded steel case. It is so constructed as to withstand the severest environmental conditions such as altitude, shock, vibration and corrosive atmosphere. It has been extensively tested by government agencies, and has been used for many government and civilian purposes, such as aircraft warning controls, de-icing equipment, etc. Ideal for packaging in special enclosures. **Terminal T-116**	30 AC/DC	6	—10°F to +500°F	Wide 12°F or more STD	Wide ±5°F STD
	125 AC	6		Narrow 6°F Max.	Narrow ±3°F Min.
	250 AC	3		Avail. 80 to 200°F	
3150  Low silhouette SPST switch, hermetically sealed, available narrow or wide differential as standard. Temperature calibrations pre-set at factory, 100% inspected. Open or close on temperature rise. Heliarc welded in steel housing, glass-to-metal seal at terminal junction. Maximum resistance to shock and vibration. Ideal for use in heater blankets, computers, crystal ovens, electronic and radar equipment, gyros, airborne de-icers, etc. **Terminal T-109**	30 AC/DC	4	—10°F to +350°F	Narrow 6°F Max. Avail. 50 to 225°F	Narrow ±3°F STD
	125 AC	4		Wide 12°F or more STD	Wide ±5°F STD
3450  This inexpensive control unit is designed with either phenolic (up to 300°F) or ceramic base, and has a tight-fitting dust-proof metal closure. It is recommended for applications where its heavy electric construction makes it ideal to control high amperage uses. **Terminal T-101**	30 AC/DC	15	+0°F to +350°F	10°F Min.	±5°F STD
	125 AC	15			
	250 AC	8			
3700  A precision, single-pole double-throw, hermetically glass sealed, heliarc welded thermostat that is engineered to instantaneously reverse a signal from one circuit to another. Airborne and ground control equipment are ideal uses for this highly reliable thermal switch. **Terminal T-130**	30 AC/DC	2	+0°F to +350°F	12°F Min.	±5°F Min.
	125 AC	3			
	250 AC	2			
3305  Sub-miniature SPST, snap-action switch measuring only .426" in diameter, with narrow (±3°F) tolerance and narrow (6°F) differential. Hermetically sealed steel housing, glass-to-metal seal, all welded construction. Fast, reliable, excellent for crystal ovens, gyro platforms, heater blankets, computers, test equipment, etc. Three terminals and two brackets available. Temperature calibrations are factory preset. 100% thermally and mechanically inspected. **Terminal T-133**	30 AC/DC	2	+90°F to +250°F	Wide 20°F Max.	Wide ±8°F
	125 AC	2		Narrow 6°F Max.	Narrow ±3°F

3000



Custom designed package houses a non-adjustable, snap action Elmwood Sensors #3100 single-pole single-throw or #3700 single-pole double-throw thermostat. Performance characteristics are outlined in #3100 and #3700 information above. Housing material is stainless steel, all-welded construction. Customized connectors, size, and threads may be designed to suit requirements. Qualified by many military and aircraft applications; complete proposals are available upon request.

SOME PROTOTYPES AVAILABLE FROM STOCK

Elmwood also features a U.L. approved line of low-cost thermostats for Commercial Applications. Ask for Folder.

AVAILABLE MOUNTING BRACKETS

FIG. B208

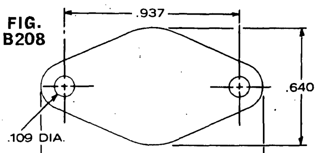


FIG. B209

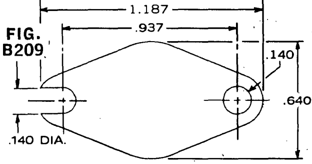


FIG. B210

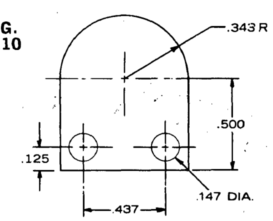


FIG. B211

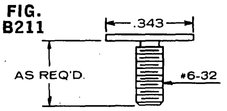


FIG. B212

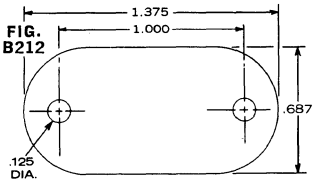
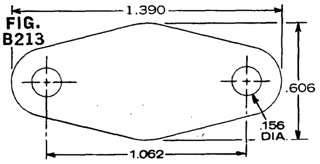


FIG. B213



SAMPLES AND ORDERING In order to facilitate the furnishing of proper samples, the following information should be included in RFQ's.

APPLICATION Description — military, industrial, other
Function — limit or control
Environmental exposure — dust, moisture, oil spray, other

AMBIENT TEMPERATURE EXPOSURE
Maximum, minimum

ELECTRICAL REQUIREMENTS
Resistive or Inductive
Amperage and Voltage

PHYSICAL REQUIREMENTS
Brackets (Stainless Steel only). If required, specify Fig. No. shown
Terminals — Specify No. shown

CALIBRATION
Opening temperature and tolerance
Closing temperature and tolerance

QUANTITY

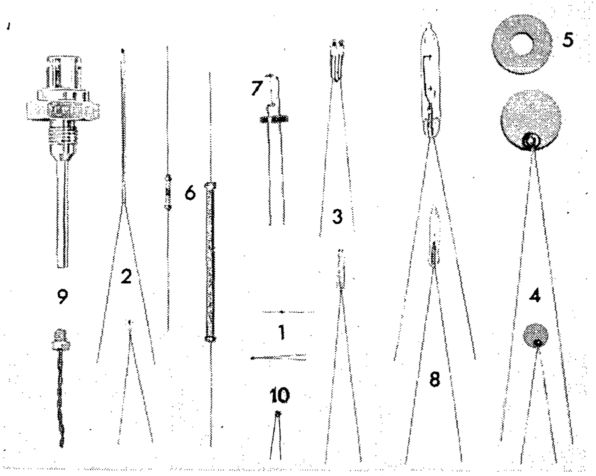
ELMWOOD SENSORS, INC.
1653 ELMWOOD AVENUE • CRANSTON, RHODE ISLAND 02907
PHONE (401) 781-6500 • TWX 710-381-6413

THERMISTORS from FENWAL ELECTRONICS

1. **Glass Coated Beads** — used where small size, fast response, high precision, stability, and temperatures to 600°F are required.
2. **Glass Probes** — medium-small in size. Many of the advantages of beads but rugged, more easily mounted, useful in liquid media.
3. **Iso-Curve*Interchangeable Thermistors** — these units available in bead or glass probe configurations, follow standard curves over wide temperature range, and are completely interchangeable. Units match standard curves as close as ±¼% of resistance or as required.

   * R.T.M.
4. **Discs** — used where medium power dissipation is a requirement and space not a problem. Useful to 300°F.
5. **Washers** — used where high power dissipation is a prime requirement.
6. **Rods** — these units have power dissipation intermediate between discs and washers and are also used where their physical shape is an asset.
7. **Mounted Beads** — provide ease in using glass beads in such applications as gas chromatography, flow and vacuum measurement, etc.
8. **Vacuum and Gas Filled Assemblies** — high power sensitivity for specialized circuit applications.
9. **Probe Assemblies** — standard catalog types or built to specific military or commercial requirements. We are experienced in design of probe assemblies for all fields of application including industrial control and indication, aerospace — specializing in telemetry applications, and oceanographic — featuring fast response, very high pressure, and interchangeability using our Iso-Curve Thermistors.
10. **NEW "LOW COST"**
    Uni-Curve* Interchangeable Thermistors — completely interchangeable units having an accuracy of ±0.2°C over a temperature range of 0°C to 70°C and available on special order to other tolerances and ranges.

*TM



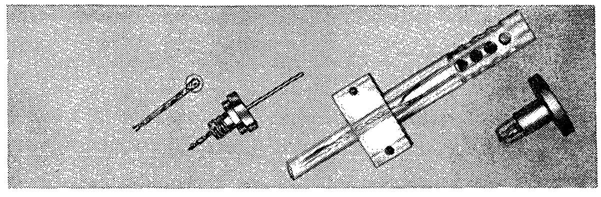
ISO-CURVE® Interchangeable Thermistors

F.E.I. Iso-curve* thermistors are special bead and glass probe thermistors that have been precision matched at the factory to standardized resistance-temperature curves. They have the unique and valuable characteristic of complete electrical interchangeability. In addition they offer all of the functional advantages associated with standard thermistors, including large resistance change per degree of temperature change which provides high accuracy and resolution.

Thermistors are normally rated by the value of their resistance at 77°F Standard units having the same rated resistance, however, will not exhibit identical resistance-versus-temperature characteristics over their full temperature range. Iso-curve thermistors, on the other hand, will match a specified R-T curve over full temperature range required. Iso-curve thermistors are available at the present time in six standardized R-T curve values: 500, 1K, 2K, 4K, 15K, and 100K ohms. These standard curves represent permanent specifications and an F.E.I. Iso-curve thermistor purchased five years from now will be perfectly interchangeable with one of the same value purchased today.

*MADE UNDER PAT. 3109227 AND OTHERS. ISO-CURVE IS A TRADEMARK OF F.E.I.

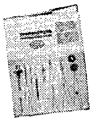
Thermistor Probe Assemblies



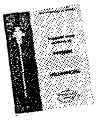
Standardized thermistor assemblies, provided in complete, ready-to-mount housings, enable you to take advantage of the precision and interchangeability of Fenwal Electronics thermistors. A complete line of thermistor probes is available for a variety of missile, aircraft, and industrial applications, including liquid level indication and control, temperature measurement and control of fluids and gases and many other applications. Precise calibration can be supplied with individual probes at all desired temperatures. Completely interchangeable probes with identical resistance-temperature curves are available to any desired tolerance down to 0.1°C over the full temperature range. Most of these housings can be made to meet military specifications if required.

Here's help in applying F.E.I. Thermistors . . .

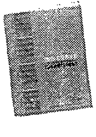
Fenwal Electronics



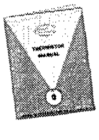
"Thermistors: Their Characteristics and Uses." Detailed bulletin gives basic information and many applications. Bulletin L-1.



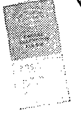
Thermistor Housing Manual (L-5). Detailed information on how Fenwal Electronics, Inc. can build thermistor sensor assemblies to fit your requirements.



Iso-Curve Thermistors (L-2). Complete data on patented interchangeable units with identical resistance/temperature curves.



Thermistor Manual (EMC-5). Most complete up-to-date listing of thermistors available. Theory, engineering data, complete specifications.



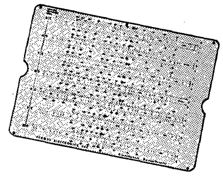
New 24-page Capsule Thermistor Course Book. A complete primer on thermistors, their characteristics and uses.

G-200. Kit contains 12 different thermistors with complete specs.
PRICE $19.95.

THERMISTOR EXPERIMENTAL KITS

G-700. (Above) Kit contains 4 thermistors. PRICE $4.95.

Now available . . . UNI-CURVE G-500 KIT containing 6 completely interchangeable thermistors ranging from 3K to 100K ohms. PRICE $19.95.



Thermistor Data & Curve Computer—(G300A) Provides resistance temperature characteristics for all F.E.I. Thermistors. Simplifies selection of the right thermistor for every application.
PRICE $1.50.

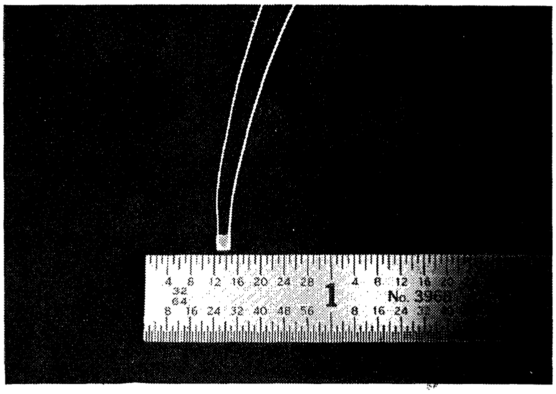
FENWAL ELECTRONICS, INC. 63 FOUNTAIN STREET, FRAMINGHAM, MASS. 01701 • (617) 872-8841

Gulton THERMISTORS

3 good reasons to look to Gulton for Thermistors

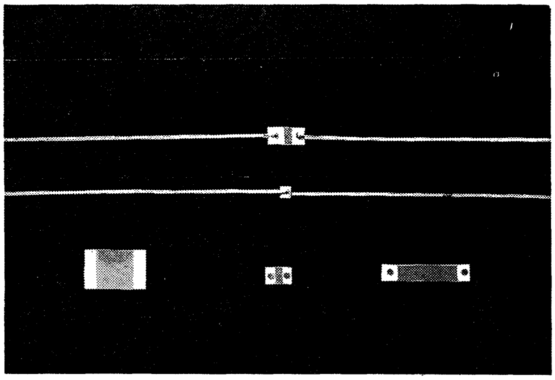
The broadest line of Interchangeable Thermistors

- Values from 1 through 100 K yield precision tracking from -55°C to +150°C



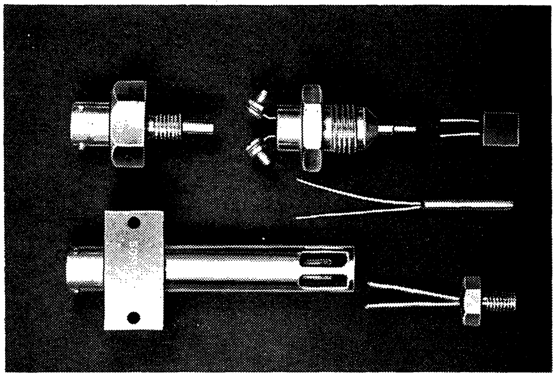
The only manufacturer of Chip Thermistors

- Small in size . . . ideal for tomorrow's microcircuits
- Values from 10 ohms to 10 megohms
- Terminations. . . Kovar tabs, gold plated nickel ribbon or silver



The greatest variety of Thermistor Probe Assemblies

- Standard or custom designed to your specifications
- For aerospace to medical applications
- From oceanography to lunar landings



Gulton manufactures a complete line of thermistors. . . beads, beads-in-bulbs, beads-in-probes, discs, rods and wafers. For information on Gulton thermistors, write to the Thermistor Department at the address below. In addition, Gulton engineers are available to discuss your thermistor requirements, and when necessary, to custom design thermistors and probes for your unique application.

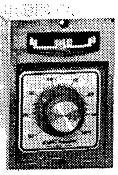
Gulton Industries, Inc. **Microceramics Division**

Metuchen, New Jersey 08840
Phone: 201-548-2800 • TWX-710-998-0592

HARREL PRECISION TEMPERATURE CONTROLS

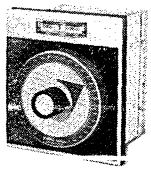
PROPORTIONAL TEMPERATURE CONTROLS

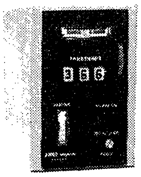
- ★ RELIABLE: Completely solid state. No tubes, relays or moving parts to wear out.
- ★ CLOSE CONTROL: Proportional plus automatic reset plus rate action eliminates temperature "droop" and ensures closer temperature control.
- ★ HIGH POWER: From a few watts to 300 KW; single phase or three phase; 115, 230, or 480 volts.
- ★ ANY TEMPERATURE RANGE: Control either heaters or coolers from −200° to +1100°C.



SINGLE TURN DIAL: Convenient direct reading dial for general purpose use.

TEN-TURN, DIRECT READING DIAL: Higher sensitivity than above plus 10-turn setting potentiometer for even closer temperature control. Direct read-out of temperature on large, 4½" dial.

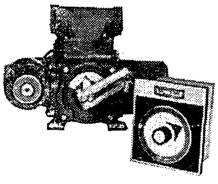


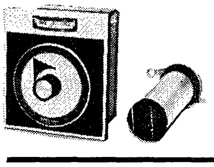


DIGITAL DIAL: Ten-turn potentiometer plus digital dial with 15/32" high numerals readable from 30 ft. away! Includes front panel on-off switch, pilot light and power output meter.

PROPORTIONAL VALVE CONTROLS

For process control applications where temperature is varied by means of motor-driven proportional valves. Three mode, heavy duty construction.

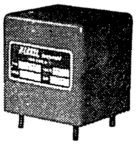




INFRARED SENSING

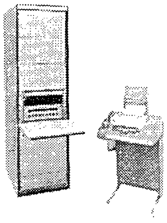
Where temperature must be controlled without touching the controlled body. Temperature ranges 25°C to 3000°C.

FIXED TEMPERATURE CONTROLLERS HIGH RELIABILITY MILITARY TYPES



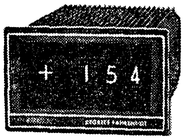
Precision temperature control to a single selected temperature. Ideal for close temperature control of floated gyros, delay lines, or other military or industrial applications. Available for operation from a-c or d-c. Output true proportional or RFI-free.

COMPUTER CONTROLLED SYSTEMS



Complete computer control and monitoring systems of temperature, pressure, time sequencing, etc. in an entire plant full of extruders, injection molding machines, environmental test equipment, etc. PLUS — tape programmers, arbitrary function programmers, cam programmers and switching type programmers.

TEMPERATURE INDICATORS

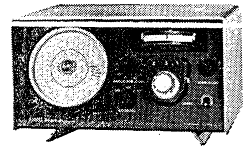


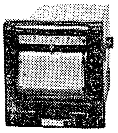
DIGITAL STYLE:

Direct digital read-out of temperature in large, 9/16" numerals. Automatic polarity change. BCD electrical output optional. Also available in conventional meter style.

TEMPERATURE RECORDERS

LABORATORY TYPE: Expanded scale readout spreads ranges as small as 2/3°C over entire scale. Eleven ranges give 0.02% accuracy.

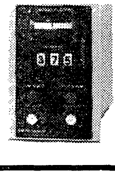


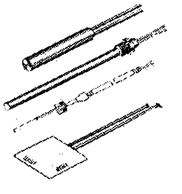


PANEL MOUNT, STRIP CHART TYPE: For continuous indication and recording of temperature at remote points.

TEMPERATURE ALARMS

Continuous monitoring of temperature at a remote point. Initiates high or low alarm whenever temperature deviates more than a prescribed amount.

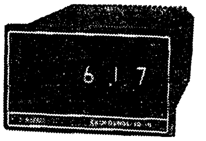




TEMPERATURE SENSORS

Wire type resistance sensors provide maximum sensitivity, linearity, & long term stability. Available in patch type for surface measurement, tubular styles, bayonet mount styles, or for air sensing.

PRESSURE INSTRUMENTATION

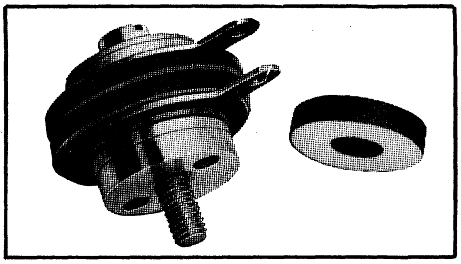


A complete line of pressure indicators, pressure recorders, pressure alarms, and pressure sensors.

PLUS . . . special controllers for heating and cooling; relay styles; controls for thermoelectronic coolers; humidity controls; complete temperature control systems and consoles. SEND US YOUR REQUIREMENTS.

HARREL, incorporated 16 Fitch Street, East Norwalk, Conn. 06855; Phone: (203) 866-2573

Keystone
CARBON COMPANY

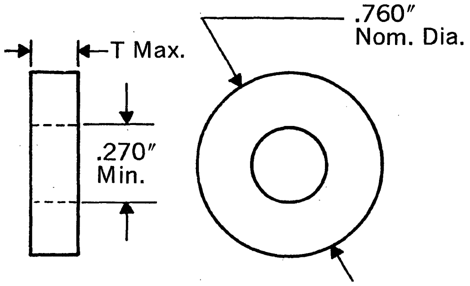


WASHER THERMISTORS

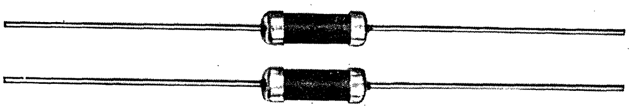
In situations where a thermistor is required to handle a relatively large amount of power, Keystone washer type thermistors provide a means of obtaining high power handling capability in a small, economical package. In addition, washer type thermistors are also very useful where mounting conditions do not permit the use of conventional component mounting methods.

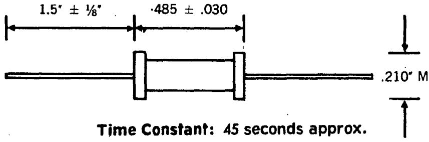
Maximum operating temperature 150°C. Standard units are supplied without leads. Units are uninsulated.

KCC PART NUMBER	RESISTANCE @ 25°C ±10%	TEMP. COEF. %/°C @ 25°C	RATIO 37.8 °C 104.4 °C	BETA °K 37.8 °C 104.4 °C	DIMENSION "T"
7611-W28-19.65-73-S1	31.5	−3.83	7.3	3505	.135
7605-W28-58.2-97-S1	100	−4.40	9.7	4005	.070
7615-W28-183.2-97-S1	315	−4.40	9.7	4005	.175
7613-W28-1K-131-S1	1850	−4.98	13.1	4535	.155
7615-W28-2580-141-S1	4840	−5.09	14.1	4665	.175
7611-W28-5230-155-S1	10K	−5.22	15.5	4830	.135



ROD TYPE THERMISTORS





Leads: T.C. AWG #20 **Dissipation Constant:** 9MW/°C Approx. **Time Constant:** 45 seconds approx.
Tolerance: ±10% at 25°C **Max. Operating Temperature:** 125°C

TYPE	RESISTANCE AT °C							BETA ±10% (37.8-104.4°C)	R @ 25°C / R @ 125°C	Neg. Temp. Coef. @ 25°C
	0	25	37.8	50	75	104.4	125			
LOW/MEDIUM TEMPERATURE COEFFICIENT										
15-20-35-S1	30.6	20	16.4	13.8	9.90	7.01	5.65	1500	3.5	1.59
15-50-42-S1	80.6	50	40.1	32.9	22.6	15.3	11.9	1700	4.2	1.78
15-100-42-S1	161	100	80.2	65.8	45.3	30.6	23.8	1700	4.2	1.78
15-200-42-S1	322	200	160	132	90.6	61.2	47.7	1700	4.2	1.78
15-500-50-S1	847	500	391	314	206	133	100	1900	5.0	1.98
15-1K-50-S1	1690	1K	782	628	413	266	201	1900	5.0	1.98
15-2K-52-S1	3430	2K	1560	1240	808	515	387	1950	5.2	2.03
15-5K-54-S1	8680	5K	3860	3060	1980	1240	924	2000	5.4	2.07
15-10K-54-S1	17.4K	10K	7730	6130	3950	2480	1850	2000	5.4	2.07
15-20K-59-S1	35.6K	20K	15.3K	12K	7560	4640	3400	2100	5.9	2.17
15-50K-62-S1	90K	50K	37.9K	29.5K	18.5K	11.2K	8120	2150	6.2	2.22
HIGH TEMPERATURE COEFFICIENT										
15-1K-139-S1*	2500	1K	656	451	227	111	71.9	3150	13.9	3.38
15-2K-139-S1*	4990	2K	1310	902	454	222	144	3150	13.9	3.38
15-5K-181-S1	13.7K	5K	3150	2100	979	450	276	3425	18.1	3.74
15-10K-192-S1	28.2K	10K	6240	4100	1890	855	520	3500	19.2	3.83
15-20K-292-S1	67.2K	20K	11.6K	7140	2920	1190	685	4000	29.2	4.46
15-50K-292-S1	168K	50K	28.9K	17.8K	7320	2980	1710	4000	29.2	4.46
15-100K-404-S1	372K	100K	55K	32.4K	12.2K	4540	2080	4400	40.4	4.86
15-200K-424-S1	753K	200K	109K	63.9K	23.9K	8740	4720	4450	42.4	4.91
15-500K-482-S1	1.95meg	500K	268K	154K	55.6K	19.7K	10.4K	4600	48.2	5.03
15-1meg-583-S1	4.06meg	1meg	523K	294K	100K	33.7K	17.1K	4830	58.3	5.22

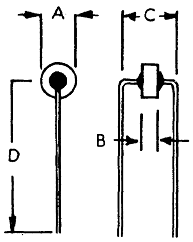
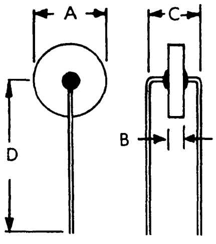
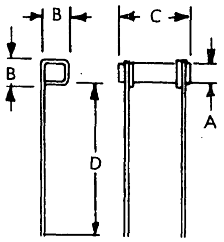
*Supplied with ±20% tolerance at 25°C only.

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-834-1591 • Telex No. 91-715

Keystone CARBON COMPANY

KEYSTONE LOW-COEFFICIENT THERMISTORS

For applications such as coil compensation which require a low temperature coefficient thermistor, Keystone offers the low coefficient, series 2 group of thermistors listed below. To specify a unit on this list, specify the code number followed by the resistance at 25°C. For example, a 1RS1-100 is a disc .2″ diameter and .1″ thick having a resistance of 100 ohms ±10% at 25°C. Various coatings, tolerance patterns and lead configurations are available on request.

CODE NUMBER	1RS1	2RS1	3RS1
TYPE	DISC	DISC	RECT. ROD
STANDARD LEAD CONFIGURATION			
Leads	AWG 20 (.032 Dia.)	AWG 20 (.032 Dia.)	AWG 24 (.020 Dia.)
Material	Tinned Copper	Tinned Copper	Tinned Copper
Diss. Constant	10 mw/°C	16 mw/°C	10 mw/°C
Time Constant	55 Sec.	85 Sec.	75 Sec.
Max. Watt Rating	1¼ Watts	2 Watts	1¼ Watts
Dimensions A	.200 ± .020	.500 ± .025	.150 ± .025
in B	.100 ± .020	.100 ± .020	.260 Maximum
Inches C	.375 ± Nominal	.375 ± Nominal	.500 ± .050
D	1½ Minimum	1½ Minimum	1½ Minimum

BETA* Degrees Kelvin	Negative Temperature Coefficient %/°C @ 25°C	1RS1 R @ 25°C	2RS1 R @ 25°C	3RS1 R @ 25°C
1000	1.14	5	.75*	20
1050	1.18	10	1.5	45
1100	1.23	15	2.5	70
1600	1.69	275	45	1200
1700	1.78	425	70	1900
1800	1.88	650	100	2900
1900	1.98	1000	150	4200
2000	2.07	1400	220	6000
2100	2.17	2000	330	9000

*Supplied with ±20% tolerance at 25°C only. Correct type number is 2RS2-.75.

*BETA is calculated between the temperatures of 37.8 and 104.4°C. Tolerance on Beta is ±15% for Betas of 1000°K to 1100°K and ±10% for Betas of 1600°K to 2100°K.

Standard resistance tolerance is ±10% @ 25°C. Other tolerances are available upon request.

Standard thermistors are supplied without coating.

Maximum operating temperature: 150°C.

Lead lengths conforming to printed circuit requirements are available on request.

CRYOGENIC THERMISTORS

TYPE	For Operation In Liquids	Resistance	Temperature Coefficient
RL10X04-10K-315-S5	Oxygen	10K	− 8.4%/°C
	Nitrogen	31.5K	−10.4%/°C
RL06X0628-31.7K-315-S5	Oxygen	31.7K	− 8.4%/°C
	Nitrogen	100K	−10.4%/°C
L0904-6.6K-H-T2	Hydrogen	6.6K	−13.0%/°C
L0904-125K-H-T2	Hydrogen	125K	−17.0%/°C
L0904-180K-H-T2	Hydrogen	180K	−18.0%/°C
L0904-100K-HE-T2	Helium	100K	−275 %/°C
L0904-3meg-HE-T2	Helium	3 meg.	−300 %/°C

Physical size of these units is approximately .1″ diameter, and .04″ thick, except the RL06X0628, which is a rod, .06″ square and .28″ long. Units are also available in TO-5 can mountings.

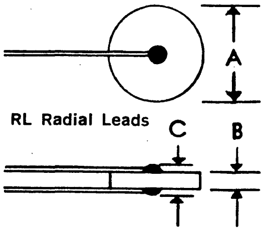
Low Temperature Types—Designed for operation in various cryogenic liquids these units are especially useful for liquid level detection. In this type of application the thermistor is slightly self-heated by passing a small current through the unit. The heat developed in the unit is dissipated more rapidly in the liquid than when the thermistor is above the liquid. The resulting change in body temperature results in a change in resistance which is easily detected because of the high temperature coefficient of the thermistor. The units listed in the table are standard low temperature thermistors.

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-834-1591 • Telex No. 91-715

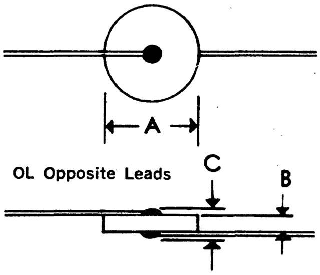
Keystone CARBON COMPANY

DISC TYPE THERMISTORS
SERIES NO. 1

TYPE	ROW NUMBER	E		S		F		B		RESISTANCE RATIO	NEGATIVE TEMPERATURE COEFFICIENT
MAX. WATTAGE RATING (WATTS)		0.36		0.82		0.88		1.00			
DISSIPATION CONSTANT (MW/°C)		2.9		6.6		7.0		8.0			
TIME CONSTANT (SECONDS)		10		45		50		60			
THERMISTOR DIA. (IN.) A		.10 ±.010		.12 ±.010		.20 ±.020		.30 ±.020			
THERMISTOR THK. (IN.) B		.03 ±.010		.15 ±.025		.06 ±.015		.06 ±.015			
MAX. THK. OVER LEADS (IN.) C		.100		.260		.150		.150			
LEAD SIZE (A.W.G.)		30		24		24		24			
TEMPERATURE °C		37.8	25	37.8	25	37.8	25	37.8	25	37.8°C/ 104.4°C	%/°C @25°C
	1	196	311.0	682	1082	98.0	155.4	43.6	69.1	7.0	3.74
	2	248	397.5	862	1382	124	198.8	55.0	88.2	7.3	3.83
	3	304	492	1060	1717	152	246.0	67.5	109.4	7.6	3.92
	4	356	581	1240	2020	178	290.5	79.0	128.8	7.8	3.98
	5	432	712	1500	2470	216	356.0	95.9	158.0	8.1	4.06
	6	489	811	1700	2820	244	405	109	180.8	8.3	4.12
	7	600	1006	2090	3500	300	503	133	223.0	8.6	4.20
	8	718	1215	2500	4230	359	607	160	270.5	8.9	4.28
	9	860	1469	2990	5110	430	734	191	326.0	9.2	4.35
	10	993	1712	3460	5970	497	857	221	381.0	9.5	4.43
	11	1070	1850	3720	6430	535	925	238	412	9.7	4.46
	12	1340	2330	4650	8100	668	1163	297	517	10.0	4.51
	13	1550	2710	5390	9430	774	1354	344	602	10.2	4.55
	14	1930	3400	6730	11850	966	1701	429	755	10.5	4.60
	15	2240	3960	7800	13800	1120	1981	498	881	10.7	4.63
	16	2600	4620	9040	16060	1300	2310	577	1025	10.9	4.67
	17	3010	5370	10500	18730	1510	2695	669	1193	11.1	4.70
	18	3490	6250	12200	21850	1740	3115	776	1390	11.3	4.73
	19	4050	7280	14100	25350	2020	3630	899	1616	11.5	4.76
	20	5050	9140	17600	31850	2520	4560	1120	2025	11.8	4.81
	21	5860	10640	20400	37050	2930	5320	1300	2360	12.0	4.84
	22	7310	13350	25500	46600	3660	6680	1620	2960	12.3	4.88
	23	8470	15520	29500	54000	4240	7770	1880	3445	12.5	4.91
	24	10600	19510	36800	67700	5290	9740	2350	4330	12.8	4.94
	25	13200	24400	46000	85100	6600	12210	2940	5440	13.1	4.98
	26	16500	30650	57400	106700	8240	15320	3660	6800	13.4	5.01
	27	20600	38450	71600	133700	10300	19230	4570	8530	13.7	5.05
	28	25700	48200	89400	167600	12800	24000	5710	10710	14.0	5.08
	29	32100	60400	112000	211000	16000	30100	7130	13420	14.3	5.11
	30	40000	75600	139000	263000	20000	37800	8900	16830	14.6	5.14
	31	46400	88000	162000	307000	23200	44000	10300	19530	14.8	5.16
	32	53800	102300	187000	355500	26900	51100	12000	22800	15.0	5.18
	33	62300	118700	217000	414000	31200	59500	13900	26500	15.2	5.20
	34	77900	149000	271000	518000	38900	74400	17300	33100	15.5	5.22



RL Radial Leads



OL Opposite Leads

Units on this list are available in the two lead configurations shown above. Standard tolerance is ±10% at 37.8°C, with ±10% @ 25°C also available. Tolerance on resistance ratio is ±.3. Maximum operation temperature is 150°C. To specify a unit on this list, first indicate RL or OL for lead configuration. Next list the row number, the column number and the number 1 for series "1". If the tolerance is to be at 25 rather than 37.8, add a "T". For example, an RL23S1T is a unit having radial leads and a resistance of 54000 ohms ±10% at 25°C.

Keystone also supplies larger size disc units up to and including 1.00 inch in diameter. For more information on these larger discs, request the complete Keystone catalog.

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-834-1591 • Telex No. 91-715

Keystone CARBON COMPANY

DISC TYPE THERMISTORS WITH CROSSED LEADS

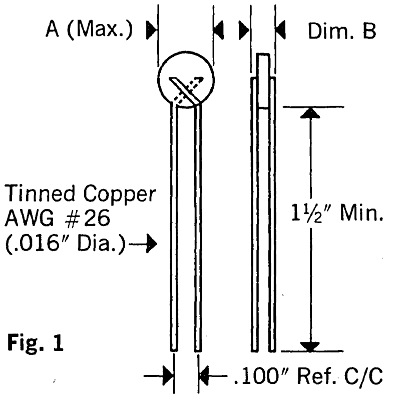

A (Max.)
Dim. B
Tinned Copper
AWG #26
(.016″ Dia.)
1½″ Min.
.100″ Ref. C/C

Fig. 1

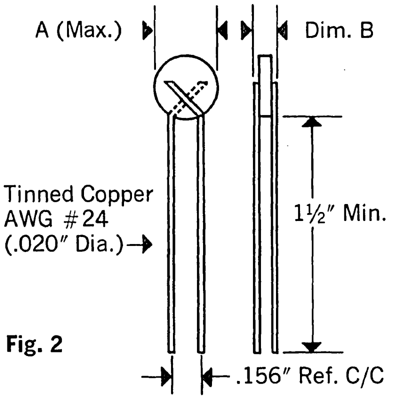

A (Max.)
Dim. B
Tinned Copper
AWG #24
(.020″ Dia.)
1½″ Min.
.156″ Ref. C/C

Fig. 2

- Improved stability at higher temperatures
- Fast time response
- Low cost reliable unit for intermediate power ranges

All parts dip soldered

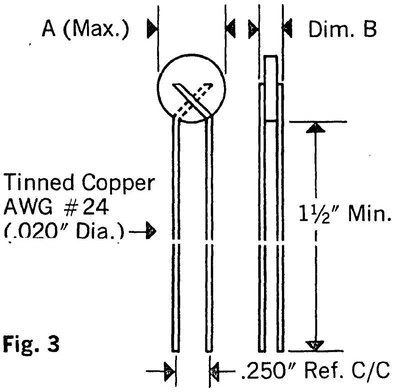

A (Max.)
Dim. B
Tinned Copper
AWG #24
(.020″ Dia.)
1½″ Min.
.250″ Ref. C/C

Fig. 3

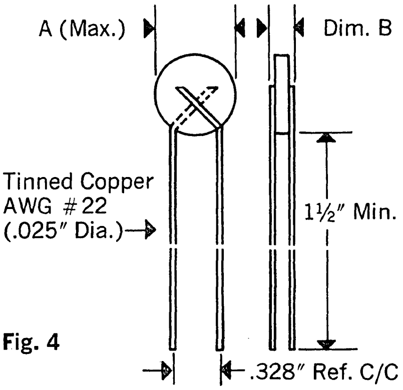

A (Max.)
Dim. B
Tinned Copper
AWG #22
(.025″ Dia.)
1½″ Min.
.328″ Ref. C/C

Fig. 4

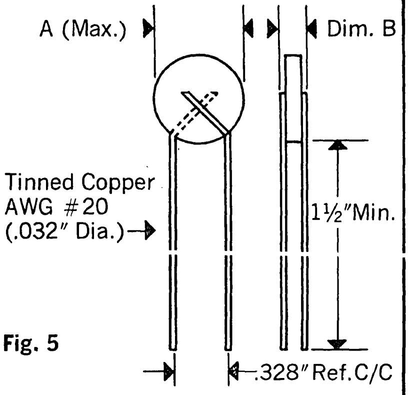

A (Max.)
Dim. B
Tinned Copper
AWG #20
(.032″ Dia.)
1½″Min.
.328″Ref.C/C

Fig. 5

KCC TYPE	R @ 25°C	Fig. 1	A Max.	B Max.	Ratio R @ 25°C/R @ 125°C	Temp. Coef. % per °C at 25°C
RL1004-65.6-59-D1	100 ohms ±20%	1	.110″	.120″	13.91	−3.38
RL1003-312-73-D1	500 ohms ±10%	1	.110″	.110″	19.22	−3.83
RL1007-624-73-D1	1000 ohms ±10%	1	.110″	.160″	19.22	−3.83
RL1013-1248-73-D1	2000 ohms ±10%	1	.110″	.225″	19.22	−3.83
RL1003-1746-97-D1	3000 ohms ±10%	1	.110″	.110″	29.28	−4.39
RL1004-2910-97-D1	5000 ohms ±10%	1	.110″	.120″	29.28	−4.39
RL1009-5820-97-D1	10000 ohms ±10%	1	.110″	.180″	29.28	−4.39
RL2004-16.4-59-D1	25 ohms ±20%	2	.220″	.125″	13.91	−3.38
RL2007-32.8-59-D1	50 ohms ±20%	2	.220″	.165″	13.91	−3.38
RL2003-62.4-73-D1	100 ohms ±10%	2	.220″	.115″	19.22	−3.83
RL2005-124.8-73-D1	200 ohms ±10%	2	.220″	.140″	19.22	−3.83
RL2008-187.1-73-D1	300 ohms ±10%	2	.220″	.175″	19.22	−3.83
RL2013-312-73-D1	500 ohms ±10%	2	.220″	.230″	19.22	−3.83
RL2004-582-97-D1	1000 ohms ±10%	2	.220″	.125″	29.28	−4.39
RL2007-1164-97-D1	2000 ohms ±10%	2	.220″	.165″	29.28	−4.39
RL2010-1746-97-D1	3000 ohms ±10%	2	.220″	.195″	29.28	−4.39
RL3004-6.56-59-D1	10 ohms ±20%	3	.320″	.125″	13.91	−3.38
RL3504-31.2-73-D1	50 ohms ±10%	3	.370″	.125″	19.22	−3.83
RL4004-174.6-97-D1	300 ohms ±10%	3	.420″	.125″	29.28	−4.39
RL4504-3.28-59-D1	5 ohms ±20%	4	.475″	.130″	13.91	−3.38
RL4504-15.6-73-D1	25 ohms ±10%	4	.475″	.130″	19.22	−3.83
RL4504-116.4-97-D1	200 ohms ±10%	4	.475″	.130″	29.28	−4.39
RL7605-6.24-73-D1	10 ohms ±20%	5	.795″	.150″	19.22	−3.83
RL7605-58.2-97-D1	100 ohms ±10%	5	.795″	.150″	29.28	−4.39

Maximum operating temperature: 125°C

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-834-1591 • Telex No. 91-715

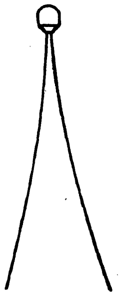
Keystone
CARBON COMPANY

MOLDED-IN-LEAD BEAD AND ROD THERMISTORS

Using a technique developed at Keystone, these units feature leads which are molded directly into the body of the thermistor. This technique yields a more reliable thermistor and by eliminating several operations permits lower prices. These units are particularly intended for applications where small size and fast response are major requirements.

TYPE	RESISTANCE AT °C:						
	0	25	37.8	75	104.4	150	260
L0504-329-59-M2	1245	500	329	114	56	22.4	*
L0504-550-71-M2	2480	878	550	169	77	29	5.5
L0504-1220-81-M2	6210	2000	1220	344	151	53	9
L0504-1248-73-M2	5520	1984	1248	376	171	62	*
L0504-1500-85-M2	8010	2515	1500	409	176	61	10.5
L0504-5000-95-M2	27.7K	8560	5000	1290	526	168	23.4
L0504-33.3K-125-M2	221K	60.4K	33.3K	7380	2665	711	70.6
L0504-55K-120-M2	360K	100K	55K	12.5K	4.58K	1246	127.6

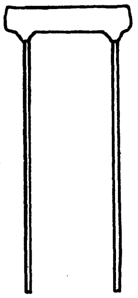
* These units processed for operation to 150°C maximum; All others, to 260°C Max.
"M2" in the above type numbers designates ±10% tolerance on resistance at 25°C.



Physical size: .065″ dia. max., .085″ long max.
Leads: .004″platinum, ½″ long
Dissipation Constant: 0.6 MW/°C Approx.
Time Constant: 7.5 seconds Approx.
All units are coated with a protective green glaze.

TYPE	RESISTANCE AT °C:						
	0	25	37.8	75	104.4	150	260
L060637-6K-85-M2	31.8K	10.1K	6000	1640	706	242	40.7
L060637-10K-85-M2	52.2K	16.7K	10K	2750	1175	403	67.8
L060637-22K-95-M2	122K	37.5K	22K	5700	2315	739	104
L060637-45K-103-M2	266K	78.2K	45K	11.1K	4370	1314	166
L060637-60K-103-M2	355K	104K	60K	14.8K	5830	1750	222
L060637-200K-120-M2	1.3meg	363K	200K	45K	16.7K	4520	520
L060637-350K-125-M2	2.35meg	637K	350K	76.5K	28K	7630	793
L060637-1.4meg-145-M2	10.2meg	2.62meg	1.4meg	284K	96.6K	23.8K	2070

"M2" in the above type numbers designates ±10% tolerance on resistance at 25°C.



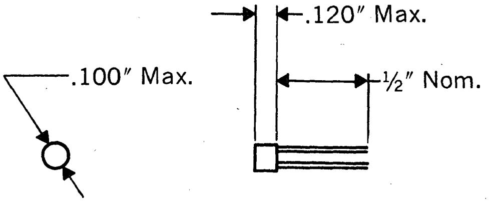
Physical size: .120″ dia. max. .420″ long max.
Leads: .010″ platinum, ¾″ long
Dissipation Constant: 2.8 MW/°C Approx.
Time Constant: 35 seconds Approx.
Maximum Operating Temperature: 260°C.
All units are coated with a protective green glaze.

GLASS BEAD THERMISTORS

TYPE	RESISTANCE AT °C						
	−21.5°C	0°C	25°C	37.8°C	50°C	104.4°C	150°C
RL0504-614.8-71-G1 *(a)*	7.680K	2.775K	1K	614.8	398.5	86.6	32.85
RL0504-55.53K-120-G1 *(b)*	1.286 meg	364.5K	100K	55.53K	33K	4.62K	1.284K
RL0504-272.6K-142-G1 *(c)*	7.385 meg	1976K	500K	272.6K	158.7K	19.09K	4.7K

"G1" in the above type numbers designates ±20% tolerance on resistance of 25°C.
(a) Temp. coefficient −3.88%/°C @ 25°C
(b) Temp. coefficient −4.80%/°C @ 25°C
(c) Temp. coefficient −5.04%/°C @ 25°C

Glass bead thermistors are exceptionally stable because the glass seal protects the thermistor from hostile environmental conditions. Most glass beads are mounted into probes for their end use application.



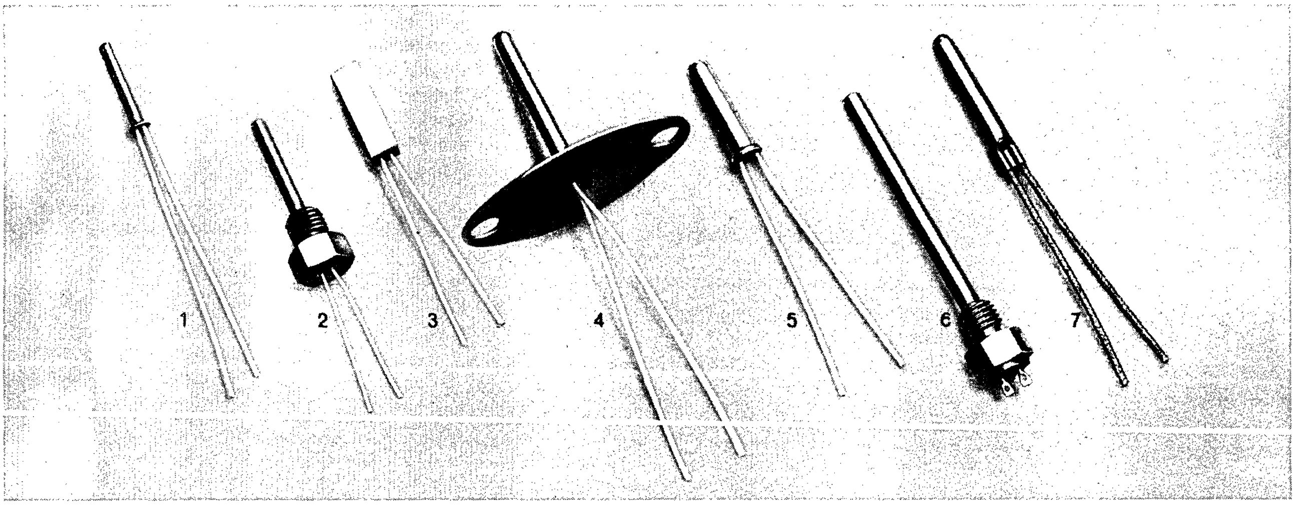
Leads: Two AWG #38 (.004″ dia.) platinum wire
Dissipation Constant: 0.75mw/°C @ 25°C approx.
Time Constant: 16 seconds approx.
Insulation: Glass encapsulated
Maximum Operating Temperature: 260°C

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-834-1591 • Telex No. 91-715

Keystone
CARBON COMPANY

VERSATILITY YOU CAN USE IN THERMISTOR PROBES

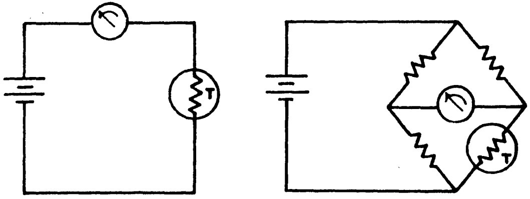
The probes illustrated below include stainless steel, aluminum, and chrome plated materials in a variety of configurations. Any thermistor listed in the table below can be provided in one or all of the probes pictured. In addition, a variety of other designs are available. These probes are used in conjunction with solid state circuitry for liquid level measurement, and for use as sensors to measure the temperature of liquids or surface temperatures. For full particulars, write detailing your proposed application.



KEYSTONE TYPE	THERMISTOR RESISTANCE					
	0°C	150°C	25°C	37.8°C	104.4°C	232°C
370603-62.66-71-S	282.6	3.308	100	62.66	8.825	.8910
370603-119.1-85-S	631.2	4.800	200	119.1	14.01	1.174
370603-375.3-95-S	2132	12.76	650	375.3	39.48	2.826
0503-630-71-S	2750	33.26	1K	630.0	88.80	8.800
370603-1145-103-S	6733	33.78	2K	1145	111.1	6.607
370603-2801-120-S	18.23K	64.42	5K	2801	233.6	11.18
370603-4452-125-S	29.74K	96.61	8K	4452	356.2	16.29
060337-6266-71-S	28.26K	330.8	10K	6266	882.5	89.10
060337-11910-85-S	63.12K	480.0	20K	11.91K	1401	117.4
0503-16920-112-S	105.3K	426.4	30K	16.92K	1511	83.20
060337-37.53K-95-S	213.2K	1276	65K	37.53K	3948	282.6
0503-55.3K-125-S	361.0K	1153	100K	55.30K	4420	189.6
060337-114.5K-103-S	673.3K	3378	200K	114.5K	11.11K	660.7
060337-280.1K-120-S	1.823 meg	6442	500K	280.1K	23.36K	1118
060337-445.2K-125-S	2.974 meg	9661	800K	445.2K	35.62K	1629
050446-556.5K-125-S	3.717 meg	12.08K	1 meg	556.5K	44.52K	2037

All parts 260°C Max. operating temperature.

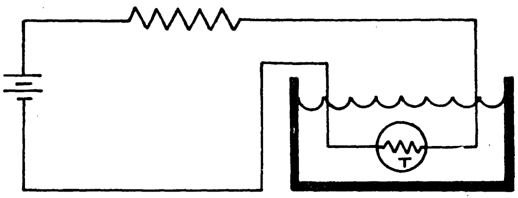
for temperature measurement



Circuit A Circuit B

Combining high temperature sensitivity with high signal level, thermistors are ideally suited for temperature sensing. In circuit A, as the temperature of the thermistor increases, its resistance decreases, allowing more current to flow. If additional sensitivity is required, a bridge circuit like that shown at B may be used.

for liquid level detection

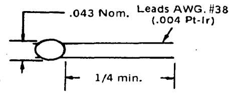


The thermistor is slightly self-heated by passing a small current through the unit. The heat developed in the unit is dissipated more rapidly in the liquid than when the thermistor is above the liquid. The resulting change in body temperature results in a change in resistance. This in turn causes a change in the current in the circuit which can be detected by a relay or other means.

Keystone CARBON COMPANY
Thermistor Division • St. Marys, Pa. 15857
814-834-1591 • Telex No. 91-715

THERMISTORS

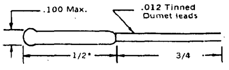
BEAD



Glass coated bead Thermistors. These are small size with fast response, and improved high-temperature stability up to 400°C. Leads are fired-in platinum iridium.

Cat. No.	Zero Power Resistance at 25°C,	Res. Ratio 25°C/125°C	Diss. Const. in W/°C	Time Const.
81B-202	2,000	19.8	0.7	2 Sec.
81B-503	50,000	35.0		
81B-154	150,000	39.7		
81B-504	500,000	46.5		
81B-105	1,000,000	51.5		

BEAD PROBES

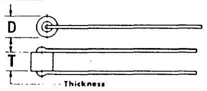


Rugged glass bead probes. Tinned Dumet leads. Max. temp. 400°C, ± 20% Tol.

*Bead probes also available in 2" lengths.

Cat. No.	Zero Power Resistance at 25°C,	Res. Ratio 25°C/125°C	Diss. Const. in W/°C	Time Const.
81G-202	2,000	19.8	1.0	25 Sec.
81G-503	50,000	35.0		
81G-154	150,000	39.7		
81G-504	500,000	46.5		
81G-105	1,000,000	51.5		

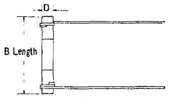
DISCS



Disc shaped Thermistors with Close Electrical Tolerances.

Cat. No.	Resistance 25°C ± 10%	Res. Ratio 25°C/125°C	Diss. Const. in W/°C	Time Const. (sec.)	D (Norm)	T (Norm)
4D051	200,000	48.78	2	4.5	0.050	0.048
4D053	100,000	48.78		3.5		.024
1D051	20,000	29.85		4.5		.048
1D053	10,000	29.85		3.5		.024
2D052	2,000	19.80		4		.034
2D054	1,000	19.80		3		.017
3D052	200	12.95		4		.034
3D054	100	12.95		3		.017
1D101	10,000	29.85	4	12	0.1	.095
1D103	5,000	29.85		8		.048
2D102	1,000	19.80		10		.070
2D104	500	19.80		6		.035
3D102	100	12.95		10		.070
3D104	50	—		6		.035
1D201	3,000	29.85	8	34	0.2	.114
1D203	1,000	29.85	7.5	19		.038
2D202	300	19.80	8	28		.084
2D204	100	19.80	7.5	16		.028
3D202	30	12.95	8	28		.084
3D204	10	12.95	7.5	16		.028
1D301	3,000	29.85	11.5	85	0.3	.256
1D303	1,000	29.85	9.0	48		.086
2D302	300	19.80	10.5	75		.189
2D304	100	19.80	8.5	38		.063
3D302	30	12.95	10.5	75		.189
3D304	10	—	8.5	38		.063
1D401	1,000	29.85	15.5	80	0.4	.152
1D403	250	—	14	35		.038
2D402	100	—	15.5	70		.112
2D404	25	—	14	25		.028
3D402	10	12.95	15.5	70		.112
3D404	2.5	12.95	14	25		.028
1D501	1,000	—	19	140	0.5	.238
1D503	500	—	16.5	90		.119
2D502	100	—	17.5	120		.175
2D504	50	19.80	15.5	70		.088
3D502	10	12.95	17.5	120		.175
3D504	5	12.95	15.5	70		.088
1D751	250	—	26	150	0.75	.134
1D753	100	29.85	22	80		.053
2D752	25	—	24	120		.098
2D754	10	19.80	20	50		.039
3D752	2.5	—	24	120		.098
3D754	1.0	12.95	20	50		.039
1D901	250	—	37	260	1.0	.238
1D903	100	—	32	155		.095
2D902	25	—	34	230		.175
2D904	10	—	30	120		.070
3D902	2.5	—	34	230		.175
3D904	1.0	—	30	120		.070

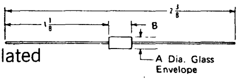
RODS



Rod Thermistors with Close Electrical Tolerances. Tinned Copper Leads.

Cat. No.	Resistance 25°C ± 10%	Diss. Const. in W/°C	Time Const. (sec.)	B (Norm)	D (Norm)
1R051	100,000	3	12	0.5	0.05
2R052	10,000				
3R052	1,000				
1R111	100,000	10	70	1.6	0.112
1R113	31,500	7	50	0.9	
2R112	10,000	8	70	1.6	
2R114	4,300	6	50	0.9	
2R116	3,150	6	50	0.9	
3R112	1,000	8	60	1.6	
3R114	430	6	40	0.9	
3R116	315	6	40	0.9	
1R171	50,000	18	120	1.8	0.173
1R173	20,000	13	80	1.1	
2R172	5,000	15	120	1.8	
2R174	2,000	11	80	1.1	
3R172	500	15	110	1.8	
3R174	200	11	80	1.1	

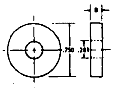
H SERIES



Small, rugged, hemetically sealed. Gold plated Dumet leads. Use up to 275°C.

Cat. No.	Resistance 25°C ± 10%	Res. Ratio 25°C/125°C	Diss. Const. in W/°C	Time Const. (sec.)
4H105	1,000,000	48.78	2	8
4H504	500,000	48.78		
1H104	100,000	29.85		
1H503	50,000	29.85		
1H203	20,000	29.85		
2H103	10,000	19.80		
2H502	5,000	19.80		
2H202	2,000	19.80		

WASHERS



Large size rugged Thermistors where large mass is required.

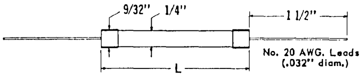
Cat. No.	Resistance 25°C ± 10%	Res. Ratio 25°C/125°C	Diss. Const. in W/°C	B (Norm)
4W751	4,150	48.78	55	.191
4W753	3,150	48.78		.145
4W755	1,000	48.78		.046
1W751	415	29.85		.191
1W753	315	29.85		.145
1W755	100	29.85		.046
2W752	41.5	19.80		.140
2W754	31.5	19.80		.106
2W756	10	19.80		.034
3W752	4.15	12.95		.140
3W754	3.15	12.95		.106
3W756	1	12.95		.034

These washers may be obtained in either bolted or soldered assemblies.

VARISTORS

INDUSTRIES

RODS

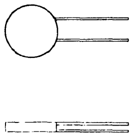


NL Industries varistors protect circuits and components from inductive voltage surges by limiting peak discharge voltage, when AC or DC magnetic or inductive circuit is suddenly interrupted. Applications include rectification of assymmetrical waveforms in TV circuits to aid High Voltage Regulation, Max. Temp. 110°C ± 20% Tol.

Catalog Number	DC Volts	Power Watts
72R-2200	3300	0.4
72R-2100	1700	0.25
71R-2100	1100	0.25
69R-2100	600	0.25
68R-2100	300	0.25
66R-2100	150	0.25

DISCS

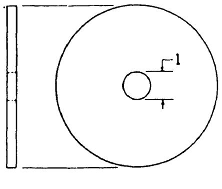
NL Industries varistors protect circuits and components from inductive voltage surges by limiting peak discharge voltage to a safe value when AC or DC magnetic or inductive circuit current is suddenly interrupted. Black dielectric coating applied after impregnation for moisture protection.



Catalog Number	Continuous Operating Volts DC	AC	Continuous Power Watts	Discharge Capacity Watts—Seconds
70D-5010	150	135	.25	30
68D-5010	60	54	.25	30
67D-5010	30	27	.25	30
65D-5010	15	13.5	.25	30
71D-7000	150	135	.75	50
68D-7000	60	54	.75	50
66D-7000	30	27	.75	50
63D-7000	15	13.5	.75	50
71D-10000	300	270	1.5	275
68D-10000	150	135	1.5	275
66D-10000	60	54	1.5	275
63D-10000	30	27	1.5	275

WASHERS

NL Industries varistors protects circuits and components from inductive voltage surges by limiting peak discharge to a safe value when AC or DC magnetic or inductive circuit current is suddenly interrupted. Silicone impregnation provided to insure protection against moisture.



Order Number	Continuous Operating Volts DC	AC	Continuous Power Watts	Discharge Capacity Watt-Seconds
71W-30100	1500	1350	3.5	9,250
69W-30100	300	270	3.0	5,100
68W-30100	150	135	3.0	1,700
67W-30100	60	54	3.0	1,700
66W-30100	30	27	3.0	1,700
63W-30100	15	13.5	3.0	1,350
62W-30100	7	6.3	3.0	1,100
69W-60100	275	250	10	22,500
68W-60200	200	180	10	22,500
68W-60100	150	135	10	22,500

ASSEMBLIES

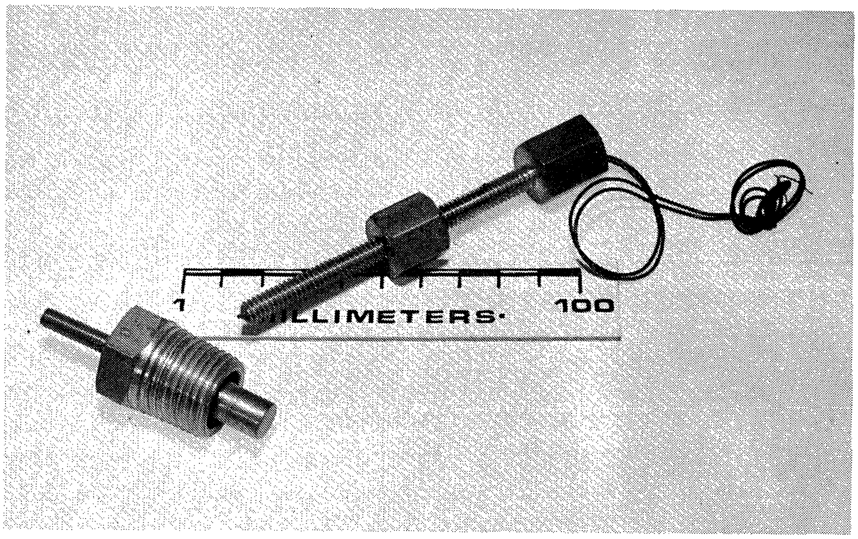
NL Industries varistors protect circuits and components from inductive voltage surges by limiting peak discharge voltage to a safe value when AC or DC magnetic or inductive circuit current is suddenly interrupted.

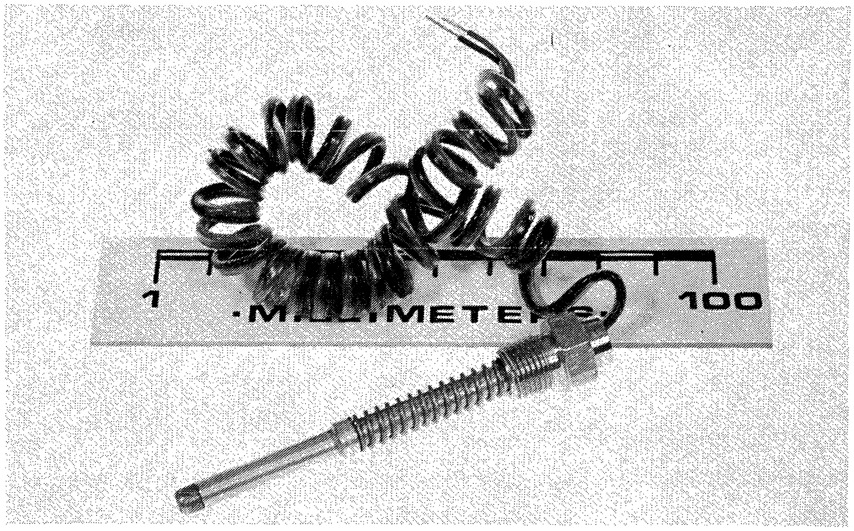
These assembles have one or more NL Industries washers connected in series or parallel. Washers are bracket-mounted on a horizontal bolt with spring lock washer for contact pressure. Washers are insulated from central bolt and mounting brackets. Bracket mounted assemblies available for stud mounting. Substitute "C" for "A" or "B" in type number. All varistors moisture protected with silicone impregnation.

Catalog Number	DC Operating Volts	Power Loss in Oper. Watts	WASHERS
9RV3A1	6	3	1
9RV3A2	6	6	2
9RV3A3	6	12	4
9RV3A4	12	3	1
9RV3A5	12	6	2
9RV3A6	12	12	4
9RV3A7	25	6	2
9RV3A8	50	3	1
9RV3A9	50	6	2
9RV3A10	50	12	4
9RV3A11	100	6	2
9RV3A12	150	3	1
9RV3A14	300	3	1
9RV3A15	600	6	2
9RV6A1	150	10	1
9RV6A2	150	20	2
9RV6A3	150	30	3
9RV6A4	150	40	4
9RV6A5	300	20	2
9RV6A6	275	10	1
9RV6A7	275	20	2
9RV6A8	275	30	3
9RV6A9	275	40	4
9RV6A10	550	20	2
9RV6A50	150	200	20
9RV6A51	200	200	20
9RV6A52	275	200	20
9RV6A53	300	240	24
9RV6A54	400	240	24
9RV6A55	550	240	24
9RV6A60	150	100	10
9RV6A61	200	100	10
9RV6A62	275	100	10
9RV6A63	300	120	12
9RV6A64	400	120	12
9RV6A65	550	120	12
9RV3A51	1500	3.5	1
9RV3A52	3000	7.0	2
9RV3A53	4500	10.5	3
9RV3A54	6000	14.0	4
9RV3A55	7500	17.5	5
9RV3A56	9000	21.0	6
9RV3A57	10500	24.5	7

NL INDUSTRIES ELECTRONICS DEPARTMENT • Sales Office: Box 420, Hightstown, New Jersey 08520 • 609-448-3200

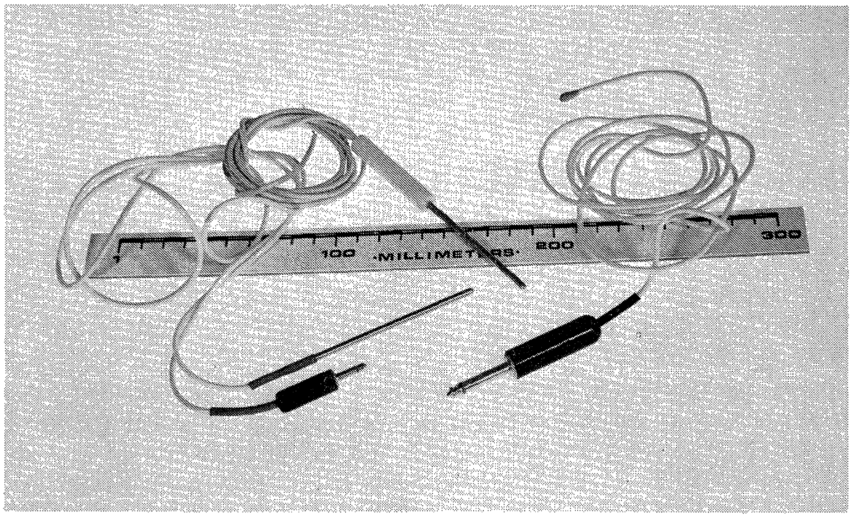
NL INDUSTRIES TEMPERATURE SENSING PROBES





Probes of various types and designs are available from NL Industries. These highly sensitive devices with National Lead quality thermistors built in are used for sensing temperature, air flow, liquid level and liquid flow. The shape and size of these devices will depend on how they are used. A careful inspection of the figures below will give an indication of the typical probes available from NL Industries. Other configurations are available upon request.

The thermistors and varistors listed above and on the previous pages are only typical products available. Thermistors and varistors possessing different electrical characteristics and shapes are available by contacting NL Industries, Electronics Department, Box 420, Hightstown, New Jersey 08520.

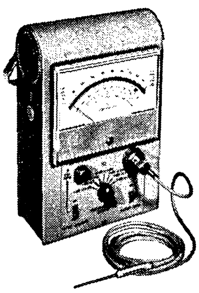


NL INDUSTRIES ELECTRONICS DEPARTMENT • Sales Office: Box 420, Hightstown, New Jersey 08520 • 609-448-3200

THERMOCONTROL DIVISION Since 1922

Temperature Measurement and Control Equipment

Direct-Reading



Electronic Thermometer

Model 212

Wide Range: -100°C to +500°C

Accuracy: ±0.75°C

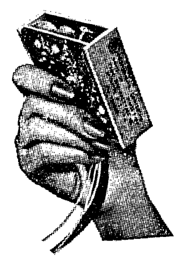
Response: 0.5 min.

Probes: Platinum

A wide range thermometer for precise temperature measurements of liquids, gases and atmosphere.

Price: **$450.00**

Lowest Cost



Proportional Controller

Model 70

Voltage/Power Ratings: Single Phase 50/60 Hz
115V. line—15A., 1.5 kW max load
208V. line—15A., 3 kW max load
230V. line—15A., 3 kW max load

Accuracy: To ±0.05°C of set point

Range: From 100°C to 400°C

A miniature, solid-state device for delivering precise power to control temperature light or any other desired load within its range.

Price: **$37.80**

Proportional Temperature Controllers

RFL offers a wide selection of controllers for most any application. A significant and major new advancement in the field is the new Model 70 Proportional Controller. This miniature, low cost unit provides true proportional control and is competitive with on-off or fixed temperature types.

Model	Range	Accuracy*	Load	Probe Resistance	Features	Price
40	-100°C to 400°C	±0.1°C	0-2V DC out	8000 to 300 ohms	Servo equipped valve use	$151.00
70	-100°C to 400°C	±0.05°C	To 3 kW	8000 to 100 ohms	OEM installation-miniature-non-indicating	37.80
72	-100°C to 400°C	±0.5°C	To 1.5 kW	8000 to 100 ohms	Zero voltage firing eliminates radio frequency interference	50.00
80	-100°C to 400°C	±0.1°C	To 100 kW	8000 to 300 ohms	Compact fast response non-indicating	155.00
90	-100°C to 400°C	±0.1°C	To 100 kW	8000 to 300 ohms	Low cost precision indicating	250.00

*of set point for 10% load

Prices less probes and are for 115V 1.5 kW 1ø

SCR's replace bulkier auto-transformers and saturable core reactors with a resultant line of light, compact and reliable controllers.

Temperature Control and Monitoring Systems

Custom Service/Engineering Consultation

RFL offers custom temperature control, alarm, and monitoring systems for simple or complex applications, whether it be of single or multichannel operation. This is accomplished by combining RFL's standard line of Proportional Controllers. Thus by using an already proven RFL Proportional Controller in a system concept, you have building block capabilities for existing or future needs without paying for further design engineering.

A system designed and developed by RFL will give you the capability of controlling as well as monitoring the temperature of any number of points or locations dependent upon your requirements. These systems can be designed for controlling and/or monitoring temperatures for textiles, packaging, chemical, fiber manufacturers, or where any critical temperature control is needed

RFL 240 System

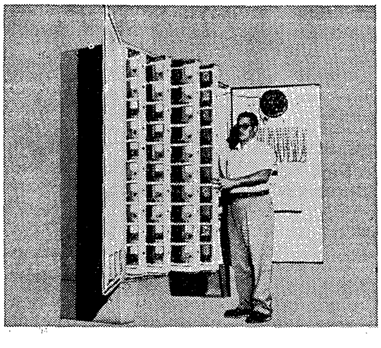
The RFL 240 System is a continuous multichannel temperature alarm, monitoring, and control system. It is ideally suited for monitoring draw twist fiber machinery having multiple draw twist stations with one, two or three critical temperatures per station.

Price: **$50.00 to $100.00** per point, depending upon application requirements.

RFL 245 System

The RFL 245 System is capable of controlling and monitoring the temperature of 200 points or less. The system is divided into two main sections: one is for control and the other is the monitor alarm section. It is suited for petro-chemical, textile, and fiber manufacturers for pipe tracing applications, but could be used for other applications as well.

Price: **$300.00** per point.

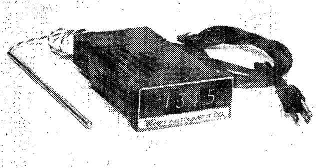


RFL 245 System

RFL Industries, Inc.
Thermocontrol Division • Boonton, New Jersey 07005 • U.S.A.
Tel. (201) 334-3100 / TWX: 710-987-8352 / CABLE: RADAIRCO, N. J.

See page 554 **Instrumentation Division** Metrology, Magnetics

WEED INSTRUMENT CO., INC.



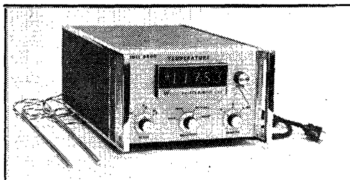
PANEL MOUNTED DIGITAL TEMPERATURE INDICATORS With WEED Platinum Resistance Sensors

MODEL 2200
RANGE: 0° to +199° or 0° to -199°, °F or °C POWER: 120 V, 60 Hz
RESOLUTION: 1° ACCURACY: 1% of Full Scale SIZE: 4"W x 2"H x 7"D
With Standard 3/16" Dia. X 8" L. Sensor PRICE EACH $475.00

MODEL 2400
RANGE: -199.9° to +199.9°, °F or °C POWER: 120 V, 60 Hz
RESOLUTION: .1° ACCURACY: .1% of Full Scale SIZE: 4"W x 2"H x 7"D
With Standard 3/16" Dia. X 8" L. Sensor PRICE EACH $775.00

MODEL 2700
RANGE: -199.99° to +199.99°, °F or °C POWER: 120 V, 60 Hz
RESOLUTION: .01° ACCURACY: .055% of Full Scale SIZE: 4"W x 2"H x 7"D
With Standard 3/16" Dia. X 8" L. Sensor PRICE EACH $1175.00

OPTIONS AVAILABLE: Other Ranges, BCD Output, Special Sensors, Switching Assemblies, Complete Systems



DIGITAL THERMOMETERS With WEED Platinum Resistance Sensor

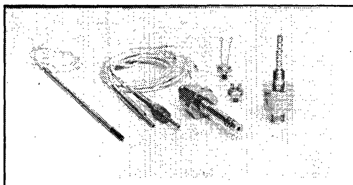
MODEL 3200
RANGE: -199.9° to +199.9°, Selectable °F or °C
RESOLUTION: .1° ACCURACY: .1% of Full Scale
CABINET: 9"W x 6"H x 15"D POWER: 120 V, 60 Hz
With Standard 3/16" Dia. X 8" L. Sensor PRICE EACH $925.00

MODEL 3400
RANGE: -199.99° to +199.99°, Selectable °F or °C
RESOLUTION: .01° ACCURACY: .055% of Full Scale
CABINET: 9"W x 6"H x 15"D POWER: 120 V, 60 Hz
With Standard 3/16" Dia. X 8" L. Sensor PRICE EACH $1325.00

OPTIONS AVAILABLE: Additional Selectable Sensors, Special Sensors, Differential Measurement, BCD Output, Other Ranges, Rack Mounted or Other Cabinet, Battery Powered.

Model 3400 is also available with resetable Max-Min Memory. Both maximum and minimum temperature values since last reset can be readout.

Model 3400 With Max-Min Memory Option PRICE EACH $1685.00

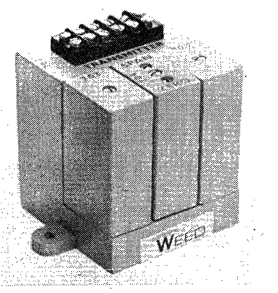


WEED SPECIAL PLATINUM RESISTANCE SENSORS FROM CRYOGENIC (-435°F) THROUGH HOT GAS (+2000°F)

WEED Can Build The Platinum Resistance Sensor That Will Do The Job Best, Accurately And Reliably

Typical Price For 50 Ohms @ 0°C Hot Gas Sensor To +1850°F Is $50.00 Each. Typical Price For 1380 Ohms @ 0°C Cryogenic Sensor To -435°F Is $75.00 Each. Some Other Special Requirements That WEED Has Built For Are: High Pressure, Nuclear Radiation Environment, Very Small Size, Area Sensing, Shaped Sensors, Directional Sensing, Special Time Constant, Very High Resistance.

Let WEED Consider Your Special Requirement
Ask For Our Special Sensor Specification Sheet



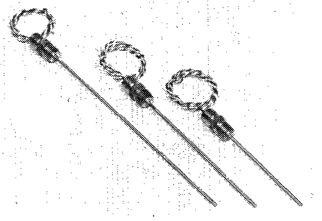
TEMPERATURE TRANSMITTERS

SERIES 1000 TEMPERATURE TRANSMITTERS furnish a linear current output directly proportional to input temperature change when used with a Platinum Resistance Sensor. Output is insensitive to load changes from 0 to 10,000 ohms resistive, and can be voltage output to 10 volts by proper choice of load resistance.

INPUT: Platinum Resistance Sensor, 1000 Ohms ±.1% @ 32°F
POWER: 120 V, 60 Hz LOAD: 0 to 10,000 Ohms Resistive
LINEARITY: .1% For Linear Input ADJUSTMENTS: Span & Zero
RANGES: 0° to 150°C for 0 to 1 Milliampere Output
Model 1000-0-150C PRICE EACH $250.00
0° to 150°F for 0 to 1 Miliampere Output
Model 1000-0-150F PRICE EACH $250.00
Platinum Resistance Sensor for Above PRICE EACH $48.00

OPTIONS AVAILABLE: Other Temperature Ranges, Other Current Outputs, Better Linearity (Overall), To Your Requirements.

FOR SENSING TEMPERATURE, SWITCH TO PLATINUM BECAUSE: GREATEST ACCURACY---WIDE RANGE LINEARITY---HIGH SENSITIVITY---EXCEPTIONAL STABILITY---INTERCHANGEABILITY. FOR THE BEST IN PLATINUM RESISTANCE SENSORS SPECIFY WEED.



HOW TO ORDER WEED STANDARD PLATINUM RESISTANCE TEMPERATURE SENSORS

Series	Temperature Range	Sheath Diameter	Fitting
101 - General Purpose	A - 320°F to +500°F	A - 1/8 inch	0 - None
201 - Variable Immersion	B - 320°F to +1700°F	B - 3/16 inch	1 - 1/4" NPT
202 - Fixed Mounting		C - 1/4 inch	2 - 1/2" NPT
301 - Spring Loaded			3 - 1/8" NPT

MODEL 101-1-A-3-B-5-2-0

Resistance at 32°F	Number of Lead Wires	Sheath Length	Head
1 - 100 Ohms	2 - Short Runs	Minimum - 2"	0 - None
2 - 200 Ohms	3 - Recommended	Maximum - 24"	1 - General Purpose
5 - 500 Ohms	4 - Precision	Increments - 1/4"	2 - Watertight
6 - 1000 Ohms			3 - Explosion Proof

For more detailed information about WEED Standard Platinum Sensors, ask for WEED's catalogue brochure and data sheets.

TYPICAL SENSOR PRICES:	List Price Each
Model 101-1-A-3-B-8-0-0	$27.75
Model 101-1-B-3-B-8-0-0	$37.75
Model 201-1-A-3-B-5-2-0	$35.50
Model 301-1-A-3-B-12-0-0	$34.75

All prices on this page are FOB Elgin, Texas.

IF YOU ARE A STRANGER TO THE APPLICATION OF PLATINUM RESISTANCE TEMPERATURE SENSORS, ASK FOR WEED'S LATEST APPLICATIONS INFORMATION.

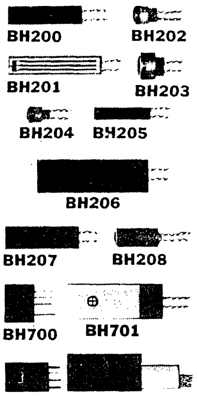
WEED INSTRUMENT CO., INC.

THE NEW SYMBOL OF QUALITY IN TEMPERATURE SENSING

Phone (512) 285-3411
P.O. Box 549 A 109 W. 11th St. Elgin, Texas 78621

HALL GENERATORS, WATTMETER TRANSDUCERS

"Hall-Pak" HALL GENERATORS

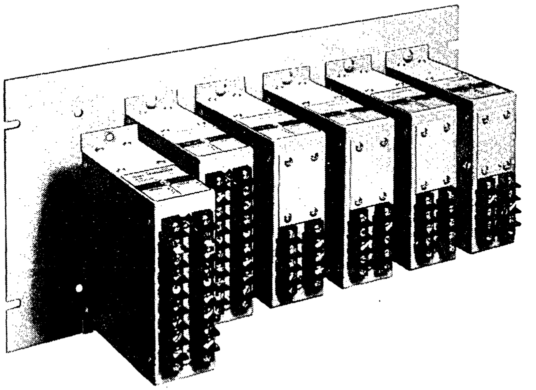


		OPEN CIRCUIT HALL VOLTAGE V_{HOC}, mV ±25% (AT NOMINAL I_C, B = 10kG)	RESISTIVE NULL VOLTAGE V_M, μV MAX (B = 0, I_C = 100mA)	INPUT RESISTANCE R_{IN}, Ω (INCLUDING LEADS)	OUTPUT RESISTANCE R_{OUT}, Ω (INCLUDING LEADS)	NOMINAL CONTROL CURRENT I_C, mA	LENGTH/WIDTH/THICK. OR DIAM./LENGTH (inch)
BH-200	General Purpose Transverse	150	100	1.5	1.0	150	.500/.130/.019
BH-201	Ultra-Thin Transverse	120	250	2.3	1.8	100	.625/.135/.006
BH-202	Small Axial	100	100	2.6	1.8	100	.130 diam./.150
BH-203	General Purpose Axial	100	100	1.9	1.3	100	.195 diam./.175
BH-204	Midget Axial	110	200	2.3	1.9	100	.100 diam./.150
BH-205	Midget Transverse	130	100	2.1	1.4	125	.375/.080/.015
BH-206	High Sensitivity Transverse	550	500	5	3.5	200	.750/.225/.030
BH-207	High Resolution Tangential	160	200	2	1.5	150	.500/.145/.045
BH-208	Ultra Midget Axial	100	250	2.7	1.9	100	.063 diam./.170
BH-700	Low Cost Transverse	500	750	5	4	200	.200/.250/.023
BH-701	High Linearity Transverse (Note 1)	75	75	2	1.5	100	.625/.230/.040
BH-702	Ferrite Imbedded	(Note 2)	250	3.5	3	200	.300/.200/.083
BH-703	3-Axis	75	100	1.5	1.5	100	.285 diam./.750

Note 1: Hall voltage (V_H) vs. B field, { ±.25% of reading from −10 kG to +10kG / ±1% of reading from −30 kG to +30kG } Linearity curves furnished for −10 kG to +10kG and −30 kG to +30kG. Optimized curves for other ranges available on special order.

Note 2: In a free field of 100 gauss the open circuit Hall voltage is 9 mV min. In a closed magnetic circuit, minimum sensitivity is 3.2 mV/ampere-turn.

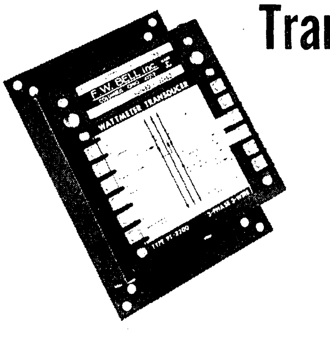
Power System Transducers



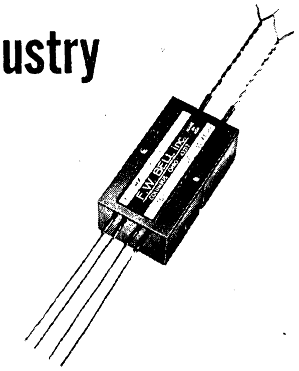
- *A complete line of utility tested and approved transducers to measure all ac power quantities: power, reactive power, voltage, current, frequency and power factor.*
- *Accurate and reliable long-life operation enhanced by: use of high grade solid-state components, epoxy encapsulated, conservative rating and substantial overload capability.*
- *Interfacing with panel meters, recorders, telemetry systems and computers is facilitated by a choice of output options: 50mV, 1mA or 10 V dc full scale.*
- *Sturdy steel case of the same size for all transducer models: easy wiring and neat appearance of group installations.*
- *Case dimensions compatible with standard racks and panels. Width only 2": permits maximum number of units per panel space.*

Transducers For Industry

- Single and 3-phase Watt Transducers for industrial applications.
- Motor power models for 240 V and 480 V operation at up to 6, 12 or 24 A load currents.
- Sturdy steel case, designed to fit in standard NEMA and JIC enclosures, providing protection in industrial environments.



- High accuracy, low cost modules for measurement of single phase power and 3-phase motor power.
- Models for standard line, audio and ultrasonic frequencies and for variable frequency operation.
- Small epoxied nylon box with input and output leads, easy to incorporate into customer designs.



Complete specifications on multipliers and transducers available on request.

Specifications subject to change without notice.

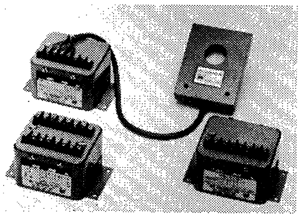
Leaders in Hall Effect Components, Instruments and Systems

F W BELL INC.
4949 Freeway Drive East Columbus, Ohio 43229
614-888-7501 TWX: 810-337-2851

OSI

Sensors—Wattmeter, Current and Magnetic Field. Thermoelectric Devices and Energy Conversion Materials.

WATTMETER TRANSDUCERS

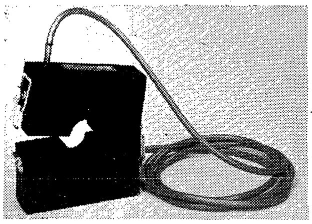


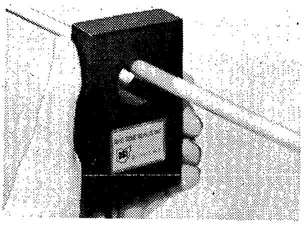
Halltron Wattmeter Transducers, when used with a meter, indicate true power consumed in single or three-phase circuits. The isolated d.c. output, proportional to EI cos θ, or true power, can be used for monitoring or control purposes. Units have fast response needed for sinusoidal or chopped waveforms. Four of our 36 standard models for power and industrial requirements are listed.

MODEL	APPLICATION	(Volts) VOLTAGE	(Ampere) CURRENT	(Millivolts) OUTPUT
PC-51	1ϕ 2 Wire	120	5	50 @ .5KW
PC-54-3	3ϕ 3 Wire	440	5	100 @ 4KW
PC-C2	1ϕ 2 Wire	240	100	50 @ 20KW
PC-C4-3	3ϕ 3 Wire	440	100	100 @ 80KW

Stock Amplifier Units are available to provide high level d.c. output. Wattmeter transducers can be tailored to meet special customer requirements.

HALLTRON d.c. to Kilohertz CURRENT TRANSDUCERS

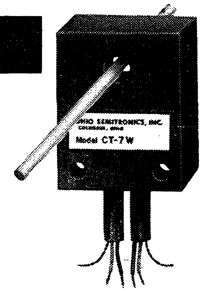




These Halltron Current Transducers provide flat d.c. to 5 Kilohertz response and require no electrical connection to the circuit being monitored. The circuit isolation makes many measuring and control applications simple, especially where conductors are at high voltage with respect to measuring or control circuits.

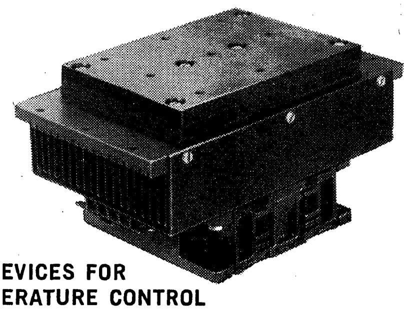
Models with better than 1% linearity and temperature effects less than 1% are stock items in current ranges to 2000 Amperes. Special units for higher currents or split-core configuration can be supplied for specific requirements. Auxiliary amplifier-power supply units are available to provide 10 volt output when desired instead of 50 millivolt output of transducer alone.

WIDEBAND d.c. to Megahertz CURRENT SENSORS



CT Series Current Transducers introduce negligible circuit interaction and require no physical or electrical connection to circuit being measured. An output voltage is provided which is directly proportional to the instantaneous current flow through the window. The flat d.c. to Megahertz frequency response together with the less - than - 1 - microsecond - risetime makes the units ideally suited for monitoring, control, or analysis of d.c., steady-state or transient currents.

MODEL	PEAK CURRENT AMPERES	BIAS CURRENT MILLIAMPERES	FULL SCALE OUTPUT MILLIVOLTS
CT-7W	30	100	60
CT-100W	100	100	60
CT-200W	200	100	100
CT-600W	600	100	60
CT-1000W	1000	100	60



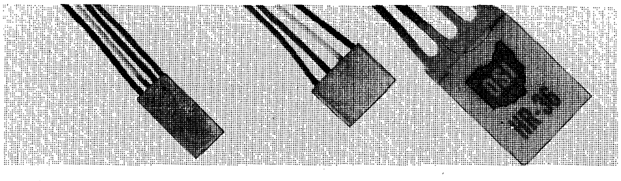
THERMOELECTRIC DEVICES FOR COOLING AND TEMPERATURE CONTROL

O.S.I. offers a variety of thermoelectric cooling units ranging from the TC Series, used in spot-cooling applications where up to 115 degree Centigrade temperature depression is needed, to the TA Series which can remove up to 85 watts from chemical bath, electronic package, or enclosure. The controllable, reversible heat pumping properties of thermoelectric devices make them ideally suited for temperature control.

MODEL	ΔT DEG. C.	HEAT PUMP WATTS	INPUT CURRENT AMPERES
TM-12	65	3	30
TM-20	65	20	30
TM-20M	65	20	30
TC-44	90	6	30
TC-1851	115	3	25
TA-6F	55*	85	30

* Specified as cold plate temperature depression from ambient air temperature.

HALLTRON, MAGNETIC FIELD SENSORS



A wide variety of Hall effect probes for use in magnetic sensing or measuring applications are maintained in stock. Units feature high-linearity, low-noise, excellent stability and ruggedness. Physical size/device characteristic combinations permit optimum use of O.S.I. sensors in critical applications.

MODEL	TYPE	CONTROL CURRENT MILLI-AMPERES	OUTPUT IN 10 Kg. MILLIVOLTS	DIMENSIONS INCHES
HP-325	Miniature	25	200	.187/.075/.015
HP-330	Micro	25	150	.040/.040/.012
HP-340	Gaussmeter	100	100	.280/.125/.020
HR-36	High-linearity	350	350	.500/.375/.025
HR-66	Low-cost	200	500	.200/.250/.028
HR-72	High-sensitivity	100	700	.200/.250/.028
HS-84	Low Temperature*	350	30,000	.500/.375/.015

* The HS-84 is designed for high sensitivity at −196°C.

ENERGY CONVERSION MATERIALS

Optimized energy conversion materials and elements of the following types are available:

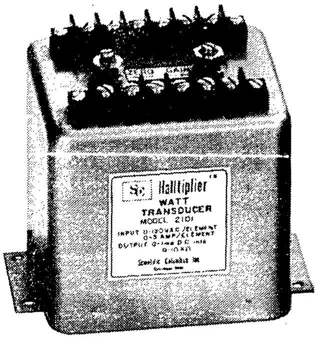
- Indium arsenide and indium antimonide for magnetic sensors and infrared filters.
- Bismuth telluride alloys; N & P type, for thermoelectric cooling and specialized power generation modules.
- Lead telluride for high quality optical infrared coatings.
- High purity arsenic trichloride for exceptional growth of intermetallic arsenides.
- Research grade bismuth, indium, arsenic, tellurium and antimony.

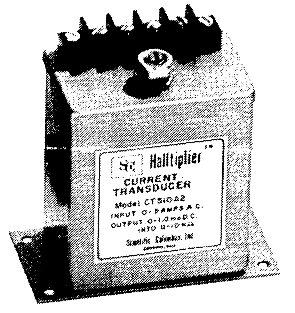
OSI

OHIO SEMITRONICS, INC.

1205 CHESAPEAKE AVENUE • COLUMBUS, OHIO 43212 • PHONE: 614-486-9561
PIONEER IN SOLID STATE ENERGY CONVERSION MATERIALS, DEVICES and SYSTEMS
See Current and Power Monitoring Equipment in VOL. I

Instrumentation to Measure All Electric Power Parameters





Halltiplier (TM) Watt Transducers

- Utility Tested and Approved
- Voltage or Current Outputs
- Minimal Space Requirements
- Calibrated Output

Scientific Columbus can provide off-the-shelf delivery of Halltiplier™ transducers to measure all of your parameters . . . volts, amps, watts, power factor, phase angle, and frequency. We also offer voltage outputs, especially calibrated to your requirements, or the popular constant current outputs of 0-lma, 1-5ma, 4-20ma or 10-50ma, which simplifies your own calibrating or scaling networks.

WATT TRANSDUCERS

(Calibration instructions, typical characteristic curves and application assistance are available on request).

	Full Scale	Nominal Voltage Input	Voltage Range	Voltage Overload	Voltage Burden	Nominal Current Input	Current Overload	Current Burden	Frequency Range (HZ)	Power Factor Range	Temperature Range (°C)	Maximum Temperature Effects on Accuracy	Accuracy/ Linearity @ 25°C (% of F.S.)	Output at Full Scale (d.c.)	Output Load Required	A.C. Component (peak)	Response Time (to 99%)	Calibrate Adjustment	Zero Adjustment	External Amplifier Power Required	Dielectric Test
6512	500/1000/ 2000 W	120/ 240V	135/270V	50%	1VA	5/10A	250A/1 Sec.	3VA	60	.0-1-.7	– 0°/+50°	±1%	±1%	110 MV	100 Ω	100%	<5 MS	NONE	NONE	NONE	1500 VRMS
WT5C5	500 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	50 MV	100 Ω	100%	<5 MS	±10%	NONE	NONE	1500 VRMS
WT5C5A1	500 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	50 MV	≥50 K Ω	<1%	<400 MS	0-110%	NONE	NONE	1500 VRMS
WT5C5A2	500 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60HZ 2W	1500 VRMS
WT5C5A3	500 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	85-135V/60HZ 2W	1500 VRMS
WT5C5A4	500 W	120V	85-135V	150V	4VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500 VRMS
WT5C5A5	500 W	120V	85-135V	150V	4VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	NONE	1500 VRMS
WT3-1K5	1000 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	100 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500 VRMS
WT3-1K5A1	1000 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	100 MV	≥50 K Ω	<1%	<400 MS	0-110%	NONE	NONE	1500 VRMS
WT3-1K5A2	1000 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60HZ 2W	1500 VMRS
WT3-1K5A3	1000 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	85-135V/60HZ 2W	1500 VRMS
WT3-1K5A4	1000 W	120V	85-135V	150V	4VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500 VRMS
WT3-1K5A5	1000 W	120V	85-135V	150V	4VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	NONE	1500 VRMS
WT3-1K5 2½	1000/ 1500 W	120V	0-135V	150V	3VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	66.7/100 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500 VRMS
WT3-1K5 2½A1	1000/ 1500 W	120V	0-135V	150V	3VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	66.7/100 MV	≥50 K Ω	<1%	<400 MS	0-110%	NONE	NONE	1500 VRMS
WT3-1K5 2½A2	1000/ 1500 W	120V	0-135V	150V	3VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	0.667/1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60HZ 2W	1500 VRMS
WT3-1K5 2½A3	1000/ 1500 W	120V	0-135V	150V	3VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	0.667/1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	85-135V/60HZ 2W	1500 VRMS
WT3-1K5 2½A4	1000/ 1500 W	120V	85-135V	150V	4VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	0.667/1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500 VRMS
WT3-1K5 2½A5	1000/ 1500 W	120V	85-135V	150V	4VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	0.667/1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	NONE	1500 VRMS
WT34-2K5	1500 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	150 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500 VRMS
WT34-2K5A1	1500 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	150 MV	≥50 K Ω	<1%	<400 MS	0-110%	NONE	NONE	1500 VRMS
WT34-2K5A2	1500 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60HZ 2W	1500 VRMS
WT34-2K5A3	1500 W	120V	0-135V	150V	2VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	85-135V/60HZ 2W	1500 VRMS
WT34-2K5A4	1500 W	120V	85-135V	150V	4VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500 VRMS
WT34-2K5A5	1500 W	120V	85-135V	150V	4VA	5A	250A/1 Sec.	2VA	50-70	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0-10 K Ω	<1%	<400 MS	0-110%	±2%	NONE	1500 VRMS

VAR TRANSDUCERS

	Full Scale	Nominal Voltage Input	Voltage Range	Voltage Overload	Voltage Burden	Nominal Current Input	Current Overload	Current Burden	Frequency HZ	Power Factor Range	Temperature Range (°C)	Maximum Temperature Effects on Accuracy	Accuracy/ Linearity @ 25°C (% of F.S.)	Output at Full Scale (d.c.)	Output Load Required	A.C. Component (peak)	Response Time	Calibrate Adjustment	Zero Adjustment	External Amplifier Power Required	Dielectric Test
VT5C5	500 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	50 MV	100 Ω	100%	<5 MS	±10%	NONE	NONE	1500VRMS
VT5C5A1	500 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	50 MV	≥50 K Ω	<1%	<400 MS	0 to 110%	NONE	NONE	1500VRMS
VT5C5A2	500 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60 HZ 2W	1500VRMS
VT5C5A3	500 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	85-135V/60 HZ 2W	1500VRMS
VT5C5A4	500 VARS	120V	85-135V	150V	4 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500VRMS
VT5C5A5	500 VARS	120V	85-135V	150V	4 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	NONE	1500VRMS
VT3-1K5	1000 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	100 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500VRMS
VT3-1K5A1	1000 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	100 MV	≥50 K Ω	<1%	<400 MS	0 to 110%	NONE	NONE	1500VRMS
VT3-1K5A2	1000 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60 HZ 2W	1500VRMS
VT3-1K5A3	1000 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	85-135V/60 HZ 2W	1500VRMS
VT3-1K5A4	1000 VARS	120V	85-135V	150V	4 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500VRMS
VT3-1K5A5	1000 VARS	120V	85-135V	150V	4 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	NONE	1500VRMS
VT34-2K5	1500 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	150 MV	100 Ω	up to 100%	<5 MS	±10%	NONE	NONE	1500VRMS
VT34-2K5A1	1500 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	150 MV	≥50 K Ω	<1%	<400 MS	0 to 110%	NONE	NONE	1500VRMS
VT34-2K5A2	1500 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	85-135V/60 HZ 2W	1500VRMS
VT34-2K5A3	1500 VARS	120V	0-135V	150V	2 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	85-135V/60 HZ 2W	1500VRMS
VT43-2K5A4	1500 VARS	120V	85-135V	150V	4 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	±10%	±2%	NONE	1500VRMS
VT34-2K5A5	1500 VARS	120V	85-135V	150V	4 VA	5A	250A/1 Sec.	0.5 VA	60	0-1-0	−20°/+60°	±1%	±0.5%	1 MA	0 to 10 K Ω	<1%	<400 MS	0 to 110%	±2%	NONE	1500VRMS

CURRENT AND VOLTAGE TRANSDUCERS

	Full Scale	Nominal Voltage	Overload	Burden @ 120 v	Frequency Range HZ	Temperature Range (°C)	Maximum Temperature Effects on Accuracy	Accuracy/ Linearity @ 25°C	Output at Full Scale (D.C.)	Output Load Required	A.C. Component	Response Time	Calibration Adjustment	Dielectric Test
CT-510	5a	—	250A/1 Sec.	1 va	50-70	−20°/+60°	±1% of F.S.	±0.5%	10 volts	1 K Ω	48%	<5 ms	NONE	1500 rms
CT-510A2	5a	—	250A/1 Sec.	1 va	50-70	−20°/+60°	±1% of F.S.	±0.5%	1 ma	0 to 10 K Ω	<1%	<400 ms	±10%	1500 rms
CT-510A3	5a	—	250A/1 Sec.	1 va	50-70	−20°/+60°	±1% of F.S.	±0.5%	3 ma	0 to 10 K Ω	<1%	<400 ms	±10%	1500 vrms
VT-110	150 v	120 v	180 v	4 va	50-70	−20°/+60°	±1%	±0.5%	10 volts	1 K Ω	48%	<5 ms	NONE	1500 vrms
VT-110A2	150 v	120 v	180 v	2.5 va	50-70	−20°/+60°	±1%	±0.5%	1 ma	0 to 10 K Ω	<1%	<400 ms	±10%	1500 vrms
VT-110A3	150 v	120 v	180 v	2.5 va	50-70	−20°/+60°	±1%	±0.5%	3 ma	0 to 10K Ω	<1%	<400 ms	±10%	1500 vrms

SCIENTIFIC COLUMBUS *The Power Instrumentation People*

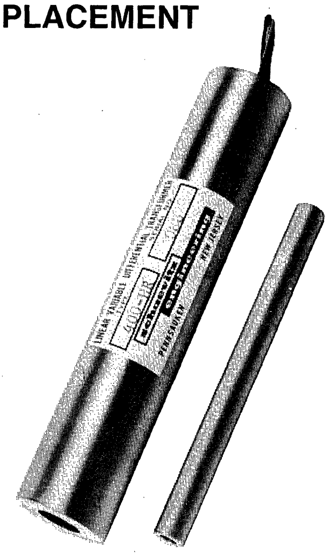
Division of Esterline Corporation
1035 West Third Avenue
Columbus, Ohio 43212 (614) 291-4681

ESTERLINE

The Measurement and Control Company **schaevitz engineering**

See Sections 2200 and 4100 for additional information

LINEAR DISPLACEMENT



Request Technical Bulletin 1001

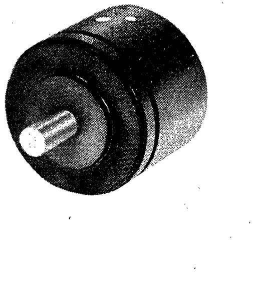
The Schaevitz Linear Variable Differential Transformer (LVDT) is a precision linear position transducer with infinite resolution and a very high order of repeatability. The position of a frictionless core is translated into a differential output voltage which is a linear function of core displacement. Measurements of displacement ranges from less than ±0.005 inches to more than ±25 inches are possible; linearities are on the order of 0.25% of full range. A wide selection of models is maintained in stock. All, except the low-cost E Series, have electrostatic and electromagnetic shielding.

AC LVDT units are operated by excitation frequencies from 50 Hz to 20K Hz with input voltages from 5V to 115V rms. Conventional signal conditioning instrumentation is normally used; Schaevitz can supply off-the-shelf compatible excitation and readout equipment for most applications. Operating temperature range of the standard AC LVDT is between–65°F and +300°F (E Series to +180°F only).

DC LVDT transducers contain built-in signal conditioning circuitry. Inputs of 24V dc or ±15V dc will produce outputs of ±5V dc or ±10V dc respectively at full range which is adequate to operate conventional meters, recorders or control instruments. Operating temperature range of the DC units is between–65°F and +200°F.

SERIES	APPLICATION	MEASUREMENT RANGE	MODELS IN SERIES	UNIT PRICE RANGE
HR	Standard High Reliability	±0.050/±10 in	10	26.40/390.00
MP	Hostile Industrial Environment	±0.050/±10 in	10	41.50/425.00
MHR	Miniature (0.375 OD)	±0.005/±1.00 in	8	89.10
E	Low Cost	±0.100/±2.00 in	6	10.80/ 56.00
HR-DC	DC Operated HR Series	±0.050/±5.00 in	8	101.40/327 00
DC-B	High Performance, DC Operated	±0.050/±2.00 in	6	690.00

ANGULAR DISPLACEMENT



Request Technical Bulletin 1001

The Schaevitz Rotary Variable Differential Transformer RVDT is a counterpart of the LVDT and measures angular displacements. Although capable of continuous rotation, the useful linear range of the RVDT is limited to ±40° from the null point. The useful range can be extended to ±60° in specially made units. All RVDT's incorporate electromagnetic and electrostatic shielding.

AC RVDT units are normally operated with excitation frequencies from 400 Hz to 20K Hz with a nominal input of 10V rms. Linearity is on the order of 1% of the reading (worst case). Operating temperature range of the AC RVDT is between –65° F and +300° F.

DC RVDT units contain integral signal conditioning circuitry. An input of ±15V dc will produce an output of ±5V dc at full range. Linearity is on the order of 1% of the reading (worst case). Operating temperature range of DC units is between–65°F and +200°F. Compatible signal conditioning and readout equipment for RVDT's is available from Schaevitz.

SERIES	APPLICATION	MEASUREMENT RANGE	MODELS IN SERIES	UNIT PRICE
R30A	AC Operated	±40°	1	90.00
R30D	DC Operated	±40°	1	190.00

SPECIAL LVDT's

Schaevitz has a variety of displacement transducers in stock with special characteristics to satisfy a wide range of physical and environmental conditions. They are summarized in the adjacent table.

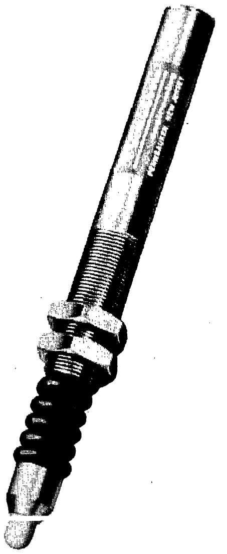
SERIES	APPLICATION	MEASUREMENT RANGE	MODELS IN SERIES	UNIT PRICE RANGE
XS-A	Large Bore (2.5 ID)	±0.250/±5.000 in	6	136.00/450.00
XS-B	Sub-miniature (0.187 OD)	±0.005/±0.250 in	6	95.00/195.00
XS-C	Pressure Sealed (withstand 5000 psi)	±0.100/±2.000 in	5	225.00/425.00
XS-D	Large Stroke/Length Ratio	±1.000/±25.00 in	6	115.00/975.00
XS-Z	Cryogenic (to-450°F)	±0.100/±2.000 in	4	345.00/595.00
XS-ZT	High Temperature (to 1100°F)	±0.100/±2.000 in	4	365.00/655.00
XS-ZTR	Radiation Resistant (to 3×10^{20} NVT)	±0.050/±1.000 in	4	365.00/655.00
PT	Proximity	0.005/0.050 in gap	4	70.00/ 95.00
VT-A	Velocity	0.050/20.00 in travel	10	36.00/395.00

schaevitz engineering U.S. ROUTE 130 & UNION AVE./ PENNSAUKEN, N. J./ 609-662-8000

The Measurement and Control Company **schaevitz engineering**

See Sections 2200 and 4100 for additional information

PRECISION GAGE HEADS



Request Technical Bulletin 1501

The Schaevitz PC Series of Precision Gage Heads are rugged measuring devices that are equally useful on the production line as in the laboratory. The wide selection of units in stock can accommodate virtually any gaging application; both spring-actuated and pneumatically-actuated types are available. The PC Series is also manufactured in armored, hermetically-sealed, and ultra-compact models. A variety of contact points is available including nylon, tungsten carbide, sapphire, diamond, and ten special shapes of hardened, ground, chrome-plated steel.

The LVDT transducer used in these gage heads has a linearity on the order of 0.1% of full scale and is capable of measurements that are repeatable to one micro-inch (0.000001"). Both AC-operated and DC-operated units are manufactured.

PCA Series gage heads are AC operated. Specified excitation frequencies extend from below 60 Hz to beyond 20K Hz. Standard gaging ranges for PCA units are from ±0.005 inches to ±1.000 inches. Gaging forces as light as 0.4 oz/psi may be achieved with pneumatically-operated gage heads. The PCA units operate with virtually any gage amplifier. They can be provided with connectors to match your existing equipment or supplied complete with Schaevitz amplifiers.

PCD Series gage heads provide a DC output. Low input current requirements for the DC-operated units makes them suitable for use in battery-operated portable gages. Standard gaging ranges for PCD units are from ±0.050 inches to ±0.500 inches; linearities are on the order of 0.25% of full range.

SERIES	APPLICATION	MEASUREMENT RANGE	MODELS IN SERIES	UNIT PRICE RANGE
PCA-100	Precision	±0.050/±1.000 ins	9	28.10/165.00
PCA-200	Ultra-precision	±0.005/±0.100 ins	8	150.00/265.00
PCD	DC Operated	±0.050/±0.500 ins	5	193.00/261.00

WEIGHT AND FORCE

schaevitz
engineering
PENNSAUKEN, NEW JERSEY

Request Technical Bulletin 5001

The Schaevitz FT Series Force Transducer (load cell) is a compact heavy-walled cylindrical unit that contains a linear elastic mechanical element and an LVDT. Various end fittings are used to accommodate the load cell to the type of force, tensile or compressive, to be measured. The LVDT converts the linear deflection produced by the applied axial force into an accurately proportional output voltage. The FT Series force transducer is designed to maintain accuracy even when subjected to abusive treatment.

Measurements from as little as 10 grams to as much as 500,000 pounds can be made with FT Series units. Linearities are on the order of 0.2% of full scale with repeatability of 0.02% of full scale. Schaevitz can supply units in fixed or portable load cell systems with features such as digital electronics, single or miltiple channels, high-low limit alarms and computer interfacing.

FTA Series load cells are AC operated. Typical excitation frequencies are from 400 Hz to 10K Hz with inputs between 1V and 5V rms. Schaevitz can supply compatible signal conditioning and readout equipment. Operating temperature range of FTA units is between -65° F and +300° F.

FTD Series load cells are DC operated devices that contain integral signal conditioning circuits. A regulated input of either 24-30V dc or ±15V dc will produce an output of ±5V dc at full scale that is suitable for operating remote display or recording equipment. Two-wire current-transmitting DC-operated load cells that provide a DC current output of from 4 to 20 ma are also available. Operating temperature range of FTD units is between -65° F and +200° F.

	SERIES SUFFIX	APPLICATION	MEASUREMENT RANGE	MODELS IN SERIES	UNIT PRICE RANGE
FTA & FTD	-U	General Purpose, Ten. or Comp	100/500,000 lbs	12	230.00/1,800.00
	-C	Compression Only	2000/500,000 lbs	8	330.00/1,700.00
	-CL	Low Deflection, Compression	5000/100,000 lbs	5	350.00/ 595.00
	-G	Small Forces	10/1000 gms	3	240.00
	-T	Compact Physical Size	1/1000 lbs	10	200.00/ 220.00
	-M	Miniaturized	1/1000 lbs	16	200.00/ 230.00

schaevitz engineering U.S. ROUTE 130 & UNION AVE./ PENNSAUKEN, N. J./ 609-662-8000

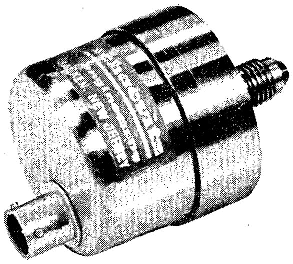
The Measurement and Control Company **schaevitz engineering**

See Sections 2200 and 4100 for additional information

PRESSURE

The Schaevitz PT Series Pressure Transducer utilizes an LVDT to measure the linear displacement of an elastic pressure element; the output signal is directly proportional to the pressure. The simple frictionless design of the PT Series assures longevity and reliability even under repeated cycling and pulsation. Repeatability of pressure measurements is limited only by the hysteresis in the conservatively stressed elastic element.

A variety of models, suitable for use with a wide range of corrosive and non-corrosive liquids and gases, is available for measuring pressures from vacuum up to 10,000 psig (readings expressed in gage, differential or absolute units depending on model). Special configurations can be manufactured to withstand radiation environments in excess of 3×10^{20} NVT or temperatures up to 500°F.



The PTA Series transducers are AC operated. A typical excitation frequency of 2500 Hz with an input of 5V rms will produce an output between 200 and 1000 mv depending upon range. Operating temperature range is between −65°F and +250°F. They may be used with conventional signal conditioning equipment or Schaevitz will supply compatible excitation and readout equipment.

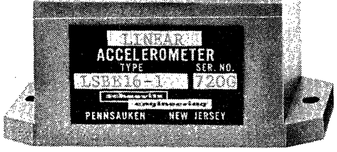
The PTD Series transducers are DC operated devices that contain integral signal conditioning circuits. A regulated input of ±15V dc will produce an output of ±2.5V dc at full scale that is suitable for operating remote display or recording equipment. Two-wire current-transmitting DC operated pressure transducers that provide a DC current output of from 4 to 20 ma are also available. Operating temperature range of the PTD Series is between −65°F and +200°F.

SERIES	APPLICATION	MEASUREMENT RANGE	MODELS IN SERIES	UNIT PRICE RANGE
PTA-1	Ruggedized Industrial Use	0-50/0-1000 ins H_2O	6	277.20/337.20
PTA-3	General Use	0-10/0-1000 ins H_2O	7	108.00/199.00
PTA-4	Ruggedized Industrial Use	0-15/0-10,000 psi	11	166.40
PTA-7	Compact Corrosive Industrial	0-15/ 0-500 psi	6	175.00
PTD-1	DC Operated PTA-1	0-50/0-1000 ins H_2O	6	352.20/412.00
PTD-3	DC Operated PTA-3	0-10/0-1000 ins H_2O	7	183.00/285.00
PTD-4	DC Operated PTA-4	0-15/0-10,000 psi	11	241.00
PTD-7	DC Operated PTA-7	0-15/0-500 psi	6	250.00
PTI-10	Two-wire Current Transmitter	0-50 ins H_2O/0-10,000 psi	16	320.00/450.00

Request Technical Bulletin 3001

ACCELERATION

Schaevitz accelerometers are closed-loop force-balance transducers that are more accurate and more stable than open-loop types. These miniature devices, encased in light-weight hermetically-sealed housings, feature a rugged acceleration sensor in combination with reliable solid-state circuitry. Configurations are available to satisfy the precise requirements of many diverse applications that include: measurement of acceleration, inertial guidance, control, vehicular vibration analysis and stabilization, and electronic leveling.



Schaevitz servo accelerometers are DC operated. Input voltages may range from a low of ±7.5V dc, balanced, to a high of ±55V dc, balanced, or from 15V dc to 100V dc, single-ended. The options available can provide: telemetry output, DC output voltage bias, output to input isolation, unipolar output, output limiting and fluid damping. Operating temperature range is between −40°F and +200°F.

The LS Models provide linear ranges from ±0.25g to ±50g with linearities on the order of 0.05% of full scale and resolution down to 0.0001% of full scale.

The AS Models provide angular ranges from ±50 rad/sec^2 to ±1500 rad/sec^2 with linearity at 0.1% of full scale and resolution to 0.0005% of full scale.

SERIES	APPLICATION	MEASUREMENT RANGE	MODELS IN SERIES	UNIT PRICE RANGE
LSB	General Use, Linear	±0.25g/±50g	8	385.00/390.00
ASB	General Use, Angular	±50/±1500 rad/sec^2	5	385.00/390.00
LSM	Miniaturized, Linear	±0.25g/±50g	8	390.00/395.00
ASM	Miniaturized, Angular	±50/±1500 rad/sec^2	5	390.00/395.00
LSE	Sub-miniaturized, Linear	±0.25g/±10g	6	450.00/455.00
LSXV	Electronic Leveling	±0.25g/±1g	3	425.00/430.00

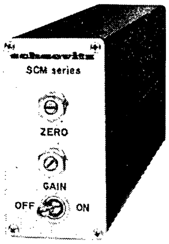
Request Technical Bulletin 4501

schaevitz engineering U.S. ROUTE 130 & UNION AVE./ PENNSAUKEN, N. J./ 609-662-8000

The Measurement and Control Company **schaevitz engineering**

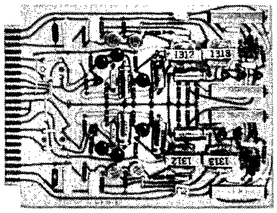
See Sections 2200 and 4100
for additional information

TRANSDUCER SIGNAL CONDITIONERS



SINGLE CHANNEL UNITS

Schaevitz single channel signal conditioners are self-contained units which provide complete AC-DC conditioning for all LVDT transducers. They operate from 115V/60 Hz, 220V/50 Hz, line power and typically deliver a low impedance output of ± 10V dc. Zero suppression circuitry is normally included; special LVDT temperature compensation circuitry is optional.



MULTIPLE CHANNEL UNITS

The Schaevitz PCB Signal Conditioner System concept consists of a single power supply, a rack-mount card enclosure and a family of plug-in printed circuit cards. The PCB system will handle up to ten channels of AC-DC conditioning for LVDT's in 5¼ x 19 inches of rack space. In addition to basic signal conditioning, the family of plug-in cards includes circuits for: signal summing and weighting, peak signal holding, high-low limit switching, and special LVDT temperature compensation. A digital display and digital line printer are also available as PCB accessories. Schaevitz can supply PCB modules individually, in kit form or as a complete system.

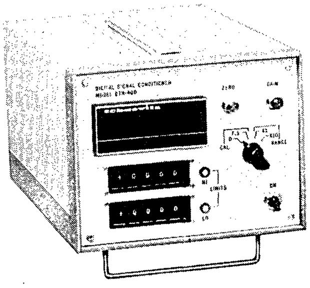
schaevitz
engineering

MODULAR UNITS

Schaevitz modular signal conditioners are compact, hard-wire encapsulated packages that convert any AC-operated LVDT to DC operation. The variety of models available readily accommodates an optimum choice of input, excitation and output parameters. Schaevitz modular units are ideal for OEM use or portable LVDT instrumentation.

Request Technical Bulletin 7001 & 7002

DISPLAY AND READOUT



Schaevitz Engineering offers a wide selection of digital and analog display equipment.

The DTR 375 model displays variables on a four-place digital indicator and contains integral signal conditioning.

The DTR 400 model features a four-place digital indicator, integral signal conditioning and a variety of modular options such as: 10:1 scale expander; BCD output; single or dual set points with indicator lamps; 10 ma analog output for driving recorders and control devices.

The ATR 200 model displays variables in analog form with an optional optical limit meter and contains integral signal conditioning.

The DTR 450 model has a high resolution five-place digital indicator and can provide a digitally coded output for interfacing with printers or other types of digital equipment. This model is an accessory for the PCB Signal Conditioner System and does not contain integral signal conditioning; furnished in half-rack mounting.

The DTP 070 model is a seven-character digital line printer capable of printing a five-digit signal plus a two-digit indentification code. Optional expansion to 12-character printing is available; furnished in half-rack mounting.

Request Technical Bulletin 7001

schaevitz engineering U.S. ROUTE 130 & UNION AVE./ PENNSAUKEN, N. J./ 609-662-8000

SRC
MOXON

VARIABLE RELUCTANCE TRANSDUCERS*

* Partial listing. SRC power supplies and data generators are covered in other sections of this publication. Send for detailed literature on specific products.

Since pioneering variable reluctance transducer measurement in 1938, SRC Div./Moxon (Crescent) has continually paced the industry by developing new transducer types and systems. The expanded line presently includes a complete range of precision sensors in the following types:

• LINEAR DISPLACEMENT • ROTARY DISPLACEMENT • FORCE • PRESSURE • TORQUE VELOCITY

Inherent advantages offered by variable reluctance transducers are no friction, long life, low cost and direct measurement.

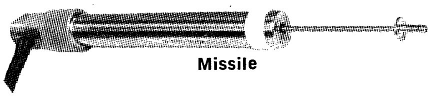
In addition to the transducer line, SRC has produced a complete line of complementary electronic components. While the standard systems fit most applications, SRC engineers have the know-how to develop custom systems for special requirements.

Transducers/electronics/systems . . . three way flexibility showing why SRC means leadership in standard and custom transducer systems for industrial or military applications.

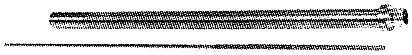
If it can be bulit, SRC can do it.

LINEAR TRANSDUCERS

DC-DC LVDT

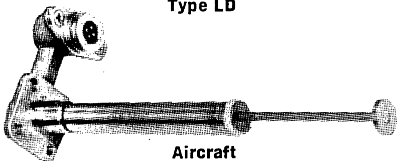


Missile



Industrial

Type LD



Aircraft

DESCRIPTION

Linear transducers provide a voltage output which is linear with the movement of a permeable probe along the instrument bore. The magnetic circuit can be provided as either a 4-wire differential transformer or a 3-wire variable inductance. DC-DC Linear Transducers are available, such as the D1110 with an accuracy of better than .1%. Displacement of the probe creates an unbalance in the transducer coils, resulting in a "high level" output voltage proportional to probe movement.

FEATURES

ACCURACY • LINEARITY • AC OR DC • RUGGED LOW FORCE REQUIREMENTS • LIGHTWEIGHT •

TYPICAL APPLICATIONS

Missile engine monitoring • measurement and control • cam following • checking bearing contour • sensing diaphragm movement • extensiometer micrometers • instrument translators • breakaway mechanisms • control pitch and yaw • monitor aircraft control surface actuators (F-14 & F-15) bellows movement • piston motion • position sensors • scale beams • meter movements • analytical balances • nuclear/seismic motion measurement •

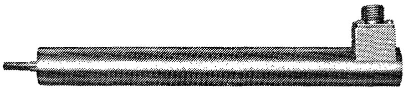
PHYSICAL CHARACTERISTICS

Displacement Ranges: 0.01 to 50 inches.
Temperature Ranges: −160° to +450°F typical.
Shielding: Magnetic and electrostatic.
Thermal Coefficient of Sensitivity: 0.02% per degree F nominal.

ELECTRICAL PERFORMANCE RANGES

Excitation: Frequency: 60Hz to 20kHz.
Excitation Voltage: Up to 115 VAC.
Sensitivity: Up to 60 v/v/inch.
Linearity Range: ± 0.1 to 1%.
Null Voltage: 0 to 3 mv/v.
Resolution: Continuous.
Repeatability: 0.01% typical.
PRICE RANGE: $75 to $250.

VELOCITY TRANSDUCERS



Type VE

DESCRIPTION

These electromechanical transducers are ideal for field use since they have a self-generated output that does not require an external excitation source. Still the units sense the velocity of a linear motion and provide a proportional DC output signal which may be used for measurement and control.

Another feature of the transducer is that the frequency response exceeds that possible with other methods since demodulators or filters are not required. This is of particular advantage when the output is used for velocity compensation of feedback control systems.

FEATURES

EXCITATION SOURCE NOT REQUIRED • TWO PICK-UP COILS FOR SINGLE-ENDED OR PUSH-PULL OPERATION

TYPICAL APPLICATIONS

Piston, shutter, valve or actuator measurement • missile, aircraft, rocket sled or ground equipment monitoring • atomic ground movement studies •

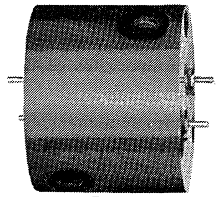
PHYSICAL CHARACTERISTICS

Displacement Ranges: 1 to 12 inches typical.
Temperature Range: −60 to +450°F.

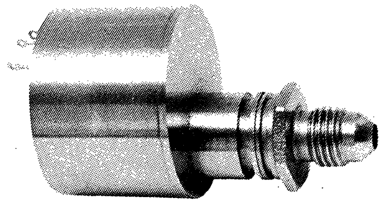
ELECTRICAL PERFORMANCE RANGES

Non-linearity: ±1% or less over linear range.
Sensitivity: 120mv/inch/sec. nominal.
Repeatability: 0.05% or better.
Resolution: Continuous.
PRICE RANGE: $100 to $300.

PRESSURE TRANSDUCERS



Pressure



P-2000

DESCRIPTION

Pressure transducers are available in absolute gage and differential types that provide a variable output directly proportional to the applied pressure. The sensing element is a twisted Bondon tube with a variable reluctance pickoff. Internal signal conditioning is use on some models for DC-DC application. Differential transformer output is available.

FEATURES

ACCURATE • LOW HYSTERESIS • SIMPLIFIED DESIGN • LOW COST •

TYPICAL APPLICATIONS

Process control and measurement • fluid or gas monitoring • leak testing • altitude measurement • depth measurement •

PHYSICAL CHARACTERISTICS

Pressure Ranges: 25 to 5,000 PSI.
Overload Limit: 200% typical.
Operating Temperature: −65°F to +250°F typical.
Cyclic Life: Greater than 10^7 cycles.
Weight: Less than 1 oz. to less than 1 lb.

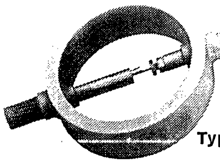
ELECTRICAL PERFORMANCE RANGES

Circuitry: Differential transformer or variable reluctance with optional DC-to-DC electronics.
Excitation Frequency: 0.4 to 10kHz.
Excitation: 30 volts max.
Linearity: 0.25 to 1%.
Hysteresis: Less than 0.1% typical.
Repeatability: Better than 0.1% typical.
Resolution: Infinite.
Phase Shift: Less than 10° typical.
Ripple: Less than 20mv typical.
Load Resistance: 10,000 ohms typical.
Sensitivity: 80mv/v typical.
Thermal Zero Shift: Less than 2% per 100°F.
Thermal Sensitivity Shift: Less than 3% per 100°F.

PRICE RANGE: $100 to $250.

SRC DIVISION/MOXON INC. ■ 2222 Michelson Drive ■ Newport Beach, California 92664 ■ (714) 833-2000 ■ (213) 623-1892 ■ TWX 910-596-1362

FORCE TRANSDUCERS


Type DVA

DESCRIPTION

SRC Force Transducers are precision instruments that measure mechanical compression, extension and weight forces. They consist of steel rings especially selected for exact modulus of elasticity characteristics. The rings are combined with linear transducers, mounted in the ring center. Together they measure changes in ring configuration, resulting from applied force. The result is a measurable AC voltage, proportional to the force.

FEATURES

AC • HIGH LEVEL • LOW NOISE • LONG CABLE RUN CAPABILITY •

TYPICAL APPLICATIONS

Crane/scale weight measurement • braking devices • scale calibration • weight stamp measurement • cable force or hydraulic thrust pressure measurement •

PHYSICAL CHARACTERISTICS

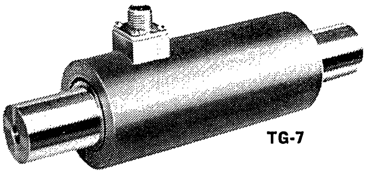
Force Range: 1 to 15,000 lbs.
Overload Range: Up to 50%.
Safe Load Capacity: 150%.
Ring Deflection: 0.015 to 0.030 inch.
Temperature Range: −160 to +500°F.

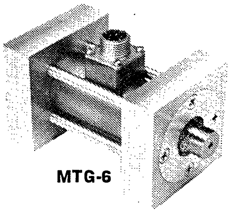
ELECTRICAL PERFORMANCE RANGES

Excitation Frequency: 60Hz to 15kHz.
Excitation Voltages: 3 to 30 volts.
Sensitivity Ranges: 20 to 30mv/fs/v.
Linearity: Within 1%.
Repeatability: Within 1%.
Resolution: Better than 0.005%.
Output Impedance: 500 ohms at 3kHz.
Hysteresis: Less than 0.1%.

PRICE RANGE: $200 to $800.

TORQUE TRANSDUCERS


TG-7


MTG-6

DESCRIPTION

SRC Torque Transducers are precision electronic torque measuring instruments for making static and dynamic measurements where breaking into a coupling is possible. Typical power transmission is through splines or keyways. It employs a linear-variable differential transformer principle to provide an AC output signal proportional to the amount of torque applied. It reverses phase 180° through null when torque is applied. Output is applied to conventional recorders and DC readout device employing the SRC Model 1501T Signal conditioning.

Since slip rings or commutators are not used, no moving parts are in contact with the stationary housing. Therefore, the transducers do not introduce interfering noise into the circuit.

FEATURES

NO SLIP RINGS, NOISE OR WEAR • INFINITE LIFE • INFINITE RESOLUTION • DYNAMICALLY BALANCED TO 10,000 RPM • COMPACT • BEARING MODELS AVAILABLE •

TYPICAL APPLICATIONS

Starting, running and braking of reciprocating motors • brake horsepower dynamometer • helicopters • lathes

PHYSICAL CHARACTERISTICS

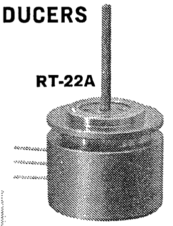
Torque Range: 2.5 to 100,000 inch-lbs.
Overload Range: 50 to 100% of full scale.
Temperature Range: −320° to +450°F.

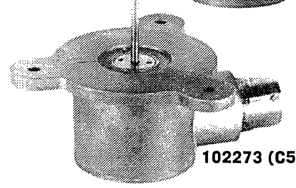
ELECTRICAL PERFORMANCE RANGE

Carrier Frequency: 400 to 5,000Hz.
Input Voltage: 5v rms.
Sensitivity: 30 to 40mv full scale per volt input.
Non-Linearity: .75% over half range; 2% over full range.
Repeatability: 0.15% or better.
Hysteresis: Less than 0.25%.
Null Voltage: 10mv nominal with external compensation.

PRICE RANGE: $200 to $2500.

ROTARY TRANSDUCERS


RT-22A


102273 (C5A)

DESCRIPTION

Rotary transducers, like the other transducers in the SRC line, are electromechanical devices. When the shaft turns, the voltage output is proportional to shaft rotation.

The magnetic circuit can be provided as either a 4-wire differential transformer or a 3-wire variable inductance. Angular displacement of the shaft results in a "high level" output proportional to angle.

FEATURES

RUGGED • COMPACT • HIGH ENVIRONMENTAL RESISTANCE • ACCURATE • DIRECT READING • INFINITE RESOLUTION • DOUBLE BEARING • NO WEAR

TYPICAL APPLICATIONS

Position monitor for ships' rudder, aircraft control surfaces. Replaces potentiometers or other limited-life transducers.

PHYSICAL CHARACTERISTICS

Displacement Ranges: 0 to ±60°.
Overtravel: ±10° to 360°.
Temperature Range: −65°F to +275° typical.
Shielding: Electromagnetic.

ELECTRICAL PERFORMANCE RANGES

Excitation: 1.5 to 30v rms, 400 to 420Hz.
Sensitivity: 0.0014 to 0.0455v rms per degree.
Sensitivity Shift: ±0.03%/°F typical.
Linearity: ±0.5% typical.
Null Voltage: 3 to 10mv rms.
Phase Shift: 10° maximum, typical.
Output Impedance: 500 ohms max.

PRICE RANGE: $250.

AC SIGNAL CONDITIONERS— Series 1500 Carrier Amplifiers

DESCRIPTION

These self-contained carrier amplifiers employ a single P.C. card per channel enclosed in an aluminum guard shield for single or multichannel installations. They offer many frequency/gain combinations for constant voltage applications with AC or DC type sensors or transducers. They are ideal where high isolation and excellent performance are required. For portable applications, a special dual channel housing/carrying case is available.

FEATURES

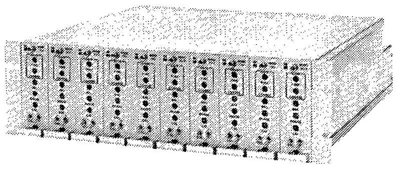
HALVES SYSTEM PACKAGING COST • MIX AC OR DC • ALL SILICON SOLID-STATE • ACTIVE OUTPUT FILTERS • SYNCHRONOUS DEMODULATOR • MASTER SLAVE OPERATION • 10 VOLT SINE WAVE EXCITATION SOURCE • COURSE/FINE FAIN AND BALANCE CONTROLS • HIGH DENSITY TEN ACROSS MOUNTING • QUADRATURE ADJUSTMENT FOR EITHER PHASE • ADAPTS FOR COMMON OSCILLATOR • REMOTE CALIBRATION •

TYPICAL APPLICATIONS

Drive LVDT, variable permeance, strain gage or torque transducers •

SPECIFICATIONS

EXCITATION SOURCE
Output Voltage: 10V rms.
Output Current: 0 to 100ma rms.
Output Frequency: Standard: 400Hz to 20KHz.
Regulation, Load: Less than 0.1% for a NL/FL change.
Regulation, Line: less than 0.02% (105 to 125 VAC).
Temperature Coefficient: Less than 0.005%°F.



OUTPUT AMPLIFIER/DEMODULATOR

Output Voltage: 0 to ±10 VDC.
Output Current: 10ma max.
Ripple: 5mv rms.
Frequency Response: −3db point at 0.1 times excitation frequency.
Signal Input: 5V rms typical.
Input Impedance: 50k ohm min.
Voltage Gain (AC in to DC out): Up to 100, depending on model (1,000 optional).
Conversion Linearity: 0.05% min.

SYSTEM

Input Voltage: 105 to 125 VAC 60Hz, single phase.
Short term Stability: Less than 0.05% of full scale for 8 hours after 30-minute warm-up.
Long term Stability: Less than 0.1% of full scale for 48 hours.
Temperature Coefficient: Less than 0.005% per degree F.
Operating Temperature Range: 35° to 135°F.
Overload Protection: Accomplished by internal current limiting circuitry.

CONTROLS

Balance Control: 20 turn potentiometer.
Coarse Gain Control: 20 turn potentiometer.
Fine Gain Control: 20 turn potentiometer.
Bridge Completion Resistors: Two internal resistors provided.

OPTIONAL: Quadrature and phase.

PRICE RANGE: $395 basic unit.

SRC DIVISION/MOXON INC. ■ 2222 Michelson Drive ■ Newport Beach, California 92664 ■ (714) 833-2000 ■ (213) 623-1892 ■ TWX 910-596-1362

DC SIGNAL CONDITIONING SYSTEMS*

* Partial listing. SRC transducers and data generators are covered in other sections of this publication. Send for detailed literature on specific products.

BRIDGE SIGNAL CONDITIONERS— General

The following summarizes the common areas SRC signal conditioners share.

FEATURES

ALL SOLID-STATE • RACK MOUNTING • FRONT PLUG-IN ACCESSIBILITY • FRONT PANEL CONTROL •

COMMON SPECIFICATIONS

Bridge Configuration: 1, 2 or 4 arms.

Wiring Configuration: 2-8 wire with shield carried through.

POWER SUPPLY

Input Voltage: 105 to 125 VAC, 60Hz.

AC Isolation: 10,000 megohms.

DC Isolation: Less than 0.1 pF.

Temperature Stability: 0.005%/°F.

Temperature Range: 35 to 135°F.

Time Stability: Less than 0.05% of full scale for 8-hrs. after 30-minute warm up.

Sensing: Selectable at power supply output or transducer.

MODELS 2541 & 2545

LOW COST • INTERMIX AC AND DC SIGNAL CONDITIONERS IN THE SAME RACK • INTERCHANGE BOTH COMPLETION AND CALIBRATION NETWORKS WITH "PIGGYBACK" TERMINAL CARDS • OVERLOAD PROTECTION • SUBSTITUTION CALIBRATION FROM EXTERNAL STANDARD • CALIBRATION RELAYS • OPEN SENSE LEAD PROTECTION • MULTI-SHIELDED TRANSFORMER • CONSTANT VOLTAGE/CONSTANT CURRENT SUPPLIES • MODULAR CONSTRUCTION

POWER SUPPLY, CONSTANT CURRENT MODE

Current Range: 2541 — 1 to 50ma (optional) 200ma); 2545 — 1 to 50ma (optional 100ma).

Compliance: 0.1 to 25v.

Resolution: 500ua.

Regulation: Line ±10%, 0.1% or 0.1ua.

Ripple: 0.5 μA p-p or 5 μV p-p, whichever is greater.

Recovery Time: 50 us for any load change.

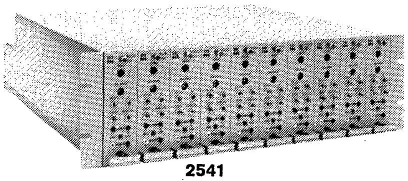
Output Impedance: Greater than 1 megohm.

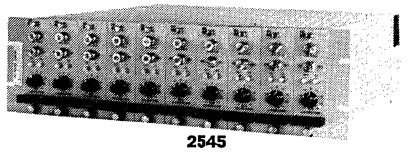
MODELS 2530 & 2531

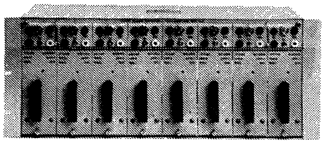
AUTOMATIC CURRENT LIMITING CIRCUITS PROVIDE OVERLOAD PROTECTION • UP TO 17 BRIDGE CONFIGURATIONS

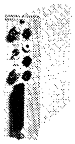
3600 SERIES

COMMON OR SEPARATE POWER SUPPLY • SIX POWER SUPPLY OPTIONS • UP TO 17 BRIDGE CONFIGURATIONS •


2541


2545


3600


2531

SIGNAL CONDITIONER SPECIFICATIONS

	2541	2545	2530	2531	3600	3602	3604
Calibration: Local	Plus and minus 1 step single or double shunt. Voltage substitution, zero cal. and Excitation Disable.	Plus and minus 1 step single or double shunt. Optional 4 steps and zero calibration.	Front panel potentiometer for 1 point shunt calibration.	2 points shunt.	2 points shunt calibration, single or dual polarity.		
Remote	Same as local cal.	Plus and minus 4 steps single or double shunt. Optional zero cal.	Same as local cal.	Optional	2 points single or dual polarity. Optional zero cal.		
Balance Control	10 Turn pot. 20PPM/°C, resolution 0.02% with friction knob or screwdriver adjustment.		Ten turn pot with knob and locking device.	Ten turn pot with screwdriver adjust and shaft lock.	Ten turn pot. 20 p-pm/°C with shaft lock.		
Calibration Controls	4 Toggle Switches	3 Position Toggle.	Front Panel Pushbutton.	3 Position Toggle.			
Bridge Output and Excitation Monitor	Terminal jacks on front for Bridge Excitation and output.	Two pushbutton switches connect Bridge Excitation or output to the monitor bus.	Front panel jacks.		Terminal jacks on front panel.		
Calibration and Bridge Completion Resistor	Bifurcated terminals are provided on plug-in circuit boards.		Ten turn pot.	Terminals provided for 2 resistors.	Bifurcated terminals provided with instant access.		
			Terminals are provided for insertion of up to 4 completion resistors.				
Size	The Rack Adapter mounts in a 19″ standard rack, occupying 5¼″ of front panel height and is 19″ deep.		7″ high x 19″ wide x 10″ deep		1¾″ vertical rack height for ea. 8 channel module; 5¼″ for ea. group of 8 3550, 3560, or 3570 supplies (below); 5¼″ for ea. group of 4 3582, 3583 or 3584 supplies (see power supplies).		
Price	$310	$298	$225	$190	$100 + $25/ch.	$120 + $40/ch.	$120 + $28/ch.

POWER SUPPLY SPECIFICATIONS — Constant Voltage Mode

					Model 3550 Pwr. Sup.	Model 3560 Pwr. Sup.	Model 3570 Pwr. Sup.
Output Voltage	0 to 25 vdc continuously adjustable.	0 to 30 vdc continuously adjustable.	0-25 Volts DC continuously variable.		**Any fixed voltage 9-30 vdc, ± 1 v vernier.**	A — 4-16 vdc B — 16-20 vdc	0-25 vdc
Output Current	0 to 200 ma.	0 to 100 mA	0-200 mA		0-100 mA		0-200 mA
Resolution	5mv		300 uV	5mv	10 mv	5 mv	
Regulation: Line	Less than 0.005% or 100uv ±10%.		(105-125 VAC) .01% or 1.5 mv, whichever is greater.				
Regulation: Load	Less than 0.005% or 100uv NL/FL.		No load to full load .01% or 1 mv, whichever is greater.		Less than 0.02% No load to full load and Line voltage changes of ±10%.		
Ripple	Less than 100uvpp.		Less than 200 uvp-p		Less than 250 u-volts p-p.		Less than 200 u-volts p-p.
Noise	Less than 5uvpp across a 350 ohm grounded bridge.		Less than 10 uvp-p per 1,000 ohms. Resistance from either output terminal.				
Short Circuit Protection	Constant current.		Current limited to less than 300mA.		Current limiting to less than 200 mA.		Current limiting (300 mA).
Overland Recovery	NL to FL to NL to less than 1% of setting in less than 50us.		NL to FL 100μ seconds				
Sense Current	Less than 300ua.		Less than 1mA.				

SRC DIVISION/MOXON INC. ■ 2222 Michelson Drive ■ Newport Beach, California 92664 ■ (714) 833-2000 ■ (213) 623-1892 ■ TWX 910-596-1362

Amperex Communication, Industrial and Special Purpose Tubes...

TUBE TYPE

2D21
2D21W/E91N/5727
2J42/JP9-7
2J42A/JP9-15
2J55/JP9-50A
2K25/KS9-20A
2K26/KS7-85
3-400Z/8163
3-500Z/8802
3B28
3CPN10A5/7815
4-65A/8165
4-125A/4D21
4-250A/5D22
4-400A/8438
4-400A/8438A
4B32
4C35/6268
4CS250H/SD621
4CX250B/7203
4CX250B/7203 JAN
4CX250BNL
4CX250F/7204
4CX250F/7204 JAN
4CX250FG/8621
4CX250FG/8621 JAN
4CX250R
4CX250R/7580W JAN
4CX350A/8321
4CX350F/8322
4CX350F/8322 JAN
4CX1000A/8168
4CX1500B/8660
4D21/4-125A
4J50/JP9-250
4J52/JP9-80
4X150A/7034
4X150A/7034 JAN
4X150D/7035
4X150D/7035 JAN
4X500A
5C22/6279
5C22A/6279
5D22/4-250A
5J26 JAN
6AK5W/5654/E95F
6AL5W/5726/E91AA
6DJ8
6DJ8/ECC88
6Q4
6R4
7C24/5762
90C1
150B2/6354
501RA
575A
652/5551A
723A/B
725A
807
813
833A
857B
866A
866AX
869B
869BL
872A
872AX
967/5557/FG17
4349
4369
4370
4371
4372
4378

TUBE TYPE

4379
4383
4390
4397
5544
5545
5551A/652
5557/FG17/967
5586 JAN
5651
5654/6AK5W/E95F
5657 JAN
5726/6AL5W/E91AA
5727/2D21W/E91N
5759
5762/7C24
5823/Z900T
5842
5842 JAN
5847/E182F
5866
5866A/7986
5867A
5868
5869
5870
5894 JAN
5894 COMM
5894A
5894B/8737
5920/E90CC
5923
5924A
6007
6008
6027H/YJ1060
6075A
6076A
6078
6079
6083
6084/E80F
6085/E80CC
6146A
6146B/8298A
6155
6155U
6156
6159
6159B
6189/E82CC
6201/E81CC
6211
6211A
6218/E80T
6227/E80L
6252
6252 JAN
6268/4C35A
6279/5C22
6293
6339
6354/150B2
6360/COMM
6360 JAN
6360A
6370/EIT
6375/DC70
6442
6463
6508
6521
6589
6617
6618
6661

TUBE TYPE

6662
6681/E83CC
6686/E81L
6687/E91H
6688/E180F
6688A
6688B
6688 JAN
6689/E83F
6693
6693A
6752
6779/Z803U
6786
6883
6883B/8032A8552
6907
6907 JAN
6922/E88CC
6922/E88CC JAN
6923/EA52
6939
6939 JAN
6960A
6961A
6977
6979
7008/YJ1010
7034/4X150A
7034/4X150A JAN
7035/4X150D
7035/4X150D JAN
7062/E180CC
7090
7092
7093
7119/E182CC
7136
7136A
7203
7203/4CX250B JAN
7204/4CX250F
7204/4CX250F JAN
7237A
7308
7308 JAN
7316
7320/E84L
7377
7459
7527
7527A
7534/E130L
7580
7580W/4CX250R JAN
7609 JAN
7643/E80CF
7645
7650
7693/E90F
7694/E99F
7699
7709/Z70W
7710/Z70U
7711/Z71U
7714/Z805U
7721/D3A
7722/E280F
7737/E186F
7753
7788
7788 JAN
7804
7805
7806
7807

TUBE TYPE

7815/3CPN10A5
7854
7900
7983
7984
7986/5866A
8008
8008AX
8020W
8032
803A/6883B/8552
8042
8078
8108/EC157
8116 JAN
8116A
8117A
8118
8119/TBL2/400
8120/TBL2/500
8163/3-400Z
8165/4-65A
8168/4CX1000A
8179
8223/E288CC
8228
8233/E55L
8233 JAN
8254
8254/EC1000
8255/E88C
8268
8269
8270
8298A/6146B
8300
8321/4CX350A
8322/4CX350F
8322/4CX350F JAN
8348
8408
8416
8436/EC158
8438/4-400A
8438A/4-400A
8457
8458
8463
8482
8505A
8509
8552/8032A/6883B
8556
8560AS
8577
8579
8580
8591
8592A
8593
8594
8595
8603
8609
8621/4CX250FG
8621/4CX250FG JAN
8624
8639
8639 JAN
8643
8647
8660/4CX1500B
8666
8667
8668
8669A

TUBE TYPE

8670A
8679
8680
8683
8728
8731
8732
8733
8734
8735
8736
8737/5894B
8744
8752
8753
8798 JAN
8801
8802/3-500Z
8812
8813
8814
8830A
8867
8888
8913
8915
55335/DX184
AX105/FG105
AX126B
AX260/PL260
DC70/6375
DX151/YK1010
DX184/55335
DX206/DX260
DX260/DX206
DX267
DX276
DX285/YJ1180
DX287
DX290/YJ1320
DX342
DX343
DX345
DX373/3219
DX393
DX401/YJ1420
DX427
D3A/7721
E1T/6370
E55L/8233
E80CC/6085
E80CF/7643
E80F/6084
E80L/6227
E80T/6218
E81CC/6201
E81L/6686
E82CC/6189
E83CC/6681
E83F/6689
E84L/7320
E86C
E88C/8255
E88CC/6922
E88CC/6922 JAN
E90CC/5920
E90F/7693
E91AA/5726/6AL5W
E91H/6687
E91N/5727/2D21W
E92CC
E95F/5654/6AK5W
E99F/7694
E130L/7534
E180CC/7062
E180F/6688

TUBE TYPE

E182CC/7119
E182F/5847
E186F/7737
E280F/7722
E288CC/8223
EA52/6923
EA53
EC157/8108
EC158/8436
EC1000/8254
ECC88/6DJ8
ECC2000
EFP60
EL360
FG17/5557/967
FG105/AX105
JP9-2.5D/F
JP9-2.5E
JP9-7/2J42
JP9-15/2J42A
JP9-50A/2J55
JP9-80/4J52
JP9-250/4J50
KS7-85/2K26
KS9-20A/2K25
KS9-20D/F
KS9-40D
OZ168
PL260/AX260
SD612
SD613A
SD621/4CS250H
SD650
TBL2/400/8119
TBL2/500/8120
YD1240
YD1300
YD1330
YD1331
YD1332
YD1333
YJ1010/7008
YJ1071
YJ1110
YJ1120/21
YJ1160
YJ1162
YJ1180/DX285
YJ1191
YJ1200
YJ1280/OM-50
YJ1320/DX290
YJ1420/DX401
YK1001
YK1010/DX151
Z70U/7710
Z70W/7709
Z71U/7711
Z303C
Z502S
Z504S
Z505S
Z803U/6779
Z805U/7714
Z900T/5823
ZA1000
ZA1001
ZA1002
ZA1003
ZA1004
ZA1005
ZB3200
ZC1031
ZC1050
ZC1060
ZX1052

AMPEREX ELECTRONIC CORPORATION
Hicksville, Long Island, New York 11802

Amperex®
TOMORROW'S THINKING IN TODAY'S PRODUCTS
A NORTH AMERICAN PHILIPS COMPANY

CUSTOM ENGINEERED

High Quality Tubes

- ***Ceramic Thyratrons***
- **High Vacuum Rectifiers — Clipper Diodes**
- **High Vacuum Amplifiers**
- **Gas & Mercury Vapor Thyratrons**
- **Gas & Mercury Vapor Rectifiers**
- **Hydrogen Thyratrons**

HIGH VACUUM RECTIFIERS — CLIPPER DIODES

E.E. TYPE NUMBER	CATHODE VOLTS	CATHODE AMPS	MAX. ANODE RATINGS PEAK INV. K-VOLTS	PEAK AMPS	AVE. AMPS	MAX. OVERALL HEIGHT	MAX. DIAM.
3B24WB-A	5.0 2.5	3.0	20	.30 .15	.060 .030	3 1/2	1 1/2
3B29W	2.5	5.0	16	.25	.065	5 3/8	1 9/16
4B31	5.0	5.0	16	10	.150	7.0	2 9/16
250R	5.0	10.0	60	1.0	.250	10 1/4	3
371-B	5.0	10.3	25	1.5	.300	8 3/4	2 17/32
576-A	5.0	14.0	25	2.5	.500	7 3/4	2 17/32
577	5.0	10.3	25	1.5	.300	7 1/2	2 1/16
577W	5.0	10.3	25	1.5	.300	7 1/2	2 1/16
578	5.0	6.0	40	.75	.100	6 1/2	2 1/16
705WA	5.0	5.0	30	.40	.100	5 1/16	2 5/16
719A*	7.0	7.0	25	10	.150	5 7/8	2 1/4
836	2.5	5.0	5	1.0	.250	6 9/16	2 7/16
8020	5.0	6.0	40	.60	.100	8.0	2 17/32
8020W	5.0	6.0	40	.60	.100	8.0	2 17/32

*RECOMMENDED FOR CLIPPER SERVICE ONLY.

HIGH VACUUM AMPLIFIERS

E.E. TYPE NUMBER	CATHODE VOLTS	CATHODE AMPS	MAX. PLATE RATINGS C.C.S. CLASS C VOLTS	INPUT WATTS	DISSIPATION WATTS	AMP FACTOR	MAX. OPERATING FREQ. (MC)	MAX. OVERALL HEIGHT	MAX. DIAM.
3C24	6.3	3.0	2000	100	25	21	100	4 3/8	1 7/16
100TH	5.0	6.3	3000	600	100	37	40	7 3/4	3 3/16
572-B	6.3	4.0	2000	300	75	170	30	6 9/16	3 1/16
250TH	5.0	10.5	4000	800	250	36	40	10 1/8	3 13/16
250TL	5.0	10.5	4000	800	250	14	40	10 1/8	3 13/16
809	6.3	4.0	1500	100	30	50	40	6 9/16	2 7/16
811A	6.3	4.0	1500	260	65	160	60	6 9/16	2 7/16
811AW	6.3	4.0	1500	260	65	160	60	6 9/16	2 7/16
812	6.3	4.0	1500	260	65	29	60	6 9/16	2 7/16
812AW	6.3	4.0	1500	260	65	29	60	6 9/16	2 7/16
812HD	6.3	4.0	2000	300	75	30	60	6 9/16	2 7/16
826	7.5	4.0	1250	175	75	31	250	3 11/16	2 3/8
E.E. 300	11.0	4.0	3000	800	200	23	30	10 1/4	3 1/16

GAS & MERCURY VAPOR THYRATRONS

E.E. TYPE NUMBER	CATHODE VOLTS	CATHODE AMPS	TYPE FILL	MAX. ANODE RATINGS PEAK INV. VOLTS	PEAK AMPS	AVE. AMPS	TUBE DROP	MAX. OVERALL HEIGHT	MAX. DIAM.
3C23*	2.5	7.0	GAS & HG	1250	6.0	1.5	12	6 5/8	2 1/16
FG-17	2.5	5.0	HG	5000	2.0	0.5	12	6 5/8	2 7/16
393-A*	2.5	7.0	GAS & HG	1250	6.0	1.5	15	6 5/8	2 1/16
323-B*	2.5	7.0	GAS & HG	1250	6.0	1.5	15	6 5/8	2 1/16
394-A	2.5	4.0	GAS & HG	1250	2.5	0.64	15	5 3/4	1 25/32
873*	5.0	7.0	HG	10,000	5.0	1.25	15	8 3/4	2 5/16
7410	5.0	7.0	GAS	1700	6.0	1.5	15	6 5/8	2 1/16

GAS & MERCURY VAPOR RECTIFIERS

E.E. TYPE NUMBER	CATHODE VOLTS	CATHODE AMPS	TYPE FILL	MAX. ANODE RATINGS PEAK INV. VOLTS	PEAK AMPS	AVE. AMPS	TUBE DROP	MAX. OVERALL HEIGHT	MAX. DIAM.
3B28	2.5	5.0	GAS	10 KV	1.0	0.25	10	6 5/32	2 1/16
4B32	5.0	7.0	GAS	10 KV	5.0	1.25	15	8 3/4	2 5/16
816	2.5	2.0	HG	7.5 KV	0.5	0.125	15	4 11/16	1 9/16
866A	2.5	5.0	HG	10 KV	1.0	0.25	10	6 9/16	2 7/16
872A	5.0	7.0	HG	10 KV	5.0	1.25	15	8 1/2	2 5/16
8008	5.0	7.0	HG	10 KV	5.0	1.25	15	8 3/4	2 5/16
8008XE	5.0	7.0	GAS	10 KV	5.0	1.25	15	8 3/4	2 5/16

GLASS & CERAMIC HYDROGEN THYRATRONS

E.E. TYPE NUMBER	HEATER* AMPS	MAX. RATINGS P.O. M.W.	Pb $\times 10^9$	epy KV	Ebb KV DC (MIN)	ib Aa	Ib Adc	MAX. OVERALL LENGTH	MAX. DIAM.
3C45	2.5	0.52	0.3	3.0	.80	35	.045	5 13/64	1 9/16
3C45W	2.7	0.52	0.3	3.0	.80	35	.045	3 7/8	1 9/16
4C35A	6.7	.350	2.0	8.0	1.5	90	.100	6 7/8	2 9/16
5C22	11.6	2.00	3.2	16.0	4.5	325	.200	8 3/4	2 9/16
KU-17	6.7	.330	2.5	8.0	1.5	83	.100	4 7/8	1 9/16
KU-25	11.6	1.5	3.8	12.0	3.5	300	.200	8 3/4	2 9/16
5956	6.7	.330	2.5	8.0	1.5	83	.100	4 3/4	1 9/16
5957	6.7	.330	2.5	8.0	1.5	83	.100	4 3/8	1 9/16
6130	2.5	0.52	0.3	3.0	.80	35	.045	5 3/16	1 9/16
7190	2.0	—	.1	1.2	.300	20	.050	2.125	.844
7191	2.0	—	.1	1.2	.300	20	.050	2.478	.844
8370	6.7	.330	2.5	5.0	.30	83	.100	4 7/8	1 9/16
**8613	11.5	—	10.0	16.0	1.0	500	.500	6.625	2.375
**8765	9.5	—	4.0	12.0	.300	350	.200	4.77	1.70

*ALL EEI THYRATRONS HAVE 6.3 VOLT HEATERS.
**CERAMIC TUBES.

1970 CATALOG

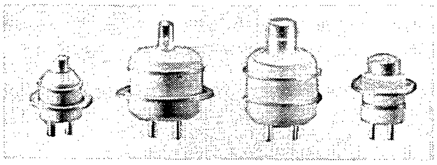
ELECTRONIC ENTERPRISES INC.

ELECTRONIC ENTERPRISES INC.

65 SEVENTH AVENUE, NEWARK, N.J. 07104 / (201) 485-8500
ORIGINAL TUBE MANUFACTURER

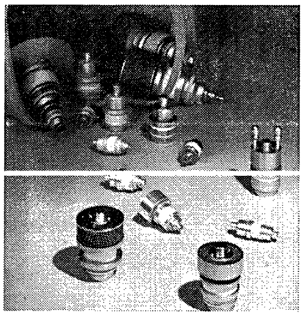
ELECTRON TUBES, MICROWAVE DEVICES

METAL-CERAMIC PLANAR TUBES



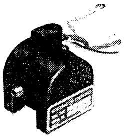
General Electric offers an extensive line of planar tubes in diode and triode designs for oscillators, amplifiers, mixers, detectors, and many other high-reliability applications from d-c to 10 gc. Unsurpassed tolerance to environment as adverse as 3000 G's impact at 3-5 ms, 30,000 G's centrifuge, up to 48 G's RMS vibration (100-2000 cps, 3 min each plane) and -55 C to $+400$ C temperature. Have also withstood 10^{18} NVT and 10^7 R/sec nuclear radiation. Minimum noise, in fractions of a db. Power outputs from low mw to 8kw peak. Tailored for CW, plate-pulsed, and grid-pulsed applications. Highest available ratio of power, efficiency, and gain-bandwidth to size and weight.

METAL-CERAMIC COAXIAL TUBES

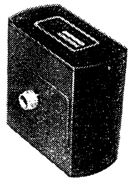


GE has the exact coaxial triodes and tetrodes for advanced VHF-UHF, RF power amplifiers, oscillators, or broad varieties of transmitter equipments to meet your most demanding application requirements. Advantages: high power gain, efficiency, voltage hold-off, duty factor; broad electronic bandwidth; long pulse-width life; reliable grid-pulsed amplifier or oscillator service.

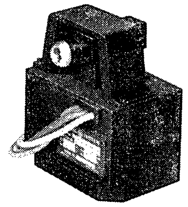
VTM's



Miniaturized shielded



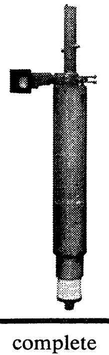
Magnetic and RFI shielded



Magnetic shielding and integral isolator

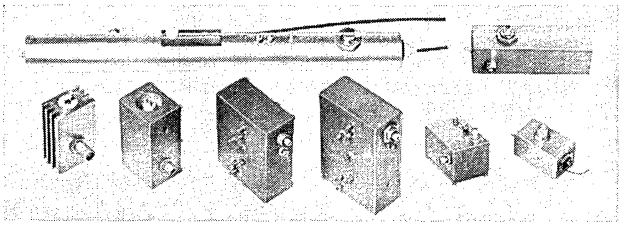
Voltage Tunable Magnetrons (VTM's) are high frequency, continuous wave oscillators operating in the microwave region. GE VTM's cover a wide range of frequencies — from 700 to over 5600 megacycles, with feasibility existing in X-band and down to 100 mc. Low power (up to 1 watt) for low-noise local oscillators, signal generators. Medium power (1-10 watts) for altimetry, telemetry. High power (over 10 watts up to 100's of watts) for broadband transmitters, barrage jamming, airborne applications. Also magnetically shielded VTM's at 1000-2000 mc and 2000 to 4000 mc (1 watt) for driver applications.

KLYSTRONS



GE has over 10 years experience in custom design, manufacture and repair of high-power, multiple resonator, amplifier klystrons and capability to produce klystrons for **specific** applications. The units, constructed of metal and ceramic, use ion pumps to maintain excellent vacuum conditions. Tunable types are designed so each cavity tunes at the same rate for perfect gang-tune tracking across frequency band. Broadband types are tunerless; flat freqency responses are rigidly, permanently determined during manufacture. Tunable and broadband pulsed ampilfier klystrons available in L, S bands.

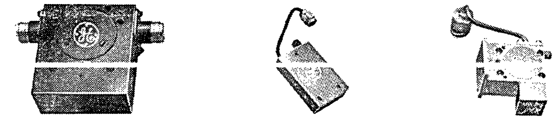
MCM's*



***Microwave Circuit Modules for use as: Oscillators, Amplifiers, Multipliers, Detectors, Mixers, Integrated Isolators and Circulators.**

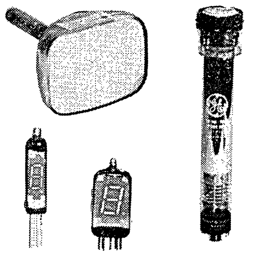
General Electric puts nearly 3 decades of commercial and military microwave component experience into the MCM. Designers can benefit from an unequalled output of highest performance active components including coaxial and planar gridded tubes. One source provides "in-house" ferrite know-how, critical testing experience and facilities, and full R&D back-up. Now, optimum integration of active devices in packaged circuits can help reduce design cycles, provide retrofit capabilities and lead to improved system performance with lower over-all cost.

CIRCULATORS AND ISOLATORS



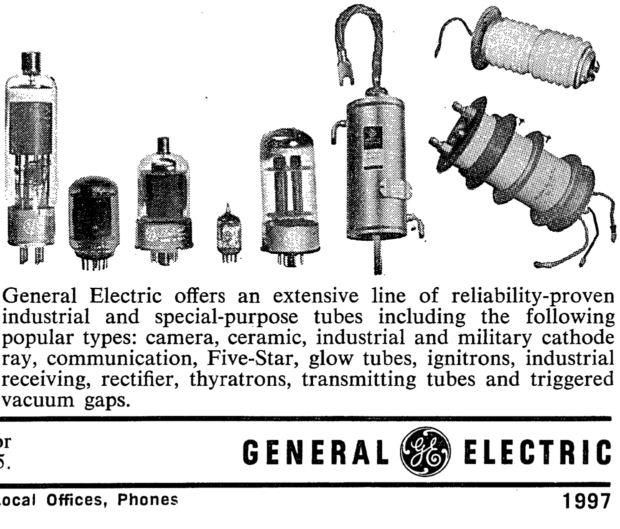
GE coaxial, stripline circulators and isolators can typically handle 100 to 500 watts CW and more, and are capable of operating under severe environmental conditions. All frequencies from 0.3 to 5.5 GHz are covered, and typical bandwidth in these frequency ranges is approximately 20 percent with greater bandwith available. Magnetically shielded and miniaturized units are available, with unique terminations and connections a specialty.

IMAGING AND DISPLAY DEVICES



GE offers industry's finest line of high-quality imaging and display tubes . . . including: image orthicons; industrial and commercial vidicons; industrial and military cathode ray tubes; and a wide selection of low-voltage, vacuum cathodeluminescent alphanumeric readout tubes.

INDUSTRIAL AND SPECIAL-PURPOSE TUBES



General Electric offers an extensive line of reliability-proven industrial and special-purpose tubes including the following popular types: camera, ceramic, industrial and military cathode ray, communication, Five-Star, glow tubes, ignitrons, industrial receiving, rectifier, thyratrons, transmitting tubes and triggered vacuum gaps.

For complete information contact your nearby GE Sales Office, or write to General Electric Co., Section 998-80. Schenectady, N. Y. 12305.

GENERAL ELECTRIC

The INTER-TECHNICAL Group, Inc.

U.S. AGENCY FOR THORN RADIO VALVES & TUBES LTD.

P. O. BOX 23
IRVINGTON-ON-HUDSON, N.Y. 10533
TEL: (914) 591-8822
TWX: 710-564-0802

BRIMAR

high quality MONITOR TUBES / RADAR TUBES / INSTRUMENT TUBES

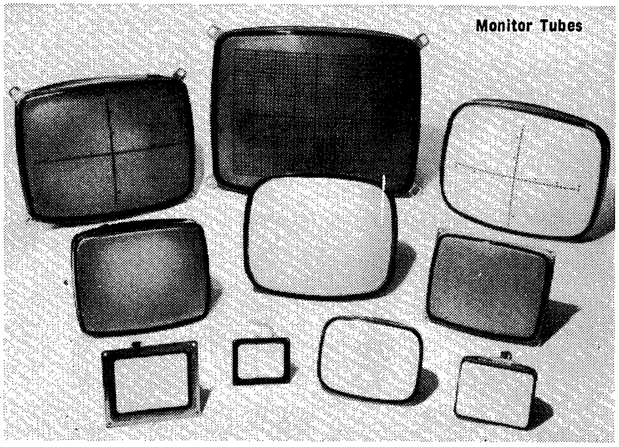
Thorn Radio Valves and Tubes Limited is one of Britains largest manufacturers of industrial cathode ray tubes. Examine a BRIMAR catalog and you will find about the widest range of tubes, one of which is likely to be a perfect fit for your requirement. But if you have something unusual in mind it is probable that BRIMAR can make it.

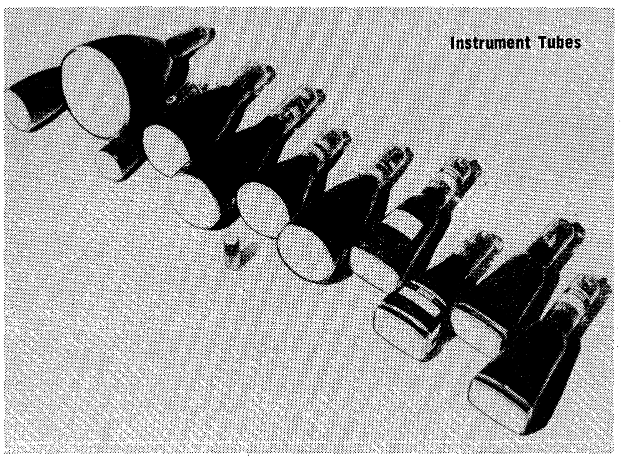
Selected Types	Application and Description	Face Shape & Dia. (Min.)	Useful Min. Screen Area (inch)
FLYING-SPOT SCANNER TUBES			
Q8-100AA	Magnetic focus. Educational EVR video reproducers	3 ●	2.1x1.5
Q13-200GS	Electrostatic focus. Document readers or telecine. EHT connection by CT8 socket	5 ●	3.5x2.7
SMALL ELECTROSTATIC DISPLAY TUBES			
D3-130	General purpose indicating device	1 ●	1.1
D7-200	Indicators. Oscilloscopes. CCTV. Alpha-numerical readout	3 ■	2x1.6
INSTRUMENT TUBES — SINGLE GUN			
SE4D	Medium bandwidth. Spiral p.d.a.	4 ●	3.1x2
D10-210	Battery oscilloscopes. Heater 11V, 68mA. Mesh p.d.a. Aluminized	4 ■	2.8x2
D13-33	Transistor scan circuit oscilloscopes. Spiral p.d.a.	5 ■	4x2.4
D13-47	Medium bandwidth. For transistor scan circuits. Spiral p.d.a.	5 ■	4x2.4
D13-51	High bandwidth. Mesh p.d.a. Transistor scan. Aluminized screen	5 ■	4x2.4
D13-600	General purpose. Short length. Large screen area.	5 ●	4x3.1
D14-150	High bandwidth. Mesh p.d.a. Very high brightness. Aluminized	5½ ■	4x3.1
D14-170	General purpose. Short length.	5½ ■	4x3.1
D14-180	Medium bandwidth for transistor scan circuits	5½ ■	4x3.1
RADAR TUBES			**Defl. Angle**
F17-10	Small boat radar. American type (7AB)	7 ●	50
F27-100	General marine use. American equivalent (10W)	10 ●	50
F28-130	Rimguard III 'push-through' protection. Private yacht radar	11 ■	90
F31-10	General marine use	12 ●	40
F31-14	Rimband protected. Private yacht transportable radar	12 ■	110
F41-12	Major radars for ships, port, and aircraft control	16 ●	50
DISPLAY AND PICTURE MONITOR TUBES			
M17-10	Medical waveform display. Television camera viewfinder	7 ■	70
M21-13	Medical waveform data display. Industrial monitors	8½ ■	90
M31-100	Alpha-numerical or graphical, computer read-out Bonded face-plate	12 ■	70
M31-180	General purpose data display	12 ■	110
M36-142	Television studio monitor. Protected version of M36-141 Bonded face-plate	14 ■	70
M38-100	Industrial monitors. Data displays. Rimguard III	15 ■	90
M38-150	Industrial picture monitors. Data display. Squared-off aluminized screen.	15 ■	110
M43-150	Alpha-numerical or graphical, computer readout	17 ■	70
M61-120	Industrial monitors. Data displays. Squared up screen Rimguard III	24 ■	110

NEW LONG PERSISTENCE GV phosphor improves display qualities — Information visible 1 to 10 seconds. Initial flash and trace colors similar, eases eye fatigue. More resistant to burn damage than other long persistence screens. Reduces replacement cost where tubes must display same unmodulated base lines and other display for long intervals.

SEVENTEEN DIFFERENT PHOSPHORS / INTERNAL & EXTERNAL GRATICULES
FLASHOVER PROTECTION / IMPLOSION PROTECTION (5 Different Constructions)

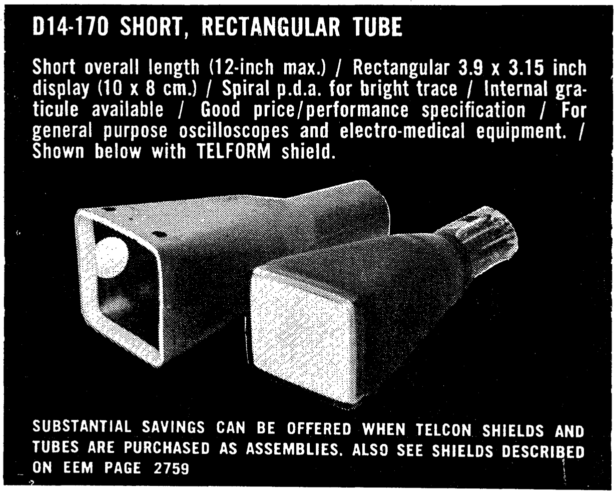
Accessories offered for Brimar cathode ray tubes include sockets, connectors, yokes, focusing coils and twist coils. Substantial savings can be offered when Magnetic Shields and Tubes are purchased as assemblies.


Monitor Tubes

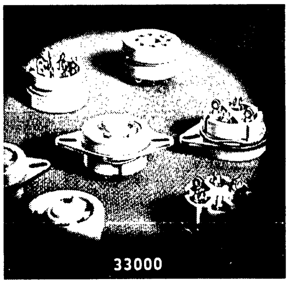

Instrument Tubes

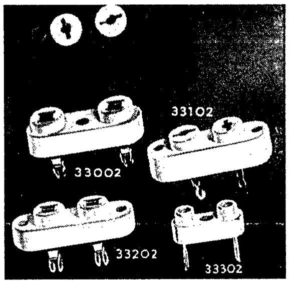
D14-170 SHORT, RECTANGULAR TUBE

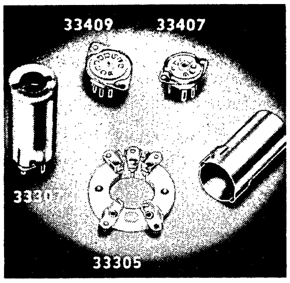
Short overall length (12-inch max.) / Rectangular 3.9 x 3.15 inch display (10 x 8 cm.) / Spiral p.d.a. for bright trace / Internal graticule available / Good price/performance specification / For general purpose oscilloscopes and electro-medical equipment. / Shown below with TELFORM shield.

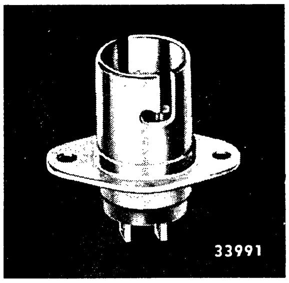


SUBSTANTIAL SAVINGS CAN BE OFFERED WHEN TELCON SHIELDS AND TUBES ARE PURCHASED AS ASSEMBLIES. ALSO SEE SHIELDS DESCRIBED ON EEM PAGE 2759









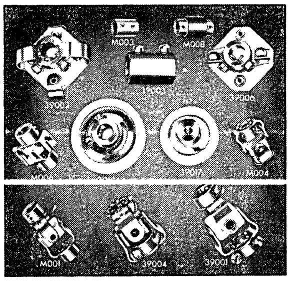
MILLEN TUBE SOCKETS DESIGNED FOR APPLICATION

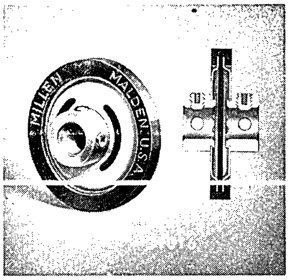
Long Flashover path to chassis permits use with transmitting tubes, 866 rectifiers, etc. Long leakage path between contacts. Contacts are type proven by hundreds of millions already in government, commercial and broadcast service, to be extremely dependable. Sockets may be mounted either with or without metal flange. Mounts in standard size chassis hole. All types have barrier between contacts and chassis. All but octal and crystal sockets also have barriers between individual contacts in addition.

Voltage regulator dual contact bayonet socket, 33991 black phenolic insulation and 33992 with low loss mica filled phenolic insulation.

MILLEN TUBE SOCKETS

No.	Description	No.	Description
33002	—Crystal Socket ¾″ x .125″....	33004	—4 Pin Tube Socket
33102	—Crystal Socket .487″ x .095″..	33005	—5 Pin Tube Socket
33202	—Crystal Socket ½″ x .125″....		
33302	—Crystal Socket .487″ x .050″..	33008	—8 Pin Tube Socket
33407	—Miniature Socket only, ceramic	33991	—Socket for 991......
33409	—Noval Socket only, ceramic....	33992	—Socket for 991......
33307	—Miniature Socket, Shield, ceramic	33207	—829 Socket...........
33309	—Noval Socket, Shield, ceramic	33305	—Acorn Socket........

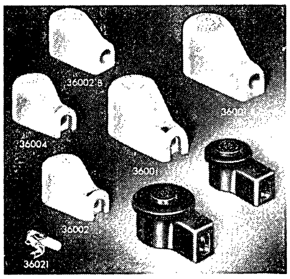


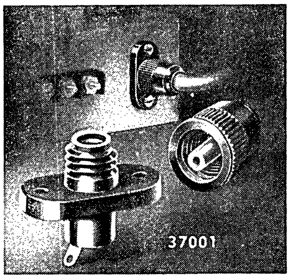


FLEXIBLE COUPLINGS — The No. 39000 series of Millen "Designed for Application" flexible coupling units include, in addition to improved versions of the conventional types, also such exclusive original designs as the No. 39001 insulated universal joint and the No. 39006 "slide-action" coupling (in both steatite and bakelite insulation). The No. 39006 "slide-action" coupling permits longitudinal shaft motion, eccentric shaft motion and out-of-line operation, as well as angular drive.

The No. 39005 and 39005 B (high torque) are similar to the No. 39001, but are not insulated. The steatite insulated No. 39001 has a special anti-backlash pivot and socket grip feature. All of the above illustrated units are for ¼″ shaft and are standard production type units.

The No. 39016 incorporates features which have long been desired in a flexible coupling. No Backlash — High Flexibility — Higher Breakdown Voltage — Smaller Diameter — Shorter Length —



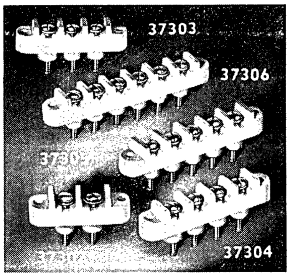


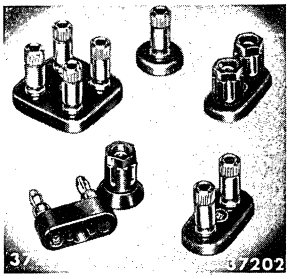
CERAMIC PLATE OR GRID CAPS — Soldering lugs and contact one-piece. Lug ears annealed and solder dipped to facilitate "mechanical plus soldered" connection of cable.

No. 36001—$\frac{9}{16}$″ .... No. 36002—⅜″ .... No. 36004—¼″ ....

SAFETY TERMINAL — Combination high voltage terminal and thru-bushing. Tapered contact pin fits firmly into conical socket providing large area, low resistance connection. Pin is swivel mounted in cap to prevent twisting of lead wire.

No. 37001, Black or Red .... No. 37501, Low loss ....

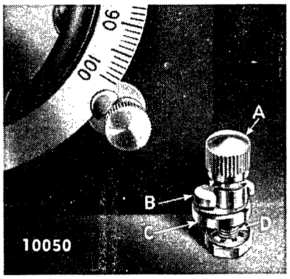


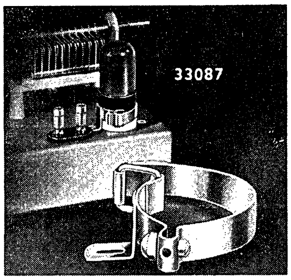


STEATITE TERMINAL STRIPS — Terminal and lug are one piece. Lugs are turret type and are free floating so as not to strain L522 ceramic on wide temperature variations. Easy to mount with series of round holes. 1400 volt and 3500 volt series.

POSTS, PLATES, AND PLUGS — The No. 37200 series, including both insulated and non-insulated binding posts with associated plates and plugs, provide various combinations to meet most requirements. The posts have captive heads and keyed mounting. The No. 37291 on No. 37223 are standard in black or red with other colors on special order. No. 37201, No. 37202, and No. 37204 are available in black, red, or low loss. The No. 37202 is also available in steatite.

No.	Description	No.	Description
37201	—Single plates, pr.	37204	—Double dual plates, pr. .....
37291	—Single plates (tapered), pr.	37212	—Dual plug ....
		37222	—Non-insulated binding post
37202	—Dual plates, pr.	37223	—Insulated binding post .....





DIAL LOCK — Compact, easy to mount, positive in action, does not alter dial setting in operation! Rotation of knob "A" depresses finger "B" and "C" without imparting any rotary motion to Dial. Single hole mounted.

No. 10050 ....

TUBE CLAMP — No. 33087 is easy to use, easy to install, effective in function. Available in special sizes for all types of tubes. Single hole mounting. Spring steel, cadmium plated.

JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY 150 EXCHANGE ST., MALDEN, MASSACHUSETTS, U. S. A.

METROPOLITAN Supply Company
A DIVISION OF METROPOLITAN OVERSEAS SUPPLY CORPORATION
468 PARK AVENUE SOUTH, NEW YORK, N. Y. 10016 DEPT. MS
TELEX: 422509, CABLE ADDRESS "LECIMEX" NEW YORK
TELEPHONE: (212) 686-2120

TUBES

Receiving, Industrial, Communication Microwave, Special Purpose Tubes

Type	Price	Other No.
OA2	1.04	6073
OA2WA	2.50	6626
OA3	1.13	
OA4G	1.58	
OA5	6.50	
OB2	1.07	6074
OB2WA	1.85	6627
OC2	1.20	
OC3	1.13	OC3W
OC3W	5.17	
OD3	1.12	OD3W
OD3W	5.17	
OG3	1.94	85A2
OZ4	1.30	
1AD2	1.30	
1AD4	2.29	
1AG5	1.85	
1B3GT	1.20	1G3GT
1B22	18.75	
1B23	25.50	
1B24	12.50	
1B35	5.70	
1B40	4.70	
1B46	9.80	
1B58	49.50	
1B58A	68.40	
1B59	12.35	R1130B
1B60	11.25	
1B62	16.75	
1B63A	27.00	
1B83	72.45	
1B84	88.75	
1B85	17.00	
1B86	17.00	
1C	9.05	3B22
1C21	3.51	
1D21	8.45	SN4
1L4	1.32	
1L6	4.25	
1P21	47.80	
1P28	19.65	
1P39	2.95	
1P40	4.32	
1R5	.87	1R5WA
1R5WA	5.95	
1T4	.76	1T4WA
1T4WA	4.90	
1U4	.90	1U4WA
1U4WA	5.15	
1U5	.92	1U5WA
1U5WA	5.20	
1V2	.83	
1X2A/B	1.38	
1Z2	4.65	
C1A	8.65	
C1B	8.65	3C31
C1BA	16.80	5664
C1JA	8.95	6014/C1K
C1K	8.95	6014/5683
E1T	19.40	6370
GXU1	6.50	3B28
SGR-1	39.50	
TT1	78.00	6144
2-01C	18.25	
2-25A	33.70	
2-240A	59.40	
2-450A	189.20	
2AF4B	1.38	
2AC15	8.50	
2AS15	10.35	
2B4	5.30	
2B22	17.50	
2B24	2.75	
2B26	2.69	866JR
2B29	18.25	829B
2B29P	15.45	3E29
2B32	15.90	832A
2B46	3.19	6146A
2B52	26.20	6252
2B94	20.50	5894
2CY5	1.49	
2C26A	4.00	
2C36	75.00	
2C37	75.00	
2C39A	16.45	
2C39WA	17.45	7289
2C40	20.95	
2C41	29.60	
2C42	12.50	
2C50	5.75	
2C51	2.01	5670
2C53	7.95	
2D24	1.38	2AF4B
2D21	1.02	2D21W
2D21W	2.16	5727
2ER5	1.25	
2E22	9.35	
2E24	5.80	
2E26	3.34	
2E29	3.00	
2E41	1.85	1AG5
2FQ5	1.29	2GK5
2G21	7.67	
2J26	90.00	
2J29	90.00	
2J30	142.00	
2J31	90.00	
2J32	90.00	
2J39	124.00	
2J40	126.00	
2J41	165.00	
2J42	260.00	2J42F
2J42F	135.00	
2J50	286.00	
2J51A	698.00	2J51M
2J51M	367.00	
2J55	350.00	2J55F
2J55F	196.00	
2J56A	170.00	
2J61/A	125.00	
2J70A	478.00	QKH136
2K22	88.00	
2K25	37.50	2K25M
2K25M	32.00	
2K26	60.50	2K26M
2K26M	50.00	
2K28A	84.50	6133
2K39-44	375.00	
2K45	192.50	2K45M
2K45M	147.00	
2K48	176.00	2K48M
2K48M	123.00	
2K56	110.00	
2SM15	9.75	
2X2A	3.57	
3-400Z	33.50	8163
3A2	1.85	
3A3A	1.09	3AW3
3A4	1.59	
3A5	1.74	
3B	9.58	610/7723
3B21	9.05	3B22
3B22	9.05	1C
3B24W	9.50	3B24WA
3B24WA	6.80	3B24WB
3B24WB	8.19	
3B28	7.48	6277
3C	10.60	4B24
3C23	9.24	
3C31	8.65	C1B
3C45	28.75	3C45W
3CPN10A5	20.90	7815
3CPX100A5	21.40	7815R
3CX100A5	23.00	7289
3CX1000A7	164.75	8283
3CX2500A3	189.70	8161
3CX2500F3	192.50	8251
3CX3000A1	226.00	8238
3CX3000A7	252.00	
3CX3000F1	238.00	8239
3CX3000F7	269.00	8162
3CX10,000A1	487.00	8158
3CX10,000A3	487.00	8159
3CX10,000A7	534.50	8160
3D21/A	9.90	3D21WA
3D21WA	21.75	3D21WB
3D21WB	50.00	
3E29	15.70	
3KM 50,000PA	8,000.00	
C3J	10.49	5632
C3J/A	10.70	5684
C3J/AL	12.30	7556A
4-65A	27.40	8165
4-125A	40.15	4D21
4-250A	41.25	5D22
4-400A	43.70	8438
4-1000A	128.50	8166
4B23	10.00	
4B24	10.60	3C
4B31	16.75	
4B32	12.90	
4B35	5.60	
4C35	41.80	6268
4CPX250K	63.00	8590
4CV 50,000E	1,800.00	
4CV 100,000C	2,425.00	
4CW 250,000V	6,200.00	
4CX250B	29.25	7203
4CX250F	31.90	7204
4CX250G	31.90	8621
4CX250K	59.75	8245
4CX250R	38.45	7580W
4CX300A	52.15	8167
4CX350A	41.20	8321
4CX600B	319.00	
4CX600J	179.00	
4CX1000A	187.00	8168
4CX1500A	197.50	
4CX1500B	191.50	8660
4CX3000A	378.20	8169
4CX5000A	471.00	8170
4CX10,000D	519.00	8171
4CX15,000A	667.00	8281
4CX 35,000C	1,685.00	8349
4D21	40.15	6155
4D21A	43.45	
4D32	47.50	
4E27A	43.25	5-125B
4J31 thru 4J35	520.00	
4J50/A	475.00	
4J51	160.00	
4J52/A	270.00	6510
4J53 thru 4J78	250.00	
4PR60B	91.70	8252
4PR60C	102.35	8252W
4PR65A	42.00	8187
4PR125A	48.00	8247
4PR1000A	150.00	8189
4W300B	61.70	8249
4W20,000A	2,400.00	8173
4X150A	19.15	7034
4X150G	58.65	8172
4X500A	117.30	
KC4	192.50	ML100
5-500A	51.10	
5AR4	1.57	GZ34
5AS4A	1.03	5U4GB
5C21/C6JA	21.17	5685
5C22	31.25	6279
5CX1500A	184.00	
5CX3000A	403.50	
5D22	41.25	4-250A
5J26	340.00	
5J29	65.00	
5J30	75.00	
5J32	90.00	
5J33	95.00	
5R4GYB	1.79	
5R4WGA	7.55	5RYWGB
5R4WGB	11.09	
5U4GB	1.03	5AS4A
5V4GA	1.45	6AW8
5Y3GT	1.00	
5Y3WGT	4.50	6087
GV5A-5B 400V-1600V	16.91	
QY5-3000A	260.00	6076
W5-2G	510.00	
W5-3G	675.00	
6AC7	1.94	6AC7W
6AC7W	4.36	6134
6AF4A	1.81	6DZ4
6AG5	1.28	6AG5WA
6AG5WA	2.50	6186
6AH6	1.92	6AH6WA
6AH6WA	2.10	6485
6AJ8	1.02	ECH81
6AK5	1.52	6AK5W
6AK5W	1.94	5654
6AL5	1.10	6AL5W
6AL5W	1.50	5726
6AM6	2.06	EF91
6AM8A	1.47	
6AN5	3.25	6AN5WA
6AN5WA	8.05	
6AN8A	1.66	
6AQ5	1.15	6AQ5W
6AQ5W	2.42	6005
6AS6	2.56	6AS6W
6AS6W	2.69	5725
6AS7GA	3.91	6080
6AU4GT	1.56	
6AU6	1.00	7543
6AU6WB	2.29	6136
6B4G	5.15	
6BA6	1.05	6BA6W
6BA6W	1.94	5749
6BE6	1.15	6BE6W
6BE6W	2.93	5750
6BG6GA	2.18	
6BH6	1.35	6661
6BJ6	1.36	6662
6BK4C	2.60	6EL4A
6BK7B	1.65	
6BL8	.91	
6BL6	64.75	
6BQ5	1.31	
6BQ6GTB	1.82	
6BQ7A	1.69	6BZ7
6BR8A	1.59	6FV8A
6BS8	1.69	
6BX7GT	2.00	
6BY6	1.15	
6C4	1.25	6C4WA
6C4WA	2.25	6100
6C21	91.00	
6C8G	2.10	
6CB6A	1.10	6676
6CD6GA	2.14	
6CG8A	1.45	
6CL6	1.60	6677
6CW4	1.90	
6CY5	1.44	7717
6DQ6	1.48	
6DJ8	1.51	ECC88
6J6WA	3.10	6101
6JB6	1.89	
6SL7GT	1.65	
6SN7GTB	1.35	
6S2	1.76	EY86
6U8A	1.32	6678
6V4	.54	EZ80
6V6GTA	1.50	
6X4	1.15	6X4W
6X4W	2.11	6202
C6JA	21.17	5685
C6J/K	25.60	C6H-1
7AK7	3.60	6888
7C24	246.40	5762
7C25	192.00	
7V7	2.60	7G7
JP9-2.5D	92.00	
JP9-7	260.00	2J42
JP9-50A	350.00	2J55
JP9-50	170.00	2J56
9C25	2,640.00	
GC10/4B	16.80	
GR10A	15.00	
GC10B	12.70	
GS10C	14.30	GS10C/S
GS10C/S	14.30	Z502S
GC10D	19.90	
GS10H	13.20	Z504S
UXCV11	17.15	
12AT7	1.19	6679
12AT7WA	2.31	6201
12AU7	1.05	6680
12AU7WA	2.86	6189
12AX7	.96	6681
12AX7WA	4.60	
12AY7	1.80	6072
12BY7A	1.02	
12SK7	1.37	
GC12/4B	20.85	
GS12D	28.50	
X-13	396.00	
X-13B,C	414.00	
C16J	44.20	5665
17ENP22	185.00	
FG17	7.31	5557
KU-17	56.00	
KY21A	23.10	
DET22	34.25	
KU23	32.50	HF300
MOBL-25	40.75	6322
25T	35.20	
28D7	3.00	
28D7W	5.20	
30AE3	1.10	PY88
FG32	14.70	5558
35C5	1.08	
35W4	.72	
FG32	15.25	5558
MFG41	710.00	5830
2F45	100.00	BS810
50C5	1.02	
EA53	24.50	
MKU54	176.00	
E55L	10.60	8233
VX55	79.50	
MFG57	20.85	5559
KT66	3.97	7581A
KT66MP	8.90	
KU71	235.00	7782
KU71Z	248.40	
RK72	5.25	
75TH	36.50	
EA76	5.90	6489
KT77	4.25	
TD-77	156.00	
E80CC	4.15	6085
E80CF	4.62	7643
E80L	5.80	6227
E81L	5.12	6686
83A1	4.57	7980
E83F	4.42	6689
EY84	2.88	6374
85A2	1.78	OG3
E88C	6.20	8255
E88CC	3.31	6922
ECC88	1.51	6DJ8
KT88	5.95	
KT88MP	12.60	
SAL-89	1,100.00	
90AV	5.60	
FG95	26.85	5560
FG97	79.15	
FG98A	92.15	
BLT-101	95.00	
102A	159.50	
QKH136	478.00	2J70A
150AVP	95.00	
VT-158	160.00	
FG172	176.00	
PL172	184.50	8295A
E180F	5.60	6688
E182CC	4.47	7119
MO220B-G	189.00	
MO221B-G	195.00	
MO222A-G	195.00	
FX227	28.75	3C45
MQKH235	940.00	6344A
MFG235	102.00	5552A
242C	49.00	
MO244A-E	320.00	
250TH	38.95	
254W	43.70	
MO258A	249.50	5553B
MO259A	219.00	
MO287A-C	460.00	
MO287D	648.00	
E288CC	5.80	8223
MFX297	406.25	
298A	5,490.00	
304TH	74.70	
304TL	74.70	
310A	9.00	
311B	15.00	
311CH	39.70	
313C	3.50	
323B	6.30	
329A	6.10	
332A	15.00	
MO336	525.00	7166
342A	1,685.00	
MO355A	615.00	
356	686.00	5771
357B	446.50	
371B	14.10	
403B	3.75	
MQKK404		
404A	7.48	5847
407A	3.61	
408A	3.35	
409A	3.95	6AS6W
416B	36.75	
417A	6.55	5842
418A	21.60	
420A	9.75	
421A	14.50	
423A	7.20	6140
429A	10.60	
432B	9.90	
QK436	115.00	6316
450TH	89.70	
MQK456	520.00	7040
MQK464A	896.00	6835A
MQKH470	5,950.00	7484A
MKU471	263.00	
MKU472	285.00	
MKU474	1,425.00	
481B	10.25	
502A	1.85	2050A
MQK531	69.75	
MQK532	69.75	
MCK533AX	4.21	
MBTR547	125.00	
MQK549	69.60	
572B	16.20	
575A	15.60	
576A	19.27	
592	56.40	3-200A3
604	10.86	7014
MKU610	29.00	
610	9.47	7723
614	9.58	3B
615	8.75	
635	11.70	7019
635P	12.65	6930
660	11.95	
660L	12.15	7786
673	19.70	
678	41.75	
MQK685	1,190.00	7571
BL693	187.50	7309
701A	12.50	
703A	5.50	
710	11.05	6011
710L	12.00	7509A
MQKH713	640.00	7256
713A	4.50	
715A	13.00	
717A	4.25	
721B	23.00	
723A	29.60	
725A	276.00	
726A	57.00	
726C	69.50	
730A	162.00	
734	19.35	5544
740	19.60	6856
740L	20.55	7022
MQK754A	340.00	
MQK756A	340.00	
760	24.95	6858
760L	26.25	7023
760P	26.70	6859
MQK787	2,050.00	7575
MBL-800	125.00	
ECLL800	610.00	
802	15.85	
MBL-803	146.00	
805	19.20	
807	2.98	
810	18.90	
811A	6.50	
812A	5.85	
813	20.15	
814	24.70	
815	16.00	
816	2.90	
MQK822	196.00	
MQK826	196.00	
828	31.00	
MBLK829	450.00	
829E	17.50	
833A	62.70	
MQK833A	685.00	
840	6.87	8754
845	31.15	
857B	212.75	
866A	2.85	
869B	128.50	
872A	8.30	
891	252.00	
891R	394.75	
892	294.00	
892R	423.50	
MQK910	340.00	
918	4.97	
922	3.65	
923	4.48	
927	3.98	
930	4.87	
931A	10.80	
MQK965	340.00	
MQK978	800.00	
1022A	123.20	6511
RS1002A	47.20	7527
1051A	72.00	

Prices are subject to change without notice.

METROPOLITAN Supply Company

A DIVISION OF METROPOLITAN OVERSEAS SUPPLY CORPORATION
468 PARK AVENUE SOUTH, NEW YORK, N. Y. 10016
TELEX: 422509, CABLE ADDRESS "LECIMEX" NEW YORK
TELEPHONE: (212) 686-2120

TUBES

Receiving, Industrial, Communication Microwave, Special Purpose Tubes

Type	Price	Other No.
N1055	823.75	
R1130B	12.35	1B59
MQK1235	791.80	
MQK1237	791.80	
1500T	304.00	
1612	3.75	
1614	4.24	
1616	8.00	
1619	5.17	
1623	2.85	
1624	6.95	
2050	1.85	
2050W	5.80	
A2624	14.50	
4028A	32.35	
4055	32.90	
5092	12.20	8421
5513	775.00	
5528/5545	36.50	6807
5551A	69.00	
5552A	102.00	
5553B	251.00	
5556	70.00	PJ8
5557	7.31	FG17
5558	15.25	FG32
5559	20.85	FG57
5560	26.85	FG95
5563A	47.20	
5575	192.50	100
5576	440.00	200
5593	445.00	
5608A	9.45	
5632	10.49	C3J
5642	2.97	
5651	1.58	
5654	1.94	6AK5W
5657	550.00	
5665	44.20	C16J
5668	349.00	
5670	2.18	
5675	7.60	
5682	2,473.00	
5686	2.97	
5687	3.20	
5687WA	4.35	
5690	13.10	
5691	6.80	
5692	6.80	
5696	1.68	
5702	3.59	
5719	2.35	
5725	2.69	6AS6W
5726	1.50	6AL5W
5727	2.16	2D21W
5736	191.50	
5751	2.12	
5762	246.40	7C24
5763	2.00	
5814A	1.98	
5823	1.32	
5824	3.43	
5830	710.00	
5840	3.96	
5842	6.55	417A
5844	2.03	
5847	7.48	404A
5866A	32.00	
5868	68.40	AX9902
5876A	7.97	
5879	1.68	
5881	2.42	
5886	4.56	
5889	19.20	
5894	20.50	
5899	4.73	
5902	4.13	
5902WA	7.48	
5915	1.54	
5918A	1,146.00	
5924A	298.00	
5948	149.00	1754
5949	140.00	1907
5963	1.21	
5960	26.75	
5965	1.57	
5966	36.45	
5973	358.00	
5976	75.00	
5986A	1,267.00	
5991	12.20	8422
6002	581.00	QKH221
6005	2.42	6AQ5W
6011	11.05	710
6014	8.95	C1K
6021	2.61	
6076	260.00	QY5-3000A
6080	4.10	
6080WB	14.00	
6085	4.15	E80CC
6088	3.00	
6096	1.94	6AK5W

Type	Price	Other No.
6100	2.25	6C4WA
6101	3.10	6J6WA
6111	3.14	
6111WA	5.28	
6115A	95.00	
6130	28.75	3C45
6133	84.50	2K28A
6136	2.29	6AU6WB
6140	7.20	423A
6144	78.00	TT1
6146A	3.29	
6146B	3.91	8298A
6155	40.15	4-125A
6156	41.25	4-250A
6159W	6.78	7357
6161	138.00	
6166A	960.00	7007
6170	540.00	
6174	4.27	
6177	245.00	
6178	810.00	QKK297
6179	1,452.00	
6181	1,253.00	
6189	2.86	12AU7WA
6199	50.00	
6201	2.31	12AT7WA
6202	2.32	
6213A	5.67	
6216	3.14	
6227	5.80	E80L
6228	3,696.00	
6236	121.00	
6251	3,160.00	
6252	26.20	
6258	371.00	
6265	3.60	
6267	1.20	EF86
6277	7.48	3B28
6286	3.52	
6299	46.00	
6322	50.00	BL25
6336A	13.40	
6342A	57.85	
6356	24.00	TD10
6360	3.34	
6367	179.50	
6370	23.46	E1T
6378	47.45	BL62
6390	127.00	
6400	199.00	
6402	2,057.00	QKH437
6403	1,925.00	QKH303
6406	1,045.00	QK428
6410	1,375.00	QK338A
6418	3.30	
6420	396.00	
6421	470.00	
6423	489.00	
6425	555.00	
6442	36.30	
6448	5,975.00	
6468	200.00	
6476A	14.95	
6481	64.50	
6485	1.57	
6489	5.90	EA76
6503	74.50	
6510	270.00	4J52A
6511		1022A
6518	1,590.00	
6520	5.94	
6524	25.50	
6528	17.32	
6541	1,512.00	TE30
6542	9.25	TD68
6544	936.00	
6550	3.60	KT88
6562	6.85	5794A
6564	275.00	MXT68
6566	32.00	BL26
6576	897.00	
6580	61.65	
6618	895.00	
6619	3.68	
6623	190.00	
6659	9.15	1042
6691	1,115.00	
6696	990.00	
6697	1,145.00	
6756	720.00	
6759	412.70	
6761	5.75	
6763	3.96	
6771	65.67	
6775	60.00	
6779	6.89	Z803U
6800	475.00	
6801	631.75	
6806	8,160.00	
6807	36.50	5545
6808/09	34.80	

Type	Price	Other No.
6842	14.30	
6844A	10.95	
6845	130.00	QK386
6852	29.75	TD24
6867	1,270.00	
6868	1,385.00	
6872	7.85	
6881	26.95	TD21
6883	3.49	
6883B	4.27	8032A
6884	47.45	
6888	3.60	7AK7
6897	32.85	
6907	25.30	
6909	13.96	
6914	135.00	
6922	3.31	E88CC
6923	16.00	EA52
6939	8.50	
6942	1,125.00	
6944	8.68	
6948	10.25	
6955	11.60	
6957	3.68	
6960A	206.00	
6967	545.00	QKH366
6972	489.70	JP9-75
6975	192.00	VA203B
6993	14.95	
6996	1,230.00	
6998	296.75	
7007	960.00	6166A
7008A	940.00	
7014	10.86	604
7034	19.15	4X150A
7040	520.00	QKH456
7054	1.30	8077
7056	.85	
7057	1.72	
7058	1.26	
7060	1.57	
7077	35.38	
7092	127.50	RS1046
7096	1,975.00	
7099	14.65	
7119	4.47	E182CC
7120	538.00	
7132	261.80	XD2
7146	25.80	TD32
7148	25.80	TD34
7156	1,900.00	
7159	67.25	
7167	1.60	
7171	64.50	
7199	2.09	
7203	29.25	4CX250B
7211	69.00	
7235	9.75	
7246	6.60	
7289	23.00	3CX100A5
7292	445.00	
7309	179.75	BL693
7310	55.00	
7328A	1,105.00	
7338	1,815.00	
7355	1.87	
7360	2.91	
7370	9.76	
7377	25.92	
7391	75.40	
7399	505.00	
7462	37.40	
7486	37.15	
7509A	12.00	710L
7527	47.20	RS1002A
7534	24.65	E130L
7551	2.97	
7554	39.20	
7558	3.17	
7576	8.63	
7591	1.14	
7603	42.00	
7642	1,260.00	
7643	4.78	E80CF
7645	10.90	
7681	152.95	
7685	138.75	
7687	1.76	
7691	1,595.00	
769J	1.81	
7701	2.48	
7703	179.50	
7717	1.44	6CY5
7719	4.89	
7723	9.47	610
7723NE	11.45	
7726	18.92	
7734	3.72	6GE8
7737	7.20	E186F
7740	120.00	
7741	2,410.00	

Type	Price	Other No.
7748	974.40	
7750	747.60	
7753	230.00	
7764	130.00	
7767	135.00	
7768	108.50	
7782	235.00	KU71
7786NE	19.95	
7788	9.25	E810F
7804	19.95	
7815	20.90	3CPN10A5
7815AL	24.00	
7841	37.25	
7842	59.65	
7843	36.15	
7854	38.75	
7855	55.00	
7855/AL	60.00	
7859	27.40	
7860	148.50	
7861	3.00	
7866	1,850.00	KU274
7867	4.47	
7868	1.96	
7900	360.00	
7905	3.47	
7910	81.40	
7964	65.00	
7980	4.57	83A1
7984	4.20	
7986	31.85	5866A
7994	12.35	
7995	12.20	
8000	22.75	
8005	18.65	
8008	8.65	
8013A	18.20	
8020	20.35	8020W
8020W	22.25	
8032	3.89	8032A
8032A	4.27	6883B
8042	10.55	
[illegible]	[illegible]	
8056	4.35	
8058	13.45	
8072	19.25	8072A
8077	1.30	7054
8096	18.60	
8106	1.31	
8117	52.37	
8121	28.37	

Type	Price	
8122	32.50	
8150	8.75	
8156	3.08	
8161	189.75	3CX 2500A3
8168	187.00	4CX1000A
8170	471.00	4CX5000A
8171	519.00	4CX 10,000D
8179	189.60	
8223	5.69	E288CC
8233	10.60	E55L
8255	6.48	E88C
8270	98.65	
8295	184.50	172
8298A	3.91	6146B
8348	9.93	
8417	2.38	
8421/22	12.20	5991/92
8438	41.10	4-400
8458	10.50	
8463	6.89	
8505A	27.45	
8509	38.15	
8511	282.00	
8556	8.65	
8560A	42.00	8560AS
8575	315.00	
8577	11.45	
8594	467.00	
8604	297.00	
8608	22.65	
8624	38.95	
8643	34.45	
8664	1,665.00	
8668	441.20	
8670A	271.00	
8680	3,465.00	
8684	2,335.00	
8727	32.85	
8752	2,575.00	
8753	25.00	
[illegible]	[illegible]	[illegible]
8798	525.00	
8801	797.60	
8806	760.00	
9001	4.25	
9002	3.30	
9003	4.25	
9005	6.97	
9006	2.31	

CATHODE RAY TUBES

(Includes Monitors, Oscilloscopes, Scanners and Radar)

1CP1-31	29.00	5CAP1	87.25
2AP1A	18.25	5CEP11	275.00
2BP1,A	22.00	5CP1,A	36.40
3ACP1	33.00	5DEP1,2	19.20
3ACP2	40.50	5DKP11-24	37.20
3ADP1	56.00	5FP7A	36.00
3ADP7	56.00	5RP1,A	125.00
3AP1	16.75	5UP1	19.20
3AP1A	43.00	5WP11-24	79.40
3ASP1	47.40	7ABP7A	57.00
3ASP2	47.40	7BP2A-7A	57.00
3BGP1	60.00	8CP1	44.50
3BP1	29.75	8KP4	31.45
3CP1	14.50	8NP4	31.45
3DP1A	23.00	8QP4	54.20
3JP1	27.40	9JP1	34.00
3KP1	24.00	10KP7,A	50.40
3RP1	18.60	10SP4	57.60
3RP1A	27.35	10WP7,A	57.00
3WP1	24.00	12ABP1,7	57.00
3WP2,5,11	30.00	12SP7B	58.40
5ABP1,A	48.50	14BAP4	65.70
5ABP7,11	48.50	14WP4-31	78.00
5ADP1,A	46.75	16AKP4,7	115.00
5ADP7,A	48.50	AW17-20	108.00
5AHP7	44.00	AW36-48	85.00
5QP1,A	47.00	17DWP4	32.95
5AZP4	135.00	17ENP22	175.00
5BGP1	215.00	21EWP4	115.00
5BP1,A	31.75	21EWP31	115.00

CAMERA TUBES (Vidicons and Image Orthicons)

4536	1795.00	735B	158.00
5820A	1095.00	7735BX	290.00
7038	54.00	8134	176.00
7038S	154.00	8480	760.00
7226	295.00	8484	158.00
7262	125.00	8484H	170.00
7262A	170.50	8507	72.00
7293A	1150.00	8507A	168.30
7295B	1370.00	8541	286.00
7295C	1495.00	8541X	370.00
7325	158.00	8572	189.00
7389C	1575.00	8573X	370.00
7735	64.50	8673	1,725.00
7735A	132.00		

ANTICIPATE YOUR NEEDS. ASK ABOUT OUR CONTRACT AND BLANKET ORDER PROGRAM.

TELEPHONE: (212) 686-2120

Write for our other new catalogs:
- Electronic Tube Directory
- Semiconductor Directory
- Aviation Components Directory
- Genelex Electron Tube Catalog

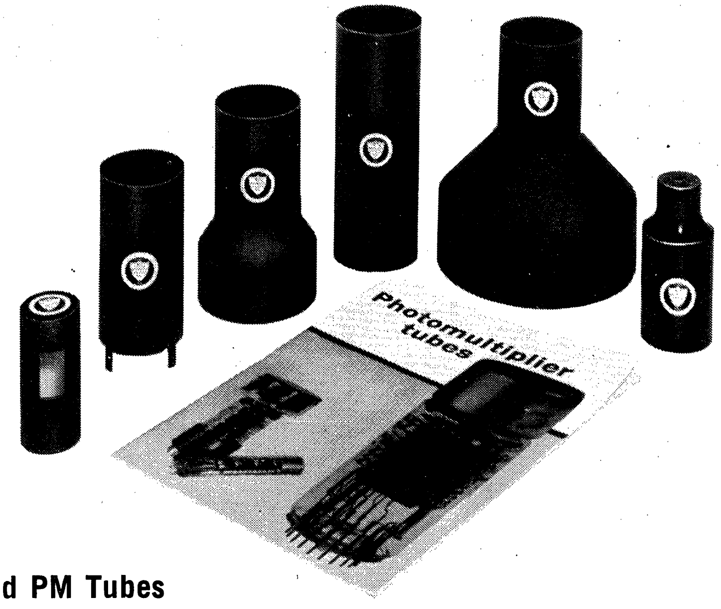
Special Discount on Quantity Orders

Prices are subject to change without notice.

PERFECTION MICA COMPANY

MAIN OFFICE & PLANT
740 THOMAS DRIVE, BENSENVILLE, ILLINOIS 60106 / (312) 766-7800 / TWX (910) 256-4815
CALIFORNIA FACILITY
1325 EAST ESTHER ST., LONG BEACH, CALIFORNIA 90813 / LONG BEACH 591-5638 / LOS ANGELES 775-8079 / TWX (910) 341-7277

Co-Netic Precision Magnetic Shields for Photomultiplier Tubes



Co-Netic shields are not significantly affected by shock or vibration. They have minimal retentivity and do not require periodic re-annealing. When grounded, they effectively shield from electrostatic as well as magnetic fields over a wide range of intensity.

Shields can be custom engineered to your specifications and desired quantities.

The largest line available
Covers over 90% of currently manufactured PM Tubes

SHIELDED DIMENSIONS

Part No.	Drawing	A	B	C	D	E	F	G	Notes
06P25	1	⅝	2½						
07P13V1	2	¾	1⅜		13/16	½	¼		a
10P25	1	1	2½						
10P40	1	1	4						
11P42X18	5	1⅛	4¼	1⅞	2 15/16	1 5/16	¼		d
12P31V1	2	1¼	3⅛		1 11/16	1⅛	⅝		a
12P35	1	1¼	3½						
12P45	1	1¼	4½						
13P23V1	2	1⅜	2⅜		1¼	1⅛	⅝		a
13P28V1	2	1⅜	2 13/16		1 9/16	1⅛	⅝		a
13P32V1	2	1⅜	3¼		1 15/16	1⅛	⅝		a
13P52V1	2	1⅜	5¼		3 15/16	1⅛	⅝		a
15P27	1	1½	2¾						
15P40	1	1½	4						
15P50	1	1½	5						
17P30	1	1¾	3						
17P33V1	2	1¾	3⅜		2 11/16	⅞	¾		a
17P45	1	1¾	4½						
17P53V1	4	1¾	5⅜		2¾	2⅝	¼	2 1/16	b
20P50	1	2	5						
21P45V1	3	2 3/16	4½		½	½	¼		c
21P55V1	3	2 3/16	5½		½	½	¼		c
22P40	1	2¼	4						
22P50	1	2¼	5						
22P60	1	2¼	6						
22P70	1	2¼	7						
23P55X32	6	2⅜	5 9/16	3 9/32	3⅜	11/16		1½	
23P61X37	6	2⅜	6⅛	3¾	3¼	¾		2⅛	
23P68X57	6	2⅜	6⅞	5¾	3	1⅞		2	
23P101X57	6	2⅜	10⅛	5¾	½	2¾		6⅞	
25P40	1	2½	4						
25P50	1	2½	5						
25P60	1	2½	6						
25P70	1	2½	7						
27P73V1	2	2¾	7⅜		3⅝	4⅜	3		a
30P67X57	6	3	6¾	5¾	3¼	1½		2	
32P80	1	3¼	8						
32P100X55	6	3¼	10	5½	3½	1		5½	
35P70	1	3½	7						

NOTES:

Unless otherwise noted:

Dimensions — All ID

Material — Two layers: .025 Netic S3-6 outside, .014 Co-Netic AA annealed inside.

Finish — Black baked enamel; wrinkle outside, flat inside.

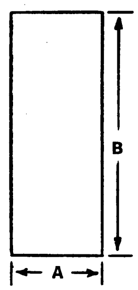
a — Upper end closed.

b — Dimensions D & E are measured from the outside of the outer shell. Dimension G is the maximum OD. Material — Three layers, separable; outer .049 Netic S3-6, two inner .031 Co-Netic AA Finish — Netic S3-6, black oxide; Co-Netic AA, none.

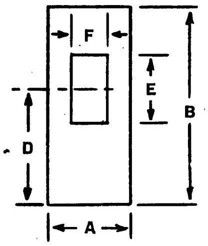
c — Has three tabs, spaced 120° apart, to grip the metal collar of the PM tube.

d — Finish — Black cadmium plated.

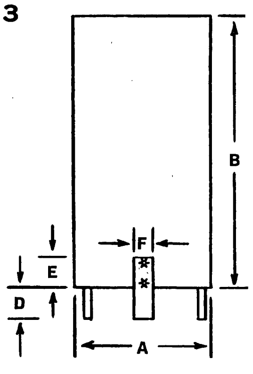
1



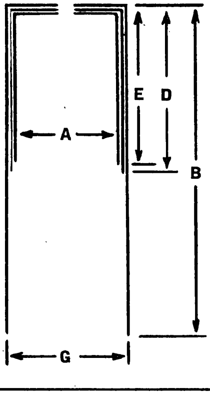
2



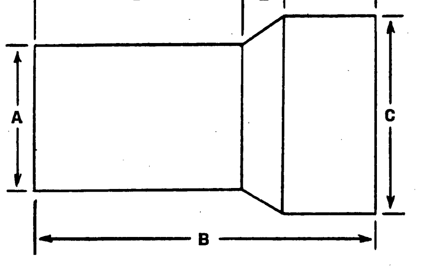
3



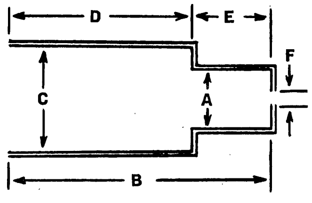
4



6



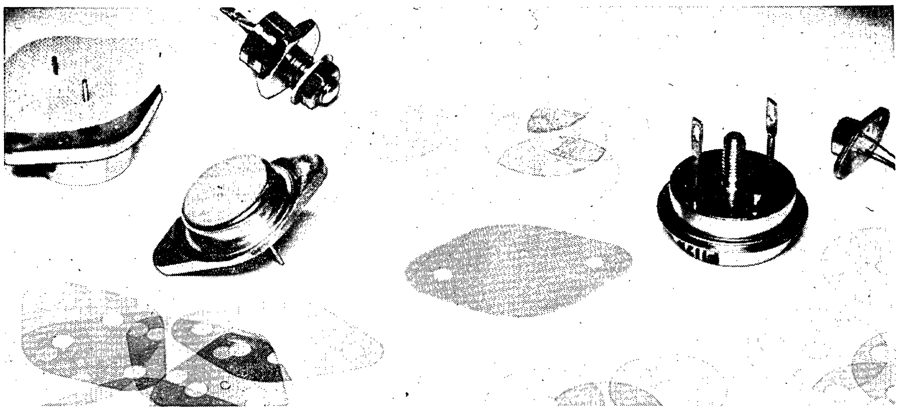
5



PERFECTION MICA COMPANY

MAIN OFFICE & PLANT
740 THOMAS DRIVE, BENSENVILLE, ILLINOIS 60106 / (312) 766-7800 / TWX (910) 256-4815
CALIFORNIA FACILITY
1325 EAST ESTHER ST., LONG BEACH, CALIFORNIA 90813 / LONG BEACH 591-5638 / LOS ANGELES 775-8079 / TWX (910) 341-7277

Semiconductor Mica Isolators



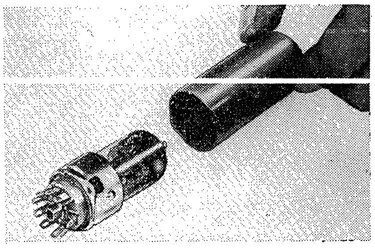
- **IMPROVED SEMICONDUCTOR EFFICIENCY from proper heat dissipation.**
- **EXTREMELY HIGH DIELECTRIC STRENGTH.**
- **THICKNESSES range from .001″ to .003″. Other thicknesses can be furnished.**
- **MANY CONFIGURATIONS available within .002″ tolerance.**
- **Custom Mica insulators manufactured to your specifications.**

Magnetic Shields for 7 and 9 Pin Tubes

MSD Co-Netic magnetic low-level tube shields are available for 7 and 9 pin vacuum tubes. They eliminate magnetic interference in high gain and critical circuits.

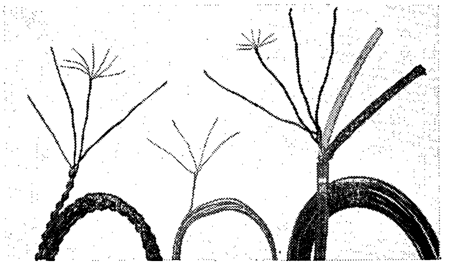
AVAILABLE SIZES

Part No.	Tube Size	Height
VT-701	7 Pin	1⅜″
VT-702	7 Pin	1¾″
VT-703	7 Pin	2¼″
VT-704	7 Pin	2⅜″
VT-901	9 Pin	1 15⁄16″
VT-902	9 Pin	2 3⁄16″
VT-903	9 Pin	2⅜″



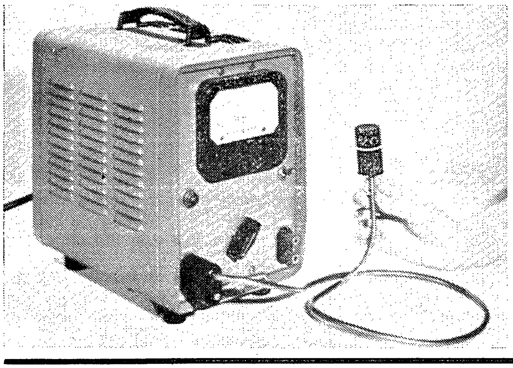
Unique Inter-8 Weave Cables reduce magnetic field pickup or radiation

Cables can be fabricated with compatible alloy wires for thermocouple applications, with plain copper wire for applications where junction EMFs are a problem, or with tinned wire. Increased magnetic or electrostatic shielding effectiveness can be realized by weaving outer shielding braids of Co-Netic or copper over the basic cable. Dielectric separation between dual layer sheaths is normally PVC but other insulating media may be used. On braided shields, a final insulating outer jacket is used. Wire sizes range from 22 to 32 AWG. Wire insulation can be PVC, Teflon or any other desired dielectric. Cables are available in continuous lengths up to 500 feet. Continuous length limitation is a function of wire size. Inter-8 cables using special wire can be fabricated in small lots for experimental and special application requirements.



Inter-8 Weave Cable — Plain, Copper Shielded, or Co-Netic Shielded.

AC Magnetic Field Evaluator Probe



The magnetic field evaluation probe Part No. EP-101, is very useful for the initial determination of fields present either in equipment or in areas where magnetic fields are generated, such as from transformers, reactors, solenoids, etc. Since it is basically an air core inductor, if oriented for maximum indication, its axis will point to the source of the field as well as give an indication of the field intensity at the plane through the color band.

The probe uses a small random wound multi-layer coil on a standard bobbin, such as is used in commercial 110 volt medium size solenoid structures. 4100 turns of No. 36 enamel covered wire are used. Coil leads are connected to a twisted pair copper shielded cable. The coil is centrally located within a brass can with flanged cover, large enough to accommodate the bobbin, with the bobbin axis concentric with that of the can.

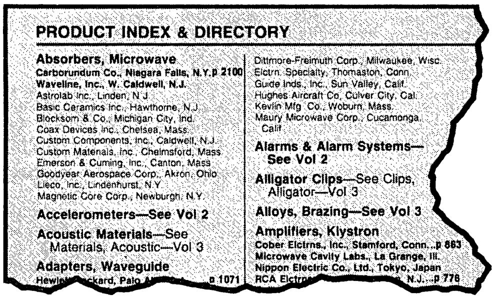
Any laboratory type AC V.T.V.M. may be used, preferably one with a full scale sensitivity of 1 millivolt. The output at 60 Hz is 20 millivolts per gauss (RMS). The evaluator is usable up to 3 KHz, with a correction formula which appears on the plug housing of each probe:

$$\text{B (Gauss)} = \frac{3\ [\text{Voltage (Mv)}]}{\text{Frequency (Hz)}}$$

How to use eem

to find manufacturers of a specific product

GREEN SECTION


PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y.p 2100
Waveline, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N.J.
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass
Emerson & Cuming, Inc., Canton, Mass
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.
Accelerometers—See Vol 2
Acoustic Materials—See Materials, Acoustic—Vol 3
Adapters, Waveguide
Hewl ckard, Palo ... p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co., Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Alarms & Alarm Systems—See Vol 2
Alligator Clips—See Clips, Alligator—Vol 3
Alloys, Brazing—See Vol 3
Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. ..p 683
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctr N.J. ..p 778

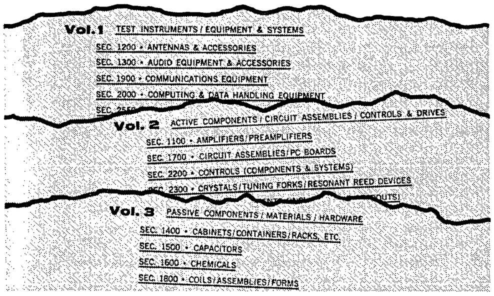
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION


Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT
Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
SEC. 2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES
Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

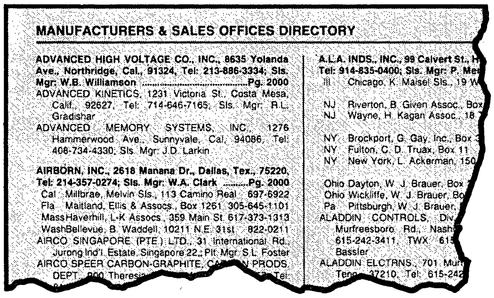
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION

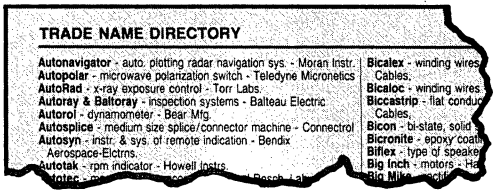

MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal. 94086, Tel: 408-734-4330; Sls. Mgr: J.D. Larkin
AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE.) LTD., 31 International Rd., Jurong Ind'l. Estate, Singapore 22.; Plt. Mgr. S.L. Foster
AIRCO SPEER CARBON-GRAPHITE, C N PRODS. DEPT. Theresi Tel:
A.L.A. INDS., INC., 99 Calvert St.,
Tel: 914-835-0400; Sls. Mgr: P.
Ill Chicago, K. Maisel Sls., 19
NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18
NY Brockport, G. Gay, Inc., Box
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150
Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer,
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-3411, TWX Bassler
ALADDIN ELCTRNS., 701 Mur Tenn. 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957


TRADE NAME DIRECTORY

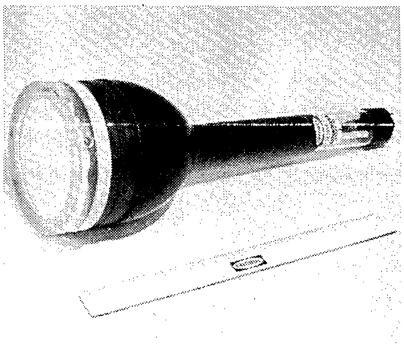
Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopolar - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires Cables,
Bicaloc - winding wires
Biccastrip - flat condu Cables,
Bicon - bi-state, solid
Bicronite - epoxy coati
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

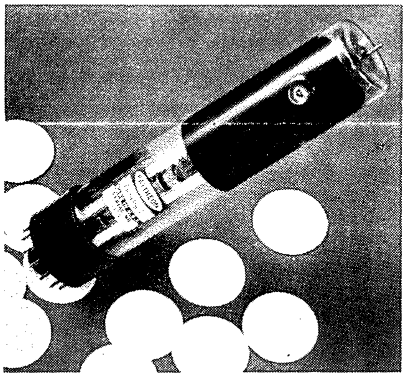
if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

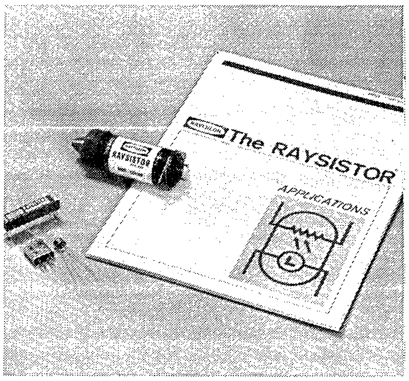
Data Display Devices from Raytheon



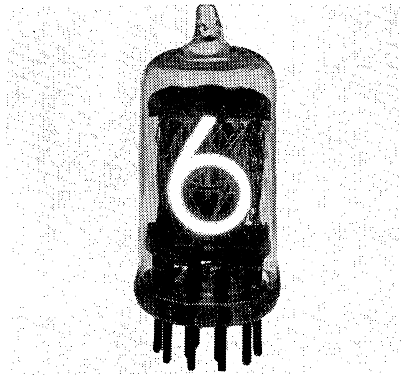
New Projectoray* CRT brings large-size displays with up to 1,000 line resolution, whether they're systems with TV type formats or any type of CRT display from radar to oscilloscope to alphanumerics. Projectoray offers high brightness, long life — lasting hundreds of hours — at 15 foot-lambert light on a 3′ x 4′ screen of unity gain. Projectoray uses a clear face-plate material that rapidly conducts heat **away** from the phosphor and an efficient heat exchanger. Refractive optical lens design allows variable throw distance for large or small theaters. **Write for Projectoray data sheets.**



Symbolray* Monoscope can generate almost any presentation you can think of — from ASCII to custom data displays and even hieroglyphics. We can meet your requirements with only an inexpensive change in target font design. A more economical method of generating displays than using circuit cards, Symbolray monoscopes cost less than $100 in quantities of 1,000. Only 2″ x 12″, Symbolray uses electrostatic deflection and focus. Full messages can be displayed when Symbolray method is used with buffer memory techniques. Monoscope is currently available with 64 and 96 character matrices. **Write for Bulletin SP-1178.**



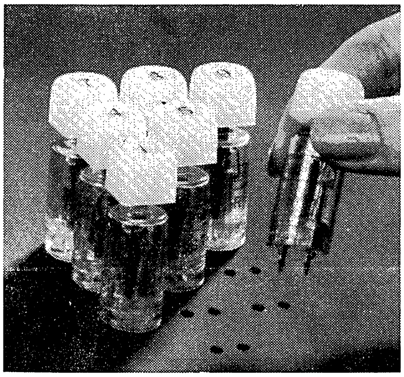
More Than 2000 Optoelectronic Devices are available from Raytheon to improve your product, cut its cost. RAYSISTORS® operate on the principle of controlled light acting on a photo-resistive element — provide a variety of control functions as variable resistors, solid-state switches, relays, voltage or signal isolators. Standard And Special Raytheon Photocells feature rugged mechanical construction, small size, lightweight, low noise. They're available with cadmium sulfide or selenide sensors, TO-5 case or glass vial packaging. **Write for data and circuit applications brochure SP-1149 and SP-1150.**



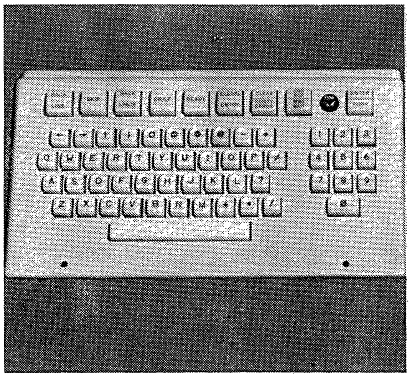
Datavue* Indicator Tubes — made in the U. S. A. — at lowest prices. For example: our CK 8754 costs less than $3.95 in 1,000 lot quantities.

Raytheon offers a complete line of side- and end-view indicator tubes in a wide range of alphanumerics, decimals, and special characters. Turn-around service on all custom designs is fast and reliable.

All Datavue Indicator Tubes are EIA rated, produced for 200,000 hours of operation, highly dependable tubes with high brightness, in-line characters. **Write for Bulletin SP-1114.**



New Keyboard Switches — an original Raytheon design — are low cost yet extremely reliable. Just a feather-light (2½-oz.) touch activates the switch which is designed for switching at logic levels. Life expectancy of the dry reed type is more than 800 million cycles. Bounce is less than 250 microseconds. Costs less than $1.00 in production quantities. **Write for Bulletin MC182B.**



Complete, custom-made keyboards — using the switches described above — are also available from Raytheon. These keyboards can be designed, built and shipped to you in minimum lead time. All assemblies are supplied with alphanumerics, symbols and coding to your specifications. They are also available with data lines, electronic interlock, connector to external power sources and with or without case. **Write, describing your application, for data and assistance.**

For data sheets, application notes, price information, call your Raytheon regional sales office. Or write: Raytheon Company, Industrial Components Operation, 465 Centre Street, Quincy, Massachusetts 02169.

RAYTHEON

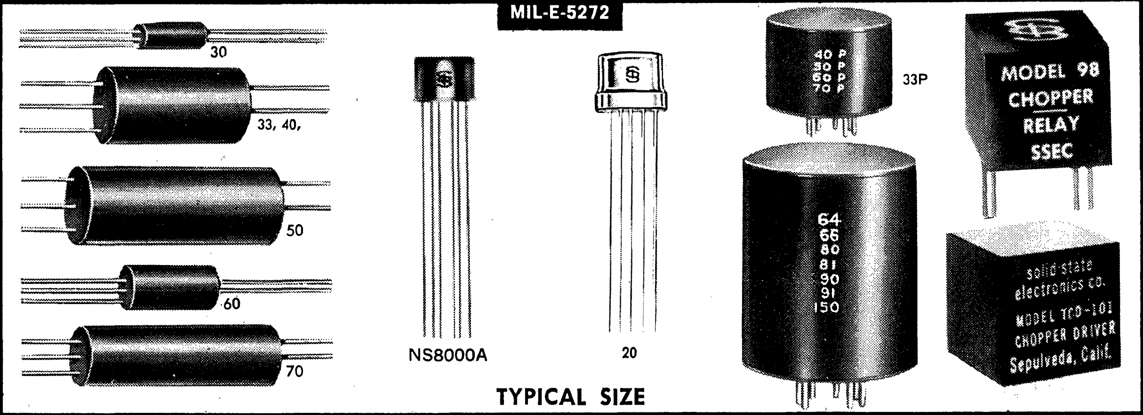
Industrial Components Operation — A reliable source for Circuit Modules / Display Devices Filters / Hybrid Thick-Film Circuits / Industrial Tubes / Optoelectronic Devices / Panel Hardware

---

* Trademark of Raytheon Company

THE MOST COMPREHENSIVE LINE OF

SOLID STATE CHOPPERS AND ANALOG SWITCHES



microminiature **lightweight** **low power** **high speed** **rugged** **indefinitely long life**

non-mechanical **inertialess** **low level** **high efficiency** **linear** **temperature stable**

The transistor chopper (or modulator) is a solidly encapsulated unit designed to alternately connect and disconnect a load from a signal source. It may also be used as a demodulator to convert an a.c. signal to d.c. It is capable of linearly switching or chopping voltages over a wide dynamic range which extends down to a fraction of a millivolt and up to 150 volts or more. Unlike mechanical choppers which can only be designed to operate over a narrow and comparatively low frequency range due to mechanical limitations, the transistorized chopper is an inertialess device that can be driven from d.c. to hundreds of kilocycles.

The switching circuitry used, operates the transistors in a manner which provides stability and freedom from drift over a wide temperature range. Only carefully selected and matched transistors are utilized.

The Model NS8000A chopper is transformer isolated and operates up to 1.5 MHz.

The Models 20, 30, 33, 33P, 40, 40P, 50, 50P, 60, 60P, 70 and 70P are direct-coupled so as to provide the circuit designer with the most basic chopper from which to synthesize solutions to special circuit problems. The Models 33 and 33P are basic field-effect chopper-relays providing exceptional linearity, stability, low noise and offset. The Models 64, 65, 66, 75 and 150 are transformer-coupled for isolation purposes. The Model 150 is for high-level signals. The Models 64 and 66 are for operation from 400 cps and 60 cps sine wave drive at 115 volts a.c. The Models 80, 81, 90 and 91 VIBRACHOPPERS are unique since they require d.c. rather than a.c. drive. The Model 98 has complete isolation and insulation between drive and contacts, even with d.c. drive. The Model TCD-101 Transistor Chopper Driver provides suitable square wave drive voltages for transistorized choppers and synchronous demodulators.

These units are practically immune to the effects of shock and vibration making them ideal for military, space vehicle and portable applications; or where power conservation, miniaturization and elimination of maintenance are a necessity.

CHOPPER MODEL SPECIFICATIONS

Model	Type	Max. Signal Voltage (Volts)	Max. Signal Current (MA)	Drive Frequency Range	Max. Drive Voltage (600Ω Source) (AC Volts)	Drive Input Impedance (Ohms)	Ambient Temp. Range (°C)	Size (Inches)	Weight (Grams)	Remarks
NS8000A	Si	±10	±10	DC to 1.5 mc	10 pk-pk	100	−55 to +100	.45 x .375 Dia.	1	Shielded Hi-Freq
20	Ge	±10	±10	DC to 100 kcps	25 pk-pk	200	−55 to +90	.210 x .315 x .405	1	Shielded Micro-Min
26	Si	±5	±3	400 kc to 5 mc	25 pk-pk	400	−55 to +130	.88 x .32 Dia.	2	RF Micro-Min
30	Ge	±10	±10	DC to 100 kcps	25 pk-pk	200	−55 to +90	.38 x .16 Dia.	½	Micro-Min Hi-Freq
33	Si	±7	±5	DC to 500 kcps	30 pk-pk	10M	−55 to +175	.7 x .44 Dia.	2	FET, Lo-Offset Hi-Temp
33P	Si	±7	±5	DC to 500 kcps	30 pk-pk	10M	−55 to +175	.5 x .75 Dia.	8	FET, Lo-Offset Hi-Temp
40	Si	±15	±40	DC to 50 kcps	40 pk-pk	600	−55 to +150	.7 x .44 Dia.	2	Sub-Min Hi-Temp
40P	Si	±15	±40	DC to 50 kcps	40 pk-pk	600	−55 to +150	½ x ¾ Dia.	8	Plug-in Hi-Temp
50	Ge	±10	±10	DC to 100 kcps	25 pk-pk	600	−55 to +90	1¼ x .44 Dia.	3	Sub-Min Hi-Freq
50P	Ge	±10	±10	DC to 100 kcps	25 pk-pk	600	−55 to +90	½ x ¾ Dia.	8	Plug-in Hi-Freq
60	Ge	±10	±50	DC to 100 kcps	50 pk-pk	600	−55 to +90	½ x ¼ Dia.	1	Micro-Min Hi-Freq
60P	Ge	±10	±50	DC to 100 kcps	50 pk-pk	600	−55 to +90	½ x ¾ Dia.	8	Plug-in Hi-Freq
64	Ge	±10	±50	.04 to 12 kcps	300 pk-pk	10K	−55 to +90	1¼ x 1 Dia.	44	115V/400 cps Xfmr-in
65	Ge	±2	±50	0.27 to 30 kcps	50 pk-pk	100	−55 to +90	¾ x ¾ Dia.	12	Xfmr-in Plug-in
66	Ge	±5	±50	.02 to 12 kcps	300 pk-pk	7K	−55 to +90	1¼ x 1 Dia.	44	115V/60 cps Xfmr-in
70	Si	±10	±40	DC to 100 kcps	4 pk-pk	600	−55 to +150	1⅛ x 5/16 Dia.	2	Hi-Freq Hi-Temp
70P	Si	±10	±40	DC to 100 kcps	4 pk-pk	600	−55 to +150	½ x ¾ Dia.	8	Plug-in Hi-Freq
71	Si	±10	±5	.04 to 70 kcps	10 pk-pk	300	−55 to +150	.84 x .84 x .75	30	Xfmr-in Plug-in
75	Si	±2	±30	0.27 to 100 kcps	10 pk-pk	100	−55 to +150	¾ x ¾ Dia.	12	Xfmr-in Hi-Temp
80	Ge	±15	±50	1.5 to 6.5 kcps	6 to 32 DC	2K	−55 to +90	1¼ x 1 Dia.	32	DC-Drive Plug-in
81	Ge	±15	±50	1.5 to 6.5 kcps	6 to 32 DC	2K	−55 to +90	1¼ x 1 Dia.	32	DC-Drive DPDT
90	Si	±6	±50	1.2 to 3.0 kcps	12 to 32 DC	2K	−55 to +150	½ x 1 Dia.	40	DC-Drive Plug-in
91	Si	±6	±50	1.2 to 3.0 kcps	12 to 32 DC	2K	−55 to +150	1¾ x 1 Dia.	40	DC-Drive Hi-Temp DPDT
98	Si	±20	±2	DC to 5.0 kcps	6 to 12 pk-pk	850	−55 to +100	.75 x .75 x .84	16	DC or AC Isolated Drive
150	Si	±150	±40	0.27 to 30 kcps	20 pk-pk	100	−55 to +150	1¼ x 1 Dia.	30	Hi-Volt Hi-Temp Xfmr-in
171	Si	±1	±5	.2 to 50 kcps	10 pk-pk	100	−55 to +150	.9 x 9 x 1.25 Dia.	30	Full-Wave Vfmr In-out

Phone, wire or write for specifications and application literature describing above units or consult your microfilm files (VSMF or Thomas Supplementary).

SOLID STATE ELECTRONICS CORP.

15321 RAYEN STREET
SEPULVEDA, CALIFORNIA
Area Code 213 — 894-2271 • 785-4473

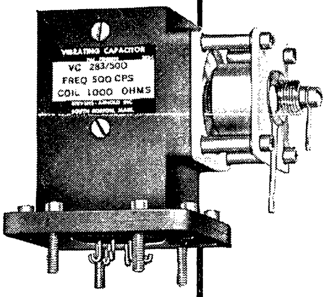
OTHER PRODUCTS — SEE EEM SECTION 5200

- FREQMETERS (MODULAR & VISUAL)
- DC DIFFERENTIAL OPERATIONAL AMPLIFIER
- XTAL PULSE GENERATORS
- VOLTAGE CONTROLLED OSCILLATORS
- TONE OSCILLATORS-TRANSFORMERS
- RELAYS (SOLID STATE, TIME DELAY, REED, LIGHT)
- MINIATURE TELEMETER SYSTEMS
- PRESSURE TRANSDUCERS
- DIGITAL LOGIC MODULES

VIBRATING CAPACITORS

A vibrating-reed type capacitance modulator used to measure currents as low as 10^{-16} amperes. Drift never exceeds ±0.2 millivolts per day, noncumulative. Thus it is ideal where stable performance without recalibration is required for periods of a month or more.

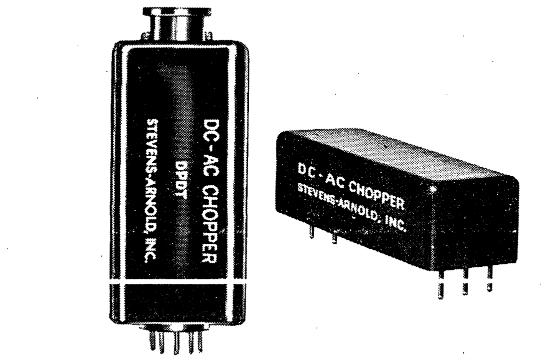
Please write for Catalog 523.


VIBRATING CAPACITOR
VC 283/500
FREQ 500 CPS
COIL 1000 OHMS

STEVENS
INCORPORATED
ARNOLD

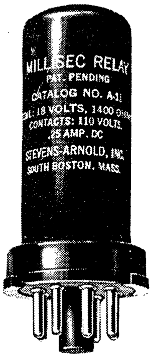
QUALITY SINCE 1943

7 ELKINS ST., SO. BOSTON 27, MASS.


DC-AC CHOPPER
DPDT
STEVENS-ARNOLD, INC.
DC-AC CHOPPER
STEVENS-ARNOLD, INC.

DC-AC CHOPPERS For 50/60/94/120 CPS

These miniature Choppers are outstanding. Long life is assured by our exclusive twin-contact construction. Noise level is less than 1 microvolt into 100,000 ohms with circuit capabilities of .01 microvolt. Packaged two ways, as shown. Built to rigid commercial specifications, there is a selection of types for all applications. Single pole, double pole, make-before-break, break-before-make, AC or DC drive.


MILLISEC RELAY
PAT. PENDING
CATALOG NO. A-1
18 VOLTS, 1400 OHMS
CONTACTS: 110 VOLTS
.25 AMP. DC
STEVENS-ARNOLD, INC.
SOUTH BOSTON, MASS.

MILLISEC RELAYS

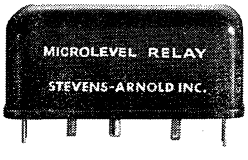
Amazingly fast, from 200 microseconds to 1 millisecond. Available in both commercial and military models, single-pole and double-pole, with shielded or unshielded coils. They are factory sealed and may be mounted in any position.

Please write for Catalog 337

NEW

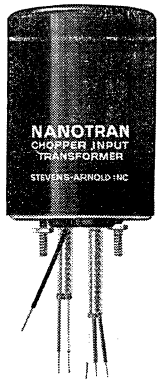
MICROLEVEL RELAYS

A new relay with exceptional characteristics for use where low thermals, high speed, and long life are required. Offset 40 nanovolts. Operating speed 250 microseconds. No bounce. Life 2 billion operations and up. Isolation 10^{11} ohms. Form C with electrical latching capabilities. Operates in any position; printed circuit board, socket, or flange mounting. Please write for Catalog 593.


MICROLEVEL RELAY
STEVENS-ARNOLD INC.

NEW

GETTING THE MOST FOR YOUR MONEY IN INSTRUMENT TRANSFORMERS

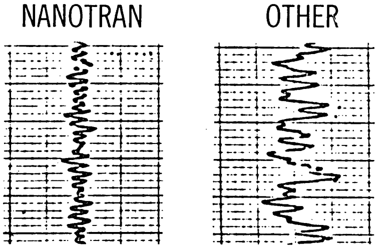

NANOTRAN
CHOPPER INPUT
TRANSFORMER
STEVENS-ARNOLD INC

NANOTRAN ISOLATION TRANSFORMERS are different. They have 200 dB common mode rejection plus all features needed to minimize thermal noise and microphonics:

Frequently cut costs, say, 10%.
Frequently cut size, say, 30%.
Eliminate microphonics:

Please write for Catalog 589.

(Microphonics Test)



S/A-43

eem
electronic engineers master
1971-72

THIS IS THE LAST PAGE
OF THE
CATALOG SECTION, VOLUME 2

MANUFACTURERS AND SALES OFFICE DIRECTORY

This is an alphabetical listing of more than 6,000 manufacturers supplying electronic equipment, instrumentation, components, materials and fabrication services. Included for each company are address, telephone number and name of the key sales executive.

Bold Face listings indicate those manufacturers who have information in the catalog sections (white pages) of the three volumes of **eem.** Their page numbers are included, as well as listings of their local sales offices. Sales offices are listed by state and city. Look for the sales office nearest you. Be sure to ask the sales office if there is a distributor of electronic parts nearby who handles the line in which you are interested.

eem
electronic engineers master
1971-72

note:
This same directory appears in all three volumes of eem.

A & D ELECTRICAL INSTRS., 73-07 88th St., Glendale, N.Y., 11227, Tel: 212-275-6516; Sls. Mgr: D.B. Schettini

A & M INSTRUMENT, INC., Community Dr., Great Neck, N.Y., 11022, Tel: 516-487-0330, TWX: 510-223-0888; Sls. Mgr: P. Stitzer

AAI CORP., P.O. Box 6767, Baltimore, Md., 21204, Tel: 301-666-1400, TWX: 710-232-1800; Sls. Mgr: K.E. Daub

AARON-DAVIS CO., 1150 S.Beverly Dr., Los Angeles,, Cal., 90035, Tel: 213-553-8121; Sls. Mgr: R. Alan Pg. 616

AAVID ENGRG., INC., 30 Cook Ct., Laconia, N.H., 03246, Tel: 603-524-4443; Sls. Mgr: P.A. Johnson

AB RIFA, See LM Ericsson

ABACUS ELCTRNS. CORP., 10 Hudson Terr., Dobbs Ferry, N.Y., 10522; Tel: 914-693-1450; Sls. Mgr: M. Meola

ABADAK INDS., INC., 200 Allen Blvd., Farmingdale, N.Y., 11735, Tel: 516-249-7246

ABALON PRECISION MFG. CORP., 540 Casanova St., Bronx, N.Y., 10474, Tel: 212-LU-9-5682; Pres: L. Orent

ABBEON, INC., 179-15 Jamaica Ave., Jamaica, N.Y., 11432, Tel: 212-AX-7-5600; Sls. Mgr: F.W. Wertheim

ABBEY ELCTRNS. DIV., Liquidonics Inc., 45 S. Service Rd., Plainview, N.Y., 11803, Tel: 516-293-6800; Sls. Mgr: R.R. Reinhardt

ABBOTT PRODS., INC., 14-10 123rd St., College Point, N.Y., 11356, Tel: 212-FL-8-1400; Pres: B.A. Jacobson

ABBOTT TRANSISTOR LABS., 5200 W. Jefferson Blvd., L.A., Cal., 90016, Tel: 213-WE-6-8185; Sls. Mgr: R. Baldarrama .... Pgs. 618-632,2948,2949

NJ Ft. Lee, Abbott Transistor Labs., 1224 Anderson Ave. 201-224-6900

ABESTO CORP., Ackerman St., Bloomfield, N.J., 07003, Tel: 201-338-6814; Sls. Mgr: R.W. Kay

ABLESTIK ADHESIVE DIV., Ablestik Labs., 833 West 182nd St. E., Gardena, Calif., 90248, Tel: 213-321-6252 H.E. Harris

ABLETECH, Div. of Ablestik Labs., 544 West 182nd St., Gardena, Calif., 90248, Tel: 213-321-0933; Gen'l. Mgr: R.E. Herzman

ABPHOT, 105 W. 27th St., New York, N.Y., 10001, Tel: 212-242-1307; Sls. Mgr: D. Andreycak

A. J. ABRAMS CO., Box 571, Westport, Conn., 06880, Tel: 226-3010; Sls. Mgr: A.J. Abrams

ABRAMS INSTR., 606 E. Shiawassee St., Lansing, Mich., 48901, Tel: 517-484-9441, TWX: 810-251-0785; Sls. Mgr: G. Michael

ABSCOA INDS., 1071 W. Arbor Vitae, Inglewood, Calif., 90301, Tel: 213-776-4561, TWX: 910-328-6180; Sls. Mgr: J.J. Cassidy

ABTRONICS, INC., Box 712, Livermore, Calif., 94550, Tel: 415-447-4785; Sls. Mgr: H.M. Owren

A C ELECTRONICS CO., 2928 Nebraska Ave., Santa Monica, Cal., 90404, Tel: 213-829-2611; Sls. Mgr: Don Balos

A C TRANSFORMER CORP., 89 Madison St., Newark, N.J., 07105, Tel: 201-589-8574; Sls. Mgr: G. Giangrande

ACCEL IND'L. HEAT SINK, 5338 Alhambra Ave., Los Angeles, Cal., 90032, Tel: 213-221-5851; Sls. Mgr: H.B. Hermann

Advertisement

34 Different heat sink types permanently available. Supplied to exact customer specifications. Urgent delivery is understood and respected. Short run or large quantity, complete machining and finishing. Specials too. Catalog & Descriptive literature upon request.

ACCESSORY CONTROLS & EQUIP., 805 Bloomfield Ave., Windsor, Conn., 06095, Tel: 203-688-4986; Sls. Mgr: C.L. Osterling

ACCRATRONICS SEALS CORP., 2121 Kenmere Ave., Burbank, Calif., 91504, Tel: 213-TH-3-1500; Pres: W. Fisch

ACCURATE ELCTRNS. CORP., Box 935J, Elyria, Ohio, 44035, Tel: 216-365-1211; Sls. Mgr: J.F. Seybold

Advertisement

AEC's Terminal Blocks, Boards, Strips, and other Connectors are made for the appliance, electronic, electrical, automotive and other industries. These are available as standard components from stock tooling or made to your individual spec. AEC also supplies high volume small metal stampings in ferrous and non-ferrous materials. Threaded stampings are a specialty with AEC. Request standard components catalog.

ACCURATE SPRING & WIRE FORMING, United-Greenfield Div. TRW Inc., 8747 W. Palmer St., River Grove, Ill., 60171, Tel: 312-456-2700, TWX: 910-255-2061; Sls. Mgr: R.J. Madden

ACCURIDE DIV., Standard Precision, Inc., 12311 S. Shoemaker Ave., Santa Fe Springs, Calif., 90670, Tel: 213-944-6236; Sls. Mgr: M.F. Hagen

ACCUTRONICS, INC., Div. Gibbs Mfg. Resch. Corp., 628 North St., Geneva, Ill., 60134, Tel: 312-232-2600; Sls. Mgr: W.C. Benson .... Pgs. 1353-1360

Cal Orange, Smith & Assocs., 363 S. Main
Cal Palo Alto, Nor-Cal Assoc., 999 Commerical St. 415-328-6616
Cal Orange, Smith & Assocs., 363 S. Main 714-633-7991
Fla Orlando, GRA MAR Assocs., Box 20493 305-841-2330
Mass Needham, Addelco Corp., 56 Pickering St. 617-444-4754
Ind Ft. Wayne, McDonald Sls. Co., Box 2848 219-745-9214
Minn St. Paul, De Beck Assocs., 2119 Grand Ave. 612-690-1557
NJ Hackettstown, EAC Assocs., Rte. 2, Box 413
NY Cortland, RJC Assocs., 26 Morningside 697-753-3909
NY Great Neck, EAC Assocs., 55 Northern 516-466-9798
Pa Kimberton, W. Dugger Co., Box 482 215-933-7756

ACDC ELCTRNS., Oceanside Ind'l. Ctr., Oceanside, Cal., 92054, Tel: 714-757-1880, TWX: 910-322-1470; Sls. Mgr: J. Hull .... Pgs. 634-639

Ala Huntsville, Beacon Elctrns., Box 4307 205-881-5031
Ariz Scottsdale, O.E.M. Spec., 6625 E. MacDonald 602-946-4617
Cal Los Altos, ACDC Elctrns., Inc., 1 First St. 415-941-1603
Colo Englewood, PLS Assocs., 8080 E. Union Ave. 303-771-0140
Fla Ft. Lauderdale, Beacon Elctrn. Assocs., 651 N.E. 45 St. 305-564-4298
Fla Maitland, Beacon Elctrn., 540 S. Maitland 305-647-3498
Ga Atlanta, Beacon Elctrn., 2285 Peachtree Rd. 404-351-3654

Ill Chicago, Data Elctrns., 5505 N. Menard 312-774-1452
Kans Leawood, Poly-Onics, 4434 W. 90th Terr. 913-648-4173
Md Silver Spring, Sel-Tronics, 721 Ellsworth 301-589-3391
Mass Lynnfield, New Eng. Mktg., 55 Salem St. 617-245-9530
Mich Orchard Lake, R. G. Sidnell & Co., Inc., 6051 Pinecroft 313-851-3518
Minn St. Paul, Electro-Prods., Griggs-Midway 612-645-7887
Mo Hazelwood, Poly-Onics, 47 Village Sq. 314-837-0597
NM Albuquerque, PLS Assocs., 4300 H Silver Ave., S.E. 505-255-2330
NY Gt. Neck, H.J. Krasner, 33 Gt. Neck Rd. 516-487-0690
NY Hyde Pk., R. Kennedy Co., Green Tree Dr. 914-229-2269
NY Rochester, R. Kennedy, 39 Saginaw Dr. 716-271-6322
Ohio Dayton, R. G. Sidnell, 3300 S. Dixie Dr. 513-293-1194
Ohio Mentor, R. G. Sidnell, 7191 Dogwood La. 216-942-3304
Pa Norristown, Data Engrg. Co. (DENCO), 304 W. Johnson Hwy. 215-272-1444
Tex Dallas, R. Martin Assoc., 6211 Denton Dr. 214-358-3704
Tex Houston, R. Martin Assocs., Box 19291 713-468-3877
Utah Salt Lake City, PLS Assocs., 5219 Major St. 801-262-2866
Wash Bellevue, Ruggles Tech., 10777 Main St. 206-455-2778
For: Can., Montreal 730, Que., Aeromotive Engrg. Prods., Ltd., 147 Hymus Blvd., Pointe Claire 514-695-6413
For: Can., Toronto, Ont., Aeromotive Engrg. Prods., Ltd., 1914 Avenue Rd. 416-782-8835

ACE DRILL CORP., 2600 E. Maumee St., Adrian, Mich., 49221, Tel: 313-265-5184, TWX: 510-450-2170; Sls. Mgr: E.J. Peters

ACE ELCTRN. ASSOCS., INC., 99 Dover St., Somerville, Mass., 02144, Tel: 617-623-3800; Sls. Mgr: N. Curtis

ACE PLASTIC CO., INC., 91-54 Van Wyck Expwy., Jamacia, N.Y., 11435, Tel: 212-523-5500; Sls. Mgr: S. Seidman

ACE SPRING MFG. CO., INC., 150 32nd St., Brooklyn, N.Y., 11232, Tel: 212-ST-8-0100; Sls. Mgr: L. Edwards

ACHESON COLLOIDS CO., Div/Acheson Inds., 1935 Washington Ave., Port Huron, Mich., 48060, Tel: 313-984-5581, TWX: 810-231-5215; Bus. Mgr: A.J. Stock

ACHRODYNE CORP., Rte. 4, Box 321, Yorktown, Va., 23490, Tel: 703-898-6152; Sls. Mgr: A.L. Newcomb

Advertisement

The Achrodyne Corporation manufactures a line of high performance power operational amplifiers. These units feature true differential operation and dc/wideband capability. Special reactive models are available for driving unusually high capacitive loads. Engineering services are also available for special applications dealing with solid state electronic power. Write for prices and data sheets.

ACIM PAPER CO., Mica Paper Div., 1400 Plaza Ave., New Hyde Park, N.Y., 11040, Tel: 516-437-6672; Sls. Mgr: M.D. Heyman

ACKERMAN ENGRAVERS, INC., 43-22 36th St., Long Island City, N.Y., 11101, Tel: 212-361-2266; Sls. Mrg: V. Raia

ACKERMAN GOULD CO., INC., 10 Neil Ct., Box 188, Oceanside, N.Y., 11572, Tel: 516-678-4110; Sls. Mgr: A.P. Fiorey

ACME BATTERY CORP., 700 Canal St., Stamford, Conn., 06904, Tel: 203-324-4125; Pres: L. Schub

ACME CHEMICAL & INSULATION CO., 166 Chapel St., New Haven, Conn., 06513, Tel: 203-562-2171, TWX: 710-465-0019; Sls. Mgr: R. Von Horn

ACME ELEC. CORP., 28 Water St., Cuba, N.Y., 14727, Tel: 716-968-2400, TWX: 510-245-2700; Sls. Mgr: F.J. Van Alstyne

ACME LITE PRODUCTS CO., Congers, N.Y., 10920, Tel: CO 8-6644; Pres: Wm. H. Katz

ACME MFG. & GASKET CO., 738 North 41 St., Philadelphia, Pa., 19104, Tel: 215-EV-6-8622; Gen'l. Mgr: H. Wagenseller

ACME MODEL ENGRG. CO., 654 Bergen Blvd., Ridgefield, N.J., 07657, Tel: 201-943-7650; Sls. Mgr: A. Asfar

ACME RESIN CO., Div. Corn Prods. Co., 1401 Circle Ave., Forest Pk., Ill., 60130, Tel: 312-366-4715, TWX: 910-220-4413; Sls. Mgr: R.E. Wright

ACMI IND'L. DIV., American Cystoscope Makers, 1500 Bassett Ave., Bronx, N.Y., 10461, Tel: 212-824-4600; Sls. Mgr: C.J. Hickis

ACOPIAN CORP., P.O. Box 585, Easton, Pa., 18042, Tel: 215-258-5441, TWX: 510-651-4919; Sls. Mgr: J.F. Whitaker .... Pgs. 640,641

Ala Huntsville, Gentry Assocs., Inc., 2109 W. Clinton Ave. 205-534-9771
Ariz Scottsdale, Compar Rocky Mt., Box 1607 602-947-4336
Cal Long Beach, Product Data Co., 3760 Orange Ave. 213-595-1777
Cal Los Altos, Held & Mollard, Inc., 175 S. San Antonio Rd. 415-941-6041
Cal San Diego, Product Data Co., 10457 Roselle St.
Colo Denver, Compar Rocky Mtn., 4600 E. Asbury Cir. 303-757-7621
Colo Englewood, Compar Rocky Mt., 300 E. Hampden Ave. 303-781-0912
Conn E. Hartford, Meas. Equip. Co., Box 8192 203-528-8192
Fla Orlando, Gentry Assocs., Inc., 550 Bumby Ave. 305-841-7740
Ill Chicago, Potter-Mac Co., 6778 N. Northwest Hwy. 312-775-6626
Kans Mission, M. E. Bettis Co., 5915B Woodson 913-362-0772
Kans Wichita, M. E. Bettis Co., 423 N. Fountain 316-MU-5-7441
Md Baltimore, Doss Elctrns, 6660 Security Blvd. 301-944-1900
Mass Wakefield, Meas. Equip. Co., 591 North Ave. 617-245-4870
Mich Birmingham, J. C. Hofstetter Co., 700 Maple E.
Minn Minneapolis, Kirkeby & Assocs., Inc., 821 Second Ave., N. 612-377-3239
Mo St. Louis, M. E. Bettis Co., 9103 Bessemer 314-HA-9-2099
NM Albuquerque, Compar Rocky Mt., 2125 San Mateo Blvd., N.E. 505-265-1020
NY Latham, L-Tron Corp., Box 336 518-ST-5-5032
NY Rochester, L-Tron Corp., 47 Devonshire Ct. 716-436-4410
NY Skaneateles, L-Tron Corp., Box 67 315-685-6172
NY Woodbury, J.N. Sweeney & Co., Inc., N. 5 Fox Meadow Ct. 516-692-4222
NC Charlotte, J. Rudisill Assocs., 1225 Harding Pl., Box 4245 704-377-6901
Ohio Medina, J.C. Hofstetter Co., 5168 Valley View Dr. 216-241-4880
Ohio Dayton, J.C. Hofstetter Co., 3300 S. Dixie Dr. 513-298-0662
Pa Ardmore, Martin Elec. Co., 118 Valley Rd. 215-649-6332
Pa Camp Hill, Beil & Whitaker, 849 W. Foxcroft Dr. 717-233-1254
Pa Harrisburg, Beil & Whitaker, 5610 Akron Dr. 717-652-0184
Pa Pittsburgh, J. C. Hofstetter Co., 176 Reed Dr.
Pa Reading, Beil & Whitaker, Inc., 3623 Jacksonwald Ave. 215-779-2610
Tex Dallas, Norvell Assoc., 10210 Monroe 214-357-6451
Tex Houston, Norvell Assocs., 6440 Hillcroft 713-774-2568
Wash Seattle, Datacom Assoc., 2207 Fairview E., No. 12 206-329-2989
For: Can, Toronto, Ont., Ahearn & Soper, Ltd., 844 Caledonia Rd. 416-RU-9-4325

ACOUSTONE CORP., Div. Newcastle Fabrics, 80 Wythe Ave., Brooklyn, N.Y., 11211, Tel: 212-782-5560; Sls. Mgr: G. Backer

ACOUSTRONICS, INC., 156 Olive St., Huntington, N.Y., 11746, Tel: 516-HA-1-1331; Sls. Mgr: E. Copel

ACR ELCTRNS. DIV., 112 Voice Rd., Carle Place, N.Y., 11514, Tel: 516-746-7000; Sls. Mgr: N.C. Bates

ACRO PRODS. CORP., 5000 S. Halsted St., Chicago, Ill., 60609, Tel: 312-924-3311; Sls. Mgr: A. Monge

ACRODYNE LTD., Box 1044, Janesville,, Wisc., 53545, Tel: 608-754-2024; Sls. Mgr: R. Mowris

Advertisement

ACRODYNE manufactures a complete line of REED RELAYS including dual in-line, encapsulated, open frame, mercury-wetted, current sensitive and hi-voltage. We can second source almost any type or style Reed Relay. Write or phone for our catalog and name of your local REP. Our prices are the most competitve in the industry and our quality is unsurpassed. Try us and see.

ACROMAG, INC., 30765 Wixom Rd., Wixom, Mich., 48096, Tel: 313-624-1541; Sls. Mgr: R.G. Hennings

ACROMARK CO., 60 Locust Ave., Dept. 397, Berkeley Hts, N.J., 07922, Tel: 201-464-6474; Sls. Mgr: W. Schmidt

ACTION SYSTEMS CO., 34 Cambridge St., Meriden, Conn., 06450, Tel: 203-238-2326; Sls. Mgr: E. Bennet

ACTIVE CONTROL INSTRUMENTATION, Box 194, E. Northport, NY, 11731, Tel: 516-864-2111; Sls. Mgr: J. Gordon

Advertisement

ACI specializes in the manufacture of instrumentation for current or voltage measurement and/or control. Multiple range, pass-thru type current sensors and probes, AC line monitors; DC analog fast response, low noise outputs, total isolation provided; accessory transducer amplifiers and power supplies for instrument excitation. APPLICATIONS-Hi accuracy measurements, level detection, feedback control, strip chart recording, etc..

ACTON ASSOCS., 100 Thompson St., Pittston, Pa., 18640, Tel: 717-654-0612; Sls. Mgr: J. Mazur

Advertisement

Fluoroetch-Pre-Bonding Treatment for fluoroplastics. A safe, easy way to insure reliable bonds on all fluorocarbon materials. HGX Mercury Decontaminant - for protection against Mercury Vapor Poisoning where mercury spills occur or where mercury is used in production. Send for free literature.

ACT ON LABS., INC., See Bomar/Ali, Inc.

A. D. DATA SYS., INC., 830 Linden Ave., Rochester, N.Y., 14625, Tel: 716-381-2370; Sls. Mgr: R. E. Godlove Pg. 328

Ala Huntsville, J.L. Highsmith Co., 3322 S. Memorial 205 881-3294
Ari Phoenix, Hytronic Meas. Inc., 1017 N. 3rd St. 602-955-2358
Cal N. Hollywood, P.I. Instr., 12139 Chandler 213-984-0826
Cal Redwood City, Caltronic, 2449 Harding 415-365-2545
Colo Denver, Hytronic Meas. Inc., 4940 E. 39th 303 388-4081
DC Wash., Powell-Pendergraph, 7979 Old Georgetown 301-656-4535
Fal Orlando, J.L. Highsmith Co., 2543 Ind'l. 305 293-5202
Ill Wheaton, Engrg. Prods., 24 W. 485 Geneva 312-653-6826
Mass Natick, Victor Assocs., 12 Mercer Rd. 617-879-5710
Minn St. Paul, Engrg. Prods., 717 Raymon 612-646-8810
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NJ Ho-Ho-Kus, Hansen Assoc., 215 Brookside 201-652-7055
NM Albuquerque, Hytronic Meas. Inc., 205 San Pablo, S. E. 505-296-6580
NC Charlotte, J.L. Highsmith Co., 3733 Monroe 704-333-7743
Ohio Cleveland, Instrumentation Systems, Inc., 21877 Euclid 216-486-0782
Ohio Dayton, Instrumentation Systems, Inc., 3481 Off. Pk. Dr. 513-293-8095
Tex Dallas, Spacetronics Co., 4515 Prentice
Utah Salt Lake City, Hytronic Meas. Inc., 2022 S. Main 801-466-4924
Va Richmond, J.L. Highsmith Co., 2604-D Buford Rd. 703-272-5888
For: Ottawa, Ont., Can., Datagraphics, 1505 Laperriere 613-722-3489
For: Kirland-Roxboro Que., Can., Datagraphics, 16700 TransCanada

ADAGE, INC., 1079 Commonwealth Ave., Boston, Mass., 02215, Tel: 617-783-1100, TWX: 710-330-0141; V.P. Mktg: T. Hagan

ADALET MFG., Div. Scott & Fetzer, 4801 West 150th St., Cleveland, Ohio, 44135, Tel: 216-267-9000; Sls. Mgr: J.C.H. Larsen

ADAM SPENCE CORP., 3856 Park Ave., Edison, N.J., 08817, Tel: 201-494-1900, TWX: 710-998-0575; Sls. Mgr: M. Evans

ADAMS & ASSOC., INC., 1062 N. Orange Grove Ave., Hollywood, Cal., 90046, Tel: 213-656-6535; Sls. Mgr: J.G. Souchot

ADAMS RITE MFG. CO., 540 W. Chevy Chase Dr., Glendale, Calif., 91209, Tel: 213-245-1095, TWX: 910-497-2276; Sls. Mgr: J.E. Randall

ADAMS-RUSSELL CO., 280 Bear Hill Rd., Waltham, Mass., 02154, Tel: 617-899-2540, TWX: 710-324-0618; Sls. Mgr: G. Sacra

ADAMS & WESTLAKE, Sub. Allied Prods., 1025 N. Michigan St., Elkhart, Ind., 46514, Tel: 219-CO-4-1141, TWX: 219-522-3102; Sls. V.P: A.C. Johnson

ADAR ASSOCS., 85 Bolton St., Cambridge, Mass., 02140, Tel: 617-492-7110; Sls. Mgr: D. Nardi

Advertisement

Adar manufactures a complete line of high speed digital test equipment and systems. DOCTOR systems perform functional, parametric, dynamic tests on MOS-LSI-Bipolar pieces and arrays. Other equipment includes 32 or 64 bit Byte Generators, 25 MHz Data Generators, Multiphase MOS Clocks, 10 mv-nsec Discriminators.

ADC PRODS., 4900 W. 78th St., Minneapolis, Minn., 55435, Tel: 612-929-7881, TWX: 910-576-2832; Mktg. Mgr: W.W. Crowdus ....Pgs. 2510-2515

Ala Huntsville, 20th Century Mktg., Box 6127 205-772-9237
Cal Burbank, 354 E. Palm 213-849-5821
Conn Bloomfield, Zaslow Sls., Six Newberry Rd. 203-242-7781
Fla Melbourne, CES Assocs., Box 1152 305-254-2183
Ill Chicago, J. Angel, 2743 Peterson W. 312-878-0653
Mich Southfield, Sterling-Lowell, 21251 Civic Center 313-352-8881
Minn St. Paul, R. Ragon, 1136 W. Larpenteur 612-488-0201
Mo Kansas City, R. Burton, 1016 Baltimore 816-471-2850
NY Great Neck, E.R.A., 330 Great Neck 516-482-9320
Ohio Cincinnati, J. Murray, Box 11028 513-662-1616
Ohio Cleveland, C. Robinson, 5010 Mayfield 216-381-9049
Okla Tulsa, T.J. Ray C., 8514 E. 31st Pl. 918-627-1515
Pa Fairview Village, Danco Corp., Box 245 215-275-2600
Tex Dallas, 11422 Harry Hines Blvd. 214-241-6783
Wash Seattle, J.B. Jolly, 10119 51st S.W., #2 206-938-4166
For: Can., Montreal, Que., Willer Engrg., 1179 Decarie 514-747-9316
For: Can, Toronto, Ont., Willer Engrg., 1800 Avenue 416-783-3373

ADDINGTON LABS., INC., 1043 DiGiulio Ave., Santa Clara, Calif., 95050, Tel: 408-248-5511, TWX: 910-338-0138; Sls. Mgr: M.L. Jaggars

Advertisement

Addington Laboratories manufactures a quality line of coaxial and waveguide microwave components both in standard and custom configurations. This line includes circulators, isolators, ferrite switches, frequency-sensitive-attenuators and solid-state oscillators of many types. Frequency ranges of operation go through Ku Band

ADDISON DIV., Muirhead, Inc., 1101 Bristol Rd., Mountainside, N.J., 07092, Tel: 201-233-6010; Pres: D. Semmels

ADE CORP., 50 Hunt St., Watertown, Mass., 02172, Tel: 617-923-2180; Sls. Mgr: R. Abbe

ADEC, INC., 86 Frelinghuysen Ave., Newark, N.J., 07114, Tel: 201-248-1330; Sls. Mgr: D.L. Wiesen

ADEL DIV., DeLaval Turbine Calif. Inc., 10777 Van Owen St., Burbank, Calif., 91503, Tel: 213-762-1131, TWX: 910-499-2176; Mktg. Mgr: J.E. Stanley

ADHESIVE PRODS. CORP., 1660 Boone Ave., Bronx, N.Y., 10460; Sls. Mgr: M.S. Peters

ADJUSTABLE BUSHING CORP., 11905 Vose St., N Hollywood, Calif., 91605, Tel: 213-875-2316, TWX: 910-499-2188; Sls. Adm. J.T. Anderson, Jr.

ADMIRAL TOOL & MFG. CO., 3652 N. Talman, Chicago, Ill., 60618, Tel: 312-GR-7-4300; Sls. Mgr: B.M. Levine

ADRE CO., Box 6415, Milwaukee, Wisc., 53209, Tel: 414-352-3531; Sls Mgr: G.B. Herrider

Advertisement

ADRE BURNISHERS CLEAN & POLISH ELECTRICAL CONTACTS. Mini "Slip-Grip" handle & pen type collet tool insulated for use on live contacts. Flex-steel blades micro-ground & hard plated for mild controlled non residual long life burnishing. Blade storage in pen handle. Used extensively since 1952 by: Elect., Gas, Telephone Utl; Industrial, Govt. Inst. & Commercial Est. for maintenance of electric, communications, heating, air conditioning & other equipment. Evaluation Kit Model 1312KA, pen tool, 6 assorted grit blades 3/16" x .012" & mini "Slim-Grip" burnisher. $3.95 ea., Box 12 $42.66 f.o.b. factory. Dealer inq. invited.

ADRONICS, INC., 9 Sand Pk. Rd., Cedar Grove, N.J., 07009, Tel: 201-746-6060; Sls. Mgr: R.C. Robinson

ADVANCE GEAR & MACH., 5851 Holmes Ave., Los Angeles, Cal., 90001, Tel: 213-587-8103; Sls. Mgr: R.L. Seitz

ADVANCE INDS., 2301 Bridgeport Dr., Sioux City, Iowa, 51101, Tel: 712-943-5081; Sls. Mgr: G.S. Chesen

ADVANCE INSTR. CORP., 1707 F. St., Belmar, N. J., 07719, Tel: 201-681-2700; Sls. Mgr: M. Tepper

ADVANCE ROSS ELCTRNS. CORP., 135 S. La Salle St., Chicago, Ill., 60603, Tel: 312-346-9126; Pres: H.C. Buckingham

ADVANCED CIRCUITRY DIV., Litton Inds., 4811 W. Kearney St., Springfield, Mo., 65803, Tel: 417-862-0751, TWX: 910-775-4705; Mktg. Mgr: F. Delnevo

Advertisement

ACD's modern facility can fill all of your needs for printed circuits or multilayer boards and A/W design as well as prototypes or production.

ADVANCED ENERGY CONVERSION, 1918 Menalto Ave., Menlo Pk., Cal., 94025, Tel: 415-325-9255; Pres: R. Kaylor

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 617

Cal Los Angeles, IFM South, 3455 Cahuenga 213-469-1641
Cal San Mateo, Dayton Assoc., Box 1461 415-347-9419
Md Greenbelt, Md., J.E. Cuesta, 8501 Glendale Rd. 301-552-1200
Mass W. Newton, Meredith Assoc., Box 126 617-969-6246
NH Barnstead, Meredith Assoc., Box 56 603-435-8447
NY Glencove, Glasman Assoc., 28 Prestwick Terr. 516-676-1039
Pa Valley Forge, J.E. Cuesta, Valley Forge 215-265-0150
Tex Ft. Worth, Bauer Co., 5731 E. Rosedale 817-265-2441

ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar

ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal, 94086, Tel: 408-734-4330; Sls. Mgr: J.D. Larkin

ADVANCED PATENT TECHNOLOGY, INC., Box 4276, Bonanza Sta., Las Vegas, Nev., 89106, Tel: 702-382-6881; Sls. Mgr: J.J. Solomon

AEG-TELEFUNKEN CORP., 570 Sylvan Ave., Englewood Cliffs, N.J., 07632, Tel: 201-568-8570; Sls. Mgr: B. Jacobs

AEMCO DIV., Midtex, Inc., 10 State St., Mankato, Minn., 56001, Tel: 507-388-6286, TWX: 910-565-2244; Sls. Mgr: R.K. Else

AERO DEVICES, INC., 494 S. Riverview Dr., Totowa, N.J., 07512, Tel: 201-785-0440 ....Pg. 2994

Cal San Jose, Electrical Distr., 1135 Auzerais Ave. 408-293-5818
Conn Bridgeport, Westconn Elctrns., 195 Colorado Ave. 203-367-7747
Fla Ft. Laud., Cons. Southern Elec., 4050 N.E. Sixth Ave. 305-565-1694
Ill Chicago, EMS Co., 6135 W. Belmont Ave. 312-889-8323
Md Baltimore, Electric Motor Sup., 356-358 N. Gay St. 301-685-4523
Mass Boston, G.H. Wahn Co., 450 Western Ave. 617-782-8500
NY Oswego, Snyder & Mackin, 201 W. First St. 315-343-9140
NC Fayetteville, Ind'l. Elec. Sup., 800 Woodfield Rd. 919-484-3195
Pa Phila., Billows Elec. Sup., 7225 Frankford Ave. 215-332-9700
Pa Scranton, Pursell Electrns., 1221-37 N. Washington Ave. 717-346-2011
Tenn Nashville, Steinhouse Sup. Co., 24 Andrew T. Whitmore S. 615-254-1613
Tex Dallas, Dealers Elec. Sup., 8015 Sovereign Row 817-756-2143
Tex Houston, Houston Elec. Distr., 1609 Velasco 713-228-8025
Tex Richardson, R.R. Stout Co., 7335 Tophill Cir. 214-231-8281

AERO MECHANISM, INC., 7750 Burnett Ave., Van Nuys, Calif., 91405, Tel: 213-782-1952, TWX: 910-495-1730; Sls. Mgr: E.G. Thompson

AERO-MOTIVE MFG. CO., Box 2678, Kalamazoo, Mich., 49003, Tel: 616-381-1242; Sls. Mgr: D. Burns

AERO VAC CORP., Box 448, Troy, N.Y., 12181, Tel: 518-274-5850; Sls. Mgr: R.O. Johnson

AEROCOM, 3090 S.W. 37th Ave., Miami, Fla., 33133, Tel: 305-448-6503; Sls. Mgr: F.I. Stacy

AEROFLEX LABS., Torque Motor Prods. Div., S. Service Rd., Plainview, N.Y., 11803, Tel: 516-694-6700, TWX: 510-224-6417; Sls. Mgr: J.H. Lewis

AEROLITE ELECTRONICS CORP., 2207 Summit Ave., Union City, N.J., 07087

AEROLUX LIGHT CO. INC., Div. Durotest Corp., 653 11th Ave., New York, N.Y., 10036, Tel: 212-246-5324; Sls. Mgr: P.J. Kayatt

AERONAUTICAL COMM. EQUIP. INC., 3090 S.W. 37th Ave., Miami, Fla., 33133, Tel: 305-448-6503; Sls. Mgr: F.I. Stacy

AERONAUTICAL DIV, ARO Corp, 400 Enterprise St, Bryan, Ohio, 43506, Tel: 419-636-4242; Plt. Mgr: E.F. Knapp

AERONAUTICAL ELEC. CO., INC., 5656 Northwest Hwy., Chicago, Ill., 60646, Tel: 312-SP-4-5200; Sls. Mgr: W.A. Youngstrom

AEROQUIP CORP., 300 S. East Ave., Jackson, Mich., 49203, Tel: 517-ST-3-2585, TWX: 810-253-1947

AEROSPACE AVIONICS, INC., 1500 Ocean Ave., Bohemia, N.Y., 11716, Tel: 516-589-9200; Sls. Mgr: R.H. Kittel

AEROSPACE CONTROLS CORP., 1645 W. 135th St., Gardena, Cal., 90249, Tel: 213-532-9755; Sls. Mgr: N.R. Hijkle

AEROSPACE KNOB CO., 9835 Dupree St., So. El Monte, Calif., 91733, Tel: 213-442-4700; Sls. Mgr: J.N. Dupree

AEROSPACE RESCH. INC., 130 Lincoln St., Boston, Mass., 02135, Tel: 617-254-7200; Sls. Mgr: W.H. York

AEROTRONIC ASSOCS., INC., Riverside Dr., Contoocook, N.H., 03229, Tel: 603-746-3141; V.P. Sls: M.R. Longley

Advertisement

Low power and high power burn-in and life test systems for both ambient and elevated temperature testing of all semiconductors.

Simulator power supplies for life test and burn-in of diodes and rectifiers.

Scanners and programmers for use with automatic test equipment.

AERTECH INDS., 825 Stewart Dr., Sunnyvale, Calif., 94086, Tel: 408-732-0880, TWX: 910-339-9207; V.P. Mktg: J.A. Allison

AGAC-DERRITRON, INC., 1332 N. Henry St., Alexandria, Va., 22314, Tel: 703-836-4641; Sls. Mgr: C.C. Vincentz

AGARD ELCTRNS. CORP., 40 Nassau Terminal Rd., New Hyde Park, N.Y., 11040, Tel: 516-328-1905; Pres: D. Easton

AGASTAT DIV., Amerace Esna Corp, 1027 Newark Ave., Elizabeth, N.J., 07207, Tel: 201-352-2900, TWX: 710-741-4788; Sls. Mgr: J.E. Cooper

AGFA-GEVAERT, INC., 275 North St., Teterboro, N.J., 07608, Tel: 201-288-4100; Sls. Mgr: K. Dowell

AGNEW-HIGGINS, INC., Box 857, Garden Grove, Calif., 92642, Tel: 714-893-1301; Sls. Mgr: B. Agnew

cont'd

cont'd —— Advertisement ——

CLEAN AIR TO WORK IN - From the manufacturers of the world's first laminar flow clean rooms. Laminar/-Flow Clean Work Stations - Modular sizes: tabletop models, floor models, downflow fume hoods, with a full range of accessories: stainless steel counter tops, filter service gauges, etc. Blower-Filter Modules for converting existing rooms into CLEAN rooms. Blower-Filter stand units for converting existing work stations into CLEAN work stations. Clean Room Kits - Everything needed to construct a low cost Class 100 clean room. Free factory consultation on your clean room needs. All equipment guaranteed in writing to meet Fed. Std. 209.

AIDLIN AUTOMATION, INC., 1613 E. New York Ave., Brooklyn, N.Y., 11212, Tel: 212-EV-5-4246; Vice Pres: S.H. Aidlin

AIL, DIV. CUTLER-HAMMER, INC., Deer Park, N.Y., 11729, Tel: 516-595-6471, TWX: 510-227-6073; Sls. Mgr: G.F. McCarthy

AINSLIE CORP., 531 Pond St., S. Braintree, Mass., 02185, Tel: 617-848-0850, TWX: 710-394-0457; Sls. Mgr: A.L. Stabile

AIR ELECTRO COMM. CORP., 85 Westwood Circle, Roslyn Heights, N.Y., 11577

AIR-O-PLASTIK CORP., Asia Pl, Carlstadt, N.J., 07072, Tel: 201-935-0500; Sls. Mgr: W.F. Carlson

AIR-O-TRONICS PRODS., Box "K", Morrisville, N.Y., 13408, Tel: 315-684-3705; Sls. Mgr: S. Trush

AIR PRODS. & CHEMS., INC., Box 538, Allentown, Pa., 18105, Tel: 215-395-4911; Sls. Mgr: R. Niehaus

AIR-VAC ENGRG. CO., 100 Gulf St., Milford, Conn., 06460, Tel: 203-874-2541; Sls. Mgr: C.S. Lasto

AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2517

Cal Millbrae, Melvin Sls., 113 Camino Real 415-697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Mass Haverhill, L-K Assocs., 359 Main St. 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 206-822-0211

AIRCO SINGAPORE (PTE.) LTD., 31 International Rd., Jurong Ind'l. Estate, Singapore 22,; Plt. Mgr: S.L. Foster

AIRCO SPEER CARBON-GRAPHITE, CARBON PRODS. DEPT., 900 Theresia St., St. Marys, Pa., 15857, Tel: 814-834-2801, TWX: 510-693-4515; Sls. Mgr: W.A. Bauer

AIRCO SPEER ELCTRNS., Grand Plaza, 945 Grand Ave., Nogales, Ariz., 85621, Tel: 602-287-5363, TWX: 910-973-9794; Sls. Mgr: R.P. Mortenson

AIRCO SPEER ELCTRNS, Resistor Plt., Foster Brook Rd., Bradford, Pa., 16701, Tel: 814-362-5536, TWX: 510-695-5921; Gen'l Sls. Mgr: R.M. Butler

AIRCOM, INC., Rte. 16B, Union, N.H., 03887, Tel: 603-473-2323; Pres: R. Rivers

AIRCRAFT & ELCTRN. SPEC., 12675 W. U.S. Hwy. 36, Plainfield, Ind., 46168, Tel: 317-TE-9-2551; Sls. Mgr: C.W. Martin

AIRCRAFT & MISSILE CONSLTS., 2722 Ardmore Ave., Manhattan Beach, Cal., 90266, Tel: 213-FR-4-0626; Sls. Mgr: C.M. Pollard

AIRFLYTE ELCTRNS. CO., Box 207, Bayonne, N.J., 07002, Tel: 201-436-2230, TWX: 710-729-4489; Sls. Mgr: M. Feinman ....Pg. 1580

Cal Los Angeles, ElCom Sls. Co., 5134 Valley Blvd. 213-233-1351
Cal Mountain View, Repex, 2015 Latham St. 415-969-9200
Conn No. Haven, Kitchen & Kutchin, 22 Broadway 203-239-0212
Fla Miami Bch., Geartner Assocs., 1125 71st St. 305-861-3661
Fla Orlando, Geartner Assocs., 1221 Lee Rd. 305-299-1000
Ill Park Ridge, MQ & Assocs., 118 W. Higgins Rd. 312-698-2044
Mass Lexington, Kitchen & Kutchin, 17 Waltham St. 617-862-8230
Minn Mipls., R.F. Specialties, 4542 4th St., N.E. 612-560-1222
NJ Clifton, Avionics Equip., Inc., 179 Louise St. 201-772-1956
NY New Hyde Park, R.P. Luce & Co., 1300 Jericho Tpke. 516-437-4550
NY Rochester, R.P. Kennedy Co., 39 Saginaw Dr. 716-271-6322
Ohio Fairborn, Tech. Assocs., Box 388 513-878-2484
Ohio Brunswick Hills, Tech. Assocs., 4406 Grafton Rd. 216-225-7344
Pa Philadelphia, R.P. Luce & Co., 8717 Patton Rd. 215-884-8365
Tex Dallas, Jacobson Co., 8609 N.W. Plaza Dr. 214-363-7584
Wash Bellevue, Repex N., 10717 N.E. 4th St. 206-455-2778
For: Can., Ottawa, Ont., Aero Sls. Engrg. Co., 2695 Regina St. 613-828-8560
For: Can., Rexdale, Ont., Aero Sls. Engrg. Co., 4 Racine Rd. 416-249-9139

AIRPAX ELCTRNS., INC., Cambridge Div., Cambridge, Md., 21613, Tel: 301-228-4600, TWX: 710-865-9655; Sls. Mgr: B. Kouzoulas ....Pg. 1877

Ariz Phoenix, Aztec Entprs., 15 N. 40th Pl. 602-267-8103
Cal Los Altos, Airpax Elctrns., Inc., 885 N. San Antonio Rd. 415-941-0893
Colo Littleton, Aztec Enterprs., 1449 W. Littleton Blvd. 303-798-4573
Fla Fern Park, Airpax Elctrn., 2550 Talbot Rd. 305-841-8793
Fla Pensacola, Trio Elec. Supply, 5208 Sycamore Dr.
Ill Chicago, K & W Assocs., 5151 N. Harlem Ave. 312-792-2618
Ind Indianapolis, A.D. Moore Co., 4020 W. 80th St. 317-291-6550
Iowa Cedar Rapids, Reid Assocs., Inc., 526 Merchants Nat'l. Bank Bldg. 319-362-6302
La Baton Rouge, E.E. Brown Instr. Co., 1821 Wooddale Ct. 504-921-5578
La Shreveport, E.E. Brown Instr. Co., 5100 Jewella Rd. 318-635-6404
Md Cambridge, Airpax Cambridge Div., Woods Rd. 301-228-4600
Md College Pk., Riffe Assocs., 4313 Knox Rd. 301-799-7770
Md Silver Spring, Aeron Assocs., 1110 Fidler La. 301-588-4047
Mass Wellesley Hills, Airpax Elctrns., Inc., 192 Worcester St. 617-237-2600
Mich Southfield, Automatic Controls, 29600 Northwestern Hwy. 313-354-1190
Minn Minneapolis, E.J. Doyle, 3024 Minnehaha Ave.
Mo Kansas City, Harris-Hanson Co., 7616 Paseo 816-444-9494
Mo St. Louis, Harris-Hanson Co., 2814 S. Brentwood Blvd. 314-962-0111
NM Albuquerque, Aztec Enterprs., 823 Penn. NE 505-255-2440
NY Buffalo, R.M. Newell, 5152 Main St.
NY Port Washington, J. Di Blasi Assocs., Inc., 14 Vanderventer Ave. 516-767-0470
NY Syracuse, H.R. Murray, 6585 Kinne Rd, Box 11 315-446-5555
NY Syracuse, C.W. Floring, 104 Whitestone 315-478-2149
NC Charlotte, Mac Guire & Crawford Instr., Box 11322
NC Winston-Salem, L. White, 1014 Brookstown 919-725-3612
Ohio Cleveland, Electro Sls., 851 E. 222 St.
Ohio Dayton, C.P. Haskell, Box 624 513-298-3331
Okla Tulsa, Lucas Controls, Box 3704 918-743-7557
Pa Harleysville, Airpax Elctrns., Box 257 215-643-5560
Pa Pittsburgh, Friday Engrg. Sls., 666 Washington Rd. 412-341-1444
Tenn Hixson, G. Grant, 5228 Hixson Pike
Tex Dallas, Stevens Sls., Box 34493 214-350-2475
Tex Houston, Haltom Co., 5814 Schumacher 713-782-5625
Tex Odessa, Barnco Co., 1507 W. Second St. 915-332-0293
Wisc Wauwatosa, Larsen Assocs., 10855 W. Potter Rd. 414-258-0529
For: Can., Port Credit, Ont., Leonard Elec., Ltd., 1008 Rangeview Rd. 416-274-3454
For: Can., Vancouver, B.C., Southwell Controls, Ltd., 1332 Powell St. 604-255-9141

AIRPAX ELCTRNS., Controls Div., Box 8488, Ft. Lauderdale, Fla., 33310, Tel: 305-587-1100, TWX: 510-955-9866; Sls. Mgr: T.A. Patterson ....Pg. 1308

Ariz Scottsdale, Carter Assoc., Box 99 602-947-4355
Cal Los Altos, Airpax Elctrns., 885 N. San Antonio Rd. 415-941-0893
Cal S. El Monte, Airpax Elctrns., Pacific Div., 1836 Floradale 213-686-0894
Cal S. El Monte, Airpax Elctrns. Pacific Div., 1836 Floradale 213-686-1960
Colo Littleton, Simpson Assocs., 2552 Ridge Rd. 303-798-8439
Fla Fern Pk., Airpax Elctrns., 2550 Talbot 305-831-6498
Fla Pensacola, C. B. Metcalf, 3601 Swan La. 904-476-7710
Ill Chicago, Actronic Sls. Engrg., 4750 N. Milwaukee 312-286-1037
Ind Indianapolis, A. D. Moore, 4020 W. 80th St. 317-291-6550
Iowa Cedar Rapids, Reid Assocs., 527 Merchants Nat'l. Bank Bldg. 319-362-6302
La Baton Rouge, Brown Automation, 1821 Woodale Cts. 504-921-5578
La Shreveport, Brown Automation, Box 9369 318-635-7697
Md Silver Spring, Aeron Assocs., 1110 Fidler La. 301-588-4047
Mass Wellesley, Airpax Elctrns., 192 Worcester 617-237-2600
Mich Southfield, Automatic Controls, 29600 Northwestern Hwy. 313-354-1190
Minn Mpls., F. Peterson, Box 16224, Elmwood Br. 612-927-4453
Mo Kansas City, Harris-Hanson, 7916 Paseo 816-444-9494
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood 314-962-0111
NJ Cherry Hill, J. McCoy, Box 20, Rt. 70E 609-428-3444
NY Port Washington, J. Di Blasi, 14 Vanderventer 516-767-0470
NY Staten Is., J. M. Joanssen, 198 Cleveland 212-984-4357
NY Syracuse, H. R. Murray, 6585 Kinne Rd., Dewitt Box 11 315-446-5555
NY Syracuse, C. W. Floring, Box 175, Onondago Br. 315-478-2149
NC Winston Salem, L. G. White Southern Co., Box 2356 919-725-3612
Ohio Cincinnati, Baehr, Greenleaf, 9505 Montgomery 513-891-3826
Ohio Cleveland, Baehr, Greenleaf, 14700 Detroit 216-221-9030
Ohio Columbus, Baehr, Greenleaf, Box 5722 614-486-4046
Ohio Dayton, C. P. Haskell, Far Hills Br., Box 624 513-298-3331
Ohio Xenia, Baehr, Greenleaf, 925 Factory Rd. 513-426-5485
Okla Tulsa, T. J. Ray Co., Box 45191 918-627-1515
Pa Harleysville, Airpax Elctrns., Box 257 215-643-5560
Pa Pittsburgh, Friday Engrg., 666 Washington 412-341-1444
Tenn Memphis, Brown Automation, Emmons Bldg. 901-682-5679
Tex Dallas, Stevens Sls., Box 34494 214-350-2476
Tex Houston, Haltom Co., 5814 Schumacher 713-782-5625
Tex Odessa, Barnco Co., 1507 W. 2nd St. 915-332-0294
Wisc Wauwatosa, Larsen Assocs., 10855 W. Potter Rd. 414-258-0529
For: Can., Calgary 21, Alb., Canadian Dynamics, 122-17th Ave., S E
For: Can., Port Credit, Ont., Leonard Elect., 1008 Rangeview 416-274-3454
For: Can., Vancouver, B. C., Canadian Dynamics, 8264 St. George St. 416-325-6014

AIRPAX ELCTRNS., Pacific Div., 1836 Floradale St., So. El Monte, Cal., 91733, Tel: 213-686-1960, TWX: 910-587-3444; Sls. Mgr: B. Snyder

AIRTEC, INC., 264 Columbus Ave., Roselle, N.J., 07203, Tel: 201-245-2990; Sls. Mgr: R. LeNoble

AJAX INT'L. CORP., Box 4007, Santa Barbara, Cal, 93103, Tel: 805-966-1796; Sls. Mgr: P.V. Worsley

AJAX MAGNETHERMIC CORP., 1745 Overland Ave., N.E., Warren, Ohio, 44482, Tel: 216-372-2529; Mktg. Mgr: M.E. Hackstedde

AJUSTO EQUIP. CO., 513 Conneaut St., Bowling Green, Ohio, 43402, Tel: 419-353-8555; V.P. Sls: W.H. VanLanen

AKG, Div. North American Philips Corp., 100 E. 42nd St., New York, N.Y., 10017, Tel: 212-697-3600; Sls. Mgr: R.W. Miller

AKRO-MILS, INC., Box 989, Akron, Ohio, 44309, Tel: 216-253-5593

AKRON PORCELAIN CO., 2739 Cory Ave., Akron, Ohio, 44314, Tel: 216-745-2159; Sls. Mgr: R.G. McCann

A.L.A. INDS., INC., 99 Calvert St., Harrison, N.Y., 10528, Tel: 914-835-0400; Sls. Mgr: P. Merlin ....Pg. 1645

Ill Chicago, K. Maisel Sls., 19 W. 324 Army Trail Rd. 312-543-6916
NJ Riverton, B. Given Assoc., Box 183 609-829-7249
NJ Wayne, H. Kagan Assoc., 18 Tilghman Dr. 201-684-7682
NY Brockport, G. Gay, Inc., Box 33 716-268-7631
NY Fulton, C. D. Truax, Box 11 315-592-7184
NY New York, L. Ackerman, 150-08 87th Ave. 212-658-8881

Ohio Dayton, W. J. Brauer, Box 35 513-898-1224
Ohio Wickliffe, W. J. Brauer, Box 305 216-943-0601
Pa Pittsburgh, W. J. Brauer, Box 8466 412-921-3213
ALADDIN CONTROLS, Div. Aladdin Elctrns., 703 Murfreesboro Rd., Nashville, Tenn., 37210, Tel: 615-242-3411, TWX: 615-244-1534; Sls. Mgr: F. Bassler
ALADDIN ELCTRNS., 701 Murfreesboro Rd., Nashville, Tenn., 37210, Tel: 615-242-3411; Sls. Mgr: F. G. Bassler
ALBANY INT'L. CORP., 1373 Broadway, Albany, NY, 12201, Tel: 518-462-6451; Sls. Mgr: R.J. Thompson
ALBEROX CORP., New Bedford Ind'l. Pk., New Bedford, Mass., 20745, Tel: 617-995-1725; Sls. Mgr: A.J. Coutu

ALCO ELCTRN. PRODS., Box 1348, Lawrence, Mass., 01842, Tel: 617-686-3887, TWX: 710-342-0552; Sls. Mgr: R.E. Laffey .... Pgs. 1438-1440,1646,1878-1880
ALCOKNOB AND ALCOSTRIP DIVISION
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd St. 602-253-6104
Cal Orange, F. Huddleston, 44 Plaza Sq. 714-639-1941
Cal Santa Clara, Nova-Tronix Elctrn. Sls., 1659 Scott Blvd. 408-243-9530
Colo Denver, Hytronic Meas., 4940 E. 39th Ave. 303-388-4081
Conn New Haven, Gerber, 29 Whalley Ave. 203-777-6279
Fla Orlando, Irby & Connolly, Box 6034B 305-423-8270
Ga Atlanta, Millar Elctrns., Box 12137, Northside Sta. 404-261-6160
Ill Chicago, KaDell Sls., 6134 N. Milwaukee Ave. 312-774-6815
Md Silver Springs, R. Davies, 10 Post Office Rd. 301-587-3910
Mass E. Longmeadow, Gerber Sls., Box 447, Baldwin St. 413-525-3059
Mass Waltham, Gerber Sls., 176 Second Ave. 617-891-8040
Mich Lathrup Vlg., R. Nordstrom, Box 32 313-444-4417
Minn St. Paul, Mesa Co., 1821 University 612-645-8676
Mo Kansas City, K & M Sls., 1627 Main St. 816-471-1355
Mo St. Louis, K & M Sls., 10561 Chevy Chase Dr. 314-423-2420
NM Albuquerque, Hytronic Meas., 205 San Pablo SE 505-268-3941
NY Port Washington, T.M.A., Box 735 516-767-2432
NY Rochester, E.J. Schomburg, Box 8465 716-244-0920
NC Raleigh, Millar Elctrns., Box 17173 919-787-9564
Ohio Cincinnati, F. Kahsar Sls., 5229 Glenway 513-471-9011
Ohio Hudson, F. Kahsar Sls., 47 W. Case Dr. 216-653-6808
Pa Phila., C & F Sls., 5451 Oakland St. 215-288-9406
Tex Dallas, Techno Assocs., Box 20544 214-357-9213
Utah Salt Lake City, Hytronic Meas., 2022 S. Main St. 801-466-4924
Wash Seattle, D. Smith Sls., 2320 N. 45th St. 206-633-3160
EXP: Thomaston, Conn., Norcon Div. Intrade, Box B 203-283-5563
For: Can., Thornhill, Ont., Elctrn. Comps. Intl., 38 Guardsman Rd. 416-889-0212
For: Thomaston, Conn., Norcon Div. Intrade, Box B 203-283-5563
ALCOLITE AND ALCODISPLAY DIVISION
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd St. 602-253-6104
Cal Inglewood, Bertrand & Zoolalian, 3402 W. Century Blvd. 213-673-0100
Colo Denver, Hytronic Meas., 4940 E. 39th Ave. 303-388-4081
Conn Hamden, Compar-New England, 2531 Whitney 203-288-9276
Fla Orlando, Irby & Connolly, Box 6034B 305-423-8270
Ga Atlanta, Electro-Rep Assoc., Box 29353
Ill Glen Ellyn, Rockford Controls, 21W181 Hill Ave. 312-469-6016
Md Ellicott City, McCourt, Chevrolet Ave. at St. John's La. 301-823-3455
Mass Newton Highlands, Compar-New England, 88 Needham St. 617-969-7140
Mich Lathrup Vlg., R. Nordstrom, Box 32 313-444-4417
Minn St. Paul, Countryman Assocs., 1821 University Ave. 612-645-9151
NM Albuquerque, Hytronic Meas., 205 San Pablo SE 505-268-3942
NY Oceanside, Bittan Assocs., 400 Merrifield 516-678-6222
NY N. Syracuse, L. Allen, Box 205 315-458-7470
NC Charlotte, Electro-Rep, 128 W. 30th St. 704-333-0451
NC Raleigh, Electro-Rep, 309 Woodburn Rd.
Ohio Cleveland, Midwest Sls., 7409 Pearl Rd. 216-234-9200
Pa Willow Grove, Techparts, 81 Old York Rd. 215-657-0100
Tex Dallas, J. Guenther, 5121 McKinney 214-528-6286
Tex Houston, J. Guenther, Box 55525 713-468-0232
Utah Salt Lake City, Hytronic Meas., 2022 S. Main St. 801-466-4924
Wash Seattle, D. Smith Sls., 2320 N. 45th St. 206-633-3160
EXP: Thomaston, Conn., Norcon, Div. Intrade, Box B 203-283-5563
For: Can., Thornhill, Ont., Elctrn. Comps. Intl., 38 Guardsman Rd. 416-889-0212
ALCOSWITCH
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd St. 602-253-6104
Cal Inglewood, W. Knight, Box 400, 112 Glasgow Ave. 213-678-4711
Cal San Carlos, Lo-Dan/Del Bucchia, 1077 Industrial Way 415-592-4600
Colo Denver, Hytronic Meas., 4940 E. 39th Ave. 303-388-4081
Conn New Haven, Gerber Sls., Box 2917, 29 Whalley Ave. 203-777-6279
Fla Orlando, Irby & Connolly, Box 6034B 305-423-8270
Ill Glen Ellyn, Rockford Controls, 21W181 Hill Ave. 312-469-6016
Iowa Des Moines, KSW Assocs., 3831 43rd St. 515-279-9235
Md Ellicott City, McCourt Co., Chevrolet Ave. at St. John's La. 301-823-3455
Mass E. Longmeadow, Gerber Sls., Box 447, Baldwin St. 413-525-3059
Mass Waltham, Gerber Sls., 176 Second Ave. 617-891-8040
Mich Lathrup Vlg., R. C. Nordstrom, Box 32 313-444-4417
Mo Kansas City, KSW Assocs., 7546 Troost Ave. 816-363-5651
Mo St. Louis, KSW Assocs., 2319 Hampton Ave. 314-781-6111
Minn St. Paul, Countryman Assocs., 1821 University, Room 424 N. 612-645-9151
NM Albuquerque, Hytronic Meas., 205 San Pablo, SE 505-268-3941
NY N. Syracuse, L.D. Allen, Wason Bldg., Box 205, 426 S. Main St. 315-458-7470
NY Oceanside, Bittan Assocs., 400 Merrifield Ave. 516-678-6222
NC Charlotte, Electro-Rep Assocs., 128 W. 30th 704-333-0451
Ohio Cleveland, Midwest Sls. Assocs., 7409 Pearl Rd. 216-234-9200
Pa Pittsburgh, Trymac Co., 201 Penn Center Blvd. 412-823-8400
Pa Willow Grove, Techparts, 81 Old York Rd. 215-657-0100
Tex Dallas, J. B. Guenther, 5121 McKinney Ave. 214-528-6286
Tex Houston, J.B. Guenther, Box 55525 713-468-0232
Utah Salt Lake City, Hytronic Meas., 2022 S. Main St. 801-466-4924
Wash Seattle, D. Smith, 2320 N. 45th St. 206-633-3160
EXP: Conn., Thomaston, Norcon Div. Intrade, Box B 203-283-5563
For: Can., Montreal, Que., Elctrn. Comps. Intl., 38 Guardsman Rd. 416-889-0212
ALCOR, INC., 215 S. Tioga St., Ithaca, N.Y., 14850, Tel: 607-AR-3-4242
ALDEN ELCTRN. & IMPULSE RECORD. EQUIP., Wash. St., Westboro, Mass., 01581, Tel: 617-366-8851; Sls. Mgr: L.A. Farrington
ALDEN SYS. CO., INC., Box A, Dept. 262, Westboro, Mass., 01581, Tel: 617-366-8556; Gen'l. Mgr: N.A. Duhamel
ALDSHIR MFG. CO., INC., 111 Lake Ave., Tuckahoe, N.Y., 10707, Tel: 914-SP-9-1297; Sls. Mgr: A.E. Smith
ALERT PRODS. DIV., Balco Mfg. Co., P.O. Box 1851, Costa Mesa, Calif., 92626, Tel: 714-545-0881; Sls. Mgr: C.A. Ballard
ALFAX PAPER & ENGRG., Washington St., Westboro, Mass., 01581, Tel: 617-366-8227; Sls. Mgr: D.H. Enman

ALFORD MFG. CO., 120 Cross St., Winchester, Mass., 01890, Tel: 617-729-8050, TWX: 710-348-1063; Sls. Mgr: G. Cohen ....Pg. 598
Ala Huntsville, Gentry Assocs., Inc., 2109 W. Clinton Ave. 205-534-9771
Cal Los Angeles, RF Assocs., Inc., 1621 Pontius Ave. 213-478-1586
Cal Palo Alto, RF Assocs., Inc., 800 San Antonio Rd. 415-327-5531
DC Washington, E-A, Inc. 202-783-7819
Fla Orlando, Gentry Assocs., Inc., 550 N. Bumby Ave. 305-841-7740
Fla St. Petersburg, Gentry Assocs., Inc., 4152 49th Ave., S. 813-867-7820
Ga Atlanta, Gentry Assocs., Inc., Box 13513, Sta. K 404-233-3816
Md Baltimore, E-A, Inc., 1406 Shoemaker Rd. 301-825-2385
Mass Waltham, Microwave Conslts. Corp., 195 West St. 617-899-4400
Mo Kirkwood, Simpson Enterprises, 514 Parkwood 314-965-1115
NJ Saddle Brook, L&M Assocs., 511 Victor St. 201-834-8700
NY Brentwood, L&M Assocs., 7 Mayflower Ct. 516-231-8363
NY Fayetteville, Graydon-Sherman, Inc., Davis Bldg.
NC Burlington, Gentry Assocs., Inc., 116 E. O'Neal Ave.
Pa Andalusia, L&M Assocs., Colonial Plaza, 965 A Bristol Pike 215-639-3100
Tex Dallas, Dannemiller-Smith, Inc., 10050 Monroe 214-357-8247
Tex Houston, Dannemiller-Smith, Inc., 5760 Rice Ave. 713-668-4461
For: Can., Montreal, Que., Microwave Specialty Co., Ltd., 8490 Lafrenaie St. 514-324-1780
ALGO, Div. Hamilton Elctrn. Corp., 50 Schrieffer St., S. Hackensack, N.J., 07606, Tel: 201-487-4550; Sls. Mgr: E. Perruso
ALL STAR PRODS., INC., P.O. Drawer 487, Defiance, Ohio, 43512, Tel: 419-782-1065; Sls. Mgr: C.J. McBride

ALL-TRONICS INC., 45 Bond St., Westbury, N.Y., 11590, Tel: 516-333-3090 ....Pgs. 1506-1508
Cal Los Altos, E. Landa Co., One First St. 415-948-0788
Cal Los Angeles, E. Landa, 1607 Pontius 213-272-9525
Cal San Diego, Ed Landa, 3650 Clairemont 714-274-7242
Colo Englewood, Beta Tech. Sls., 4732 S. Broadway 303-781-3271
Fla Maitland, Geartner, 2101 Mohawk Trail 305-647-4000
Fla Miami Beach, Geartner, 350 Lincoln 305-531-0200
Mass Stowe, Musello, Box 125, Harvard Rd. 617-369-5900
Minn Mipls., Tec Sls., 9906 Chicago Ave., S. 612-884-1180
Mo St. Louis, G. Fixman Eng. Co., 8160 Stanford Ave. 314-PA-5-5219
NY Great Neck, Meas. Tech., 295 Northern 516-482-3500
Ohio Cleveland, E. Frost, 30170 S. Woodland 216-831-1442
Pa Media, W. Reeves, 2973 N. Providence 215-LO-6-6709
Tex Houston, Chester Butt, Box 18045 713-526-3101
Wash Seattle, A.C.E. Assocs., 124 S.W. 156th St. 206-CH-4-9391
ALLACO PRODS., 130 Wood Rd., Braintree, Mass., 02184, Tel: 617-843-7845; Sls. Mgr: A.P. Alexander

ALLARD INSTR. CORP., 770 Main St., Westbury, NY, 11590, Tel: 516-334-8742; Sls. Mgr: J.J. Ackerman Pg. 1435
Cal Berkley, P. Rosen Co., Box 16 415-526-8286
Cal Pico Rivera, Westrep, 9519 Telegraph Rd. 213-949-2551
Fla Melbourne, Tech-Rep Assoc., Box 2095 305-723-9140
Me Denmark, Great Northern Elec., Main St. 207-452-2811
Mich Grand Rapids, Elfi Sls. Assoc., 1635 Pembroke Dr. SE 616-455-2920
ALLEGRI-TECH, INC., 141 River Rd., Nutley, N.J., 07110, Tel: 201-661-2220; Sls. Mgr: A. Longarzo
ALLEN, ALVA INDS., 1001-15 No. Third St., Clinton, Mo., 64735, Tel: 816-885-3331; Sls. Mgr: D. Sell

ALLEN AVIONICS, Div. A. K. Allen Co., 255 East 2nd St., Mineola, N.Y., 11501, Tel: 516-248-8080; Sls. Mgr: L. Jacobson ....Pgs. 1510,2729-2731
Cal Los Angeles, E.V. Roberts & Assoc., 9601 W. Jefferson Blvd. 213-870-9561
Cal Palo Alto, Adtek Assoc., 201 Town & Country Village 415-323-5414
Cal San Diego, E. V. Roberts, 4379 30th 714-282-7691
Colo Denver, J. Hurlbut, 1295 S. Bannock 303-744-1451
Fla Clearwater, R. Brennan, Inc., Box 5045 813-446-5006
Ill Park Ridge, R. Specialtists, 118 W. Higgins 312-698-2044

Md Baltimore, D. Jones, 2100 N. Charles 301-752-0577
Mass Wayland, Wayland Engrg. Sls., Box 189 617-653-5256
NJ Cherry Hill, Mid-Eastern Assocs., 1759 Country Club 609-428-7977
NY Woodbury, J. Sweeney, 5 Fox Meadow 516-692-4222
Tex Dallas, Spacetronics, 4515 Prentice 214-368-1215
Utah Granger, J. Hurlbut, 3817 W. 3280 South 801-299-4321
Wash Seattle, J. McClamrock, 127 S.W. 156 206-244-9391
EXP: N.Y., Westbury, Minthorne Int'l. Co., 2200 Shames Dr. 516-334-3303
For: Can., Pointe Claire 730, Que., Aeromotive Engrg. Prod. Ltd., 147 Hymus Blvd. 514-695-6413
For: Can., Toronto, Ont., Aeromotive Engrg. Prod. Ltd., 1912A Avenue Rd. 416-782-8835

Advertisement

Allen Avionics manufactures passive delay lines and filters that are used in Broadcast and Television and for computer applications, data transmission, navigation and guidance. Radar, satellite and space communications. Telemetry, telephone and telegraph and vehicular communications. We are unique in our field in that we build lumped delay lines having time delay to rise time rations of up to 300/1. We are the sole supplier of the Spiradel delay line. See section 2350 for information.

ALLEN-BRADLEY CO., 1201 S. 2nd St., Milwaukee, Wisc., 53204, Tel: 414-671-2000, TWX: 910-262-3451 Pgs. 1511,1535,2331,2822,2823,2908,2909
Ariz Phoenix, W. B. Knight, Box 11394 602-264-3578
Ark Little Rock, C.H. Stout, 2207 Cantrell 501-374-8201
Cal Inglewood, W. B. Knight, 112 Glastow 213-678-4711
Cal San Francisco, Hunter, 1208 Fox Plaza 415-626-8576
Colo Denver, Allen-Bradley Co., 2600 W. 2nd 303-936-7303
Conn Stratford, Allen-Bradley, 1720 Barnum 203-378-7364
Fla Jacksonville, Van & Smith, 2723 Park 904-384-2376
Fla Miami, C. Lee & Assocs., 3796 W. Flager 305-444-7414
Fla Orlando, Van & Smith, 1220 N. Edgewater 305-425-7026
Fla Tampa, Van & Smith, 4921 Cypress 813-877-8393
Ga Atlanta, R. E. Wilson Co., 1058 Northside 404-876-8833
Ill Chicago, Allen-Bradley Co., 838 S. Des Plaines St. 312-922-9302
Ill Rockford, Allen-Bradley, 1013 Broadway 815-965-8795
Ind Ft. Wayne, Allen-Bradley Co., 2212 S. Calhoun St. 219-745-7068
Ind Indpls., Allen-Bradley, 1491 N. Harding 317-638-1491
Iowa Cedar Rapids, Allen-Bradley, 1502 1st 319-366-7629
Ky Louisville, Rietze Co., 123 N. Sherrin Ave. 502-893-2571
La Metairie, Allen-Bradley, 3320 Hessner 504-888-2281
La Shreveport, C. Stout, 231 Fairfield Bldg. 318-425-5485
Me Portland, Allen-Bradley, 550 Forest 207-772-3555
Md Baltimore, Allen-Bradley, 6601 Whitehead 301-265-5600
Mass Boston, Allen-Bradley, 137 Penn. Ave. 617-879-5900
Mass Springfield, Allen-Bradley, 121 Chestnut 413-732-3430
Mich Detroit, Allen-Bradley, 6750 E. Davison 313-365-5300
Mich Flint, Allen-Bradley, 2523 Clio 313-232-9341
Mich Grand Rapids, E.B. Dewey, 300 Fulton 616-454-1825
Mich Kalamazoo, E.B. Dewey, 2519 Lake 616-344-6163
Minn Mpls., I. I. Aaron, 1905 3rd 612-336-6659
Mo Kansas City, Allen-Bradley, 1818 Main 816-421-4595
Mo St. Louis, Allen-Bradley, 3850 Wash. 314-535-1901
Neb Omaha, Midwest Equip., 1614 Izard 402-341-7600
NJ Bloomfield, Allen-Bradley, 1293 Broad 201-338-4600
NM Albuquerque, W. Dolde Sls., 114 Morningside Dr., N.E. 505-256-0307
NY Albany, Allen-Bradley, 1654 Central 518-869-5373
NY Buffalo, Allen-Bradley, 1589 Kenmore 716-873-7617
NY Rochester, Allen-Bradley, 1337 Main 716-482-0010
NY Syracuse, Allen-Bradley, 218 Boss 315-463-4501
NC Charlotte, Allen-Bradley Co., 307 Lincoln St. 704-372-3287
Ohio Akron, Allen-Bradley, 680 E. Market St. 216-253-2106
Ohio Cincinnati, Allen-Bradley, 2331 Reading 513-721-4482
Ohio Cleveland, Allen-Bradley, 3416 Prospect 216-391-2855
Ohio Columbus, Allen-Bradley, 4355 N. High 614-263-6881
Ohio Dayton, Allen-Bradley, 3000 S. Dixie 513-298-6121
Ohio Toledo, Allen-Bradley, 5550 W. Central 419-531-8311
Okla Tulsa, J. W. Elder Co., 1526 E. 4th St. 918-583-9149
Ore Eugene, J.A. Tudor, 1257 W. 6th 503-344-9212
Ore Portland, J. Tudor, 14 N.E. Tillamook 503-288-5154
Pa Allentown, Allen-Bradley, 842 Hamilton 215-437-2401
Pa Erie, Allen-Bradley Co., 1611 Peach St. 814-455-5680
Pa King of Prussia, Allen-Bradley Co., 480 American Ave. 215-337-1990
Pa Pittsburgh, Allen-Bradley Co., 4489 Campbell Run Rd. 412-923-1844
Pa York, Allen-Bradley, 653 W. Market 717-848-2239
Tenn Knoxville, Allen-Bradley, 1211 Euclid 615-525-9578
Tenn Memphis, C. H. Stout of Tenn., 3506 Tchulahoma Rd. 901-362-1616
Tex Dallas, Allen-Bradley Co., 165 Cole St. 214-748-6356
Tex Houston, Allen-Bradley, 2105 McKinney 713-225-0747
Utah Salt Lake Cy., Stevens Sls., 1476 Major 801-467-5489
Va Norfolk, Allen-Bradley, 6378 Center Dr. 703-499-0218
Va Richmond, Allen-Bradley, 2519 Grenoble 703-282-4285
Wash Seattle, J.A. Tudor, 2605 Western 206-682-7444
Wash Spokane, J.A. Tudor, E. 201 Augusta 509-327-3328
WVa Charleston, H. E. Payne, 114 Charleston Nat'l. Plaza 304-343-1393
Wisc Appleton, Allen-Bradley, 615 N. Lynndale 414-734-6262
Wisc Milwaukee, Allen-Bradley Co., 224 N. Greenfield Ave. 414-671-2000
Wisc Milwaukee, I.I. Aaron, 829 N. Marshall 414-276-8515
EXP: N.J., Bloomfield, Allen-Bradley, 1293 Broad 201-338-6262
For: Can., Calgary, Alberta, R. L. Brews & Son, Ltd., 504 51st Ave., S.E. 403-252-0151
For: Can., Edmonton, Alberta, R. L. Brews & Son, Ltd., 10810 119th St. 403-452-3732
For: Can., Fredericton, N.B., Foulis Engrg. Sls., Ltd., 181 Westmorland St. 506-475-6012
For: Can., Halifax, N.S., Foulis Engrg. Sls., Ltd., 5502 Atlantic St. 902-429-3330
For: Can., Hamilton, Ont., Allen-Bradley Can., Ltd., 256 Parkdale Ave., N. 416-544-2876
For: Can., London, Ont., Allen-Bradley Can., Ltd., 457 Hibiscus Ave. 519-471-5150
For: Can., Montreal, Que., Allen-Bradley Can., Ltd., 7000 Park Ave. 514-271-2461
For: Can., No. Bay, Ont., Allen-Bradley Can., Ltd., 475 Ski Club Rd. 705-474-4120
For: Can., Ottawa, Ont., Allen-Bradley Can., Ltd., 3266 Kodiak St. 613-728-3355
For: Can., Que., Que., Allen-Bradley Can., Ltd., 20 St. Jean St. 418-529-7584
For: Can., Regina, Saskatchewan, Thurman Supply Co., Ltd., 2505 7th Ave. 306-527-8501
For: Can., St. Johns, Newfoundland, Foulis Engrg. Sls., Ltd., Hussey Bldg., O'Leary Ave. 709-726-3212
For: Can., Toronto, Ont., Allen-Bradley Can., Ltd., 43A, Lesmill Rd., Don Mills 405 416-445-3740
For: Can., Vancouver, B.C., KHW Seppala, Ltd., 12 E. Third Ave. 604-879-4541
For: Can., Winnipeg, Man., N. L. Haney Agency, Ltd., 727 Wall St. 204-786-6756

ALLEN-BRADLEY, Numerical Control Sys. Div., 747 Alpha Dr., Cleveland, Ohio, 44143, Tel: 216-449-6700, TWX: 810-427-2975; Sls. Mgr: F.L. Durant

ALLEN ELCTRNS. DIV., Allen Organ Co., Macungie, Pa., 18062, Tel: 215-965-9801; Mgr: M.F. Nelson ..Pg. 2481

ALLEN MFG. CO., Drawer 570, Hartford, Conn., 06101, Tel: 203-242-8511; Sls. Mgr: L. G. Ullring

ALLIANCE MFG. CO., North American Philips Co., Alliance, Ohio, 44601, Tel: 216-821-5360

ALLIED CHEMICAL CORP., Specialty Chemicals Div., P.O. Box 70, Morristown, N.J., 07960, Tel: 201-538-8000

ALLIED ELCTRNS. CORP., 2400 W. Washington Blvd., Chicago, Ill., 60612, Tel: 312-421-2400; V.P. Mktg/Sls: B. Barrick

ALLIS-CHALMERS, Box 512, Milwaukee, Wisc., 53201, Tel: 414-475-2000, TWX: 910-262-3445; Mgr. Mktg: D. Gibson

ALLIS, LOUIS CO., Div. Litton Inds., 427 E. Stewart St., Milwaukee, Wisc., 53201, Tel: 414-481-6000, TWX: 910-161-3160; Dir. Corp. Rel: W.E. Barta

ALLIS LOUIS CO., Power Elctrns. Ctr., 6702 Industrial Loop, Greendale, Wisc., 53129, Tel: 414-421-1200; Sls. Mgr: G.E. Martin

ALLOYS UNLIMITED, INC., 16661 Ventura Blvd., Encino, Calif., 91316, Tel: 213-783-8150, TWX: 910-495-1798; Sls. Mgr: N.M. Cox

ALMOND INSTRS. CO., 1060 E. Cypress St., Covina, Cal, 91722, Tel: 213-967-4151; Sls. Mgr: G.A. Almond Pg. 329

ALLYN, W., INC., Skaneateles Falls, N.Y., 13153, Tel: 315-685-5788; Sls. Mgr: W.F. Allyn

ALNOR INSTR. CO., 420 N. LaSalle St., Chicago, Ill., 60610, Tel: 312-467-1331; Sls. Mgr: D.J. Fox

ALPHA COMPS. CORP., 4087 Glencoe Ave., Venice, Calif., 90291, Tel: 213-821-4964; Sls. Mgr: J.T. Cataldo

ALPHA METALS, INC., 56 Water St., Jersey City, N.J., 07304, Tel: 201-434-6778; V.P. Sls: M.A. Boyle

ALPHA-MONARCH CORP., 10030 Monroe, Dallas, Tex., 75229, Tel: 214-FL-2-8040; Sls. Mgr: W.L. Cowley

Advertisement

AMC Electronics manufactures temperature controls, temperature sensors and portable environmental test chambers. The chambers operate over a range of -100°F to +400°F, are programmable for performing Mil-STD-833 test. Engineering reps in most areas. Off-the-shelf delivery for catalog items. OEM pricing.

ALPHA WIRE CORP., Div. Loral Corp., 711 Lidgerwood Ave., Elizabeth, N.J., 07207, Tel: 201-925-8000, TWX: 710-996-5895 N. Miller ....Pg. 2995
Ariz Phoenix, Shefler-Kahn, 2017 N. 7th St. 602-258-7893
Cal Oakland, F. Moulthrop, 1530 E. 12th 415-261-7676
Cal Torrance, Alpha Wire, 2815 Columbia St. 213-775-6871
Colo Boulder, Straube Assoc., 2490-20 28th St. 303-443-8600
Conn New Haven, Gerber Sls. Co., Box 2917 203-777-6279
Fla Winter Park, Hawkins Hutto, 501 Park N. 305-647-7407
Ga Atlanta, Millar Elctrns., 3110 Maple N.E. 404-261-6060
Haw Honolulu, B. Kolans Co., Box 2098 811-628
Ill Chicago, Alpha Wire, 6251 W. Touhy Ave. 312-774-6929
Ind Indianapolis, Thomas & Sukup, 2060 E. 54th 317-251-4574
Kans Wichita, L. Florence, 2900 Woodland 316-838-7226
La Metairie, Texport Co., 3220 N. Turnbull 504-885-0558
Mass E. Longmeadow, Gerber, 44 Baldwin 413-525-3059
Mass Waltham, Gerber Sls., 176 2nd Ave. 617-891-8040
Mich Ferndale, Shalco, 23529 Woodward Ave. 313-547-4771
Minn Minneapolis, C.R. Gibb, 1311 W. 25th 612-377-1200
Mo Kansas City, L. Florence, 406 W. 34th 816-561-7222
NM Albuquerque, Shefler-Kahn, 408 San Mateo 505-265-7077
NY Rochester, Marsey Sls., 206 Park 716-442-9700
NC Raleigh, Millar Elctrns., Box 17173 919-787-9564
Ohio Cleveland, Marlow Assocs., 1500 S. Green 216-381-4500
Pa Reading, Beil & Whitaker, 3623 Jacksonwald 215-779-2610
Tenn Memphis, Texport Co., 5118 Park Ave. 901-683-0880
Tex Dallas, Texport Co., 2411 Farrington St. 214-631-6270

Tex Houston, Texport Co., 8811 Gaylord Ave. 713-464-2828
Va Richmond, D. Miller, 2252 Staples Mill 703-353-5324
Wash Seattle, D. Miller, 2319 N. 45th 206-632-7070
For: Can., Weston, Ont., F. Eakin, 9 Milvan Dr. 416-741-7485

ALTAIR RESCH. & MFG. CO., 1241 E. State St., Ontario, Calif., 91761, Tel: 714-983-2418; Sls. Mgr: J.D. Askew

ALTEC, Div. LTV Ling Altec, Inc., 1515 S. Manchester Ave., Anaheim, Calif., 92803, Tel: 714-774-2900, TWX: 910-591-1142; V.P. Mktg: D. Davis

ALTHOR PRODS., 2260 Benson Ave., Brooklyn, N.Y., 11214, Tel: 212-373-7444; Sls. Mgr: J. Kessler

ALTRON ELCTRNS. CO., 1307 Jefferson Ave., Woodlyn, Pa., 19094, Tel: 215-833-1224; Sls. Mgr: W.C. McQuiston

ALUMINUM CO. AMERICA, 1628 Alcoa Bldg., Pittsburgh, Pa., 15219, Tel: 412-553-4545; Pres: J.D. Harper

AMACOIL MACHINERY, 111 Plain Ave., New Rochelle, N.Y., 10801, Tel: 914-235-5050

AMATOM ELCTRN. HARDWARE, Mite Corp., 81 Rockdale Ave., New Rochelle, N.Y., 10802, Tel: 914-636-5700; Sls. Mgr: J. Cutter

AMAX ALUMINUM CO., Foil Prods. Div., 6106 S. Broadway, St. Louis, Mo., 63111, Tel: 314-HU-1-7000, TWX: 314-556-0434; Sls. Mgr: J.H. Botaish

AMBAC INDS., 900 Old Country Rd., Garden City, N.Y., 11530, Tel: 516-742-5700, TWX: 510-222-4536

AMCO ENGRG. CO., 7333 W. Ainslie St., Chicago, Ill., 60656, Tel: 312-867-8500, TWX: 910-221-5192; Sls. Mgr: R.C. Komarek

AMECO, INC., P. O. Box 13741, Phoenix, Ariz., 85002, Tel: 602-252-7731; Sls. Mgr: M. A. Hausman

AMECOM DIV., Litton Inds., 5115 Calvert Rd., College Park, Md., 20740, Tel: 301-864-5600, TWX: 710-825-0077; Sls. Mgr: G.A. Brown

AMERICAN AEROSPACE CONTROLS, 131 Verdi St., Farmingdale, N.Y., 11735, Tel: 516-MY-4-5100; Sls. Mgr: R. Gitlin ....Pgs. 1304-1307
Mass Newton Ctr, Daner, 684 Commonwealth 617-969-4650
Minn Anoka, A & R Assocs., Rte. 1, Box 230 612-421-0751
NY New York, Al-Tronics, 60-38 68th 212-821-2403
Va Arlington, Gans-Frying, 2030 16th 703-527-3262

AMERICAN AIR FILTER, 215 Central Ave., Louisville, Ky., 40208, Tel: 502-637-0011, TWX: 502-589-1020

AMERICAN ALUMINUM CO., 230 Sheffield St., Dept. EEM, Mountainside, N.J., 07092, Tel: 201-AD-3-3500; Dir. Mktg: W.F. Lowry, III

AMERICAN ASTRIONICS, Sub. of Technicolor, 855 N. Cahuenga Blvd., Hollywood, Cal, 90038, Tel: 213-466-9741; Sls. Mgr: R.A. Bedrosian ....Pg. 335
Ariz Phoenix, Thorson Co., 2505 E. Thomas 602-956-5300
Cal Hollywood, American Astrionics, 855 N. Cahuenga 213-466-9741
Colo Denver, Thorson Co., 5040 E. 41st Ave. 303-355-3521
Mass Waltham, I.C.M., 223 Crescent St. 617-891-8059
NJ Ridgewood, Instrumentation Sls., Box 403 201-445-5210
NM Albuquerque, Thorson Co., 5921 Lomas Blvd., N.E. 505-265-5655
Ohio Dayton, Rep/Corp., 2077 Embury Pk. 513-278-5885
Pa Norristown, Denco, Inc., 304 W. Johnson Hwy. 215-272-1444
Tex Dallas, Thorson Co., 7700 Carpenter Frwy. 214-631-5440
Tex Houston, Thorson Co., 6655 Hillcroft 713-771-3504
Utah Salt Lake City, Thorson Co., 445 E. Second, S.
Va Springfield, E-Tech. Corp., 6615 Backlick Rd. 703-451-6500
Wash Seattle, Thorson Co., 1767 Fifteenth Ave., S. 206-632-0710

AMERICAN ATOMICS CORP., 425 S. Plumer Ave., Tucson, Ariz., 85719, Tel: 602-622-1488; Sls. Mgr: R.J. Doda

AMERICAN BILTRITE RUBBER CO., INC., Boston Woven Hose & Rubber Div., P.O. Box 1071, Boston, Mass., 02103, Tel: 617-876-6000; V.P. Sls: A.F. Cannie

AMERICAN COMPS., INC., 8th Ave. & Harry St., Conshohocken, Pa., 19428, Tel: 215-828-6240, TWX: 510-660-9268; Sls. Mgr: J.J. Donahue, Jr.

AMERICAN DATA SYS., 8851 Mason Ave., Canoga Pk., Cal, 91306, Tel: 213-882-0020; Sls. Mgr: L. Brissende

AMERICAN ELECTRIC & MACHINE CO., 320-324 State Hwy. 17, Upper Saddle River, N.J., 07458, Tel: 201-327-7707; Pres: L.F. Himmelman

AMERICAN ELEC. CABLE CO., 181 Appleton St., Holyoke, Mass., 01040, Tel: 413-539-9893; Sls. Mgr: Paul Kesseli

AMERICAN ELEC. HEATER, 6110 Cass Ave., Detroit, Mich., 48202, Tel: 313-875-2505, TWX: 810-221-5369; Sls. Mgr: R.A. Kuhn

AMERICAN ELCTRN. CONTROLS CO., 25 Clark Dr., Barrington, N.J., 08007, Tel: 609-546-5792; Sls. Mgr: E. Schempp

AMERICAN ELCTRN. LABS., INC., Box 552, Lansdale, Pa., 19446, Tel: 215-822-2929, TWX: 510-661-4976; Mgr. Adv: ....Pg. 1552

(American Elctrn. Labs., Inc.)
Ariz Tucson, 1241 W. Maxmilian Way 602-622-7943
Cal Orange, E. Bell, 2526 Blue Ridge Ave. 213-670-8755
NJ Red Bank, 15 Peters Pl. 201-741-0947
Va Springfield, 6629 Iron Pl. 703-354-5700

(Broadcast Representatives)
Alas Juneau, Juneau Elctrns., 241 S. Franklin 907-586-2260
Cal Sunnyvale, T. Aye, 796 The Dalles
Fla Ft. Lauderdale, R. Crider, 3101 N. Federal Hwy. 305-564-7613
Ill Chicago, Comms. Sls. Co., 9926 S. Seeley 312-445-0795
NJ E. Orange, Friedman, 110 Halsted St. 201-673-2500
RI Cumberland, WRH Productns., 32 Nicholas 401-333-2070
Tex Houston, H. Jewell, Box 34400 713-944-7886
Tex Midland, Management, 4519 Versilles 915-694-5887
WVa Charleston, Perfection Music, 816 Shelsea 304-344-2395
WVa Dunbar, Programmed Materials, 1141 Dunbar 304-344-2877

(Commercial Representatives)
Ariz Phoenix, Shefler-Kahn Co., Box 1587 602-258-7893
Cal Orange, E. Bell, 2526 Blue Ridge Ave. 714-637-8470
Cal Los Altos, Walter Assocs., Inc., Box AN 415-941-3141
Colo Denver, Shefler-Kahn, 2422 S. Downing 303-733-6330
Fla Orlando, Gra-Mar, Inc., Box 20493 305-841-2330
Haw Honolulu, Har-Kom Hawaii, Inc., 630 Piikoi St. 587-178
Ill Chicago, Midwest Microwave, 6414 W. Belmont Ave. 312-283-4900
Kans Shawnee Mission, Mid America, Box 575 913-432-8678
Mass Needham, Addelco Corp., 56 Pickering St. 617-444-4754
NM Albuquerque, Shefler-Kahn Co., Box 8342
NY Syracuse, Lightstone Corp., E. Malloy Rd. 315-454-3209
Ohio Columbus, Mulligan & Mathias, 1810 MacKenzie 614-457-2242
Pa Hatboro, DeShawn Assocs., 218 Beatrice 215-675-9111
Tex Dallas, G. Weinreich, 11554 E. Northwest Hwy. 214-321-2800
Wash Seattle, H. Levinson, 1211 E Denny Wy. 206-323-5100
For: Can., St. Jerome, Que., Microwave Spec., 850 Industrial
For: Can., Burnaby, B.C., Microwave Spec., Box 325

(Medical Representatives)
Cal Pasadena, Palenscar, 1550 Mountain 213-SY-4-1662
Cal San Francisco, Lab-Items, Box 321 415-GA-1-3172
Haw Honolulu, X-Ray & Medical Equip., 1157 S. King 503-124
Ill Skokie, Universal Sls., 5144 Main 312-OR-6-3650
Md Silver Spring, R. Davies, 10 Old Post Off. Rd. 301-587-3910
Mass Arlington, Instrs. Assocs., 30 Park Ave. 617-648-2922
Minn Minneapolis, T.B. Allen, 4810 Excelsior 612-WA-7-3861
Miss Greenwood, L.R. Massey Co., Box 724 601-GL-3-3038
NJ Ridgewood, R.N. Juntwait, Box 295 201-652-9191
NM Albuquerque, A.L.S. Elctrns., Box 11626 505-268-9600
Ohio Cleveland, Dann Co., 1801 E. 40th St. 216-391-7240
Ore Lake Oswego, McMillan Elctrns., 16679 S.W. Maple Cir. 503-636-6257
Tex Houston, Texas Sls., 3701 Kirby Dr. 713-JA-3-6821
Utah Salt Lake City, Coronado Elctrn. Assoc., 4422 Emigration Canyon 801-328-4459

AMERICAN ELCTRNS., INC., Control Comps. Div., 1600 E. Valencia Dr., Fullerton, Cal., 92631, Tel: 714-871-3020, TWX: 910-592-1256; Sls. Mgr: J.D. Hannam

AMERICAN GAS & CHEMICALS, 511 E. 72nd St., New York, N.Y., 10021, Tel: 212-535-7336; Sls. Mgr: D.Q. Rawn

AMERICAN GELOSO ELCTRNS., INC., 251 Park Ave., S., New York, N.Y., 10010, Tel: 212-254-2282; Sls. Mgr: S. Goldberg

AMERICAN INSTR. CO., Div. Travenol Labs., 8030 Georgia Ave., Silver Spring, Md., 20910, Tel: 301-JU-9-1727; Sls. Mgr: J.W. Crump

AMERICAN LAVA CORP., Sub. 3M Co., Cherokee Blvd. & Mfrs. Rd., Chattanooga, Tenn., 37405, Tel: 615-265-3411 ....Pg. 2810
Ariz Tempe, American Lava, 4417 S. Willow 602-966-4345
Cal Los Angeles, Minnesota Mining & Mfg. Co., 6023 S. Garfield Ave. 213-685-9600
Cal So. San Francisco, Minnesota Mining & Mfg. Co., 320 Shaw Rd. 415-761-1155
Conn Orange, American Lava, 214 Surrey 203-795-3254
Ill Elmhurst, American Lava, 165 Arlington 312-279-8055
Ind Indpls., American Lava, 8442 Browning 317-888-2196
Mass Needham Hgts., Minnesota Mining & Mfg. Co., 155 Fourth Ave. 617-449-0300
Mo Lee's Summit, American Lava Corp., 881 Chestnut St. 816-524-2415
NJ Ridgefield, Minnesota Mining & Mfg. Co., 700 Grand Ave. 201-943-6700
NY Phoenix, American Lava, Box 12A 315-695-3335
Ohio Chagrin Falls, American Lava Corp., 18107 Chillicothe Rd. 216-543-6050
Pa Philadelphia, Minnesota Mining & Mfg. Co., 8698 Rising Sun Ave. 215-742-0200
Tex Richardson, American Lava, Box 164 214-235-4985
Va Salem, American Lava, 25 Sawyer 703-389-3730

AMERICAN MAGNETICS CORP., P.O. Box 8, Carterville, Ill., 62918, Tel: 618-985-4838; Sls. Mgr: V. Stoner

AMERICAN MAGNETICS, Box R, Oak Ridge, Tenn., 37830, Tel: 615-482-4220; Pres: D.L. Coffey

AMERICAN METAL CLIMAX, INC., 1270 Ave. of the Americas, New York, N.Y., 10020, Tel: 212-757-9700

AMERICAN MICRO-SYS., INC., 3800 Homestead Rd., Santa Clara, Cal., 95051, Tel: 408-246-0330, TWX: 910-338-0018; Dir/Sls: W.G. Andrews

AMERICAN NICKELOID CO., Box 333, Peru, Ill., 61354, Tel: 815-223-0373, TWX: 910-642-3942; Sls. Mgr: J. Pomatto

AMERICAN NUCLEONICS CORP., 6036 Variel Ave., Woodland Hills, Cal, 91364, Tel: 213-347-4500, TWX: 910-494-2090; Sls. Mgr: R.E. Williams ....Pg. 307
Ala Huntsville, Reynolds, 904 Wallace 205-536-1941
Cal Costa Mesa, W.F. Stuart, 1810-C Newport 714-642-8441
DC Wash., Amer. Nucleonics, 1101 17th 202-659-3790
Fla Ft. Laud., Reynolds, 161 S.W. 75th 305-581-6611
Fla Melbourne, Reynolds, 822 E. Strawbridge 305-727-3205
Fla Orlando, Reynolds, Box 8877 305-843-6440
Ga Atlanta, Reynolds, 175 W. Wieuca 404-252-5360
Ill Chicago, Electro-Tech Mktg., 3525 W. Peterson 312-528-8422
Mo St. Louis, Ozark Elctrn. Mktg., 2573 Woodson 314-423-7200
NM Albuquerque, Rustco Entprs., Box 11261 305-727-3205
NY Jericho, Dal-Tech Devices, 366 N. Broadway 516-433-7448
Tex Dallas, Airep Elctrns., Inc., 6300 N. Central Expwy. 214-363-5291
Va Fairfax, Schibley, 10604 Warwick 703-591-3008
Wisc Brookfield, G. Tuscany, Box 341 414-782-1630

AMERICAN OPTICAL CORP., Sci. Instr. Div., Eggert & Sugar Rds., Buffalo, N Y, 14215, Tel: 716-895-4000, TWX: 710-522-1731; Sls. Mgr: R.R. Remmer

AMERICAN PAMCOR, INC., Box 1776, Paoli, Pa, 19301

AMERICAN PRECISION INDS., INC., Delevan Div. Clutch & Brake Prods., 270 Quaker Rd., E. Aurora, N.Y., 14052, Tel: 716-652-3600; Dir. of Sls. J. Mendolia Pgs. 1585,2490
Cal Los Angeles, L-Tronix, 1617 W. Colorado 213-CL-6-2224
Cal San Diego, L.L. Stoakes, 4438 Ingraham 714-BR-4-6281
Cal Los Altos, Servo-Data, 1485 Sedar St. 415-964-1325
Fla Oviedo, Conley, Box 668 305-365-3283
Fla Tampa, Conley & Assoc., Box 18662 813-933-3183
Kans Leawood, H.C. Heyde, 9221 Wenonga 912-MI-9-8628
Md Towson, J.A. Dougherty, 320 Hillen 301-823-0431

Mass Boston, P.J. Engrg. Sales, Box 267 617-924-5950
Mich Southfield, Sheridan, 25625 Southfield 313-358-3333
Mich Grand Rapids, Sheridan, 2637 Golfridge SE 616-949-8110
NJ Cranford, Martech, Box 181 201-272-5510
NY Endicott, Tech-Mark, 101 Jefferson Ave. 607-748-7473
NY Fairport, Tech-Mark, 19 Valley Brook Dr. 716-377-5531
NY Huntington, Martech, 60 Bayview 516-271-7611
NC Greensboro, Martech, 3504 Kirby Dr. 919-299-9339
Ohio Cincinnati, Sheridan Assocs., Box 37646 513-761-5432
Ohio Cleveland, Sheridan Assocs., 7800 Wall 216-524-8120
Ohio Dayton, Sheridan, 5045 N. Main St. 513-277-8911
Pa Phila., Loman, 2007 Naudain St. 215-732-8888
Pa Pittsburgh, Sheridan, 1601 Penn 412-243-6655
Tex Dallas, Scott Technical, Box 30324 214-FL-2-7698
For: Can., Montreal, Que., J. Weiss, 5725 Monkland 514-489-6887
For: Can., Rexdale, Ont., J. Weiss, Box 310 416-742-5195
For: Can., Vancouver, B.C., J. Weiss, Box 448 604-684-4357

AMERICAN RADAR COMPS., INC., 415 E. Main St., Denville, N.J., 07834, Tel: 201-OA-7-5530; Pres: J.P. Hundley

Advertisement

American Radar Flanges have been used in every major system over the last 20 years. While attaining this performance record, we have amassed the largest collection of flange tooling in the world. No order is too large or too small and no requirement is too difficult.

In addition to UG, WR, RE, CMR and CPR flanges we manufacture and almost infinite variety of specials in all types of material.

AMERICAN RADIO RELAY LEAGUE, INC., 225 Main St., Newington, Conn., 06111, Tel: 203-666-1541

AMERICAN RECTIFIER CORP., 116-15 15th Ave., College Point, N.Y., 11356, Tel: 212-FL-3-2828; Sls. Mgr: F.E. Klans

AMERICAN RESCH. CORP., Rte. 6 & New Britain Ave., Farmington, Conn., 06032, Tel: 203-677-2693; Pres: J. Shamroth

AMERICAN SAFETY RAZOR, Ind'l Prods. Div., Box 500, Staunton, Va, 24401, Tel: 703-886-6893; Ass't Sls. Mgr: B. Raybin

AMERICAN SEMICONDUCTOR CORP., 4 N. Hickory Ave., Arlington Hgts., Ill., 60004, Tel: 312-392-8830, TWX: 910-687-2263; Sls. Mgr: J. Yost

AMERICAN SILVER CO. DIV., Sherman Inds. Inc., 36-07 Prince St., Flushing, N.Y., 11354, Tel: 212-353-8012; Asst Sales Mgr: N. Sullivan

AMERICAN SMELTING & REFINING CO., 120 Broadway, New York, N.Y., 10005, Tel: 212-RE-2-9500; Pres: C.F. Barber

AMERICAN STANDARD, Aero Resch. Instr., 9000 Kings St., Franklin Pk., Ill., 60131, Tel: 312-671-0511, TWX: 910-227-0052; Sls. Mgr: M. Scadron

AMERICAN TECH. CERAMICS, Norden La., Huntington Sta., N.Y., 11746, Tel: 516-271-9600, TWX: 510-226-6993; Sls. Mgr: V. Perna .... Pgs. 2332,2333
Ariz Scottsdale, Fryco, Box 460 602-945-3281
Cal Inglewood, Allgood, 1621 Centinela 213-776-5820
Cal Mt. View, Allgood, 2680 Bayshore Frontage 415-961-9686
Fla Orlando, FM Assocs., 5018 Mortier 305-851-5710
Ill Chicago, Comm. Engrs., 7106 N. Western 312-761-0548
Ind Fort Wayne, Comm. Engrs., 418 E. Berry 219-743-9866
Mass Wayland, Wayland Engrg. Sls., Box 189 617-653-5256
NC Greensboro, FM Assocs., 904 Montrose 919-294-2754
Ohio Cincinnati, Sheridan Assocs., Box 37826 513-761-5432
Tex Addison, Parvin Sls., Box 307 214-239-9148

Advertisement

ATC Porcelain Capacitors increase power output by typically 1. dB, as much as 3. dB, because of their extremely low series resistance, especially when used for base-emitter tuning in high frequency or high power amplifiers. They extend the bandwidth of amplifiers and varactor-tuned circuits because of their low inductance and high Q.
ATC Phased Array Capacitors operate at up to 1000. volts peak RF with such negligible loss that system efficiency is significantly increased, the DC current necessary decreased (reducing the heat generated), and system MTBF increased compared to that possible with common NPO or K1200 ceramic types. This also allows the use of less expensive transistors. Both ATC types reduce the number of stages necessary to attain a given power output by increasing the available gain per stage. They provide the lowest Insertion Loss and widest frequency range of operation available.

AMERICAN THERMO ELEC. CO., 7269 Santa Monica Blvd., Los Angeles, Calif., 90046, Tel: 213-851-1632; Sls. Mgr: J. Levy

AMERICAN TIME PRODUCTS, Bulova Watch, 6120 Woodside Ave., Woodside, N.Y., 11377, Tel: 212-335-6000, TWX: 710-582-2637; Sls. Mgr: R. Ansell Pgs. 660,1366,1642
Ariz Phoenix, Toward Engrng., Box 15268 602-955-3193
Cal Encino, Cardinal Assocs., 161-61 Ventura Blvd. 213-788-4540
Cal Menlo Pk., Straube Assocs., 483 Willow Rd. 415-323-2476
Colo Boulder, Straube Assoc., Box 1649 303-443-8600
Fla Orlando, Perrott Assocs., 1607 Forsyth Rd. 305-275-1132
Ill Chicago, Comm. Engrs., 7106 N. Western 312-761-0548
Md Baltimore, J.R. Daniel, 1404 Bare Hills 301-825-3330
Mass Winchester, S.C. Hooker, 2 Winchester Pl. 617-729-5482
Minn Mpls., T. Bell, 5705 21st Ave. S. 619-729-4483
NY Mamaroneck, Cane Tech., 555 E. Boston Post 914-698-4411
Tex Richardson, C. Tinch, First Bank & Trust Bldg. 214-AD1-1322
Wash Seattle, J.J. Backer, 221 W. Galer St. 206-285-1300
EXP: N.Y., N.Y. City, C. Tennant, 100 Park Ave. 212-889-8530
For: Can., Ottawa, Ont., Canadian Micronics, Box 6157 613-235-1934

AMERICAN TOWER CO., P.O. Box 29, Shelby, Ohio, 44875, Tel: 419-342-2481; Sls. Mgr: H.F. Palmer

AMERICAN TRANS-COIL CORP., 124-06 101st Ave, Richmond Hill, N.Y., 11419, Tel: 212-441-5207; Sls. Mgr: W. Clancy

Advertisement

American Trans-Coil Specializes in Military type Coils and Transformers. Tolerances within one quarter of one percent. For prototype and Production quantities of linear permeable tuned R.F. and I.F. Coils and Transformers, B.F.O.'s discriminator transformers, R.F. Oscilators, Toroids, networks and filters, send your specifications or drawings for immediate responsive quotations.

AMERICAN ULTRAVIOLET CO., 123 Commerce St., Chatham, N.J., 07928, Tel: 201-635-8355; Sls. Mgr: C.A. Reynolds

AMERICAN ZETTLER, 697 Randolph Ave., Costa Mesa, Calif., 92626, Tel: 714-540-4190; Gen'l Mgr: G. Rueb Pgs. 1309,1647-1653,1882,1883
Ariz Tucson, Hamilton Reps., Box 50526 602-297-2279
Cal Mountain View, G.C. Woempner, 1101 San Antonio 415-964-5454
Cal San Diego, Dawson Assocs., 7969 Engineer Rd. 714-278-9260
Cal Santa Monica, Rep. Assocs., 1710 Santa Monica 213-451-8901
Colo Denver, J.F. Hurlbut, 1295 S. Banneck 303-744-1451
Fla Miami, Barrett, 300 Northwest 123rd 305-681-4957
Fla Orlando, Barrett Assoc., Box 14205 305-277-2857
Ga Atlanta, J.E. Joyner, Box 10678 404-758-7496
Ill Elk Grove Vlg., Knoblock, Box 67 312-593-5940
Ind Indpls., Quad-El, Inc., Box 33099 317-783-2618
Kans Shawnee Mission, F & Meyer, 5812 Roeland 913-722-5210
Kans Wichita, F & Meyer, 2900 Woodland 316-TE-8-7226
Mass Winchester, Blake Assocs., 7 Lowell Ave. 617-729-7890
Minn Hopkins, Grayden & Flemmer, Hamilton 612-941-1120
Mo Berkeley, F. & Meyer, 8650A Airport 314-521-6800
NY Lynbrook, MWM Assocs., Box 412 516-593-6190
NY Pompey, S.F. Foster, 2806 Hannaberry 315-677-3333
NY Webster, S.F. Foster, 1591 Greensboro 716-872-6262
Ohio Columbus, T. Mulligan, 1810 Mackenzie 614-457-2242
Pa Fairview Vlg., Danco Corp., Box 245 215-539-9300
Tex Dallas, R. Martin Assoc., Box 64513 214-358-3704
Tex Houston, R. Martin Assocs., Box 19291 713-468-4491
Utah Salt Lake Cy., J. Hurlbut Co., 3605 S. Bannock 801-299-4321
Wash Seattle, C. Lyle Reeve Mktg., Box 7087 206-542-5889
Wisc Milwaukee, DeVos/Prinz Sls., 1819 E. Kenilworth 414-272-0356

Advertisement

Alois Zettler, a Swiss company, is one of the largest relay and switch manufacturers in Europe. American Zettler, a wholly owned subsidiary, follows the traditional Swiss observance of quality and precision. Assembly and checkout facilities in the United States are staffed by highly skilled and experienced circuit analysts who are on call to assist you in specifying any relay or switch application. A complete stock of products assures you of immediate, off-the-shelf delivery. Our engineers will be glad to provide you with free samples of American Zettler relays and switches and discuss your problems at no cost or obligation. Simply call or write one of the Sales-Engineering Representatives listed, or contact our headquarters in Costa Mesa, California.

AMERICON CORP., 87 Rumford Ave., Waltham, Mass., 02154, Tel: 617-891-5230, TWX: 710-324-6377

AMERSIL, INC., 685 Ramsey Ave., Hillside, N.J., 07205, Tel: 201-688-4500 .... Pg. 2816
Cal Burlingame, Engelhard Inds. Div., 863 Malcolm Rd.
Cal Los Angeles, Engelhard Inds. Div., 6001 Bandini Blvd.
Ill Skokie, Engelhard Inds. Div., 8131 Monticello Ave.
Mich Detroit, Engelhard Inds. Div., 424 New Center Bldg.
Tex Dallas, Engelhard Inds. Div., 2878 Walnut Hill La.
Tex Houston, Engelhard Inds. Div., 7900 Westglen
Wash Seattle, Engelhard Inds. Div., 3203 Fremont Ave., N.

AMETEK/INSTRS. & CONTROLS, 860 Pennsylvania Blvd., Feasterville, Pa., 19047, Tel: 215-355-6900; Sls. Mgr: F.G. Daveler

AMETEK/LAMB ELEC., 631 Lake St., Kent, Ohio, 44240, Tel: 216-673-3451, TWX: 810-437-2332; Mktg. Mgr: C.R. Woodward .... Pgs. 1572,1573,2776,2777
Cal Los Angeles, 1285 Thousand Oaks Blvd. 805-497-2817
Colo Denver, 7600 Oxford Ave., E. 303-771-6611
Ill Chicago, 1314 West N.W. Hwy. 312-255-3097
Minn Minneapolis, 7710 Computer Ave. 612-922-3324
NJ Morristown, 11 DeHart St. 201-267-3772
EXP: Kent, Ohio, AMETEK/Lamb Elec., 627 Lake St. 216-673-3451

AMETEK/TESTING EQUIP. SYS., Spring & Maple Ave., Lausdale, Pa., 19446, Tel: 215-855-9545; Sls. Mgr: J. Roth

AMETEK/U.S. GAUGE, 900 Clymer Ave., Sellersville, Pa, 18960, Tel: 215-CH-8-3368; Sls. Mgr: R. Glassmeyer

AMF ELECTICAL PRODS., Development Div., 1025 N. Royal St., Alexandria, Va., 22314, Tel: 703-548-7221 TWX: 703-931-4209; Sls. Mgr: K.C. Cannon

AMF ELECTROSYSTEMS DIV., AMF Inc., Box 128, Vandalia, Ohio, 45377, Tel: 513-898-5881, TWX: 810-472-2822; Sls. Mrg: R.D. Carr

AMGLO INDS., INC., 5301 Wesley Terr., Rosemont, Ill., 60018, Tel: 312-671-4321; Sls. Mgr: D. Seery Pg. 1641

AMICON CORP., 25 Hartwell Ave., Lexington, Mass., 02173, Tel: 617-861-9600; Gen'l. Mgr: J.C. Bolger

AMMON INSTRS., INC., 345 Kelley St., Manchester, N.H., 03105, Tel: 603-669-1531; Sls. Mgr: R.P. Arel

AMOCO CHEMICALS CORP., 130 E. Randolph Dr., Chicago, Ill, 60601

AMP INC., Capitron Div., 155 Park St., Elizabethtown, Pa., 17022, Tel: 717-367-1105, TWX: 510-657-4561; Sls. Mgr: W. L. Pharmer .... Pgs. 642,643,2338,2518,2519

Cal Compton, J.B. Miller, 1840 S. Wilmington Ave. 213-537-4490
Cal Palo Alto, John Hill 415-345-9875
Cal San Jose, J. Hill, 2771 La Jolla Ave. 408-265-2266
Fla Orlando, J.R. Hogaboom, 2203 Beatrice Dr. 305-295-3927
Ill Deerfield, L.M. Reis, 945 Mountain Dr. 312-945-4061
Md College Pk., J.G. Greene, 3604 Marlbrough Way 301-935-5502
Mass Needham, J.B. Sullivan, 101 Lexington Ave. 617-444-4839
NJ Fairlawn, E. R. Kelly, 10-04 Dewey Pl. 201-791-6817
NJ Willingboro, B.P. Kulwin, 47 Marboro La. 609-877-2358
NY Ronkonkoma, J. Auletta, 495 Joan St. 516-588-6330
Tex Richardson, R.L. Perrenot, 200 First Bank & Trust Bldg. 214-AD-1-2118

AMP INC., Ind'l. Div., Box 3608, Harrisburg, Pa., 17105, Tel: 717-564-0101; Vice Pres: F.E. Howell Pgs. 330,331,1881

Cal Compton, 1840 S. Wilmington Ave. 213-537-4490
Cal Cupertino, 10300 N. Tantau Ave. 408-255-3830
DC Washington, 955 L'Enfant Plaza N., S.W. 202-484-05[illegible]
Ga Atlanta, 2970 Peachtree Rd., N.W. 404-261-4151
Ill Elk Grove Village, 1050 Morse Ave. 312-439-5800
Mass Waltham, 60 Hickory Dr. 617-893-4306
Mich Southfield, 30555 Southfield Rd. 313-645-5590
Minn Minneapolis, 4600 W. 77th St. 612-920-8210
NJ Camden, 130 N. Broadway 609-964-5055
NJ Englewood, 80 West St. 201-568-2913
Ohio Columbus, 1890 Northwest Blvd. 614-486-0276
Tex Dallas, Box 45168 214-352-4852
Wash Renton, 15 Grady Way 206-228-6044

AMPEREX ELCTRN. CORP., Comp. & Entertainment Div., 35 Hoffman Ave., Hauppauge, N.Y., 11787, Tel: 516-234-7000, TWX: 510-227-8552; Sls. Mgr: A. Patterson .... Pgs. 308,2334-2337,2482,2818,2819

Ariz Phoenix, J. Berman, 2101 W. Shangri La 602-944-3361
Cal San Mateo, G. C. Woempner, 2040 Pioneer Ct. 415-349-6316
Cal Van Nuys, Shephard Comps., 16152 Covello St. 213-787-4610
Colo Denver, M. Pearson, 1860 S. Acoma 303-744-2323
Conn Shelton, X Comark Assoc., 28 Walnut Tree Hill 203-929-4884
Fla Winter Pk., Hawkins-Hutto, 501 Park Ave. N. 305-647-7407
Ga Atlanta, Millar Elctrns., 3110 Maple Dr. N.E. 404-261-6160
Ill Northlake, Amperex Elctrn., 360 E. North Ave. 312-261-7877
Md Baltimore, Brothers & Conneen, 6302 Lincoln 301-764-7189
Mass Belmont, Vector Sls., 774 Pleasant St. 617-489-1400
Minn Mpls., Amperex Elctrn., 6700 France Ave. S. 612-920-7955
Mo St. Louis, Palatine Engrg. Sls., 1573 N. Warson 314-426-7055
NY Hempstead, Kahgan Sls., 556 Peninsula Blvd. 516-538-2300
NY Hicksville, Amperex Elctrn., 230 Duffy Ave. 516-931-6200
NY Rochester, Reed Elctrns., 39 Saginaw Dr. 716-473-2767
Ohio Columbus, T. Mulligan, 1810 MacKenzie 614-457-2242
Pa Philadelphia, Paragon Sls., 111 S. 22nd St. 215-563-7060
Pa Reading, Beil & Whitaker, 3623 Jacksonwald 215-779-2610
Tex Dallas, Dunbar Assoc., Box 30511 214-239-7151
Va Richmond, Medical Science Ctr. Bldg., 5700 Old Richmond Ave. 703-282-6515
Wash Seattle, Fleehart & Sullivan, 10109 Aurora Ave. N. 206-522-1533

AMPEREX ELCTRN., Electro-Optical Devices Div., Box 278, Slatersville, R.I., 02876, Tel: 401-762-3800, TWX: 710-382-6332; Gen. Mktg. Mgr: Rodney E. Nelson

AMPEREX ELCTRN., Integrated Circuits Div., 99 Bald Hill Rd., Cranston, R.I., 02920, Tel: 401-737-3200, TWX: 710-387-1591; Mktg. Mgr: E. Meagher

AMPEREX ELECTRONIC CORP., Hicksville Div., 230 Duffy Ave., Hicksville, N.Y., 11802, Tel: 516-931-6200, TWX: 516-433-9045; Sls. Mgr: A. Merkin ....Pg. 1995

Ariz Phoenix, J. Berman, 2101 W. Shangrila Rd. 602-944-3361
Cal Palo Alto, R. W. Thompson Assocs., Inc., 4135 El Camino Way 415-321-6383
Cal Van Nuys, Shephard Comps., 16152 Covello 213-787-4610
Colo Denver, M. Pearson, 1860 S. Acoma 303-744-2323
Fla Winter Pk, Hawkins-Hutto, Inc., 501 Park Ave. N. 305-647-7407
Ga Atlanta, Millar Elctrns., 3110 Maple Dr. N.E. 404-261-6160
Ill Aurora, D. Smith, 32 S. River St. 312-896-0828
Ill Mt. Prpspect, Contemporary Science, Inc., Box 205 312-CL-5-3793
Ill Northlake, Amperex Elctrn., 360 E. North Ave. 312-261-7877
Md Baltimore, Brothers & Conneen Assoc., 6302 Lincoln Ave. 301-764-7189
Md Rockville, Spectroscopy Systems, Box 1067 301-949-8261
Mass Manchester, Applied Technology, Inc., 7 Vine St. 617-CA-7-2700
Mass Waltham, Gerber Sls. Co., 176 Second Ave. 617-891-8040
Minn Minneapolis, Amperex Elctrns., 6700 France Ave. S. 612-920-7955
Mo St. Louis, Palatine Engrg. Sls., Inc., 1573 N. Warson Rd. 314-426-7055
NY Hempstead, Kahgan Sls., 556 Peninsula Blvd. 516-538-2300
NY Purchase, Radiation Elctrns., Inc., 16 Pinehurst Dr. 914-725-1420
Ohio Columbus, T. Mulligan, 1810 MacKenzie Dr. 614-457-2242
Pa Philadelphia, Paragon Sls., 111 S. 22nd St. 215-563-7060
Pa Reading, Beil & Whitaker, 3623 Jacksonwald 215-779-2610
Tenn Knoxville, Pulcir, Inc., 1001 Corning Rd. 615-584-7871
Tenn Memphis, Cartwright & Bean Inc. of Tenn., 560 S. Cooper St. 901-276-4442
Tex Dallas, Dunbar Assoc., Inc., Box 30511 214-239-7151
Tex Dallas, Overall Engrg., Box 31273 214-363-0563
Va Richmond, Amperex Elctrn. Corp. Medical Science Ctr. Bldg. 5700 Old Richmond Ave.
Wash Seattle, Fleehart & Sullivan, Inc., 10109 Aurora Ave. 206-522-1533

AMPEREX ELCTRN., Semiconductor & Microcircuit Div., Providence Pike, Slatersville, R.I., 02876, Tel: 401-762-9000, TWX: 710-387-1591; Mgr. Sls. Adm: J. Lorea

AMPERITE CO., INC., 600 Palisade Ave., Union City, N.J., 07087, Tel: 201-UN-4-9504; Sls. Mgr: T. Whalen

AMPEX CORP., 401 Broadway, Redwood City, Calif., 94063, Tel: 415-367-2011, TWX: 415-364-9034; Pres: W.E. Roberts

AMPHENOL CADRE DIV., Bunker Ramo Corp., 20 Valley St., Endicott, N.Y., 13760, Tel: 607-754-4444, TWX: 510-252-0898; Dir. of Mktg: C.N. Kowal Pg. 2814

(Refer to Amphenol Sales Div for sales office information)

AMPHENOL CANADA LTD., 44 Metropolitan Rd., Scaroborough, (Tor.), Can., Tel: 416-291-1621, TWX: 06-217-676; Sls. Mgr: R.M. Newbold

Refer to Amphenol Sales Div. for sales office information

AMPHENOL COMPS. GRP. MKTG., Bunker Ramo Corp., 1200 Harger Rd., Oak Brook, Ill., 60521, Tel: 312-654-3100, TWX: 910-226-1961; VP Mktg: R.E. Hall

Refer to Amphenol Sales Div. for sales office information

AMPHENOL CONNECTOR DIV., Bunker Ramo Corp., 2801 S. 25th Ave., Broadview, Ill., 60153, Tel: 312-261-2000, TWX: 910-226-1974; Mkt. V.P. S. Kelleher Pgs. 2560-2590

(Refer to Amphenol Sales Div. for sales office information.)

AMPHENOL CONTROLS DIV., Bunker Ramo Corp., 120 S. Main St., Janesville, Wisc., 53545, Tel: 608-754-2211, TWX: 910-288-2924; Sls. Prod. Mgr: L.J. Wisz Pgs. 1436,1437,2902-2907

(Refer to Amphenol Sales Div. for sales office information.)

AMPHENOL IND'L DIV., Bunker Ramo Corp., 1830 S. 54th Ave., Chicago, Ill., 60650, Tel: 312-242-1000, TWX: 910-229-1541; Sls. Mgr: R. Colt ....Pgs. 2538-2557

(Refer to Amphenol Sales Div. for sales office information.)

AMPHENOL RF DIV., Bunker-Ramo Corp., 33 E. Franklin St., Danburry, Conn., 06810, Tel: 203-743-9272, TWX: 710-456-0281; V.P. Mktg: E. Lehmann Pgs. 1884-1887,2520-2537

(Refer to Amphenol Sales Div. for sales office information.)

AMPHENOL SALES DIV., Bunker Ramo Corp., 2875 S. 25th Ave., Broadview, Ill., 60153, Tel: 312-261-2020, TWX: 910-226-1961; VP Sls: D. O'Connell Pgs. 1436,1437,1884-1888,2520-2590,2814,2902-2907

Cal Encino, 17000 Ventura Blvd. 213-788-8560
Cal San Jose, 52 Harold Ave. 408-248-3350
Colo Littleton, 709 W. Littleton Blvd. 303-794-4269
Fla Orlando, 5400 Diplomat Cir. 305-647-5504
Haw Honolulu, Earl Assoc., 2825B Ualena St. 808-996-953
Ill Westchester, 9845 W. Roosevelt Rd. 312-345-9000
Ind Indianapolis, L.M. DeVoe, 665 E. 61st St. 317-257-1227
Md Silver Spring, 8605 Cameron St., Ste 216 301-588-2600
Mass Andover, R. Purinton, Inc., 28 Park St. 617-475-7055
Minn Minneapolis, 7701 Normandale Rd. 612-927-6589
Mo Hazelwood, 47 Village Sq. 314-838-6996
NJ Moorestown, York House East, 214 W. Main St. 609-234-3434
NY Lake Success, 3000 Marcus Ave. 516-488-1700
NY Syracuse, 6443 Ridings Rd. 315-437-2689
NC Greensboro, 1015 Hoffman St. [illegible]
Ohio Dayton, 3131 S. Dixie Dr. 513-294-0461
Ohio Milan, 16 1/2 Church St. 419-499-2441
Tex Dallas, 777 S. Central Expwy. 214-235-8318
Wash Seattle, 924 104th N.E. 206-455-2525

AMPHENOL SPACE & MISSILE SYS., Bunker Ramo Corp., 9201 Independence Ave., Chatsworth, Cal., 91331, Tel: 213-341-0710, TWX: 213-341-2531; VP Mktg: B. Brachman ....Pgs. 2558,2559

(Refer to Amphenol Sales Div. for sales office information.)

AMPHENOL SWITCH DIV., Bunker Ramo Corp., 2855 S. 25th St., Broadview, Ill., 60153, Tel: 312-261-2000, TWX: 910-226-1974; Sls. Mgr: G.L. Basett ....Pg. 1888

(Refer to Amphenol Sales Div. for sales office information.)

AMPLIFIER CORP. AMERICA, 75 Frost St., Westbury, N.Y., 11590, Tel: 516-333-9100, TWX: 510-222-9774; Pres: S. Hack

AMPLIFIER RESEARCH CORP., Box 242, Fairview Village, Pa., 19409, Tel: 215-345-1006; Sls. Mgr: D.W. Roth

AMPROBE INSTR., Div. SOS Consolidated Inc., 630 Merrick Rd., Lynbrook, N.Y., 11563, Tel: 516-LY-3-5600; V.P. Sls: G. Behrens

AMSCO INDUSTRIAL CO., Div. American Sterilizer Co., 2820 West 23 St., Erie, Pa., 16512, Tel: 814-456-2021; Gen'l. Mgr: E.R. Bindseil

AMSTRO CORP., 114 Clinton Rd., Fairfield, N.J., 07006, Tel: 201-228-3881; Pres: J.F. Fiore

AMUNEAL MFG. CORP., 2900 E. Tioga St., Philadelphia, Pa., 19134, Tel: 215-423-4717; Pres: S.M. Kamens

Advertisement

Amuneal offers a complete line of standard and custom shields for magnetic-sensitive tubes and components, including weld-fabricated or spun CRT shields, printed circuit shields, drawn can shields, and foil Wrap-Around Shielding, supplied in rolls. Amuneal "U-Tile-Mu" Shielding Tiles, 6"x6" or 12"x12", with pressure-sensitive adhesive backing, provide a simple, versatile means for do-it-yourself magnetic shielding of rooms, test chambers, cabinets, etc. Ask for literature.

ANACONDA AMERICAN BRASS CO., 414 Meadow St., Waterbury, Conn., 06720, Tel: 203-757-2021, TWX: 203-754-7385; V.P. Sls: E.V. Pierce

ANACONDA WIRE AND CABLE CO., 605 Third Ave., New York, N.Y., 10016, Tel: 212-867-8000; V.P. Sls: R. McIlvane

ANADEX INSTRS., INC., 7833 Haskell Ave., Van Nuys, Calif., 91406, Tel: 213-873-6620, TWX: 910-495-1762; Sls. Mgr: K.A. Mathews ....Pgs. 391-400

Ala Huntsville, Currie Aerospace, Box 1424 205-536-5650
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd 602-253-6104
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
Conn Hartford, Instr. Assoc., 234 Murphy Rd. 203-525-9367
DC Wash., SONCO, 4720 Montgomery La. 301-654-5226
Fla Orlando, Currie Aerospace, Box 13229 305-855-0843
Ill Chicago, Pivan Engrg., 3535 W. Peterson 312-539-4838
Ind Indpls., Pivan Engrg., 1259 W. 86th 317-253-1681
Kans Mission, Pivan Engrg., 5920 Nall 913-722-1030
Mass Bedford, Instr. Assocs., 175 Middlesex 617-275-0700
Mich Farmington, Carter, McCormic & Peirce, Inc., 23995 Freeway Park Dr. 313-477-7700
Minn Mpls., Pivan Engrg., 3307 N. Hwy. 100 612-537-4501
Mo St. Louis, Pivan Engrg., 725 Old Ballas 314-872-8424
NJ Ft. Lee, Tech. Mktg., 4 Horizon Rd. 201-224-6911
NM Albuquerque, Hytronic Meas., Inc., 205 San Pablo, S.E. 505-268-3941
NY E. Syracuse, Ossmann Instrs., Inc., 6666 Old Collamer Rd. 315-437-6666
NY Rochester, Ossmann Instrs., 474 Thurston 716-328-2230
NY Vestal, Ossmann Instrs., Vestal Pkwy. 607-785-9947
NY Wappingrs Fls., Ossmann Instrs., Box 207 914-297-7777
NC Winston-Salem, Currie Aerospace, Box 10329 919-764-0682
Ohio Cleveland, Carter, McCormic & Peirce, Inc., 21380 Lorain Rd. 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, Inc., 5423 Webster St. 513-278-5873
Pa King of Prussia, SONCO, 107 Town Ctr. 215-CH-2-8460
Pa Pittsburgh, Carter, McCormic & Peirce, Inc., 201 Penn Center Blvd. 412-824-3760
Tex Houston, Data Mktg., 3925C Dacoma 713-686-9627
Tex Dallas, Data Mktg., 10048 Monroe 214-358-4643
Utah Salt Lake Cy., Hytronic Meas., 2022 S. Main 801-466-4924
Wisc Brookfield, Pivan Engrg., 3055 N. Brookfield 414-786-1940
For: Can., Ottawa, Ont., Radionics, 376 Churchill 613-728-4624
For: Can., Montreal, Que., Radionics, 195 Graveline 514-735-4565
For: Can., Vancouver, B.C., Radionics, 2182 W. 12th 604-732-7317
For: Can., Downsview, Ont., Radionics, 1111 Finch 416-638-0218
For: Can., Quebec, Que., Radionics, 1001 Rte. De L'Eglise 418-651-5845

ANALOG DEVICES, INC., Rte. 1 Ind'l. Pk., Norwood, Mass., 02062, Tel: 617-329-4700, TWX: 710-394-6577; V.P. Sls: M. Sallen

ANALOG GENERAL CORP., 7 Neil Ct., Oceanside, N.Y., 11572, Tel: 516-678-1441; Sls. Mgr: H. Zaron

Advertisement

Analog General Corp. specializes in design and manufacture of servos, electromechanical assemblies, precision gear assemblies, simulator and trainer sub-systems, to your specifications or drawings. AGC-A Good Complement-to your own design and manufacturing facilities.

ANALOGIC, Audubon Rd., Wakefield, Mass., 01880, Tel: 617-246-0300, TWX: 710-348-0425; Sls. Mgr: B.L. Friedman

ANALYTICAL MEAS., INC., 31 Willow St., Chatham, N.J., 07928, Tel: 201-273-7500; Sls. Mgr: F.G. Paully

ANAREN MICROWAVE, INC., 185 Ainsley Dr., Syracuse, N.Y., 13205, Tel: 315-475-1621, TWX: 710-541-1507; Sls. Mgr: R.A. Worden

ANCHOR ALLOYS, INC., 968 Meeker Ave., Brooklyn, N.Y., 11222, Tel: 212-782-7090; Sls. Mgr: B. Stamtom

ANCHOR METAL CO., INC., 966 Meeker Ave., Brooklyn, N.Y., 11222, Tel: 212-ST-2-7093; Sls. Mgr: H. Drapkin

ANCHOR PLASTICS CO INC., 36-36 36th St., Long Island City, N. Y., 11106, Tel: 212-RA-9-1494; Sls. Mgr: J. B. Shapiro

ANCHOR SPECIALTY MFG., 300 Hollister Rd., Teterboro, N.J., 07608, Tel: 201-288-1939; Pres: W. Zablocky

ANDERSEN LABS. INC., 1280 Blue Hills Ave., Bloomfield, Conn., 06002, Tel: 203-242-0761, TWX: 710-425-2390; Sls. Mgr: C. Yax ....Pg. 2728

Iowa Cedar Rapids, H.R. Brown Sls. Co., 3400 Indian Rd. S.E. 319-366-0635
Minn Minneapolis, Hasse & Assocs., Box 7707 612-588-0551
Tex Dallas, Gillett Inds., Co., 5635 Yale Blvd. 214-363-0107

ANDERSEN W. M. A. & ASSOCS., 4 Main St. Ext., Tariffville, Conn., 06081, Tel: 203-658-7666; Sls. Mgr: W.A. Andersen

ANDERSON, W.E., INC., 320E West 80th St., Kansas City, Mo., 64114, Tel: 816-333-9882; Sls. Mgr: E. Charles

ANDONIAN ASSOCS., INC., 26 Thayer Rd., Waltham, Mass., 02154, Tel: 617-484-0500; Sls. Cood: R.S. Byrnes

ANDREW CORP., 10500 W. 153 St., Orland Pk., Ill., 60462, Tel: 312-349-3300, TWX: 910-651-3340; Sls. Mgr: H.L. Woodbury

ANGELICA UNIFORM CO., 700 Rosedale Ave., St. Louis, Mo., 63112, Tel: 314-863-0500; V.P. Sls: S.L. Abelov

ANN ARBOR DIV., Automation Inds., Box 1025, Ann Arbor, Mich., 48106, Tel: 313-769-6410, TWX: 810-223-6038; Prod. Mgr: W. Sailer

ANNIS, R.B. CO., 1101 N. Delaware St., Indianapolis, Ind., 46202, Tel: 317-637-9282

ANOCUT ENGRG. CO., Sub. Brown & Sharpe Mfg. Co., 2375 Estes Ave., Elk Grove Village, Ill., 60007, Tel: 312-437-5400; Prod. Mgr: Y. Shulman

Advertisement

DIGITAL TRANSDUCERS, INDICATORS AND CONTROL SYSTEMS. DC POWER SUPPLIES 1-1000 KVA.

Bidirectional counters, rotary and linear digital encoders, rate indicators. Many available from stock. DNC, N/C and MDI systems. Many applications to a variety of processing, metalworking and assembly machinery. Custom, special-purpose system engineering is a specialty. Anocut's engineering sales force will respond promptly to your requirements.

ANODYNE INC., Five and Ten Div., 1270 Northwest 165th St., N. Miami Beach, Fla., 33169, Tel: 305-621-3641, TWX: 810-848-7200; Mgr: T. Turney

ANRITSU ELECTRIC CO., LTD., 12-20, Minamiazabu 4 chome, Minato-ku, Tokyo, Japan, Tel: 446-1111; Sls. Mgr: T. Iizuka

ANSLEY DIV. ACI INC., Park Ave. & Ridge Rd., Perkasie, Pa., 18944, Tel: 215-257-3655, TWX: 612-333-4511; Sls. Mgr: A.H. Froden

ANSLEY ELCTRNS. CORP., Sub. Thomas & Betts Corp., Old Easton Rd., Doylestown, Pa., 18901, Tel: 215-345-1800, TWX: 510-665-8105; Sls. Mgr: J. Churchill

ANSLEY ELCTRNS. CORP., Sub. Thomas & Betts Corp., 4100 N. Figueroa St., Los Angeles, Cal., 90065, Tel: 213-223-2331, TWX: 910-321-3938; Sls. Mgr: M. M. Musselman

ANTENNA PRODUCTS CO., Box 9588, Austin, Texas, 78757, Tel: 512-258-1651; Sls. Mgr: G. Havener

ANTI-CORROSIVE METAL PRODS. CO., INC., Box 1894, Albany, N.Y., 12201, Tel: 518-732-7711, TWX: 965-9731; Sls. Mgr: J. Mengel

ANZAC ELCTRNS., 39 Green St., Waltham, Mass., 02154, Tel: 617-899-1900, TWX: 710-324-6484; Sls. Mgr: A. L. LeMay

A.O.I.P., Assoc. des Ouvriers en Instr. de Prec., 177, rue de Bercy, 75/Paris 12eme, France; Sls. Mgr: Mr. Escure

A. P. CIRCUIT CORP., 865 West End Ave., New York, N.Y., 10025, Tel: 212-222-0876; Sls. Mgr: D. Ellern Pg. 1509

Va Fairfax, Schibley, 10604 Warwick Ave. 703-591-3008
For: Can., Vancouver 15, B.C., Canadian Dynamics, Ltd., 8264 St. George St. 325-6014

APAHOUSER CORP. OF N.E., 1312 Boylston St., Boston, Mass., 02215, Tel: 617-KE-6-1223; Sls. Mgr: J.F. Gately

APERCO CO., 1383 Luddington Rd., East Meadow, N.Y., 11554, Tel: 516-486-3949; Sls. Mgr: E. Belgard

APEX MACHINE CO., 3000 Northeast 12th Terr., Ft. Lauderdale, Fla., 33308, Tel: 305-566-1572; Sls. Mgr: A.R. Coningsby

API INSTRS. CO., Div. of LFE Corp., 1601 Trapelo Rd., Waltham,, Mass., 02154, Tel: 617-890-2000, TWX: 710-324-0681; Sls. Mgr: L. Rowe ....Pgs. 402,403

Ariz Phoenix, Hytronic Meas., 1017 N. 3rd 602-253-6104
Cal Mountain View, API Instrs., 2339 Charleston 415-964-2925
Cal Temple Cy., LFE Corp., 5770 N. Rosemead 213-287-0941
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
Ga Atlanta, LFE Corp., 175 W. Wieuca 404-252-2445
Ill Arlington Hgts., LFE Corp., 605 E. Algonquin Rd. 312-593-5551
Kans Prairie Village, Thunderbird Tech. Sls., 4014-A W. 95th St. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls., 7707 E. Osie St. 316-684-3941
Mich Farmington, LFE Corp., 22784 Orchard Lake Rd. 313-477-2770
Minn Mpls., R.W. Marshall, 6106 Excelsior 612-929-0457
Mo Hazelwood, Thunderbird Tech. Sls., Box 12849 314-542-6488
NJ Oakland, LFE Corp., Box 123 201-337-6163
NM Albuquerque, Hytronic Meas., 205 San Pablo, S.E. 505-268-3941
NY N. Syracuse, KLM Assocs., 201 S. Main 315-458-6214
NY New Hartford, KLM Assocs., 1 Nouvelle 315-735-8525
NY Rochester, KLM Assocs., 39 Saginaw Dr. 716-442-0820
Ohio Chesterland, LFE Corp., 11655 Chillicothe 216-729-1611
Ohio Dayton, LFE Corp., Box 133, Centerv. Br. 513-434-8873
Pa Newtown Sq., LFE Corp., 3545 W. Chester Pike 215-353-0772
Tex Ft. Worth, Carey-Wolf, Box 12425 817-738-1702
Tex Houston, Carey-Wolf, 4031 Broadway 713-643-2114
Utah Salt Lake, Hytronic Meas., 2022 S. Main 801-466-4924
Wash Seattle, Comptronics, 3220-16th Ave., W. 206-284-4842

APM HEXSEAL CORP., 44 Honeck St., Englewood, N.J., 07631, Tel: 201-LO-9-5700; Mktg. Mgr: C. Czapinski

APOLLO CORP., 5-1, Togoshi 6-Chome, Shinagawa-Ku, Tokyo, Japan, Tel: 786-2001; Sls. Mgr: M. Kohmoto

APPLIED CONTROL CO., 1275 Bloomfield Ave., Fairfield, N.J., 07006, Tel: 201-226-2401; Sls. Mgr: W. Merel

APPLIED DESIGN CO., INC., 2461 Sheridan Dr., Tonawanda, N.Y., 14150, Tel: 716-837-4400; Sls. Mgr: T.Y. Smith

APPLIED DIGITAL DATA SYSTEMS, INC., 100 Marcus Blvd., Hauppauge, N.Y., 11787, Tel: 516-231-5400; Sls. Mgr: R. Kaufman

APPLIED DYNAMICS COMPUTER SYS., Div. Reliance Elec. Co., Box 1488, Ann Arbor, Mich., 48104, Tel: 313-971-4444, TWX: 810-223-6050; Sls. Mgr: C.R. Moores

APPLIED ELECTRO MECHANICS, 2350 Duke St., Alexandria, Va., 22314, Tel: 703-548-2166; Sls. Mgr: R.E. Howard

APPLIED MAGNETICS CORP., 75 Robin Hill Rd., Goleta, Calif., 93017, Tel: 805-964-4881, TWX: 910-334-1195; V.P. Sls: W.P. Graham

APPLIED MATERIALS TECH., INC., 2999 San Ysidro Way, Santa Clara, Cal, 95051, Tel: 408-738-0600; Sls. Mgr: T. Rafalovich

APPLIED MICROWAVE LAB., Andover St., Andover, Mass., 01810, Tel: 617-475-8500, TWX: 710-347-0337; Sls. Mgr: H. K. Clark ....Pg. 599

Ala Huntsville, Mekco, Holliday Off. Ctr. 205-881-3721
Cal Anaheim, Blair, 421 N. Brookhurst 714-635-1350
Cal Portola Valley, Kipp, 4388 Alpine 415-851-0123
Colo Denver, W. Engrg., 880 Bonnie Brae 303-777-5585
Fla Orlando, Mekco, 3165 McCory 305-841-2215
Ill Highland Pk., Feller, 3065 Univ. Ave. 312-433-3651
Ky Louisville, Ridgway East, 3807 Bishop 502-968-1250
Mass Andover, AML, Andover St. 617-475-8500
Mo St. Louis, Fixman Engrg., 8160 Stanford 314-725-5219
NJ Ridgewood, Damon/Engel, Inc., 40 W. Ridgewood Ave. 201-444-1400
NC Burlington, Mekco, 1349 S. Church 919-226-7177
Ohio Loveland, Ridgway East, Inc., Box 68 513-683-4350
Tex Ft. Worth, C. Wolf & Assoc., Box 12425 817-738-1702
Va Annandale, Hopkins, 4520 Starr Jordan 703-280-2086
EXP: N.Y., Hicksville, EMEC, Inc., 55 E. Old Country Rd. 516-931-3700

APPLIED PLASTICS CO., 612 E.Franklin Ave., El Segundo, Cal., 90245, Tel: 213-322-8050; Sls. Mgr: G.P. Whitbread

APPLIED RESEARCH INC., 76 S. Bayles Ave., Port Washington, N.Y., 11050, Tel: 516-883-5700, TWX: 510-223-0822; Sls. Mgr: C.G. Costas ....Pg. 1554
Cal Portola Valley, Kipp Assocs., 4388 Alpine Rd. 415-851-0123
Cal Westlake Village, 3 DBM Inc., 5388 Sterling Ctr. Dr. 213-889-2300
Mass Waban, Bawer Assocs., 53 Rokeby Rd. 617-244-6572
NY Huntington Sta, Gray & Reed, 9 Dunford St. 516-433-3333
NY Syracuse, Lightstone Corp., Pickard Bldg. 315-454-3209
Pa Newtown Sq, SWR Assocs., 8 Smedley La. 215-356-8550
Tex Dallas, Texas Avionics, 4515 Prentice St. 214-368-3566
Va Fairfax, Schibley Assocs., 10604 Warwick Ave. 703-591-3008

APPLIED SYSTEMS CORP., 18325 W. McNichols Rd., Detroit, Mich, 48219, Tel: 313-535-5800; Sls. Mgr: M. Wyrod

APPLIED TECH., Div. Itek, 3412 Hillview Ave., Palo Alto, Cal., 94304, Tel: 415-321-5135, TWX: 910-373-1218; Dir. Mktg: F.B. Lemmon

A.P.W. CO., INC., 72 W. Main St., Rockaway, N.J., 07866, Tel: 201-627-0643; Sls. Mgr: A.K. Pfeil

ARBOR SYS., INC., Box 1325, Ann Arbor, Mich., 48106, Tel: 313-663-6656; Sls. Mgr: J.N. Ciraulo

ARC PRODS. DIV., Chemetron Corp., 840 N. Michigan Ave., Chicago, Ill., 60611

ARCOLECTRIC SWITCH CO., Box 348, N. Hollywood, Calif., 91603, Tel: 213-985-3130; Sls. Mgr: L. Lewis

AREMCO PRODS., INC., Box 145, Briarcliff Manor, N.Y., 10510, Tel: 914-762-0685; Sls. Mgr: H. Schwartz

ARENBERG ULTRASONIC LAB., INC., 94 Green St., Jamaica Plain, Mass., 02130, Tel: 617-JA-2-8640; Sls. Mgr: D.L. Arenberg

A.R.F. PRODUCTS, INC., Box 3226, Boulder, Colo., 80303, Tel: 303-443-4844, TWX: 910-940-3446; Sls. Mgr: J.D. Ellington

A.R.F. PRODUCTS, INC., Gardner Rd., Raton, N.M., 87740, Tel: 505-445-3665, TWX: 910-984-0561; Pres: A.H. Maciszewski

ARGENT INDS., INC., 8514 N. Main St., Dayton, Ohio, 45415, Tel: 513-890-9780; Sls. Mgr: D.R. Herres

ARGOS PRODS. CO., INC., 600 S. Sycamore St., Genoa, Ill., 60135, Tel: 815-784-5118; Sls. Mgr: A. Hoyne

ARCO SYSTEMS INC., 1069 E. Meadow Cir., Palo Alto, Cal, 94303, Tel: 415-328-2570; Sls. Mgr: R. Kochis

ARISTO-CRAFT DISTINCTIVE MINIATURES, 314 Fifth Ave., New York, N.Y., 10001, Tel: 212-BR-9-9035; Pres: I. Polk

ARIZONA ELCTRNS., INC., Drawer AE, Benson, Ariz., 85602

ARK-LES SWITCH CORP., 51 Water St., Watertown, Mass., 02172, Tel: 617-924-2330; Gen. Sls. Mgr: R.W. Swift

ARLIN MFG. CO., INC., 239 Industrial Ave., E., Box 222, Lowell, Mass., 01853, Tel: 617-454-9165; Sls. Mgr: J.R. Mitchell

ARMCO STEEL CORP., 703 Curtis St., Middletown, Ohio, 45042

ARMCO STEEL CORP., Advanced Materials Div., Box 1697, Baltimore, Md., 20203

ARMEC CORP., 195 W. Hills Rd., Huntington Sta., N.Y., 11746, Tel: 516-427-7787

ARMEL ELCTRNS., INC., 1601 - 75th St., N. Bergen, N.J., 07047, Tel: 201-869-4300, TWX: 201-868-0069; Sls. Mgr: V.A. Pasqualino

ARMOUR ELCTRNS. CORP., 51 Jackson St., Worcester, Mass., 01608, Tel: 617-753-8103; Sls. Mgr: G. Clark

Advertisement

Armour Electronics manufactures a complete line of "slot" power supplies for use in computers, terminals and other peripherals. All standard power supplies delivered from stock. Separate OEM department for the development of custom supplies. Our motto "More Power for the Dollar" is backed by a sincere 10 year warranty on all standard products.

ARMSTRONG BROS. TOOL CO., 5200 W. Armstrong Ave., Chicago, Ill., 60646, Tel: 312-RO-3-3333, TWX: 910-221-0957; Sls. Mgr: T.P. Sawyer

ARMSTRONG CORK CO., W. Liberty St., Lancaster, Pa., 17604, Tel: 717-397-0611, TWX: 717-560-4405; Sls. Mgr: R.L. Collister

ARMSTRONG PRODS. CO., Box 657, Warsaw, Ind., 46580, Tel: 219-267-3226, TWX: 810-298-0790; Sls. Mgr: M.V. Rothschild

ARNOLD ENGRG. CO., Box G, Marengo, Ill., 60152, Tel: 815-568-2000, TWX: 910-642-2790; Sls. Dir: F.M. Kinney Pgs. 2754,2755
Ariz Scottsdale, C. T. Fink & Assocs., Box 434 602-992-9884
Cal Fullerton, Arnold Engrg. Co., 1551 E. Orangethorpe 714-871-1560
Cal Palo Alto, Arnold Engrg. Co., 701 Welch Rd. 415-326-9302
Ill Chicago, Arnold Engrg. Co. 312-AN-3-6300
Ill Marengo, Arnold Engrg., Box G 815-568-2000
Ind Huntington, Arnold Engrg. Co., 306 U.B. Bldg. 219-356-5224
Kans Wichita, Centech Assoc., 1126 Brunswick 316-722-6341
Mass Lexington, Arnold Engrg. Co., 49 Waltham St 617-862-2804
Mich Jackson, Arnold Engrg. Co., 1304 W. Michigan Ave. 517-784-5663
Minn Minneapolis, Arnold Engrg. Co., 7601 Wayzata Blvd. 612-545-1494
Mo Grandview, CenTech Sls., Box 310 816-763-2900
NJ Leonia, Arnold Engrg. Co., 135 Fort Lee Rd. 201-461-8150
NY Buffalo, Arnold Engr., 1660 Kenmore Ave. 716-875-2470
NY Fayetteville, M. P. Andrews, 319 Mott Rd. 315-637-3144
NC Raleigh, Arnold Engrg. Co., 204 N. Person St. 919-828-3270
Ohio Shaker Heights, Arnold Engrg. Co., 3570 Warrensville Center Rd. 216-283-7580
Okla Tulsa, Allied Comps., Box 4768 918-939-2848
Tex Dallas, Allied Comps., Box 38009 214-348-6660
Tex Houston, Allied Comps., 6400 Westpark Dr. 713-782-5406
Wisc Milwaukee, Arnold Engrg. Co., 4604 N. Wilson Dr. 414-964-8060
EXP: Ill, Marengo, Arnold Engrg. Co. 815-568-2267
EXP: NY, New York, S. Ginsbury, Ltd., 425 Park Ave. S. 212-689-5212
For: Can, Dundas, Ont., El-Met-Parts, Ltd., 47 Head St. 416-628-6366

ARNOLD LABS, 7103 Laurel Canyon Blvd., N. Hollywood, Cal., 91605, Tel: 877-5268

ARNOLD MAGNETICS, Culver City, Cal., 90230, Tel: 213-870-7014, TWX: 910-343-6468; Sls. Mgr: R. Pizer Pgs. 644-651
Ariz Phoenix, Dorton Enterprises, 364 E. Virginia Ave. 602-263-0414
Cal Mtn. View, Nor-Cal Assocs., 2680 Bayshore Frontage Rd. 415-328-6617
Fla Orlando, W. Jones Co., 2317 E. South St.
Ill Chicago, Comms. Engrs., 7106 N. Western Ave. 312-PA-1-0548
Ind Ft. Wayne, Comms. Engrs., 418 E. Berry St. 219-743-9866
Md Towson, W. Jones Co., 1107 Echo Ct., N. 301-823-5721
Mass Wakefield, Meas. Equip. Co., 591 North Ave. 617-245-4870
Minn Minneapolis, Scott Elctrn. Sls., 5209 W. 60th St. 612-929-2985
Mo St. Louis, PEM Sls., 9451 Lackland Rd. 314-HA-7-7200
NJ Pompton Lakes, Comp. Tech. Sls., 26 Chestnut Ave.
NJ Riverdale, Comp. Tech. Sls., Box 50
NY Lynbrook, Comp. Tech. Sls., Box 384 516-593-2628
Ohio Cleveland, E. Bock, 18838 Canyon Rd.
Ohio Dayton, Sculley & Ingling Assoc., 2600 Fair Hills Bldg. 513-298-9575
Pa Media, W. Reeves Assocs., Inc., 2973 N. Providence Rd. 215-LO-6-6709
Pa Pittsburg, Automated Equip. & Engrg., Inc., 646 Center Ave. 412-931-7616
Tex Dallas, Tesco Co., 2837 Anode St. 214-631-6270
Tex Houston, Texport Co.
For: Can., Montreal, Que., Electrodesign Ltd., 9124 St. Lawrence Blvd. 514-389-5914
For: Can., Toronto, Ont., Electrodesign Ltd., 3433 Bathurst St. 416-787-0991

ARNOUX CORP., 35 Anacapa St., Santa Barbara, Cal, 93101, Tel: 805-963-3476

A.R.P. INDS., INC., 36 Bay Dr., E., Huntington, N.Y., 11743, Tel: 516-427-1585; Sls. Mgr: A.R. Purccinelli

ARRA INC., Antenna & Radome Resch. Assocs., 15 Harold Ct., Bayshore, N.Y., 11706, Tel: 516-231-8400, TWX: 510-227-6231; Sls. Mgr: P.L. Bleifer ......Pg. 1553
Ariz Phoenix, R. A. Mayes, 4014 N. 7th 602-279-5243
Cal Los Angeles, Thorson Co., 347 S. Ogden 213-937-0790
Cal Palo Alto, Thorson Co., 2443 Ash St. 415-321-2414
Cal San Diego, Thorson Co., 444 Olive 714-298-8385
Cal Tustin, Thorson Co., 17461 Irvine Blvd. 714-544-5121
Colo Denver, Engr. Reasearch, 231 Detroit 303-377-8306
Ill Highland Pk., Feller, 3065 University 312-433-3646
Kans Overland Pk., Tech. Reps., 9009 W. 95th 913-381-5852
Kans Kansas City, Impala, Inc., 5424 N. 95 913-299-9622
Md Baltimore, Doss Elctrns., 6660 Security 301-944-1900
Mass Cochituate, Micronic Assocs., Box 162 617-653-8229
Mo Hazelwood, Tech. Reps., 8618 Latty 314-524-6900
NM Albuquerque, R. A. Mayes, 8016 Zuni 505-265-7989
NY Great Neck, EAC, 55 Northern Blvd. 516-466-9798
NY Syracuse, Tesco Assocs., 2002 Teall 315-463-4566
Pa Newton Sq., Holdsworth & Co., Box 298 215-356-8550
Tex Richardson, R. A. Mayes, 202 N. Greenville 214-235-3043
Wash Seattle, Thorson Co., 1767 15th Ave., S. 206-325-5000
EXP: NY, Hicksville, EMEC, 55 E. Old Country 516-931-3700
For: Can., Don Mills 404, Ont., York Instrs., 1262 Don Mills Rd. 416-445-1255

ARROW FASTENER CO., INC., 271 Mayhill St., Saddle Brook, N.J., 07663

ARROW-HART, INC., 103 Hawthorn St., Hartford, Conn., 06106, Tel: 203-249-8471; Mktg. Mgr: G. Heiden

ART WIRE & STAMPING CO., 9 Wing Dr., Cedar Knolls, N.J., 07927, Tel: 201-621-7272; Sls. Mgr: P. Sirazza Pg. 2815
Ariz Scottsdale, J. Hagestad, 3031 N. 69th Pl. 602-945-8415
Cal Downey, Corbett-Smith, 10247 Paramount [illegible]
Cal Sausalito, E.C. Miller, 3030 Bridgeway 415-332-4360
Fla Hallandale, W. Carlin, 111 Golden Isles 305-920-4499
Ind Indpls, Hoster & Sieloff, 444 W. 91st 317-846-6555
Minn St. Paul, R. Bittrick, 183 S. Chatsworth 612-226-6178
Mo Kansas City, L. Bruns, 2210 N. 50th 913-AT-9-5242
Tex Dallas, P. Scanlon, 724C S. Sherman 214-AD-1-4661

ARTECH CORP., 2816 Fallfax Dr., Falls Church, Va., 22042, Tel: 703-560-3292; Sls. Mgr: S.L. Dance

ARTISAN ELCTRNS. CORP., 5 Eastmans Rd., Parsippany, N.J., 07054, Tel: 201-887-7100; Mktg. Mgr: A. Seman

ARTOS ENGRG. CO., 15600 W. Lincoln Ave., New Berlin, Wisc., 53151, Tel: 414-782-3300, TWX: 414-322-7919; Sls. Mgr: H.T. Randar

ARTRONIC INSTR. CO., 11232 Triangle La., Silver Spring, Md., 20902, Tel: 301-949-1131; Sls. Mgr: M.E. Pugh ....Pg. 2732

ARTRONIX, INC., 716 Hanley Ind'l. Ct., St. Louis, Mo., 63144, Tel: 314-644-2456; Sls. Mgr: D. Allen

ARVEE ENGRG. CO., Box 3759, Torrance, Calif., 90510, Tel: 213-373-1324; Sls. Mgr: R.V. Allee ....Pg. 1278

ARVIN FREQUENCY DEVICES, Elctrn. Sys. Div., Arvin Inds., 15th St. Plant, Columbus, Ind., 47201, Tel: 812-379-3842, TWX: 810-352-1275; Sls. Mgr: R. Watson Pg. 1361
Cal Los Angeles, E. Landa, 1607 Pontius Ave. 213-879-0770
Cal San Diego, E. Landa, 3650 Clairemont Dr. 714-274-7242
Cal Sunnyvale, Waldman Assocs., 1094 W. Evelyn 408-245-2500
Fla Orlando, Jaeger Assocs., 1010 Executive Ctr. Dr. 305-841-1511
Mass Braintree, D. Stewart, 22 River St. 617-848-1477
NJ Old Bridge, S.E.A. Co., Box 444 201-679-8800

ARVIN MAGNETICS, Div. of Arvin Ind. Inc., 6950 Washington Ave. S., Eden Prairie, Minn., 55343, Tel: 612-941-6700, TWX: 910-576-2774; Dir. Mktg: W. Kammeier ....Pg. 309
Cal Buena Pk., Arvin Mag. Div., 5821 Beach Blvd. 714-523-8323
Mass Bedford, Arvin Mag. Div., 29 Pine St. 617-275-0795
Minn Eden Prairie, Arvin Mag. Div., 6920 Wash. Ave. S. 612-941-6700
Ohio Cleveland, Schroeder Sls., 2084 Noble Rd. 216-268-3636
Tex Dallas, Besco, 1715 Matgorda Dr. 214-376-1929

ARVIN SYS., INC., 1771 Springfield St., Dayton, Ohio, 45403, Tel: 513-254-6177; Mktg. Dir: J. Costello

ASC SYS. CORP., 2060 N. Kolmar Ave., Chicago, Ill., 60639, Tel: 312-278-4430, TWX: 910-221-5569; Sls. Mgr: R.F. Reisener

ASCO WIRE & CABLE CO., 412 Housatonic Ave., Bridgeport, Conn., 06608, Tel: 203-366-5294; Sls. Mgr: M.L. Madow

ASHEVILLE-SCHOONMAKER MICA, 900 Jefferson Ave., Newport News, Va., 23607, Tel: 703-CH-4-7311; Sls. Mgr: C.P. Barry

ASHLAND ELEC. PRODS., 32-02 Queens Blvd., L.I.C., N.Y., 11101, Tel: 212-EX-2-4010; Sls. Mgr: J.R. Lukasik Pgs. 1574-1579,2778-2781

Cal Burlingame, W.J. Purdy, 770 Airport 415-347-7701
Cal Los Angeles, C. Repp, 12121 Wilshire 213-GR-7-4475
Cal Sacramento, Wm. J. Purdy Co., 4110 Stillmeadow Way 916-481-0971
Colo Littleton, Wm. J. Purdy Co., 1449 W. Littleton Blvd. 303-794-4283
Fla N. Palm Beach, J. Griffin, 812 Lakeside 305-848-4617
Ill Chicago, D. Dolin Sls., 3525 W. Peterson 312-JU-8-3738
Ill Skokie, S. Sargis, 7125 N. Laramie Ave. 312-OR-4-8606
Mass Brookline, Harman, 251 Harvard 617-232-6687
NJ Cherry Hill, Bi-Tech, Box 224
NY Binghamton, Elcom Sls., Box 134 607-723-9270
NY Rochester, Elcom Sls., Box 9112 716-385-1400
NY Utica, Elcom Sls., Box 38 315-732-6445
NY Woodbury, J.N. Sweeney, 5 Fox Meadow Ct. 516-692-4222
Tex Dallas, Berry Co., 3011 Hood St. 214-528-0461
Va Richmond, Reynolds Cowardin, Box 9764 703-266-3457

ASM CORP., 525 Truck La., Smithfield, N.C., 27577, Tel: 919-934-3104, TWX: 510-939-1455; Pres: L.L. Armstrong

ASSEMBLY ELCTRNS. LTD., Box 461, 8529 Stonley Ave. S., Niagara Falls, Can.; Gen. Mgr: D.P. Stewart

ASSOCIATE GENERAL LABS., INC., 8934 W. Ogden Ave., Brookfield, Ill., 60513, Tel: 312-485-1135; Sls. Mgr: A. Schroeder

Advertisement

COLD WELD HERMETIC SEALING, with AGL's Mark 5 system. Air-hydraulic press operation within a stainless steel glove box. Mark 5 press units and weld tools for standard device packages are available from stock. Welding laboratory backs up this system.

ASSOCIATED ENGRG. & MFG. CORP., Glen Ridge, N.J., 07028, Tel: 201-743-8899; Sls. Mgr: D.M. Fox

Advertisement

Metals-Chemicals-Alloys-Parts
Tungsten - Molybdenum - Dumet - Bases - Filaments - Leads - Fluorescent Powders for Incandescent - Fluorescent Lamps for Electronic Industries - Precision Metal Components for Electronics, Nucleonics, Avionics and Rocketry - Specialists in forming, deep drawing, accurately, molybdenum, tungsten, tantalum, kovar, nickel, steel, stainless steel, aluminum, brass, copper, and mu metals, all precision quality metal components.

ASSOCIATED MFG. CO., 2414 Lawrence Ave., Chicago, Ill., 60625, Tel: 312-561-8365; Sls. Mgr: C.L. Lineberger

ASSOCIATED RESCH., 3773 W. Belmont Ave., Chicago, Ill., 60618, Tel: 312-267-4040; Sls. Mgr: R.S. Barnard Pgs. 404,405

Alas Anchorage, Dunn & Assoc., Box 2346 907-272-1714
Ariz Scottsdale, Engrg. Sls. Assoc., Box 544 602-945-5781
Ark Little Rock, Electra-Tech., Inc., 10324 Independence La. 501-562-4090
Cal Paramount, Brenner-Fiedler, 16210 Gundry 213-531-7222
Cal San Francisco, Calif. Instr., 351 Tenth 415-863-0350
Fla Miami, Ludlum Assocs., 7025 N.W. 42nd 305-885-2514
Fla Orlando, Ludlum Assoc., Box 6274 305-841-2278
Ga Atlanta, Holman-Lobsinger, 3110 Maple 404-261-5238
Ind Indpls., C. M. Buck, 1802 E. 46th 317-251-1281
Mass Burlington, Mancib, "A" St. at Middlesex 617-272-9450
Mich Birmingham, Electro-Mation, 1137 Cole 313-564-6517
Minn Mpls., Klass Co., 814 S. 9th 612-338-8427
Mo Kansas City, Cleaves-Bessmer, Inc., 5618 Raytown Rd. 816-353-6011
Mo St. Louis, Fitzgereld Sls., 4 North 8th 314-241-4066
Neb Lincoln, F.C. Clatterbaugh Co., Box 6181 402-489-5912
NJ E. Orange, Friedman, 110 Halsted 201-673-2500
NY Rochester, H. Rittenhouse, 291 Howland 716-442-1380
NC Charlotte, J. Rudisill, 1225 Harding 704-377-6901
Ohio Brecksville, D & B Engrg. Sls. Co., 7517 Winding Way 216-526-6320
Pa Pittsburgh, Bollinger & Wirth, Box 8088 412-561-2340
Pa Wayne, Bartlett Assoc., Inc., 130 W. Lancaster Ave. 215-688-7325
Tex Dallas, J. Schoonmaker, 2995 Ladybird 214-357-8481
Wisc Milwaukee, T.R. Bickler Assoc., Box 7245 414-453-3772
For: Can, Calgary, Alb., Showalter Agencies, Ltd., 2510 4th St., S.W. 403-269-6411
For: Can., Don Mills, Ont., G.M. Fraser, Ltd., 180 Duncan Mill Rd. 416-449-6600
For: Can, Montreal, Que., Hobson Assoc., 1024 Notre Dame 514-637-1231

ASSOCIATED SPECIALTIES CO., 1751 Main St., Orefield, Pa., 18069, Tel: 215-395-9172; Sls. Mgr: V. Laudenslager

ASSOCIATED TESTING LABS., INC., 200 Rte. 46, Wayne, N.J., 07470, Tel: 201-256-2800, TWX: 710-988-5712; V.P. Mktg: W. Luke ....Pg. 388

Ariz Scottsdale, Engineering Sls., 7155 E. Thomas 602-945-5781
Cal Los Altos, IFM, 2235 Grant Rd. 415-961-2828
Cal Van Nuys, G. Elliott, 13615 Victory 213-873-6862
Fla Windermere, R. Attaway, Lake Butler-Bl. 305-424-9983
Ill Chicago, Midwest Elctrn., 5707 W Division 312-626-0030
Ind Indianapolis, Midwest Elctrn., 4000 Meadows 317-546-4967
Iowa Cedar Rapids, Midwest Elctrn., 2042 Franklin 319-362-4410
Kans Wichita, Aero-Hill Sls., 901 N. Broadway 316-267-7167
Md Bethesda, ARA Elctrns., 7805 Old Georgetown 301-657-2585
Mass Acton, E. Specialists, Box 956 617-259-9200
Mass Boxborough, E. Specialists, 111 Massachusetts 617-259-9200
Mich Detroit, Electro Entprs., 11211 Morang 313-521-1500
Minn Mpls., E. Doyle, 3024 S Minnehaha 612-721-3393
NY Albany, J. Reagan, 6 Highland 518-489-4777
NY Binghampton, J. Reagan, 52B Crestmont 607-723-9661
NY New Hartford, J. Reagan, 41 Woodberry 315-732-3775
NY Rochester, J. Reagan, 891 Monroe 716-473-2115
NY Great Neck, Trionic Assocs., 320 Northern 516-466-2300
NC Winston Salem, RADCO, 614 Nissen Bld 919-722-9671
Ohio Cleveland, Electro Enterprises, 851 E. 222nd 216-261-7670
Ohio Dayton, Electro Entprs., 2621 Mardon 513-426-6071
Pa Glenside, ARA Elctrns., 501 Edge Hill 215-887-5250
Tex Dallas, True Technology, 12016 Fieldwood 214-239-7741
Wash Seattle, J. Dooley, 4110 Stone Way, N. 206-632-1618
Wisc Waukesha, Midwest Elctrn., 1317 Garfield 414-542-5129

ASTATIC CORP., Box 120, Conneaut, Ohio, 44030, Tel: 216-593-1111; Pres: F. Gluck

ASTRO COMM. LAB., Div. Aiken Inds., 9125 Gaither Rd., Gaithersburg, Md., 20760, Tel: 301-948-5210, TWX: 701-828-9706; Sls. Mgr: C.L. Costolo

ASTRO DYNAMICS, INC., 2nd Ave., N.W. Ind'l. Pk., Burlington, Mass., 01803, Tel: 617-272-3900; Sls. Mgr: J.R. Kirwin

ASTRO INDS., 606 Olive St., Santa Barbara, Cal., 93101, Tel: 805-963-3461; Sls. Mgr: J.L. Wiester

ASTRO-METRIX, 125 W. Providencia Ave., Burbank, Cal., 91502, Tel: 213-849-4759; Sls. Mgr: J.K. Floyd

ASTRO RESCH. CORP., 1330 Cacique St., Santa Barbara, Cal, 98103, Tel: 805-963-3423; Sls. Mgr: W.G. Welshans

ASTRO-SCIENCE, 9700 Factorial Way, S. El Monte, Cal., 91734, Tel: 213-443-3211, TWX: 910-587-3440; Sls. Mgr: K.C. Fetty

ASTRO SEAL, 1710 Chico, S. El Monte, Cal., 91733, Tel: 213-686-0670; Sls. Mgr: J.D. Wood

ASTRO-SPACE LABS., 110 Wynn Dr. N.W., Research Pk., Huntsville, Ala, 35806, Tel: 205-837-5830, TWX: 810-726-2111; Sls. Mgr: R.G. Mapes ....Pg. 633

Cal Encino, King-Way, 17100 Ventura 213-788-4124
Colo Boulder, J. Smith 303-449-7509
Conn Hamden, Impact Sls., 60 Connolly Pkwy. 203-248-9368
Fla Orlando, Jaeger, 1010 Executive Ctr. 305-841-1511
Ga Marietta, Immco 404-432-4715
Ill Lombard, Quantron, Box 306 312-627-6800
Md Baltimore, A. Myers Co., 5962 Glen Falls 301-426-5583
Mass Waltham, Impact Sls., 223 Crescent 617-893-2850
Minn Mpls., McNelly, 5622 W. Lake 612-926-7800
NJ Bergenfield, H. Gray, 20 Foster 201-384-3643
NJ Cherry Hill, Quality Comps., Box 583 609-428-6266
NM Albuquerque, J. Smith 505-255-2111
NY New York, H. Gray Assocs. 212-BR-9-3766
Tex Dallas, Southern Engrg., Box 8393 214-357-0669

ASTRODATA, 240 E. Palais Rd., Anaheim, Cal., 92803, Tel: 714-772-1000, TWX: 714-776-3760; Dir. Admin: K.W. Pommier

ASTRODYNE, INC., Sub. Roanwell Corp., 353 Middlesex Ave., Wilmington, Mass., 01887, Tel: 617-272-3850, TWX: 710-347-0704; Sls. Mgr: A.Q. Mowatt ....Pg. 1794

Ariz Litchfield Pk., S. Runyan Co., Box 1072 602-935-4266
Cal San Diego, Earle Assocs., 4433 Convoy 714-278-5441
Cal San Lorenzo, Wm. Parks Assocs., Box 36 415-357-4240
Cal Pasadena, Space Engrg., 491 N. Los Robles 213-681-4421
Colo Golden, Comm-Well Sls. & Engrg., RR #5, Box 761 303-277-0807
Fla Jupiter, Massey Assocs., Box 877 305-746-4591
Fla St. Petersburg, Massey Assocs., Box 13577 813-347-6183
Fla Winter Park, Massey Assocs., Box 1201 305-855-4510
Ga Tucker, Massey Assocs., 1885 Fellowship 404-938-9849
Ill Chicago, Escor Assocs., 6582 Northwest 312-763-4797
Ind Ft. Wayne, Escor, 9541 Manor Woods 219-432-9854
Iowa Clarion, Escor Assocs., 309 4th Ave. 515-532-3218
Mass Brookline, Harman, 251 Harvard 617-232-6687
Mich Birmingham, Comp/Insulation, 610 N. Woodward 313-644-0087
Minn Hopkins, Beta Engrg., 128 Jackson 612-938-2551
Mo St. Louis, Escor, 4969 Bancroft 314-352-2027
NJ Harrington Park, Metro Tech. Sls., 39 Bluefield 201-768-8495
NY Endicott, Tech Mark, Professional Bldg. 607-748-7473
NY Fairport, Tech/Mark, 19 Valley Brook 716-377-5531
NY Jericho, Metro Tech., 333 N. Broadway 516-935-3330
NC Burlington, P. Nahser Co., Box 432 919-226-8053
Ohio Cleveland, Comp/Insulation, 14235 Detroit 216-521-3570
Okla Tulsa, G. Peck Co., Box 15671 918-585-5853
Pa Pittsburgh, J.W. Kight, 4 Longfellow 412-781-8304
Tex Dallas, G.V. Peck, 210 Casa Linda Plaza 214-328-3511
Tex Houston, G.V. Peck, 5757 Bellaire 713-664-1435
Wash Seattle, G.M. Gillett, Box 99035 206-284-3344
For: Can., Scarborough, Ont., Douglas Randal, 1710 Midland 416-751-7911
EXP: Conn, Stamford, J.P. Int'l., 1989 Summer 203-348-2691

ASTROLAB INC., 4 Mc Candless St, Linden, N J, 07036, Tel: 201-925-2252; Sls. Mgr: J.R. Toma

ASTRONAUTICS CORP. OF AMER., 907 S. First St., Milwaukee, Wisc., 53204, Tel: 414-671-5500, TWX: 910-262-3153; Sls. Mgr: R.D. Seinfeld

ASTRONICS, INC., 10030 Monroe, Dallas, Tex., 75229, Tel: 214-352-8040; Sls. Mgr: J.G. Prather

ASTROSYSTEMS, 6 Nevada Dr., Lake Success, N.Y., 11040, Tel: 516-328-1600, TWX: 510-223-0411; V.P. Mktg: N.I. Wheatcroft .... Pgs. 332-334,406-409

Ala Huntsville, Kemp Instr., 4306 Governors W. 205-837-4304

Ariz Scottsdale, Bennewitz, 532 N. Brown 602-947-7379
Cal Fullerton, Astrosys., 4341 W. Commonwealth 714-523-0820
Colo Denver, Bennewitz, 2801 E. Colfax 303-399-1132
Fla Orlando, J. Highsmith, 2543 Industrial 305-293-5202
Ill Wheaton, Engrg. Prod., 25 W. 485 Geneva 312-653-6826
Mass Sudbury, Digital Mktg., Box 309 617-899-7148
Minn St. Paul, Engrg. Prods., 2119 Grand Ave. 612-698-5531
Mo St. Louis, Kemp Engrg., 10702 Manchester 314-968-0300
NM Albuquerque, Bennewitz, 9720 Candelaria NE 505-298-6775
NY Sodus, DeCew Agency, Box F 315-483-3261
NC Charlotte, J. Highsmith 704-333-7743
Ohio Dayton, Rep/Corp., 2077 Embury Pk. 513-278-5885
Ore Hillsboro, Showalter-Judd, 1445 NE Arrington 503-648-6372
Tex Dallas, Kemp Engrg., 2618 Manana 214-357-6663
Tex Houston, Kemp Engrg., 6001 Gulf Frwy. 713-928-5426
Va Richmond, J. Highsmith, 2604-D Buford 703-272-5888
Wash Seattle, Showalter-Judd, 1806 S. Bush 206-324-7911

ATEC, INC., 1125 Lumpkin St., Box 19426, Houston, Tex., 77024, Tel: 713-468-7971; Sls. Mgr: G.N. Swanstrom ....Pgs. 410,411
Ala Huntsville, Col-Ins-Co., 505 Chicamauga Cir. SE 205-881-1835
Cal Huntington Bch., Atec-West, Box 2089 213-680-9393
Cal LA, Burtis Instr., 8921 S. Sepulveda 213-670-5863
Cal Palo Alto, Atec-West, 770 Welch Rd. 415-326-1272
Fla Orlando, Col-Ins-Co., 1313 44th St. 305-423-7615
Fla W. Palm Bch., Col-Ins-Co., Box 14247 305-848-6885
Ill Chicago, SEA, Inc., 4210 W. Irving Pk. 312-282-6694
Ind Carmel, SEA, Inc., 620 S. Range Line 317-846-2593
Mass Waltham, Tech. Entrprs., 181 West St. 617-891-5300
Md Ellicott, Nine Assocs., Box 68
Mich Detroit, WKM Assocs., Inc., 1474 E. Outer Dr. 313-892-2500
Minn Minneapolis, SEA, Inc., 7601 N. Kentucky 612-425-4455
Mo Kansas City, Prod. Automation, Box 11584 816-763-2132
Mo St. Louis, Prod. Automation, 8622 St. Charles Rock 314-426-2331
NJ Ramsey, Atec-East, Box 235 201-327-2657
NC Raleigh, Col-Ins-Co., Box 27866 919-834-6591
Ohio Cleveland, WKM Assocs., 16141 Puritas Ave. 216-267-0445
Ohio Dayton, WKM Assocs., 6073 Far Hill Ave. 513-434-7500
Pa Norristown, Data-Rep Assocs., Box 349 215-279-8210
Pa Pittsburgh, WKM Assoc., 90 Clairton Blvd. 412-892-2953
SC Raleigh, Col-Ins-Co. 919-834-6591
Tenn Raleigh, Col-Ins-Co., Inc. 919-876-1167
Tex Austin, Systems Eng., 512 E. Riverside 512-444-6694
Tex Houston, Systems Eng., 5757 Bellaire 713-668-7840
Tex Richardson, Systems Eng., Dal Mac Bldg. 214-231-9364
Va Annandale, Nine Assocs., Inc., 7753 Patriot Dr. A-1 703-256-9105
Wisc Waukesha, SEA, Inc., 142B South St. 414-547-6637

ATKINS TECHNICAL, INC., 100 Stengel & S.W. Archer Rd., Gainesville, Fla., 32603, Tel: 904-372-3518; Sls. Mgr: R.M. Atkins
ATKOMATIC VALVE CO., Box 11258, Indianapolis, Ind., 46201, Tel: 317-357-8421; Sls. Mgr: A. Richardson
ATLANTIC INDIA RUBBER CO., 571 W. Polk St., Chicago, Ill., 60607, Tel: 312-427-8290, TWX: 910-221-0026; Sls. Mgr: E. J. Ryan
ATLANTIC INSTRS. CORP., 50 Hunt St., Watertown, Mass., 02172, Tel: 617-926-2400; Sls. Mgr: R. Macomber
ATLANTIC OPTICAL MOULDING CO., Ellis St., Dudley, Mass., 01570, Tel: 617-943-1746; Sls. Mgr: J.F. Krysiak
ATLANTIC ULTRAVIOLET CORP., 24-10 40th Ave., Long Island City, N.Y., 11101, Tel: 212-ST-4-6106; Sls. Mgr: H. Boehme
ATLAS COVERALL & UNIFORM SUPPLY, 1441 E. Adams Blvd., L.A., Cal., 90011, Tel: 213-232-3271; V.P. Sls: Sam Cohen
ATLAS ELECTRIC DEVICES, 4114 N. Ravenswood Ave., Chicago, Ill., 60613, Tel: 312-327-4520; Sls. Mgr: R. Metzinger
ATLAS ENGRG. CORP., 26 Custer St., W. Hartford, Conn., 06110, Tel: 203-246-5651; Sls. Mgr: C. Schectman
ATLAS FIBRE CO., 6970 N. Central Park Ave., Chicago, Ill., 60645, Tel: 312-465-1234; Sls. Mgr: L.A. Grusin
ATLAS SCREW & SPECIALTY CO., INC., 630 Dowd Ave., Elizabeth, N.J., 07201, Tel: 212-966-0600; Sls. Mgr: V.J. Merz
ATLAS SOUND DIV., American Trading & Production Corp., 10 Pomeroy Rd., Parsippany, N.J., 07054, Tel: 201-887-7800; Sls. Mgr: H.M. Jaffe
ATLAS TACK CORP., Fairhaven, Mass., 02719, Tel: 617-977-9491; Sls. Mgr: A. Pelson
ATLAS/UNI-SEAL, Atlas Chemical Inds., Valley Forge, Pa., 19481, Tel: 215-666-0700, TWX: 510-660-4788; Sls. Mgr: H. Debbi
ATMOSPHERE CONTROL CO., INC., 5315 Chester Ave., Philadelphia, Pa., 19143, Tel: 215-SA-9-1388; Sls. Mgr: W.J. Corney
ATOCON CO., Box 22, Lakeview, Ohio, 44833, Tel: 513-843-5315; Sls. Mgr: E.M. Wagstaff
ATOMERGIC CHEMETALS, Div. Gallard-Schlesinger Chem. Mfg., 584 Mineola Ave., Carle Place, N.Y., 11514, Tel: 516-333-5600, TWX: 212-428-0318; Sls. Mgr: C.J. Monteleone

ATOMICHRON, INC., Sub. Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Park, N.Y., 11040, Tel: 516-328-0360, TWX: 510-223-0418; Sls. Mgr: Mr. F. Kupersmith ....Pg. 469
Ala Huntsville, Int'l. Sci. Instr., Box 2091 205-837-1601
Cal Sherman Oaks, Windsor Dynamics, Inc., Box 5500 213-989-3631
Cal Woodside, Windsor Dynamics, Inc., 195 Greer Rd. 415-854-4870
Fla Orlando, Truex Assocs., Inc., 3165 McCrory Pl. 305-841-8931
Ill Des Plaines, S. Sterling, 1001 E. Touhy 312-298-4830
Md Rockville, Marktron, 651 Loftstrand La. 301-762-6210
Mass Newton Highlands, Compar New England, 88 Needham St. 617-969-7140
Mich Ferndale, Tiby Co., 380 Hilton Rd. 313-547-3550
Mo St. Louis, S. Sterling, 11734 Lackland Ind. Dr. 314-542-3636
NJ Fairlawn, C.R. Mayer Co., Box 484 201-791-8989
NY Huntington, C.R. Mayer Co., Box 152 516-921-7876
NY Rochester, Ossmann Comp. Sls., 280 Metro Pk. 716-442-3290
NC Winston Salem, Int'l. Sci. Instr., 614 1st Union Bank Bldg. 919-722-1783
Ohio Cleveland, Tiby Co., 2245 Warrensville Center Rd. 216-371-5335
Pa Glenside, Elcom Inc., 130 S. Eastern Rd. 215-885-1325
Tex Houston, R. Martin Assoc., Inc., Box 19291 713-468-3877
Wash Seattle, Associated Inds., 3711 S. Hudson St. 206-723-5600

ATR ELCTRNS., INC., 300 E. 4th St., St. Paul, Minn., 55101, Tel: 612-222-3791; Sls. Mgr: A.A. Goffstein Pg. 652
ATV RESEARCH, 13th & Bdway., Dakota City, Neb., 68731, Tel: 402-987-3771; Sls. Mgr: M.H. Shadbolt
AUBIN, A.E. CO., P.O. Box 29, Glastonbury, Conn., 06033, Tel: 203-633-4788; Sls. Mgr: A.E. Aubin
AUBURN MFG. CO., Pease Ave. & Stack St., Middletown, Conn., 06457, Tel: 203-346-6631; Sls. Mgr: C. A. Hart
AUDIO ACCESSORIES, INC., Gilsum, N.H., 03448, Tel: 603-352-2320; Pres: F.S. Hall
AUDIO DEVICES, INC., 100 Research Dr., Glenbrook, Conn., 06906, Tel: 203-327-6500, TWX: 710-474-2045; Sls. Mgr: W. Goldstein
AUDIO DYNAMICS CORP., Pickett District Rd., New Milford, Conn., 06776, Tel: 212-354-3911; V.P. Sls: W.C. Simonite
AUDIO EQUIP. CO., INC., Div. W. Kidde & Co., Inc., 75 Harbor Rd., Pt. Washington, N.Y., 11050, Tel: 516-883-5111; Sls. Mgr: R. Raden
AUDIO INSTR. CO., 311 Mountain Rd., Union City, N.J., 07087, Tel: 201-864-4542; Sls. Mgr: P. Sohmer
AUDIO-VIDIO ENGRG. CO., 65 Nancy Blvd., Merrick, N.Y., 11566, Tel: 516-546-4239; Sls. Mgr: R. Drucker
AUDIOSEARS CORP., Stamford, N.Y., 12167, Tel: 607-652-7305; Sls. Mgr: G.V. Mahler
AUDIOTRONICS, 7428 Bellaire Ave., N. Hollywood, Cal., 91605, Tel: 213-877-1308; Sls. Mgr: D. Lansing

AUGAT INC., 33 Perry Ave., Attleboro, Mass., 02703, Tel: 617-222-2202, TWX: 710-391-0644; Sls. Mgr: E. Redgate ....Pg. 1536
Cal Los Angeles, P. Wiley, 1632 Silverlake 213-663-8028
Cal San Carlos, D. Ross, 1095 Ind'l. Rd. 415-591-4411
Colo Littleton, Simpson, 2552 Ridge 303-798-8439
Conn New Canaan, S. Pierce, 115 Bald Hill 203-966-4630
Fla Clearwater, H.R. Gross & Co., Box 4607 813-446-6649
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill 404-237-2273
Ill Chicago, R. Krueger, 5755 W. Irving Pk. 312-282-8444
La Metairie, Cartwright & Bean, Box 73336 504-887-5225
Md Lutherville, Daniel & Co., Box 124 301-825-3330
Mass Norwood, S. Pierce, Inc., 24 Linden St. 617-762-3164
Mich Detroit, Hilltronics, Inc., 13720 Puritan 313-342-3242
Minn Mpls., M. Foster, 228 S. Cedar Lake 612-374-2612
NY Mt. Vernon, D. Sonkin Assocs., 10 Fiske 914-668-9809
NY Syracuse, Midstate Resch. Sls., 327 Wellesley Rd. 315-478-8314
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-333-6457
NC Raleigh, Powertronics, 2454 Medway 919-834-6947
NC Thomasville, Powertronics, Box 403 919-476-4257
Ohio Brecksville, A. Nace Co., Inc., Box 156 216-526-4323
Ohio Dayton, A. Nace Co., Inc., Box 93, Riverdale Sta.
Ore Portland, C.K. Shanks, Box 25375 503-292-5656
Pa Glenside, Daniel & Co., Box 3 215-887-0550
Pa Pittsburgh, A. Nace Co., 1725 Wash. Rd. 412-561-3544
Tenn Memphis, Cartwright & Bean, 560 S. Cooper 901-276-4442
Tex Dallas, J.B. Guenther, 5121 McKinney 214-528-6286
Tex Houston, J.B. Guenther, Inc., Box 55525 713-468-0232
For: Can., Ottawa 5, Ont., Whittaker Elctrns., Ltd., 42 Howden Ave.
For: Can., Roxboro, Quebec, Whittaker Elctrns., Box 216
For: Can., W. Vancouver, B.C., Whittaker Elctrns., Ltd., 1144 Millstream Rd.
For: Can., Downsview, Ont., Essential Elctrns., Ltd., 43 Troutbrooke Dr.
For: Can., Toronto 19, Ont., Avnet Elctrns., 87 Wingold Ave.
For: Can., Montreal 11, Quebec, Avnet Elctrns., Ltd., 1505 Louvain St., W.
For: Can., Edmonton, Alta., Cardinal Ind'l. Elctrns., Ltd., 14310 118th Ave.
For: Can., Vancouver 12, B.C., R-A-E Ind'l. Elctrns., Ltd., 1350 E. 4th Ave.

AUL INSTRS., INC., 139-30 34th Rd., Flushng, N.Y., 11354, Tel: 212-886-0600; Sls. Mgr: E. Saul
AURICORD, Division Scovill Mfg Co, 35-41 29th St., Long Island City, N.Y., 11106, Tel: 212-361-7400; Sls. Mgr: L. Rosenblatt
AUSTIN ELCTRNS., 450 W. First Ave., Roselle, N.J., 07023, Tel: 201-241-3300, TWX: 710-996-5981; Sls. Mgr: K.H. Rumzie

AUSTRON, INC., 10214 N. Interregional Hwy., Austin, Tex., 78753, Tel: 512-836-3523, TWX: 910-874-1356; Sls. Mgr: J.L. Toms ....Pg. 653
REPRESENTATIVES FOR DATA LOGGING INSTR. DIV.
Ariz Scottsdale, BFA Corp., 503 N. Brown 602-946-4215
Cal Anaheim, Tekmark West, 1077 W. Ball 714-772-2180
Cal Los Altos, Sys. Mktg. Conslts., Box 1376 415-941-4777
Colo Denver, BFA Corp., 1309 S. Inca 303-744-3301
Conn Hartford, Tech. Entprs., 181 West St. 617-891-5300
Ill Chicago, Megatek, 1915 N. Harlem 312-889-1277
Ind Freetown, Megatek, Inc., Rte. 1 317-988-7002
La Baton Rouge, Pan/Tech. Engrg., Box 1783 504-344-2791
Md Wheaton, K-G Elctrns., 11151 Veirs Mill 301-946-4055
Mass Arlington, Tech. Entprs., 181 West St. 617-891-5300
Mich Detroit, B. Hocker, 26847 Grand River 313-531-1403
Minn Mpls., Megatek, Inc., 7710 Computer 612-866-9769

NJ Totowa, Control Sls., 780 N. Riverview 201-785-0131
NM Albuquerque, BFA Corp., 1238 Ortiz, S.E. 505-268-4387
Ohio Dayton, B. Hocker, 1400 Devereux Dr. 513-298-8638
Pa Phila., Y. W. Miller Co., Box 4361 215-247-9600
Tex Houston, Pan/Tech. Engrg., 3230 Mercer 713-623-0640

REPRESENTATIVES FOR TIME & FREQUENCY DIV.

Ala Huntsville, Currie Aerospace, 2603 Artie 205-536-5650
Fla Orlando, Currie Aerospace, 2907 McCoy 305-855-0843
Md Rockville, Austron, Inc., 621 Lofstrand La. 301-762-2885

AUTH ELEC. CO., INC., 505 Acorn St., Deer Park, NY, 11729, Tel: 516-667-9000; Sls. Mgr: Ron Auth

AUTO CONTROL LABS., Rucker Control Sys., 5251 W. Imperial Hwy., Los Angeles, Calif., 90045, Tel: 213-776-8600; Sls. Mgr: G.R. Larson

AUTO PRODS. CO., 2735 Olive St., St. Louis, Mo., 63103, Tel: 314-OL-2-7305; Sls. Mgr: R.M. Lottes

AUTO-SWAGE PRODUCTS, INC., 726 River Rd., Shelton, Conn., 06484, Tel: 203-929-1401; V.P. Sls: D.L. Brenton

AUTOCALL CO., THE, 366 Mack Ave., Shelby, Ohio, 44875, Tel: 419-342-3015; Sls. Mgr: R.W. McPherson

AUTOCON INDS., INC., 995 University, St. Paul, Minn., 55104, Tel: 612-645-0721, TWX: 612-551-0972; Sls. Mgr: P.T. Durgin

AUTOMATED MEAS., Div. E.H. Research Labs, Box 1289, Oakland, Calif., 94604, Tel: 415-834-3030, Ext. 319, TWX: 910-366-7258; Sls. Mgr: W. Boggs Pgs. 442-447

(Refer to E-H Resch. Labs. for sales office information)

AUTOMATED PACKAGING SYS., 8400 Darrow Rd., Twinsburg, Ohio, 44087, Tel: 216-425-4242; Sls. Mgr: A Gould

AUTOMATIC CLERICAL SYS., 389 N. Fair Oaks Ave., Pasadena, Calif., 91103, Tel: 213-795-7205; Sls. Mgr: E.J. Petre

AUTOMATIC COIL, Div. Designatronics Inc., 55 S. Denton Ave., New Hyde Pk., N.Y., 11040, Tel: 516-328-3300, TWX: 510-223-0642; Sls. Mgr: J. Keith Pg. 2483

Cal Panorama City, Technical Prod. Sls., 14431 Chase St. 213-894-8371
Fla Ormond Bch., Mktg. Technology, 110 E. Granoda Ave. 904-672-2314
Mich Grand Rapids, R. Urban & Assoc., 119 Burton S.E. 616-245-0511
NY E. Northport, A. Kalinsky, 6 Dublin Ct. 516-364-1137
NY Great Neck, ERA, 330 Great Neck Rd. 516-HU-2-9320
Pa Phila., A. Colen c/o Technicraft, 7028 Ridge Ave. 215-IV-3-4700
Tex Dallas, G. A. Muller, Box 8011 214-368-6713

Advertisement

Automatic Coil Company offers the industry complete facilities for the efficient production of quality custom engineered electronic coil and related windings. A full line of IF-RF Coils, chokes, toroids and assemblies, both military and commercial, are offered, in quantity, and at competitive prices. Write for fully illustrated catalog.

AUTOMATIC CONTROL ELCTRNS. CO., Box 20264, San Antonio, Tex., 78220, Tel: 512-661-4111; Sls. Mgr: D.E.J. Fitz Simon

AUTOMATIC DIE CUTTING MACH. CO., 149 Church St., New York, N.Y., 10007, Tel: 212-962-7658; Sls. Mgr: E.E. Cosgrove

AUTOMATIC SIGNAL DIV., LFE Corp., Regent St., E. Norwalk, Conn., 06856, Tel: 203-838-4791; V.P. Sls: R.M. Rockafellow

AUTOMATIC SWITCH CO., 50-56 Hanover Rd., Florham Park, N.J., 07932, Tel: 201-966-2000, TWX: 710-986-8528; Sls. Mgr: R. Taylor

AUTOMATIC TIMING & CONTROLS, INC., King of Prussia, Pa., 19406, Tel: 215-265-0200; Sls. Mgr: V.C. McMahon

AUTOMATION DEV., Div. American Digital Corp., 9905 W. Jefferson Blvd., Culver City, Cal., 90230, Tel: 213-838-7346; Sls. Mgr: B.S. Angwin ....Pg. 1310

Ariz Scottsdale, OEM Specialities, 6625 E. MacDonald 602-946-4617
Cal Redwood City, Long, 505 Middlefield Rd. 415-369-3324
Cal Santa Monica, Davidson, 2920 Nebraska 213-829-1731
Ga Atlanta, J.E. Joyner, Box 10678 404-758-7496
Ill Barrington, Perhats, 1280 Burr Oak La. 312-381-6360
Ind Wabash, R. Scales, 550 Sommers Ave. 219-563-4886
NY Roslyn, East Coast Engrg., 1405 Northern 516-621-7500
Okla Tulsa, T.J. Ray Co., Box 45191 918-627-1515
Pa Phila., Humphrey Inc., No. Phila. Airport 215-676-1654

AUTOMATION DEVICES, INC., Box A.D., Automation Pk., Fairview, Pa., 16415, Tel: 814-474-5561; Gen'l. Sls. Mgr: C.D. Leslie

AUTOMATION DYNAMICS, Div. Resalab, Inc., 35 Industrial Pkwy., Northvale, N.J., 07647, Tel: 201-768-9200; Sls. Mgr: C.E. Barlow

AUTOMATION INDS., 1901 Bldg. Century City, Los Angeles, Cal., 90067, Tel: 213-879-2222; Sls. Mgr: D. Seaman

AUTOMATION INDS., Mat'ls. Evaluation Grp., Shelter Rock Rd., Danbury, Conn., 06810, Tel: 203-748-3581, TWX: 710-456-0392; Sls. Mgr: R.Y. Neiley

AUTOMATION PRODUCTS, INC., 3030 Max Roy St., Houston, Tex., 77008, Tel: 713-UN-9-1485; Sls. Mgr: Q.M. Baker

AUTOTRON, INC., 3629 N. Vermilion, Danville, Ill., 61832, Tel: 217-446-0650, TWX: 910-244-1455

AUTRONICS CORP., 180 N. Vinedo Ave., Pasadena, Calif., 91107, Tel: 213-681-3545, TWX: 213-449-2854; Sls. Mgr: J.F. Hayward ....Pg. 1311

Ariz Phoenix, Thorson Co., 2505 E. Thomas Rd. 602-956-5300
Cal Los Angeles, Thorson Co., 347 S. Ogden Dr. 213-937-0790
Cal Palo Alto, Thorson Co., 2443 Ash St. 415-321-2414
Cal San Diego, Thorson Co., 444 Olive St. 714-298-8385
Cal Tustin, Thorson Co., 17461 Irvine Blvd. 714-554-5121
Colo Denver, Thorson Co., 5040 E. 41st Ave. 303-355-3521
Md Baltimore, R. P. Luce & Co., 19 E. 21 St. 301-752-8200
NJ Berkeley Hgts., R. P. Luce & Co. 30 Locust Ave., 201-464-6440 81-3545
NM Albuquerque, Thorson Co., 5921 Lomas Blvd., N.E. 505-265-5655
NY New Hyde Pk., R. P. Luce & Co, 1300 Jericho Tpke. 516-437-4550
Pa Phila., R. P. Luce & Co., 8717 Patton Rd. 215-884-8365
Tex Dallas, Thorson Co., 7700 Carpenter Frwy. 214-631-5440
Tex Houston, Thorson Co., 6655 Hillcroft 713-771-3504
Utah Salt Lake Cy., Thorson Co., 445 E. 2nd S. 801-322-2127
Wash Seattle, Thorson Co., 909 N. E. 43 St. 206-632-0710

AVA ELCTRNS., 416 Long La., Upper Darby, Pa., 19082, Tel: 215-626-9100; Sls. Mgr: J. Mustico

AVANTEK, INC., 2981 Copper Rd., Santa Clara, Cal., 95051, Tel: 408-739-6170, TWX: 910-339-9274; Sls. Mgr: A.E. Acker

AVCO BAY STATE ABRASIVES DIV., 12 Union St., Westboro, Mass., 01581, Tel: 617-366-4431; V.P. Mktg: E.L. Auker

AVCO CORP., Avco Elctrns. Div., 2630 Glendale Milford Rd., Cincinnati, Ohio, 45241, Tel: 513-563-6000, TWX: 513-482-9129; Dir. Mktg: E.J. Morgan

AVCO ELCTRNS., Tulsa Oper., 10700 E Independence St, Tulsa, Okla., 74115, Tel: 918-437-1776, TWX: 910-845-2252; Sls. Mgr: J.C. Law

Advertisement

Avco/Tulsa manufactures a complete line of shock testing equipment, which includes both pneumatic and free-fall machines. In addition shock specialists are available for consultation on your unique testing requirements.

AVCO FELKER CORP., 1900 S. Crenshaw Blvd., Torrance, Calif., 90509, Tel: 213-328-4704; Sls. Mgr: F.C. Stockinger

AVCO MEAS. STANDARDS LABS., Avco Sys. Div., 201 Lowell St., Wilmington, Mass., 01887, Tel: 617-657-2856; Sls. Mgr: H.M. Tobey

AVDEL, INC., 210 S. Victory Blvd., Burbank, Calif., 91503, Tel: 213-843-4330, TWX: 910-498-2215; Sls. Office Mgr: D. Ladin

AVERY PRODS. GRAPHICS DIV., 2620 S Susan St, Santa Ana, Calif, 92704, Tel: 714-540-4020; Sls. Mgr: R. Vanasse

AVIATION INSTRUMENT MFG. CORP., 9033 Monroe Rd., Houston, Tex, 77017, Tel: 713-944-8562; Sls. Mgr: B.R. Harvester

AVIEL ELECTRONICS INC, 150 W Cypress Ave, Burbank, Calif., 91502, Tel: 213-846-9302; Sls. Mgr: C. Hornblower

AVIONICS, INC., 1915 Bendix Dr., South Bend, Ind., 46628, Tel: 219-232-8056; Sls. Mgr: G.J. McClure

AVIONICS, LTD., Box 200, Niagara-on-the-Lake, Ont., Can., Tel: 416-468-3632; Gen'l. Mgr: J.G. Mitchell

AVIONICS RESCH. PRODS., Div. Del Mar Engrg. Labs., Inc., 6901 W. Imperial Hwy., Los Angeles, Calif., 90045, Tel: 213-641-7700; Sls. Mgr: W.R. Parsons

AVTEL CORP., Div. Airtronics, 1130 E. Cypress St., Covina, Cal., 91722, Tel: 213-331-0661, TWX: 910-584-1311 J.J. Waterman, Jr. ....Pgs. 654-659

Cal Palos Verdes Estates, Power Conversion/Control Co., 348 Tejon Pl. 213-375-3679
Cal Santa Clara, Richards, 2938 Scott Blvd. 408-256-5860
DC Wash., Intern'l. Tech. Prods., 1828 "L" St., N.W. 202-223-5520
Fla Ft. Lauderdale, Thorsen, 4015 S.W. 1st St. 305-587-3849
Ill Mt. Prospect, Cain & Co., 1203 Ironwood 312-253-3578
Ind Indianapolis, Holsapple, 2253 Curry Dr. 317-894-0513
Md Annapolis, Hayden, 16 Decatur Ave. 202-296-6059
Mass Holbrook, McLellan, 63 Cedar Hill Rd. 617-963-8812
NJ Montville, G & A Sls., 8 Brittany Rd. 201-227-3926
NM Albuquerque, Premmco, 401 C San Pedro, N.E. 505-265-0115
Pa Ambler, W.M. Assocs., 910 Denston Dr. 215-643-4119
Tex Dallas, Cain, 8609 Northwest Plaza 214-369-2897
Wash Bellevue, A. Smith Co., 405 166 S.E. 206-746-6770

AVTRON MFG., INC., 10409 Meech Ave., Cleveland, Ohio, 44105, Tel: 216-641-8310; Sls. Mgr: J.R. O'Lenick

AVX AEROVOX CORP., 740 Belleville Ave., New Bedford, Mass., 02741, Tel: 617-994-9661, TWX: 710-344-6985 D. Thostenson ....Pg. 2330

Ala Huntsville, 20th Century Mktg., Box 6127 205-772-9237
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd St. 602-253-6104
Cal Mt. View, Quadrep, 943 Stierlin Rd. 415-964-3532
Cal San Diego, Interstate Mktg. Assocs., 3731 Sixth Ave. 714-298-6146
Cal Woodland Hills, Interstate Mktg. Assocs., 22030 Ventura Blvd. 213-883-7606
Colo Denver, Hytronic Meas., 4940 E. 39 Ave. 303-388-4081
Conn New Haven, Gerber Sls., Box 2917 203-777-6279
Fla Oviedo, Conley & Assocs., Box 668 305-365-3283
Ill Chicago, Gassner & Clark, 6644 N. Western Ave. 312-764-6121
Ind Indpls., F. J. Campisano Assocs., 3453 Nolen Dr. 317-291-4066
Kans Leawood, Poly-Onics, 4434 W. 90 Terr. 913-648-4173
Md Towson, Burgin-Kreh Assocs., Box 9787 301-661-1120
Mass E. Longmeadow, Gerber Sls., Box 447 413-525-3059
Mass Waltham, Gerber Sls., 176 Second Ave. 617-891-8040
Mich Southfield, Carrier & Gable, 1 Northland Plaza 313-444-8980
Minn Minneapolis, F. B. Hill Co., 7317 Cahill Rd. 612-941-5270
Mo Hazelwood, Poly-Onics, 47 Vill. Sq. Shop. Ctr. 314-837-0597
NJ Cherry Hill, J. N. Barrett Assoc., 140 Barclay Ctr. 609-429-1551
NM Albuquerque, Hytronic Meas., 205 San Pablo, S.E. 505-268-3941
NY Garden City, Comtronic Assocs., 370 Old Country Rd. 516-741-8966
NY Ithaca, B. Dean, 714 W. Clinton St. 607-272-2187
Ohio Cincinnati, F. J. Campisano Assocs., Box 11043 513-662-1616
Ohio So. Euclid, F. J. Campisano Assocs., 3819 Sherwood Rd. 216-381-4949
Okla Oklahoma City, Ammon & Champion, Box 12274 405-721-6417
Okla Tulsa, Ammon & Champion, 5500 Skelly Dr. 918-627-7670
Pa Pittsburgh, G. S. Root & Co., 809 Wainwright Dr. 412-561-4125
Tex Dallas, Ammon & Champion, Box 34555 214-233-5591
Tex Houston, Ammon & Champion, Box 35552 713-729-1233

Utah Salt Lake City, Hytronic Meas., 2022 S. Main St. 801-466-4924
Va Lynchburg, Burgin-Kreh Assocs., 2600 Memorial Ave. 703-845-5600
Wash Bellevue, Western Tech. Sls., 10843 N.E. 8th 206-GL4-3906
EXP: N.Y., New York, Auriema Int'l Group, 120 Liberty St. 212-349-8220
For: Can., Downsview, Ont., Kaytronics Engrg., 1001 Finch Ave., W. 416-638-5511
For: Can., Montreal, Que., Kaytronics Engrg., 7370 Cote St. Luc Rd. 514-487-3434

AYDIN DATA SYSTEMS, 401 Commerce Dr., Ft. Washington, Pa, 19034, Tel: 215-646-8100, TWX: 510-661-1520; Sls. Mgr: C.T. Morton

AZIMUTH ELCTRNS., 2377 S. El Camino Real, San Clemente, Cal., 92672, Tel: 714-492-6481; Sls. Mgr: K. Johnsen

B & B MOTOR & CONTROL, 96 Spring St., New York, NY, 10012; Sls. Mgr: P. McLaughlin

B-D SPEAR MEDICAL SYS., Sub. Becton, Dickinson & Co., 335 Bear Hill Rd., Waltham, Mass., 02154, Tel: 617-899-4800; Sls. Mgr: J.N. Burns

B & K INSTRS., INC., 5113 W. 164th St., Cleveland, Ohio, 44142, Tel: 216-267-4800, TWX: 810-421-8266; Sls. Mgr: H. Lawrence

B & W ELCTRN. RESCH. LABS., 10807 Royal Pk., Dallas, Tex., 75230, Tel: 214-EM-3-4619; Sls. Mgr: J.T. Hayward

B-W MFRS., INC., Phillips Radio Div., 721 N. Webster St., Kokomo, Ind., 46901, Tel: 317-452-5444; Sls. Mgr: J. Oetjen

BABCOCK RELAYS, Div. Babcock Elctrns. Corp., 3501 Harbor Blvd., Costa Mesa, Calif., 92626, Tel: 714-540-1234, TWX: 910-595-1517; Dir. of Mktg: T.C. Schroeder ....Pgs. 1654-1659
Ariz Phoenix, S.W. e/m Engrg., 8341 N. 7th St. 602-944-1521
Cal Los Altos, E. Landa, One First St. 415-948-0788
Cal L A, E. Landa Co., 1607 Pontius 213-879-0770
Cal San Diego, E. Landa, 3650 Clairemont 714-274-7242
Colo Denver, Checkmate Sls., Box 22411 303-771-4920
Conn Haven, Kitchen & Kutchin, 22 Broadway 203-239-0212
Fla Orlando, G. Bohman, 6990 Lake Ellenor 305-855-0274
Fla Palm Bch. Gardens, G. Bohman, 10249 N. Military Trail 305-842-7188
Ga Chamblee, K. Ekmark, 3676 Teal Rd. 404-457-5703
Ill Chicago, Carlson Elctrn., 7448 N. Harlem 312-774-4812
Ind Ft.Wayne, D.C. Flanagan, 2512 East Dr. 219-484-3233
Md Bethesda, W. Mount, 4924 St. Elmo 301-657-9312
Mass Lexington, Kitchen & Kutchin, 17 Waltham St. 617-862-8230
Mich Southfield, G & H, 24001 Southfield 313-358-1910
Minn Minneapolis, Exon Elec. Sls., 5164 Rainier Pass 612-788-4111
Mo St. Louis, Carlson Elctrn., 453 N. Lindbergh 314-991-0262
NJ Teaneck, R. T. Reid, 175 Cedar La. 201-692-0200
NM Albuquerque, Data Handling, 209 San Pablo, S.E. 505-268-0928
NY Red Hook, Ossmann Comp., 77 Kelly 914-297-7773
NY Rochester, Ossmann Comp., 280 Metro Pk. 716-442-3290
NY Syracuse, Ossmann Comp., 132 Pickard 315-454-4477
NY Vestal, Ossmann Comp., 1901 Vestal Pkwy., E. 607-785-9949
Ohio Cincinnati, G & H Sls., 10599 Chester Rd. 513-771-8231
Ore Beaverton, Arneson, 4175 S.W. Cedar Hills 503-646-3416
Pa Jenkintown, W. Mount, 700-6 Fox Pavilion 215-886-0383
Tex Dallas, Aid Elec., 8383 Stemmons Frwy. 214-638-8015
Wash Seattle, Arneson, 5950 Sixth Ave., S. 206-762-7664
For: Can., Montreal, W., Que., S. Hooker, 144 Ronald 514-487-5151
For: Can., Toronto, Ont., S. Hooker, 761 Jane 416-767-7725

BAC ELCTRNS., 7300 Crescent Blvd., Pennsauken, N.J., 08110, Tel: 609-662-3031; Sls. Mgr: H.S. Langefeld, Jr.

BACHARACH INSTR. CO., Div. AMBAC Inds., Inc., 625 Alpha Dr., Pittsburgh, Pa., 15238, Tel: 412-782-3500, TWX: 710-664-2085; Sls. Mgr: D. Tenny

BACHARACH INSTR. CO., West Coast Opern. - J-W Prods., 2300 Leghorn St., Mt. View, Calif., 94040, Tel: 415-967-7221; Sls. Mgr: J. Jenkins

BACHE, SEMON & CO., 636 Greenwich St., New York, N.Y., 10014, Tel: 212-924-2121; Sls. Mgr: S. Canter

BACKER-LORING CORP., 65 Walnut St., Peabody, Mass., 01960, Tel: 617-531-3600; Sls. Mgr: U.B. Heide

BACON INDS., 192 Pleasant St., Watertown, Mass., 02172, Tel: 617-926-2550; Sls. Mgr: R.S. Cass

BAER, N.S. CO., 9 Montgomery St., Hillside, N.J., 07205, Tel: 201-688-2250; Sls. Mgr: S.W. Nette

BAFCO, INC., 717 Mearns Rd., Warminster, Pa., 18974, Tel: 215-674-1700; Sls. Mgr: A.M. Fuchs ....Pg. 412
Cal Palo Alto, Mauldin, 200 California 415-326-5291
Cal San Pedro, ABCO Co., 555 W. Ninth 213-833-8333
Fla Orlando, Truex, 3165 McCrory Pl. 305-841-8931
Ohio Dayton, P. Glavinos, 329 Grants Trail 513-433-2347

BAGANOFF ASSOCS., INC., 6809 W. Florissant, St. Louis, Mo., 63136, Tel: 314-383-2432; Pres: F. Baganoff

BAILEY INSTRS., INC., 515 Victor St., Saddle Brook, N.J., 07662, Tel: 201-845-7252; Sls. Mgr: R.J Bailey

BAILEY METER CO., Sub. BaBcock & Wilcox, Wickliffe, Ohio, 44092, Tel: 216-943-5500, TWX: 216-944-4160; Sls. Mgr: C.E. Bergman

BAKER CO., INC., 106 Granite St., Biddeford, Me., 04005, Tel: 207-284-5951; Sls. Mgr: T.R. Dawson

BAKER, J.T. CHEMICAL CO., Phillipsburg, N.J., 08865, Tel: 201-859-2151, TWX: 510-235-2924; Sls. Mgr: W.F. Schumacher

BAL, WILLIAM CORP., 947 Newark Ave., Elizabeth, N.J., 07208, Tel: 201-354-9625; Sls. Mgr: L. Perna

BALANCE TECHNOLOGY, INC., 41 Enterprise Dr., Ann Arbor, Mich., 48103, Tel: 313-769-2100; Sls. Mgr: W. Ramer

BALCO CAPACITORS, Div. Balco Elctrns., Inc., 307 Washington St., Orange, N.J., 07050, Tel: 201-677-1200, TWX: 710-994-5812, Mktg. Mgr: M.K. Goldstein Pgs. 1296,2346,2347,2820,2821
Cal Culver City , Sodaro Co., 3753 S. Robertson Blvd. 213-870-6001
Conn Meriden, Abbitt-Allison, Box 467 203-237-9232
Fla Winter Park, Spartak, 1320 Minnesota Ave. 305-644-3023
Md Gaithersburg, Wright Co., 19003 Coltfield Ct. 301-948-5588
NJ Harrington Pk., Metro Tech. Sls., 39 Bluefield Ave. 201-768-8495
NY Jericho, Metro Tech. Sls., 333 N. Broadway 516-935-3330
NY Utica, B.D. Hummel Co., 2224 Maynard Ave. 315-736-7821
Ohio Columbus, McFadden Sls., 150 E. Broad St. 614-221-3363
Pa Pittsburgh, R.M. Davis Co., 814 Wainwright Dr.
Tex Dallas, W. Reese Assoc., 3131 Stemmons 214-638-6575
Wash Seattle, J.B. Jolly, 10119 51st S.W. 206-938-4166
Wisc Milwaukee, Gentron Corp., 6000 W. Oklahoma 414-543-8110
For: Can., Ville Lasalle, Que., Electrodesign Ltd., 840 Lafleur 514-363-5120
For: Can., Toronto, Ont., Electrodesign Ltd., 3433 Bathurst St. 416-787-0991

BALDWIN ELCTRNS., 1101 McAlmont St., Little Rock, Ark., 72203, Tel: 501-375-7351; Mktg. Mgr: L.R. Keenen

BALLONOFF HOME PRODS. CO., 14055 Cedar Rd., Cleveland, Ohio, 44118, Tel: 216-932-3100; Sls. Mgr: S.I. Miller

BALSTON IND'L. LTD., Box C, Lexington, Mass, 02173, Tel: 617-482-4150; Sls. Mgr: R. Strauss

BALTEAU ELECTRIC CORP., 10-14 Meadow St., Stamford, Conn., 06902, Tel: 203-324-6118; Mktg. Mgr: F.C. Guise

BARBER-COLMAN CO., Electro-Mechanical Prods. Div., Dept. S, 12116 Rock St., Rockford, Ill., 61101, Tel: 815-968-6833; Sls. Mgr: M. Kelley

BARBER-COLMAN CO., Industrial Instrs. Div., 1300 Rock St., Rockford, Ill., 61101, Tel: 815-877-0241, TWX: 815-398-0341; Dir. Mktg. W.F. Paetz

BARCO CHEM. PRODS. CO., 701-703 S. LaSalle, Chicago, Ill., 60605, Tel: 312-427-2957; Sls. Mgr: R.R. Barewin

BARCO, INC., 829 N. Marshall, Milwaukee, Wisc., 53202, Tel: 414-276-8515, TWX: 414-322-8396; Sls. Mgr: C. Mach

BARDEN CO., Div. Interdyne Co., 2217 Purdue Ave., Los Angeles, Cal., 90064, Tel: 213-477-3511, TWX: 910-342-6490; Sls. Mgr: G.D. Nicklas

BARDEN CORP., 200 Park Ave., Danbury, Conn., 06810, Tel: 203-744-2211, TWX: 203-744-0097; Sls. Mgr: G.J. Hopkins

BARGER CORP., 165 San Lazaro Ave., Sunnyvale, Cal., 94086, Tel: 408-245-4480; Sls. Mgr: F. Peterson

BARIUM & CHEMS., INC., P.O. Box 218, Steubenville, Ohio, 43952, Tel: 614-282-9776; Sls. Mgr: A. Pavlik, Jr.

BARKER ELEC. SLS., Box 405, Ship Bottom, NJ, 08008, Tel: 609-494-8209; Sls. Mgr: T. Robinson-Cox

Advertisement

Vacuum Thermocouples, Mfr. L.R. Graham Co. UHF and STANDARD Low Frequency styles from 1mA up. Accurate RMS and true SQUARE LAW outputs with Low Reversal Errors and Compensated Temperature Coefficients. Wide current tracking ratios, long to fast time responses. Single units and matched parameters. Complete technical catalog available.

BARKER PRODS. CO., 344 Central St., Saugus, Mass., 01906, Tel: 617-233-6676; Sls. Mgr: W.A. Brackett

Advertisement

BARKER
MOLDED-ON PLUGS
AND CONNECTORS

The greatest name in "Molded-On" plugs and connectors is Barker - manufacturers of connecting cables for every audio, hi-fi and stereo need. Barker plugs are solid plastic units, molded directly onto the wire ends to provide unfailing performance and unexcelled appearance. Barker has the most manufacturing experience . . .the most engineering experience.

BARKER & WILLIAMSON, Beaver Dam & Canal Rds., Bristol, Pa., 19007, Tel: 215-788-5581; Sls. Mgr: E. Bush

BARNES CORP., 24 N. Lansdowne Ave., Lansdowne, Pa., 19050, Tel: 215-622-1525, TWX: 510-669-9977; Sls. Mgr: K. Blanchard ....Pg. 2591
Ala Huntsville, Beacon Elctrn. Assocs., 3222 Memorial Pkwy. 205-881-5031
Cal Mt. View, Acadia Sls., 2166 Old Middlefield Way 415-969-9900
Cal Van Nuys, Dorado Elctrns., 13615 Victory Blvd. 213-873-4124
Colo Boulder, Straube Assocs., Box 1649 303-443-8600
Conn W. Hartford, Hale-Forden Assoc., 1245 Farmington Ave. 203-521-5620
Fla Ft. Lauderdale, Beacon Elctrn. Assoc., 651 N.E. 45th St. 305-564-4298
Fla Maitland, Beacon Elctrn. Assoc., 540 S. Maitland Ave. 305-647-3498
Ga Atlanta, Beacon Elctrn. Assoc., 2285 Peachtree Rd. 404-351-3654
Ill Chicago, Kennedy Engrg., Inc., 6713 N. Oliphant Ave. 312-631-8283
Kans Overland Pk., Penzner Assoc., 5600 W. 95th St. 913-381-0004
Md Baltimore, Comp. Sls., Inc., 7 Church La. 301-484-3647
Mass Melrose, Hale-Forden, 661 Main St. 617-266-3333
Mich Detroit, McShane Co. 313-642-7050
Minn Minneapolis, M. Westlund Assocs., 5516 13th Ave. S. 612-869-0027
Mo Hazelwood, Penzner Assoc., 400 Brookes La. 314-731-4334
NJ Teaneck, R.T. Reid Assocs., 175 Cedar La. 201-692-0200
NM Albuquerque, Elctrn. Enterprises, 5206 Constitution Ave. 505-256-1585
NM Las Cruces, Elctrn. Enterprises, Box 116 505-524-0126
NY Fayetteville, M.P. Andrews, Inc., 319 Mott Rd. 315-637-6405
NY Kingston, Martin P. Andrews, Inc., Governor Clinton Hotel 914-338-2700
NY New York, R.T. Reid Assocs. 212-279-2273
NC Santee, Beacon Elctrn. Assoc., Box 31 803-897-2670
Ohio Medina, McShane Co., Box 523 216-725-4283
Okla Tulsa, T.J. Ray Co., Box 45191 918-627-1515
Pa Devon, Electech, Box 181 215-687-5305
Utah Morgan, Straube Assocs., RFD 1, Box 316 801-829-6448
Wash Seattle, J.J. Backer Co., 221 W. Galer St. 206-283-6470
EXP: Conn., Stamford, D. Dage Corp., 757 Main St. 203-324-3123

BARNES ENGRG. CO., 3012 S Halladay St, Santa Ana, Calif., 92705, Tel: 714-545-5561; Sls. Mgr: G.W. Barnes

BARNES ENGRG. CO., 30 Commerce Rd., Stamford, Conn., 06902, Tel: 203-348-5381, TWX: 710-474-3367; Sls. Mgr: S. Haffner

BARNES & REINECKE, INC., 351 E. Ohio St., Chicago, Ill., 60611, Tel: 312-321-0350; Sls. Mgr: J.E. Smart

BARON-BLAKESLEE, INC., 1620 S. Laramie Ave., Chicago, Ill., 60650, Tel: 312-656-7300, TWX: 910-229-1526; Sls. Mgr: A.L. Bashe

BARRETT ELCTRNS. CORP., 630 Dundee Rd., Northbrook, Ill., 60062, Tel: 312-272-2300, TWX: 910-686-0007; Mktg. Mgr: W. Dean

BARRINGER RESEARCH, LTD., 304 Carlingview Dr., Rexdale, Ont., Can., Tel: 416-677-2491; V.P. Mktg: D.A. Whiteman

BARRON CONTROLS & RELAY CORP., 3 N. Barron Blvd., Box 385, Grayslake, Ill., 60030, Tel: 312-223-4868; Sls. Mgr: W. Rose

BARRY CONTROLS, Div. Barry Wright Corp., 700 Pleasant St., Watertown, Mass., 02172, Tel: 617-923-1150, TWX: 710-327-1290; Sls. Mgr: R. Erhart

BARRY RESCH. CORP., 1530 Page Mill Rd., Palo Alto, Cal., 94304, Tel: 415-321-6800

BARTH ELCTRNS., INC., 7777 Wall St., Cleveland, Ohio, 44125, Tel: 216-524-5136

Advertisement

Microwave heating for industrial uses to improve product quality and reduce process time. Microwave heating has specific advantages in heating thermally insulating materials such as rubber. If a faster or more uniform method of heating is your bottleneck, microwave heating could be your answer. Contact us for a quick appraisal.

BARTON MINES CORP., North Creek, N.Y., 12853, Tel: 518-998-2296; Sls. Mgr: J.B. Burns

BARWOOD ELCTRNS., INC., 120 S. Maryland, Glendale, Cal., 91205, Tel: 213-245-4063; Sls. Mgr: W.H.E. Barwood

BASIC CERAMICS INC., Sub. Basic Inc., 221 Seventh Ave., Hawthorne, N.J., 07507, Tel: 201-427-4211, TWX: 710-988-4133; Sls. Mgr: J. Liker

BASLER ELEC. CO., Box 269, Rte. 143, Highland, Ill., 62249, Tel: 618-654-2341, TWX: 910-996-2522; Sls. Mgr: D.L. Ginther

BAUMKER MFG. CO., 5144 Enterprise, Toledo, Ohio, 43612, Tel: 419-726-1874; Sls. Mgr: L.R. Baumker

BAUSCH & LOMB, 87971 Bausch St., Rochester, N.Y., 14602, Tel: 716-232-6000, TWX: 716-235-0672; Pres: W.W. McQuilkin

BAY LABS., INC., 20160 Center Ridge Rd., Cleveland, Ohio, 44116, Tel: 216-333-3898; Pres: G.J. Prusha

BAY PRODS., Div. American Metal Works, Somerset & Gurney Sts., Phila., Pa., 19134, Tel: 215-426-6050; Asst. Sls. Mgr: Ted Ford

BAYSIDE TIMERS, INC., 43-69 162 St., Flushing, N.Y., 11358, Tel: 212-IN-3-8935; Pres: G. Dorothea

BEAR MFG. CORP., Applied Power Ind., 2830-5th St., Rock Island, Ill., 61201, Tel: 309-788-9311; Ind'l. Sls. Mgr: H. Sullivan

BEARING INSPECTION, 10041 Shoemaker Ave., Santa Fe Springs, Cal., 90670, Tel: 213-944-6251; V.P. D.L. Hutton

BEAU MOTOR DIV., UMC Elctrns. Co., 460 Sackett Point Rd., N. Haven, Conn., 06473, Tel: 203-288-7731; V.P-Mktg. F.H. Rehm

BEAVER GEAR WORKS, INC., 5459 - 11th St., Rockford, Ill., 61105, Tel: 815-874-2471

BECKMAN INSTRS., ADVANCED TECH., 2500 Harbor Blvd., Fullerton, Cal., 92634, Tel: 714-871-4848, TWX: 910-592-1260; Mktg. Mgr: W. Wimer

BECKMAN INSTRS., (AISSD), 2500 Harbor Blvd., Fullerton, Cal., 92634, Tel: 714-871-4848, TWX: 910-592-1260; Sls. Mgr: T. Waller

BECKMAN INSTRS., Cedar Grove Opers., 89 Commerce Rd., Cedar Grove, N.J., 07009, Tel: 201-239-6200, TWX: 710-994-5781 ....Pgs. 414,415

Cal	Fullerton, Kendall Co., Box 5368	714-870-4110
Cal	Palo Alto, Kendall Co., Box 11073	415-322-6338
Colo	Denver, Williams-Assocs., 4971 4971 Jackson	303-388-4391
Fla	Miami, Brinkley-Pallatz, Box 487	305-238-0864
Ill	Chicago, Megatek, Inc., 1915 N. Harlem Ave.	312-889-1277
Kans	Mission, Mid-America Elctrns., 5822 Reeds Rd.	913-432-8678
Md	Silver Spring, Gawler-Knoop, 10 Old Post Rd.	301-589-4406
Mass	Newtonville, H. Schuft, 815 Washington	617-527-5304
NJ	Roseland, Gawler-Knoop, 14 Beaufort	201-226-4545
NY	Cortland, RJC Assocs., 26 Morningside Dr.	607-753-3909
Ore	Portland, R. Legg, Box 25327	503-292-8824
Pa	Pittsburgh, K. J. Lesker, 5635 Horning	412-892-2996
Pa	Doylestown, Gawler-Knoope, Box 794	215-348-4646

Tex	Dallas, Crockett Engrg. Co., Box 47287	214-637-6120

BECKMAN INSTRUMENTS, Elctrn. Instrs. Div., 3900 N. River Rd., Shiller Pk., Ill., 60176, Tel: 312-671-3300; Sls. Mgr: A. Melkerson ....Pg. 413
(Refer to Beckman Instruments, Fullerton, Cal. for sales office information.)

BECKMAN INSTRS., Helipot Div., 2500 Harbor Blvd., Fullerton, Cal., 92634, Tel: 714-871-4848, TWX: 910-592-1260; Mktg. Mgr: H.L. Crout ....Pg. 413

Ala	Huntsville, Murphy & Cota, 904 Bob Wallace Ave.	205-539-8476
Ariz	Phoenix, Barnhill Five, 537 E. Osborn	602-263-1250
Cal	El Monte, G.S. Marshall, 9674 Telstar	213-686-0141
Cal	Palo Alto, Beckman Instrs., 1117 California Ave.	415-326-1970
Cal	San Diego, G.S. Marshall, 7990 Engineer	714-278-6350
Cal	Sunnyvale, G.S. Marshall, 732 N. Pastoria	408-732-1100
Colo	Denver, Barnhill Five, 1170 S. Sheridan	303-934-5505
Conn	Hamden, Compar New Eng., 2531 Whitney	203-288-9276
Fla	St. Petersburg, Lynch-Gentry Assocs., Box 13248	813-347-5131
Ga	Atlanta, Murphy & Cota, 500 Plasamour NE	404-875-2525
Ill	Mt. Prospect, Magnuson, Box 130	312-956-0700
Md	Silver Spring, Beckman, 12050 Tech	301-622-2500
Md	Beltsville, Angus, 10759 Tucker	301-345-7050
Mass	Newton Highlands, Beckman, 88 Needham	617-969-7140
Mich	Detroit, Sheridan Assocs., Box 128	313-358-3333
Mich	Grand Rapids, Sheridan, Box 6312	616-949-8110
Minn	St. Paul, Magnuson, 1246 West 7th	612-227-8495
Mo	Florissant, Sheridan, Box 677	314-837-5200
NJ	Moorestown, Beckman, Pleasant Valley Ave.	609-235-3314
NJ	Moorestown, Angus, Pleasant Valley Ave.	609-235-1900
NJ	Mountainside, Beckman, U.S. Hwy. #22 at Summit Rd.	201-232-7600
NJ	Rutherford, Schley-OTS, 5 Industrial	201 935-2120
NM	Albuquerque, Barnhill Five, 1410-D Wyoming NE	505-299-7658
NY	Farmingdale, G.S. Marshall, 195 P Central	516-293-4141
NY	Kingston, Ossmann Comp., 411 Washington	314-338-5505
NY	Rochester, Ossmann, 39 Saginaw	716-442-3290
NY	Syracuse, Ossmann, 132 Pickard Bldg.	315-454-4477
NY	Vestal, Ossmann, 1901 Vestal Pkwy., E.	607-785-9949
NC	Winston-Salem, Murphy & Cota, 1106 Burke	919-723-1001
Ohio	Cincinnati, Sheridan Assocs., Box 37826	513-761-5432
Ohio	Cleveland, Sheridan Assocs., Box 4457	216-524-8120
Ohio	Dayton, Sheridan Assocs., Inc., Box 423	513-277-8911
Ore	Portland, Almac/Stroum, 8888 S.W. Canyon	503-292-3534
Pa	Pittsburgh, Sheridan, 1601 Penn Center	412-243-6655
Tex	Dallas, Norvell, 10210 Monroe	214-357-6451
Tex	Houston, Norvell, 6440 Hillcroft Ave.	713-774-2568
Utah	Salt Lake City, Barnhill Five, 2459 S. Main	801-487-1327
Wash	Seattle, Almac/Stroum, 5811 6th Ave.	206-763-2300
For:	Can., Toronto, Ont., Beckman, 901 Oxford	416-251-5251

BECKMAN INSTRS., Porterville Plant, 167 W. Poplar Ave., Porterville, Cal., 93257, Tel: 209-784-0800; Plt. Mgr: W. Misko

BECKMAN INSTRS., Process Instrs., 2500 Harbor Blvd., Fullerton, Cal., 92634, Tel: 714-871-4848, TWX: 910-592-1260; Mktg. Mgr: G. Green

BECO SOLID STATE SYSTEMS, Box 686, Salem, Va., 24153, Tel: 703-362-9158; Sls. Mgr: A.T. Ball

Advertisement

BECO Solid State Systems manufactures standard lines of Power Supplies, Signal Sources, and Automotive Electronics. In addition to the standard lines, BECO manufactures CUSTOM power supplies, signal sources, automotive electronics, and various electronic systems, equipment, subassemblies, etched circuit boards, etc. for government, industrial, and consumer application.

BEDFORD DIV., Sanders Assoc., Crosby Rd., Bedford, Mass., 01730, Tel: 603-275-0200, TWX: 710-326-6376; Dir. Mktg: J.Stettner

BEEBE INSTRS., INC., P.O. Box 137, N. White Plains, N.Y., 10603, Tel: 914-761-8637

BEECHWOOD MFG., 360 S. Downey Ave., Indpls., Ind., 46219, Tel: 317-356-2493; Sls. Mgr: R.E. Cox

BEEDE ELECTRICAL INSTR. CO., INC., S. Main St., Penacook, N.H., 03301, Tel: 603-753-6362, TWX: 710-364-6977; Sls. Mgr: Lou Issel ....Pgs. 416,417

Ala	Huntsville, Components Sls., Box 1156	205-539-6973
Ariz	Tempe, Elctrn. Compts., 1000 E. Apache	602-967-8809
Cal	LA, Universal Comp., 2330 Westwood	213-474-1537
Cal	San Carlos, Elctrn. Engrg., 1293 Laurel	415-593-2189
Colo	Denver, Elctrn. Comp. Sls., Box 22011	303-771-0710
Conn	Farmington, R. Perron, 10 Briarwood	203-673-4825
Conn	Trumbull, R. Perron, 36 Louis	203-AM-8-9631
Fla	Ft. Lauderdale, Comps. Sls. Corp., 850 E. Oakland Pk. Blvd.	305-563-1860
Fla	St. Petersburg, Comps. Sls., Box 9545	813-360-7460
Ill	Skokie, Saffro & Assoc., 3736 Dempster	312-JU-8-0905
Iowa	Marion, Thomas & Modrcin, 890 17th	319-377-6261
Kans	Shawnee Mission, Thomas & Modrcin Assoc., Inc., 5450 Buena Vista Dr.	913-HE-2-2131
Mass	Norwood, R. Perron, 159 Morse	617-762-8114
Mich	Detroit, Burcaw, 18236 W. McNichols	313-533-7700
Minn	Mpls, Wenco Sls., 7728 Morgan	612-866-3639
Mo	Hazelwood, Thomas & Modrcin, 47 Vlg.	314-838-6446
NH	Dover, R. Perron & Co., Inc., 1 Elm St.	603-742-2321
NM	Albuquerque, Elctrn. Comp., 1811 Carlisle	505-256-9831
NY	Kingston, Ossman Comp., 411 Wash. Ave.	914-338-5505
NY	Rochester, Osmann Comp., 280 Metro Pk.	716-442-3290
NY	Syracuse, Ossmann Comp., 132 Pickard Bldg.	315-454-4477
NY	Valley Stream, Levison Sls., 66 W. Merrick	516-561-9696
NY	Vestal, Ossman Comp., 1901 Vestal	607-785-9949
NC	Raleigh, Comp., Box 6401	919-832-1897
Ohio	Vandalia, W. Brauer & Assoc., Box 35	513-898-1224
Ohio	Wickliffe, W. Brauer & Assoc., 29300 Euclid	216-943-0601
Okla	Tulsa, Southwest Elctrn. Ind., 2015-C S. Lakewood	918-835-2481
Pa	Devon, B & A Assoc., 237 Lancaster Ave.	215-688-5173
Pa	Pittsburgh, W. Brauer & Assoc., Box 8466	412-921-3213
Tex	Dallas, Southwest Elctrn. Inds., 621 Meadows Bldg.	214-EM-3-1671
Tex	Houston, Southwest Elctrn. Inds., 1405 S. Post Oak	713-621-3760
Utah	Salt Lake Cy., Elctrn. Comp., 445 E. 2nd	801-355-5327
Wash	Seattle, F. Haight, 3212 Eastlake Ave.	206-322-1818

BEEMER ENGRG. CO., Industrial Pk., Ft. Washington, Pa., 19034, Tel: 215-MI-6-8440, TWX: 510-661-1654; Sls. Mgr: J.H. Swartz

BEHLMAN DIV., California Instrs. Co., 5150 Convoy St., San Diego, Cal, 92111, Tel: 714-279-8620; V.P. Mktg: H.W. Clark ....Pgs. 670,671

Ala	Huntsville, Currie Aerospace, Box 1424	205-536-5650
Ariz	Tempe, Recording Science, Box 27806	602-275-1372

Cal Downey, RDP Instrs., 11565-B Paramount 213-923-6784
Cal San Jose, RDP Instrs., 100 N.Winchester 408-248-0120
Colo Littleton, RADCO Elctrns., 2552 Ridge 303-794-4279
Conn Hamden, Applied Meas., Inc., Box 5181 203-288-5288
Fla Orlando, Currie Aerospace, Box 13229 305-855-0843
Ill Rosemont, Cozzens & Cudahy, 9501 W. Devon 312-825-1144
Ind Indianapolis, Cozzens & Cudahy, 647 Mulford Ct. 317-244-2456
Mass Acton, Applied Meas., Inc., Box 316 617-263-2766
Minn Mpls., Cozzens & Cudhay, 7450 France S. 612-920-1022
Mo St. Louis, Cozzens & Cudahy, 10534 Natural Bridge 314-423-1234
NJ Fairfield, KLS Assocs., 387 Passaic 201-227-2900
NJ Hazlet, Mer Mon (2M) Elctrn. Instru., Box 302 201-264-1851
NM Albuquerque, Bennewitz, 9720 Candelaria NE 505-298-6775
NM Albuquerque, Recording Science, 1811 Carlisle NE 505-265-7631
NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314
NC Winston-Salem, Currie Aerospace, Box 10329 919-725-1927
Ohio Medina, Cozzens & Cudahy, 735 South Ct. 216-725-5660
Pa Abington, Bach-Stewart, 947 Old York 215-927-1200
Tex Austin, Sesco, 512 E. Riverside 512-444-6694
Tex El Paso, Recording Science, Box 4033 915-565-5530
Tex Houston, Sesco, 5757 Bellaire 713-668-7840
Tex Richardson, Sesco, 300 N. Central Expwy. 214-231-9364
Va Annandale, Nine Assocs., 7753 Patriot 703-256-9105
Wash Seattle, Datacom Assocs., 2207 Fairview 206-329-2989
For: Can., Downsview, Ont., Electronetic Sys., 62 Alness 416-636-3673
For: Can., Ottawa, Ont., Electronetic Sys., 1342 Bank 613-733-3781
For: Can., Montreal, Que., Electronetic Sys., 6420 Victoria 514-342-4112

BEHLMAN ENGRG. CORP., Box 4518, 427 N. Nopal St., Santa Barbara, Cal., 93103, Tel: 805-963-9019; Sls. Mgr: S. Gancher

BEL FUSE, INC., 203 Van Vorst St., Jersey City, N.J., 07302, Tel: 201-432-0463, TWX: 710-730-5301; Sls. Mgr: A. Sutta ....Pgs. 2734-2738
Cal Burlingame, Leddy, 1319 Howard 415-347-5247
Cal Los Angeles, Universal Comp. Co., 2330 Westwood Blvd. 213-474-1537
Colo Littleton, Alden Sls., 7386 S. Platte 303-794-1531
Conn Norwalk, Eastern Tech. Sls., Box 122 203-846-9133
Ill Chicago, Memac Sls., 4740 N. Austin 312-545-1033
Kans Mission, Inland Assocs., 6047 Howe Dr. 913-362-2366
Mass Newton, QRC Co., 134 Upland Rd. 617-332-9600
Minn Hopkins, Beta Engrg., 128 Jackson 612-938-2551
Mo St. Louis, Inland Assoc., 453 N. Lindbergh 314-993-0301
NM Albuquerque, Alden Sls., 12400 Morrow
NY Hempstead, Kahgan Sls., 556 Peninsula 516-538-2300
NY Pompey, S. Foster, 2806 Hennaberry 315-677-3333
Pa Bala Cynwyd, M. Friedman, 7 Heather 215-839-3450
Tex Addison, Parvin Sls. Co., Box 307 214-239-9148

BEL-TRONICS CORP., 344 W. Interstate Rd., Addison, Ill., 60101, Tel: 312-543-7777; Sls. Mgr: T. Wright

BELDEN CORP., Box 5070-A, Chicago, Ill., 60680, Tel: 312-378-1000, TWX: 910-221-5620; Sls. Mgr: E. Stull

BELDING CHEM. INDS., 1430 Broadway, New York, N.Y., 10018, Tel: 212-CH-4-6040, TWX: 212-640-4690; Sls. Mgr: H.L. Smith

BELFAB, A Unit of Bailey Meter Co., P.O. Box 1881, Daytona Beach, Fla., 32015, Tel: 904-253-0628, TWX: 810-857-0308; Sls. Mgr: E.R. Thompson Sr.

BELL CO., INC., 106 Morrow Ave., Trussville, Ala., 35173, Tel: 205-655-2135; Sls. Mgr: R.C. Bell

BELL, F.W., INC., 4949 Freeway Dr., E., Columbus, Ohio, 43229, Tel: 614-888-7501, TWX: 810-337-2851; Sls. Mgr: R.J. Mackessy ....Pgs. 418,1985
Cal Menlo Park, Straube, 483 Willow Rd. 415-323-2476
Cal Pasadena, P. Nurches, 2396 E. Foothill 213-796-5844
Colo Greeley, G. Moss Elctrns., 1530-13 303-353-1452
Fla Orlando, Physimetrics, 999 Woodcock Rd. 305-841-4956
Ga Atlanta, Physimetrics, 3376 Peachtree, N.E. 404-237-8278
Ill Chicago, Carter Elctrns., 4919 W. 63 St. 312-585-5485
Ind Indianapolis, Carter Elctrns., 6333 Hollister 317-293-0696
Mass Waltham, Elctrn. Comp., 611 Trapelo 617-894-6921
Mich Detroit, WKM Assocs., 1474 E. Outer Dr. 313-892-2500
Minn Mpls., Carter Elctrns., 2401 W. 66th St. 612-869-3261
Mo St. Louis, Carter Elctrns., 400 Brook Dr. 314-731-2237
NM Albuquerque, G. Moss Elctrn., 2418 Barcelona, S.W. 505-345-1251
NY Mamaroneck, Cane Tech., 555 E. Boston Post 914-698-4411
NY Syracuse, Labtronics, Inc., 161 Pickard Bldg.
Ohio Cleveland, Weschler Elec., 4250 W. 130th 216-251-4609
Ohio Cleveland, WKM Assocs., 16141 Puritas 216-267-0445
Ohio Dayton, WKM Assocs., 5335 Far Hills 513-434-7500
Pa Paoli, Tyler Griffin Co., 46 Darby Rd. 215-644-7710
Pa Pittsburgh, WKM Assocs., 90 Clairton 412-892-2953
Tex Ft. Worth, Carey-Wolf, 3327 Winthrop 817-738-1702
Tex Houston, Carey-Wolf Co., 4031 Broadway 713-643-2114
Wisc Milwaukee, Carter Elctrn., 6400 W. Capitol 414-464-5555
EXP: NY, NY, J. Plasencia, 521 Fifth Ave. 212-867-8084
For: Can, Toronto, Ont., Megatronix, 1800 Ave. 416-783-3329

BELL FASTENERS CORP., 352 Evelyn St., Paramus, N.J., 07652, Tel: 201-262-8400, TWX: 710-990-6616; Sls. Mgr: W.P. Hackett

BELL & HOWELL CO., Elctrns. & Instr. Grp., 360 Sierra Madre Villa, Pasadena, Calif., 91109, Tel: 213-796-9381, TWX: 213-577-0067

BELL & HOWELL CO., Transducer Div., 1400 S. Shamrock St., Monrovia, Calif., 91016, Tel: 213-796-9381; Dir. Mktg: T.W. Buirley

BELL P/A PRODS. CORP., 1200 N. Fifth St., Columbus, Ohio, 43201, Tel: 614-299-1487; Sls. Mgr: P. Cartmille

BELLAIRE ELCTRNS. INC., 81 Main St., Farmingdale, N.J., 07727, Tel: 201-938-5621

BELLEVILLE ELCTRNS. CO., 25 Fifth St., Belleville, Mich., 48111, Tel: 313-697-9227; Sls. Mgr: T.R. Scothorn

BELLOFRAM CORP., 103 Blanchard Rd., Burlington, Mass., 01803, Tel: 617-272-2100; Sls. Mgr: J.L. Diegnan

BELTONE ELECTRONICS CORP., 4201 W. Victoria, Chicago, Ill., 60646, Tel: 312-583-3600; Sls. Mgr: B. Wofford, Jr.

BEMAN MFG., INC., New Cumberland, Pa., 17070, Tel: 717-938-1451, TWX: 510-650-3539; Sls. Mgr: J.S. Newell

BENCO TELEVISION ASSOC., Div. Redifon (Can.), Ltd., 27 Taber Rd., Rexdale, Ont., Can., Tel: 416-743-4361; Sls. Mgr: W.H. Seeley

BENDIX AEROSPACE-ELCTRNS., Navigation & Control, Teterboro, N.J., 07608, Tel: 201-288-2000, TWX: 201-288-4550; Sls. Dir: E. Metzler

BENDIX CORP., Aerospace Sys. Div., 3300 Plymouth Rd., Ann Arbor, Mich., 48107, Tel: 313-665-7766, TWX: 810-223-6041; Dir. Prod: B. Maddalena

BENDIX, Automation & Meas., 721 Springfield St., Dayton, Ohio, 45401, Tel: 513-254-5377, TWX: 513-944-0406; Dir. Mktg: L. Reichbauer

BENDIX, Cutting Tool, 180 Laurel St., Greenfield, Mass., 01301, Tel: 413-774-4336, TWX: 510-290-2460; Mktg. Mgr: J.W. Constance

BENDIX, Elec. Power, Hwy. 35, Eatontown, N.J., 07724, Tel: 201-542-2000, TWX: 710-722-6686; Sls. Dir: N.P. Barny

BENDIX CORP., Elec. Comp. Div., Sidney, N.Y., 13838, Tel: 607-563-9511, TWX: 510-261-7550; Sls. Mgr: F.N. Bulken

BENDIX, Electro-Optics, 1975 Green Rd., Ann Arbor, Mich., 48107, Tel: 313-663-3311, TWX: 810-223-6029; Sls. Mgr: C.V. Johnson

BENDIX ENVIRONMTL. SCI., 1400 Taylor Ave., Dept. 81, Baltimore, Md., 21204, Tel: 301-825-5200, TWX: 710-232-1805; Prod. Mgr: C.W. Barbour ....Pg. 336
EXP: N.Y., New York, Bendix Corp., 605 Third Ave.
For: Can., Montreal, Que., Aviation Elec. Ltd., Box 2140, St. Laurent 514-744-2811

BENDIX, Flight & Eng. Instrs., S. Montrose, Pa., 18843, Tel: 717-278-1161, TWX: 510-656-3569; Sls. Mgr: R.F. Henry

BENDIX, Fluid Power, 211 Seward Ave., Utica, N.Y., 13503, Tel: 315-797-2500, TWX: 510-242-0284; Dir. Mktg: B.W. Goldberg

BENDIX, Ind'l. Controls, 12843 Greenfield, Detroit, Mich., 48227, Tel: 313-272-3710, TWX: 810-243-4028; Dir. Mktg: J. Price

BENDIX CORP., Instr. & Life Support Div., 2734 Hickory Grove Rd., Davenport, Iowa, 52808, Tel: 319-324-9101, TWX: 319-322-0022; Sls. Mgr: I.H. MacMillan

BENDIX, Microwave Devices, Box 239, Franklin, Ind., 46131, Tel: 317-736-6136, TWX: 810-260-2600; Sls. Mgr: W.H. Canfield ....Pgs. 1555,2597,2756
Ala Birmingham, Tech. Mktg., Box 5971 205-871-5431
Cal No. Hollywood, Jewett, 13111 Ventura 213-789-8103
Cal Oakland, F.W. Moulthrop, 1530 E. 12th 415-261-7676
Colo Denver, Gossard, 12159 W. Dakota 303-985-0602
Conn No. Haven, Forsberg Sls., 22 Broadway 203-239-5111
Fla Hallandale, Tech. Mktg., Box 127 305-563-8585
Fla Orlando, Tech. Mktg., 1511 E. Robinson 305-843-2500
Ga Marietta, Tech. Mktg., Box 1152 404-435-0079
Ill Chicago, Comms. Engrs., Inc., 7106 N. Western Ave. 312-761-0548
Ind Ft. Wayne, Comms. Engrs., 418 E. Berry 219-743-9866
Mass Brockton, Forsberg Sls., 646 Summer St. 617-522-6300
Minn Minneapolis, F.B. Hill Co., 7317 Cahill Rd. 612-941-5270
NJ Montclair, L. Freeman, 484 Bloomfield 201-746-5200
NY E. Aurora, Harries & Kershaw, 654 Main 716-652-1221
Ohio Dayton, Comms. Engrs., 34 N. Clinton 513-434-6871
Ore Portland, C.K. Shanks, 3176 S.W. 87th 503-292-5656
Tex Dallas, J. McKinney Sls., 1303 Chemical 214-631-9450
Va Fairfax, Schibley, 10604 Warwick 703-591-3008
EXP: N.Y., N.Y., Bendix Int'l., 605 3rd Ave. 212-246-5900
For: Can., Hamilton, Ont., Simmonds Aerocessories of Can., Ltd., 637 Parkdale Ave., N. 416-547-1248

BENDIX, Mosaic Fabrications, Galileo Pk., Sturbridge, Mass., 01518, Tel: 617-347-9191, TWX: 710-347-1190; Sls. Mgr: J.M. O'Neil

BENDIX, Motor Comps., Elmira, N.Y., 14903, Tel: 607-733-9121, TWX: 510-252-1594; Sls. Mgr: R.D. Sanderson

Advertisement

Bendix manufactures a complete line of electric clutches and brakes from 32 oz. in. to 12,000 lb. ft., sizes from 7/8 inches in diameter to nearly 3 feet and applications from business machines to steel mills. Bendix specializes in small clutches for the OEM.

BENDIX, Scientific Instrs. & Equip., 1775 Mt. Read Blvd., Rochester, N.Y., 14615, Tel: 716-458-2550; Dir. Mktg: E. Dohring

BENNETT LABORATORIES, INC., 5800 Christie, Emeryville, Calif., 94608, Tel: 415-655-9696; Sls. Mgr: R. Fisher

BENTHOS, INC., Edgerton Dr., N. Falmouth, Mass., 02556, Tel: 617-563-5917; Sls. Mgr: S.O. Raymond

BENTLEY-HARRIS MFG. CO., 1050 Colwell La., Conshohocken, Pa., 19428, Tel: 215-828-7600, TWX: 510-660-8829; Mktg. Mgr: M. Nakonechny

BERG ELCTRNS., INC., York Expwy., New Cumberland, Pa., 17070, Tel: 717-938-6711, TWX: 510-650-3538; Fld. Sls. Mgr: R. Petersen ....Pgs. 2592-2595
Cal Encino, 18075 Ventura Blvd. 213-881-4406
Ill Elmhurst, 608 N. York 312-832-2050
Ind Indpls., 7407 Glenview Dr., E. 317-849-4905
NH Amherst, Box 583 603-673-5881

BERGEN LABS., INC., 60 Spruce St., Paterson, N.J., 07501, Tel: 201-278-3020; Dir. Mktg: A.J. Lynn

BERGEN WIRE ROPE CO., 1234 Gregg St., Lodi, N.J., 07644, Tel: 201-487-3521

BERK TEK, INC., Box 60, RD 1, Reading, Pa., 19607, Tel: 215-376-8071; Pres: J.L. Boscov

BERKELEY NUCLEONICS CORP., 1198 Tenth St., Berkeley, Calif., 94710, Tel: 415-527-1121; Sls. Mgr: M. Brown

BERKLEY & CO., Spirit Lake, Iowa, 51360, Tel: 712-336-1520; Sls. Mgr: D. Newbiggin

BERKSHIRE ELEC. CABLE CO., Leeds, Mass., 01053, Tel: 413-584-3853; Sls. Mgr: G.R. Fields

BERKSHIRE TRANSFORMER CORP., Rte. 341, Kent, Conn., 06757, Tel: 203-927-3541; Sls. Mgr: B.R. Hordeski

BERTAN ASSOCS., INC., 15 Newtown Rd., Plainview, N.Y., 11803, Tel: 516-293-5340; Sls. Mgr: L. Bertan

BEST ELECS. DIV., Harry Levinson Co., 1211 E. Denny Way, Seattle, Wash., 98122, Tel: 206-323-5100, TWX: 910-444-2154; Sls. Mgr: H. Levinson

Advertisement

Best Electric Div. supplies a full range of Vacuum Thermocouples for use in measuring True RMS. Both Standard Pattern and UHF models available off the shelf. Matched Pairs and Specials available at extra cost.
Watch for Multijunction announcement soon.

BEST MFG. CO., 3214 Troost, Kansas City, Mo., 64109, Tel: 816-531-6611; Sls. Mgr: B. French

BETA INSTR., 20 Ossipee Rd., Newton Upper Falls, Mass., 02164, Tel: 617-969-6510; Sls. Mgr: M.J. Gallant Pg. 337

Cal Mt. View, IFM-North, 2269 E. Middlefield 415-961-2828

Cal Pasadena, A-F Sales Engrg., Inc., 1000 E. Walnut St. 213-681-5631

Fla Melbourne, Hanson Assocs., Box 26 305-727-7474

Ill Chicago, Comm. Eng., 7106 N. Western 312-761-0548

Mass Burlington, Research Instrs., 87 Terrace Hall Ave. 617-272-1800

NJ Teaneck, Budd-Tronics, 71 Grayson Pl. 201-837-1660

NY Schenectady, N.W. Alexander, Box 2529 518-377-0581

Pa Phila., ECI, Inc., 1349 W. Cheltenham 215-927-6262

Tex Dallas, Mfrs. Mktg. Service, 10303 Carry Back 214-357-6893

Tex Houston, Mfrs. Mktg. Service, 6306 Schevers 713-645-3581

BETAMITE ELECTRONIC DEVICES, 6321 W. Slauson Ave., Culver City, Calif., 90230, Tel: 213-390-3401, TWX: 910-343-7408; Pres: S.J. Adler ....Pg. 1660

Ariz Scottsdale, J. Swanson Assocs., Box 172 602-947-4379

Ariz Scottsdale, Klein Aerospace, Box 3244 602-274-6682

Cal Escondido, Andrew Elctrn. Comps., Box 2154 714-747-3015

Cal Los Angeles, C.E. Holmes, 107 N. Avenue'64 213-256-2255

Colo Englewood, Klein Aerospace, Box 1056 303-781-4967

Conn W. Hartford, Victor Assocs., 893 Farmington Ave. 203-523-5680

Fla Palm Bch. Gardens, Trainor Sls., 10475 Riverside Dr. 305-622-1383

Ind Greenwood, Valentine-Schillinger, Box 242 317-881-3547

Ind South Bend, Valentine-Schillinger, 5231 S. North Lee Ct. 219-291-6258

Md Baltimore, B. White, 7 Church La. 301-484-5400

Mass Framington, Victor Assocs., 280 Worcester Rd. 617-879-5710

Minn St. Paul, Northport Engrg., 2027 Grand Ave. 612-698-3841

Mo St. Louis, Hitt & Assocs., 9623 St. Charles Rock 314-426-2322

NY Hyde Pk., R. Kennedy, Green Tree Dr. N. 914-229-2269

NY Rochester, R. Kennedy, 39 Saginaw Dr. 716-271-6322

NY Scarsdale, Bassin Tech. Sls., 52 Fayette 914-SC3-3334

Ohio Dayton, Aertronic Assocs., 5899 Huberville 513-253-8144

Okla Tulsa, Allied Comps., Box 4768 918-939-2848

Pa King of Prussia, Monteiro Assocs., 600 Lewis Rd. 215-265-0634

Tex Dallas, Allied Comps., Box 38009 214-348-6660

Tex Houston, Allied Comps., 6400 Westpark Dr. 713-783-5406

Wash Bainbridge Island, Viking Sls., 59 Bill Point 206-VI2-5611

BETZELT GMBH, D-8 Muenchen 80, Trogerstr. 32, W. Germany, Tel: 0811-44-30-30, TWX: 47-47-30; Sls. Mgr: W. Betzelt

Advertisement

BETZELT, well-renowned in its field, is an expanding engineering-oriented company producing specialized avionics equipment, simulator instruments, precision altitude and airspeed transducers for autopilots, wind computers, digital cloud coverage measuring systems, radiosondes, high precision temperature and humidity indicators, two-axis servo tripods, synchro angle indicators and other servo instruments. New additions to product line include electromedical equipment, servo controls for nucleonics, optical coatings.

BEUKERS LABS., INC., 1324 Motor Pkwy., Hauppauge, N.Y., 11787, Tel: 516-234-2200; Sls. Mgr: J.H. Shanley

BEVIN-WILCOX LINE CO., Div. Brownell & Co., Inc., Moodus, Conn., 06469, Tel: 203-267-2414; Sls. Mgr: J.C. Turner

BF ELCTRNS., 415 S. Nardo, Solana Beach, Calif., 92075, Tel: 714-755-1881

BFC-BERNARD FRANKLIN CO., 4045 Torresdale Ave., Phila., Pa., 19124, Tel: 215-JE-3-4500; Sls. Mgr: R. Bernard

B.H. INDS., 5794 Venice Blvd., Los Angeles, Cal., 90019, Tel: 213-937-4763; Sls. Mgr: D. Senit

Advertisement

SOME OF OUR PRODUCTS INCLUDE...
*DC to DC or DC to AC Converters
*Time Delay Modules
*Thermocouple Meters
*Custom Digital Displays
*Fail-Safe Power Systems
For special product requirements, write, call or visit B.H. Industries. (213) 937-4763

BICRON ELCTRNS. CO., Box 807, Barlow St., Canaan, Conn., 06018, Tel: 203-824-5125; Adv. Mgr: M.J. Biron

Advertisement

BICRON's new line of solenoids includes the BOX FRAME series-BF1009, BF1212 and BF1616 AC or DC. Also custom designed solenoids to your requirements. BICRON also specializes in coil assembly and toroidal winding work. The instrument division produces X-ray noncontact thickness gages, Multipulse, and square wave generators.

BIDDLE, JAMES G., Jolly Rd., Plymouth Meeting, Pa., 19462, Tel: 215-646-9200 ....Pg. 419

Ala Huntsville, Col-Ins-Co., Inc., Box 4246 205-539-1771

Ariz Phoenix, Hyer Assocs., 3003 N. Central Ave. 602-275-7542

Cal Burbank, Tech-Ser, Inc., 2435 Naomi St. 213-846-9631

Cal Palo Alto, Tech-Ser., Inc., 800 San Antonio Rd. 415-326-6400

Cal San Diego, Tech-Svc., Inc., Box 10544 714-222-1121

Colo Denver, D.E. Bond Assoc., 2149 S. Clermont St. 303-756-1234

Colo Denver, Hyer Assocs., 2335 S. Inca St. 303-935-4681

Fla Orlando, Col-Ins-Co., Inc., 1313 - 44th St. 305-423-7615

Ga Atlanta, O.V. Scott, Jr. & Assoc., 305 Techwood Dr., N.W. 404-523-0927

Ga Marietta, Col-Ins-Co., Inc., 200 Carrington Way 404-422-8327

Ill Chicago, K.W. Meyers Co., 7256 W. Touhy Ave. 312-774-6440

Ill Geneva, J.G. Biddle Co., Box 408 312-232-8485

Ind Indianapolis, K.W. Meyers Co., 3512 Rockville Rd. 317-243-6681

La New Orleans, Butler & Land, Inc., 1067 Magazine St. 504-524-0688

Md Silver Spring, Sel-Tronics, Inc., 721 Ellsworth Dr. 301-588-7866

Mass Needham Hgts., Cowperthwait & Brodhead, 570 Hillside Ave. 617-444-9410

Mich Royal Oak, Satullo Co., 4514 N. Woodward Ave. 313-549-3910

Minn Minneapolis, K.W. Meyers Co., 4725 Excelsior Blvd. 612-920-7080

Mo Kansas City, C.B. Fall Co., 11301 Bennington St. 816-761-6545

Mo St. Louis, C.B. Fall Co., 317 North 11th St. 314-241-2433

NJ Saddlebrook, L & M Assoc., 511 Victor St. 201-843-8700

NM Albuquerque, Hyer Assocs., 6401 Acoma, S.E. 505-265-5961

NY Brentwood, L & M Assoc., 7 Mayflower Ct. 516-231-8363

NY Rochester, Savage Sls. Co., Box 8425 716-473-4205

NC Charlotte, Ranson, Wallace & Co., Inc., 116-1/2 E. 4th St. 704-334-4244

NC Winston-Salem, Col-Ins-Co., Inc., Box 5597 919-765-3650

Ohio Cleveland, P.E. Lax Co., 13945 Lake Ave. 216-226-8815

Okla Tulsa, Butler & Land, 1560 E. 21st St. 918-743-8921

Ore Portland, Instr. Lab., Inc., 1316 S.E. 7th Ave. 503-234-6683

Pa Andalusia, L & M Assoc., 965A Bristol Pike 215-639-3100

Pa Pittsburgh, P.E. Lax Co., 1725 Washington Rd. 412-833-5477

Tenn Memphis, Butler & Land, Inc., 3181 Poplar Ave. 901-452-0039

Tex Dallas, Butler & Land, Inc., Box 8085 214-361-6631

Tex Houston, Butler & Land, Inc., 9186 Old Katy Rd. 713-464-3838

Tex Lubbock, Butler & Land, Inc., 4009 Ave. "R" 806-744-8449

Utah Salt Lake City, Hyer Assocs., 2896 S. Main 801-487-7747

Va Richmond, Virginia Tech. Assoc., Inc., Box 9524 703-266-9654

Wash Seattle, Instr. Lab., Inc., 934 Elliott Ave., S. 206-283-5850

Wisc Milwaukee, K.W. Meyers Co., 4359 S. Howell Ave. 414-482-1313

BIMET CORP., Box 518, Morris, Ill., 60450, Tel: 815-942-2600; Sls. Mgr: J.A. Peterson

BINARY ELCTRNS. OF CAL., 1429 N. State College Blvd., Anaheim, Calif., 92806, Tel: 714-772-3070; Sls. Mgr: P. Frink

BIO-MEDICAL ELCTRNS., INC., 653 Lofstrand La., Rockville, Md., 20850, Tel: 301-762-8373; Sls. Mgr: A.L. Klein

BIOCOM, INC., 9522 W. Jefferson Blvd., Culver City, Cal., 90230, Tel: 213-836-7263; Sls. Mgr: R. Neustein

BIOELECTRIC INSTRS., Div. Gen. Microwave, 155 Marine St., Farmingdale, N.Y., 11735, Tel: 516-694-4545; Sls. Mgr: H. Cohen

BIOMATION CORP., 1070 E. Meadow Cir., Palo Alto, Cal, 94303, Tel: 415-321-9710; Mktg. Mgr: Frank Wezniak

BIONIC INSTRS., INC., 221 Rock Hill Rd., Bala Cynwyd, Pa., 19004, Tel: 215-839-3250; Sls. Mgr: J.M. Benjamin, Jr.

BIOTRONICS, INC., Sub. Gulton Inds., 838 Butte St., Redding, Cal., 96001, Tel: 916-243-5047; Sls. Mgr: H.D. Miller

BIRD ELCTRN., 30303 Aurora Rd., Cleveland, Ohio, 44139, Tel: 216-248-1200, TWX: 216-248-6458; Sls. Mgr: R.E. Neitzelt ....Pgs. 420,421

Cal Encino, Bird Elctrn. Corp., 16000 Ventura Blvd. 213-986-4321

Cal San Francisco, Bird Electronic Corp. 415-568-1110

Fla Altamonte Springs, Bird Elctrn. Corp., 703 Beverly Ave. 305-831-1530

Iowa Cedar Rapids, Bird Elctrn. Corp., 611 Higley Bldg.

Mass Waltham, Bird Elctrn. Corp., 235 Bear Hill Rd. 617-899-4162

Pa Lancaster, Bird Elctrn. Corp., 56 N. Duke St. 717-394-3735

Tex Dallas, Bird Elctrn. Corp., 9422 Timberline Dr. 214-358-3774

BIRD, RICHARD H. & CO., INC., 1 Spruce St., Waltham, Mass., 02154, Tel: 617-894-0160; Sls. Mgr: R.J. Cameron

BIRNBACH CO., INC., 177 Hanse Ave., Freeport, N.Y., 11520, Tel: 516-223-8400; Sls. Mgr: J.E. Myers

BIRTCHER CORP., Ind'l. Div., Box D, Monterey Park, Cal., 91754, Tel: 213-268-8584, TWX: 910-321-3076; Sls. Mgr: W. K. Jacobs

BISHOP GRAPHICS, 7300 Radford Ave, No. Hollywood, Cal., 91605, Tel: 213-982-2000; Sls. Mgr: R.T. King

BISSETT-BERMAN, 3860 Centinela Ave., Los Angeles, Cal., 90066, Tel: 213-390-3585, TWX; 910-343-6583; Dir. Sls: M.A. Williams ....Pg. 1314

BISSETT-BERMAN, 3939 Ruffin Rd., San Diego, Cal., 92112, Tel: 714-278-6500; Sls. Mgr: P.C. Stahl

BIVAR, INC., 1500 S. Lyon St., Santa Ana, Cal., 92705 Pg. 2809

Cal Long Beach, Premmco/Ph, 3351 59th St. 213-636-9205

Cal Palo Alto, Premmco/Ph, 999 Commercial St. #7 415-628-5250
Cal San Diego, Premmco/Ph, Box 7336 714-222-9424
Ill Chicago, Kennedy Engr., 6713 N. Oliphant A. 312-631-8283
Minn Mpls., Thurston Assocs., 2727 Lyndale Ave. S. 612-827-1506
Pa Elkins Pk., K.B. Erdman, 7906 Montgomery Ave. 215-244-1833
Tex Dallas, Elcom Co., Box 20313 214-352-5006
Wash Seattle, Blum & Assocs., 2300 N.W. 97th St. 206-782-1600
EXP: Schenectady, N.Y., Elbar Elctrns., Box 660 518-372-5841
For: Can., Scarborough, Ont., Lake Engr., 123 Manville 416-751-5980
For: Can., St. Laurent, Que., Lake Engr., 3380 Toupin 514-331-4884

BLACK & DECKER MFG. CO., THE, 701 E. Joppa Rd., Towson, Md., 21204, Tel: 301-828-3900; V.P. Prof. Div: P. McDonough

BLACK LIGHT CORP. AMER., 5114 Walnut Grove Ave., San Gabriel, Cal., 91778, Tel: 213-285-3123; Sls. Mgr: P.B. Warren

BLACK LIGHT EASTERN, 29 New York Ave., Westbury, N.Y., 11590, Tel: 516-ED-3-4840; Sls. Mgr: M.R. Cooper

BLACK LIGHT PRODS., Box 45278, Chicago, Ill., 60645, Tel: 312-561-4046; Sls. Mgr: J. Richardson

BLACK & WEBSTER, INC., 281 Winter St., Waltham, Mass., 02154, Tel: 617-891-8100, TWX: 710-324-1959; Sls. Mgr: J.E. Barber

BLACKHAWK NETWORKS CORP., 14 N. Parker Dr., Janesville, Wisc., 53545, Tel: 608-752-8701; Sls. Mgr: R.W. Brandt

Advertisement

BLACKHAWK specializes in custom Bandpass and SSB crystal filters. We have probably supplied filters similar to your requirement in the past 13 years. Samples to your specifications in 4 weeks are routine at BLACKHAWK.

BLAKE ELECTRONICS, INC., Muskego, Wisc., 53150, Tel: 414-422-0040; Sls. Mgr: J.A. Blake

Advertisement

Blake Electronics is a designer and manufacturer of Special Purpose Electronic Controls and Monitoring Systems. BEI will develop a high quality electronic system for your product or process. Quantities of 1 to 100,000 at OEM prices.

BLAND CO., Prec. Threaded Prods. Div., 95 Granby St., Bloomfield, Conn., 06002, Tel: 203-242-0755; Sls. Mgr: J. Livingston

BLH ELCTRNS., INC., Sub. Baldwin Lima Hamilton Corp., 42 Fourth Ave., Waltham, Mass., 02154, Tel: 617-894-6700, TWX: 710-324-0683; Sls. Mgr: R.A. Welch

BLICKMAN, S., INC., 201 Gregory Ave., Weehawken, N.J., 07087, Tel: 201-UN-3-0800; Sls. Mgr: T.B. Lanahan

BLILEY ELECTRIC, 2545 W. Grandview Blvd., Erie, Pa., 16512, Tel: 814-838-3571, TWX: 510-696-6886; Sls. Mgr: G.E. Wright ....Pgs. 1367-1372,2733

Cal L.A., Elsner-Rambo, 2526 Hyperion 213-664-2928
Fla Melbourne, Hanson Assocs., Box 26 305-727-7474
Ill Hinsdale, Hill-Gray, 2 Salt Creek La. 312-325-4810
Iowa Cedar Rapids, J. Vrbik, 3-50th St., N.E. 319-377-8244
Mass Chestnut Hill, P. Sturgeon, 1330 Boylston 617-734-7710
NY Buffalo, R. Mitscher, 496 Ellicott Sq. Bldg. 716-854-2517
NY Elmont, F. Schmitt, 311 Meacham 516-437-8150
Ohio Columbus, McFadden Sls., 150 E. Broad 216-221-3363
Ore Portland, C.K. Shanks, Box 25375 503-292-5656
Pa Pittsburgh, R.E. Tanner, 486 Broadmoor 412-561-4687
Tex Grand Prairie, Howell Sls., Box 747 214-262-5153
EXP: N.Y., Roslyn, Telesco Int'l., 1044 Northern 516-484-4920
For: Can, Winnipeg, Man., Smith-Paterson, 1550 Erin 204-774-1855

SPECIAL REPRESENTATIVES FOR ULTRASONIC DELAY LINES:

Md Laurel, J. J. Wild, Inc., 380 Main St. 301-776-7670
Mass Needham, J. J. Wild, 570 Hillside Ave. 617-444-2366
NJ Mountainside, J. J. Wild, Box 1217 201-654-3272
NY Hastings on Hudson, J. J. Wild, Box 266 914-963-3803
NY Jericho, J. J. Wild, 400 Jericho Tpke. 516-935-6600
Pa Southampton, J. J. Wild, 80 Second St. Pike 215-357-6645
EXP: Conn., Stamford, Dage Corp., 757 Main 203-324-3123

BLISS ELCTRN. CORP., Box 366, Sussex, N.J., 07461, Tel: 201-875-3800; Sls. Mgr: F. Colonna

BLOC-LITE, See LVC Inds. Inc.

BLOCKSOM & CO., Box 300, Michigan City, Ind., 46360, Tel: 219-TR-4-3231, TWX: 810-296-3982; Sls. Mgr: C.F. Westman

BLONDER-TONGUE LABS., INC., One Jake Brown Rd., Old Bridge, N.J., 08857, Tel: 201-679-4010; Dir. of Mktg: I.S. Blonder

BLU-RAY INC., 2923 Westbrook Rd., Essex, Conn., 06426

BLUDWORTH MARINE DIV., States Elctrns. Corp., 10 Adams St., Linden, N.J., 07036, Tel: 201-925-8650; Sls. Mgr: A. Stiansen

BLUE M ENGRG. CO., Div. Blue M Electric Co., 138th & Chatham St., Blue Island, Ill., 60406, Tel: 312-385-9000, TWX: 910-689-3398; Sls. Mgr: A. Lazzara ....Pg. 389

Ariz Scottsdale, 7244 E. Indian School Rd. 602-947-7026
Cal El Monte, 9650 Telstar Ave. 213-442-6672
Cal Los Altos, 4898 El Camino Real 415-969-9384
Conn Milford, 1340 Boston Post Rd. 203-878-5937
Ga Atlanta, 2989 N. Fulton Dr., N.E. 404-237-7644
Mass Framingham, 51 New York Ave. 617-235-8320
Mich Oak Park, 21590 Greenfield Rd. 313-399-4660
NY New Rochelle, 271 North Ave. 914-632-1465
Ohio Cincinnati, 1821 Summit Rd. 513-821-6278
Pa Ardmore, 219 E. Lancaster 215-649-1448
Tex Garland, 2301 Forest La. 214-272-2509
Wash Seattle, 1836 Westlake Ave., N. 206-282-0606

BLUM, JULIUS & CO., INC., Box 292, Carlstadt, N.J., 07072, Tel: 201-438-4600, TWX: 710-989-0112

BODINE ELEC. CO., 2542 W. Bradley Pl., Chicago, Ill., 60618, Tel: 312-478-3515; Sls. Mgr: H.M. Fulmer Pg. 1581

Cal Los Angeles, C.E. Mello, 406 S. Main St. 213-626-9159
Cal San Francisco, J. F. Cady, 1485 Bayshore Blvd. 415-467-8656
Mass Bedford, F. Olson & Son, 30 Shawsheen Ave. 617-275-7644
Mich Grosse Ile, Miller & Miller, Box 36 313-386-0900
Minn Minneapolis, E. R. Kaye, 1840 Major Dr. 612-588-2821
NY Buffalo, S.E. Shea & H.H. Cardozo, 3871 Harlem Rd. 716-834-3377
NY New York, D. V. Mayorga, 55 W. 42nd St. 212-565-2841
NY Rochester, J. F. Serr, 3700 East Ave. 716-586-6226
NY E Syracuse, R. H. Nichols, 6666 Old Collamer Rd. 315-437-2813
Ohio Chagrin Falls, D.E. DeWolf, 17877 Lost Trail Dr. 216-543-1591
Ore Portland, Donal Co., Box 19013 503-246-3131
Tex Dallas, General Power Equip. Co., 6770 Twin Hills 214-368-4655
Tex Houston, General Power Equip. Co., 4507 San Jacinto 713-524-1895
Va Lynchburg, Electro Mechanical Handling, Inc., 450 Oakley Ave. 703-847-6611
EXP: N.Y., New York, Export Dept.-Bodine, 55 W. 42nd St. 212-239-8540

BODNAR PRODS. CORP., 30 Grove Ave., New Rochelle, N.Y., 10801, Tel: 914-636-4664; Pres: J. Hebron

BOEHME, H.O., INC., 45 S. Service Rd., Plainview, N.Y., 11803, Tel: 516-293-6800; Sls. Mgr: R. Reinhardt

BOGEN DIV., Lear Siegler, Inc., P.O. Box 500, Paramus, N.J., 07652, Tel: 201-343-5700, TWX: 201-488-8109; Pres: J.T. Morgan

BOGUE ELEC. MFG. CO., 52 Iowa St., Paterson, N.J., 07509, Tel: 201-525-2200; Sls. Mgr: T.C. Spencer

BOLT BERANEK & NEWMAN, Data Equipment Div., 1762 McGaw Ave., Santa Ana, Calif., 92705, Tel: 714-546-5300; Sls. Mgr: S.H. Zuck ....Pg. 587

Ala Huntsville, W.A. Brown Instrs., 1314 Buford 205-539-6884
Ariz Phoenix, Moxon Elctrns., 15 N. 40th 602-273-7363
Cal Los Angeles, Moxon Elctrns., 2311 Pontius 213-272-9311
Cal San Diego, Moxon Elctrns., 2054 Garnet 714-274-6595
Cal Sunnyvale, Moxon Elctrns., 1259 Birchwood 408-734-4352
Colo Denver, F. Gates Co., 700 E. Louisiana 303-722-4674
Conn W. Hartford, Instr. Dynamics, 345 Main 203-233-5503
Fla Ft. Lauderdale, W. Brown Instrs., 961 N.W. 53rd 305-564-6000
Fla Orlando, W. Brown Instrs., 222 Weber 904-243-6424
Ga Tucker, W. Brown Instrs., 1682 Weymouth 404-939-1674
Ill Chicago, K.W. Meyers, 7256 W. Touhy 312-774-6440
Ind Indpls., K. Meyers Co., 3512 Rockville 317-243-6681
Md Silver Spring, Gawler-Knoop Co., 10 Old Post Office Rd. 301-589-4406
Mass Wakefield, Instr. Dynamics, Lakeside Off. Pk., #7 617-245-5100
Mich Farmington, Carter, McCormic & Peirce, 23995 Frwy. Pk. 313-477-7700
Minn Mpls., K. Meyers Co., 4725 Excelsior 612-920-7080
NJ Roseland, Gawler-Knoop Co., 14 Beaufort 201-226-4545
NM Albuquerque, F. Gates Co., 2631 Texas 505-298-1875
NY Syracuse, Labtronics, Inc., 130 Pickard Bldg. 315-454-9314
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain Rd. 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster 513-278-5873
NC Winston-Salem, W. Brown Instrs., 1108 Burke 919-725-5384
Tex Houston, Scientific Sls., 6400 Westpark 713-781-2711
Tex Richardson, Scientific Sls., 777 S. Central Expwy. 214-231-6541
Utah Salt Lake City, Scientific Sls., 455 E. 4th South 801-359-1101
Wash Seattle, Arva, Inc., 1320 Prospect 206-622-0177

BOMAC ELCTRNS., INC., 18755 Napa St., Northridge, Cal., 91324, Tel: 213-886-2161; Sls. Mgr: R.B. McKnight

BOWMAR/ALI, INC., Sub. Bowmar Instr. Corp., 531 Main St., Acton, Mass., 01720, Tel: 617-263-7756, TWX: 710-347-1441; Sls. Mgr: J.R. Mahoney

BOOKER & WALLESTAD, 1324 S. 5th St., Hopkins, Minn., 55343, Tel: 612-935-8871; Sls. Mgr: E. Ostergard

(Refer to Thermotech Coil Forms & Components Div. for sales representatives.)

BOONTON ELCTRNS., Rte. 287 & Smith, Parsippany, N.J., 07054, Tel: 201-887-5110, TWX: 710-986-8241; Mktg. Mgr: F. Stevens ....Pgs. 422,423

Ala Huntsville, J. Highsmith, 3322 S. Memorial 205-881-3294
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd 602-253-6104
Cal N. Hollywood, O'Halloran, 10700 Ventura 213-877-0173
Cal Palo Alto, O'Halloran, 3921 E. Bayshore 415-326-1493
Cal San Diego, O'Halloran, 3760 Midway 714-224-2824
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
Conn Hamden, Scientific Devices, 2315 Whitney 203-248-9361
Fla Orlando, J. Highsmith, 2543 Ind'l. Blvd. 305-293-5202
Ill Chicago, K. Meyers, 7256 W. Touhy 312-774-6440
Ind Indpls., K.W. Meyers, 3512 Rockville 317-243-6681
Iowa Cedar Rapids, Engrg. Svcs., 1026 Third 319-366-1591
Kans Prairie Vlg., Engrg. Svcs., 7924 A State Line 913-649-4000
Md Silver Spg., Sel-Tronics, 721 Ellsworth 301-589-3391
Mass Wakefield, Scientific Devices - N.E., 591 North Ave. 617-246-0920
Mich Ypsilante, Micro Sls., 650 Greenlawn 313-482-1229
Minn Mpls., K.W. Meyers, 4725 Excelsior 612-920-7080
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NJ Englewood, Scientific Devices, 95 Cedar 201-871-3916
NM Albuquerque, Hytronic Meas., 205 San Pablo 505-268-3941
NY Hyde Pk., Scientific Devices, 158 S. Albany Post 914-229-5655
NY Syracuse, Scientific Devices, 5858 E. Molloy 315-457-7420
NC Charlotte, J.L. Highsmith, 3733 Monroe 704-333-7743
Ohio Cleveland, Micro Sls., 2000 Lee Rd. 216-371-0522
Ohio Dayton, Micro Sls., 1250 W. Dorothy La. 513-298-3033
Pa Melrose Pk., Meyers, 613 W. Cheltenham 215-224-1663

Tex Dallas, Airep Elctrns., 6300 N. Central 214-363-5291
Utah Salt Lake Cy., Hytronic Meas., 2022 S. Main 801-466-4924
Va Richmond, J.L. Highsmith, 5003 Brook 703-266-2060
Wash Bellevue, Scientific Devices, 854 106th 206-454-0901
Wisc Milwaukee, K.W. Meyers, 4359 S. Howell 414-482-1313
EXP: N.J., Parsippany, Boonton Elctrns. Corp., Rte. 287, at Smith Rd. 210-887-5110
For: Can., Montreal, Que., Canadian-Marconi Co., 2442 Trenton Ave. 514-738-9441

BOONTON ELECTRONICS CORP., Automation Prods. Div., 1279 U.S. Rte. 46, Parsippany, N.J., 07054, Tel: 201-335-9550, TWX: 710-986-8241; Sls. Mgr: R.W. Sierk Pg. 423
Ala Huntsville, J. Highsmith, 3322 S. Memorial Pkwy. 205-881-3294
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd St. 602-253-6104
Cal N. Hollywood, O'Halloran Assocs., 10700 Ventura Blvd. 213-877-0173
Cal Palo Alto, O'Halloran Assocs., 3921 E. Bayshore 415-326-1493
Cal San Diego, O'Halloran Assocs., 3760 Midway Dr. 714-224-2824
Colo Denver, Hytronic Meas., 4940 E. 39th Ave. 303-388-4081
Fla Orlando, J. Highsmith, Box 7835 305-293-5202
Ill Chicago, K. Meyers, 7256 W. Touhy Ave. 312-774-6440
Ind Indianapolis, K. Meyers, 3512 Rockville Rd. 317-243-6681
Iowa Cedar Rapids, Engrg Svc., 1026 3rd Ave. S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svc., 7924-A State Line 913-649-4000
Md Silver Spg., Sel-Tronics, Box 192 301-589-6554
Mass Burlington, R.J. Sicles Assocs., 12 Cambridge St. 617-272-7285
Mich Ypsilanti, Micro Sls., 650 Greenlawn Ave. 313-482-1229
Minn Minneapolis, K. Meyers, 4725 Excelsior Blvd. 612-920-7080
Mo St. Louis, Engrg. Svc., 6717 Vernon Ave. 314-726-2233
NJ Parsippany, Boonton Elctrns., U.S. Rte. 46 201-335-9550
NM Albuquerque, Hytronics Meas., 205 San Pablo, S.E. 505-268-3941
NY Elmont, Crane & Egert, 146 Meacham Ave. 516-488-2100
NY Syracuse, Scien. Devices, 140 Pickard Bldg. 315-455-5696
NC Charlotte, J. Highsmith, Box 9367 704-333-7743
Ohio Dayton, Micro Sls., 1250 W. Dorothy La. 513-298-3033
Pa Melrose Park, R. Meyers Assocs., 613 W. Cheltenham 215-224-1663
Tex Dallas, Airep Elctrns., 6300 N. Central Expwy. 214-363-5291
Utah Salt Lake City, Hytronic Meas., 2022 S. Main St. 801-466-4924
Va Richmond, J. Highsmith, 2604-D Buford Rd. 703-272-5888
Wash Bellevue, Scientific Devices-Northwest, 854 106th Ave., N.E. 206-454-0900

BOONTON MOLDING CO., INC., 300 Myrtle Ave., Boonton, N.J., 07005, Tel: 201-334-4400, TWX: 201-334-6366; Sls. Mgr: K.R. Broo
BORDEN CHEMICAL CO., Krylon Dept., Ford & Washington, Box 390, Norristown, Pa., 19401, Tel: 215-279-1950; Gen'l. Mgr: J.J. McAnally
BORDEN CHEM., Div. Borden, Inc., 350 Madison Ave., New York, N.Y., 10017, Tel: 212-573-4000, TWX: 212-867-6270; Pres: H.C. Wechsler
BORG-WARNER CONTROLS, 3300 S. Halladay St., Santa Ana, Cal., 92702, Tel: 714-545-5585; Mktg. Mgr: R.L. Calvin
BORG-WARNER THERMOELECTRICS, Dept. Borg-Warner, Wolf & Algonquin Rds., Des Plaines, Ill., 60018, Tel: 312-827-3131; Sls. Mgr: R.W. Meyer
BOSE CORP., 1 Strathmore Rd., Natick, Mass., 01760, Tel: 617-655-5560; Sls. Mgr: R.L. Komack
BOSSERT MFG. CORP., 1030 Oswego St., Utica, N.Y., 13503, Tel: 315-797-1600; Sls. Mgr: D.R. Samson
BOSTITCH, Div. of Textron, Inc., Briggs Dr., E. Greenwich, R.I., 02818, Tel: 401-TU-4-2500; Gen'l. Sls. Mgr: E.F. Pogor
BOSTON DIGITAL CORP., 21 Main St., Ashland, Mass., 01721, Tel: 617-881-1600; Sls. Mgr: A. Aykanian
BOSTON INSULATED WIRE & CABLE CO., 65 Bay St., Dorchester, Mass., 02125, Tel: 617-265-2104, TWX: 94-540; Sls. Mgr: W. Neumeyer
BOURNS, INC., Instr. Div., 6135 Magnolia, Riverside, Calif., 92506, Tel: 714-684-1700, TWX: 910-332-6103; Sls. Dir: R. Spitsnaugle
BOURNS, INC., Trimpot Prods. Div., 1200 Columbia Ave., Riverside, Cal., 92507, Tel: 714-684-1700, TWX: 714-682-9582; V.P. Mktg: R.C. McColloch
BOURNS PACIFIC MAGNETIC CORP., Div. Bourns, Inc., Box 1398, Romoland, Calif., 92380, Tel: 714-657-5195, TWX: 910-332-1252 M. Caplan
BOURNS SECURITY SYS., 681 Old Willetts Path, Smithtown, N.Y., 11787, Tel: 516-234-0460, TWX: 510-227-8558; N.S.M: T.B. Rieger
BOW SOLDER PRODUCTS, 25 Amsterdam St., Newark, N.J., 07105, Tel: 201-621-6996; Sls. Mgr: S. Turkus

Advertisement

Manufacturers of: QPL approved rosin core solders; acid core and solid wire solders; extruded bar solders; fusible alloys in wire and ribbon form; QPL approved rosin fluxes; acid and organic fluxes; flux thinners and removers; speciality retail packages.

BOWERS ELCTRN. LABS., 3128 Marion Ave., Evansville, Ind., 47712, Tel: 812-985-2687

BOWMAR INSTR. CORP., 8000 Bluffton Rd., Ft. Wayne, Ind., 46809, Tel: 219-747-3121, TWX: 810-332-1510; Sls. Mgr: J.R. Blakeslee .... Pgs. 1312,1313,1442,1582
Ariz Paradise Valley, Bowman Instr., 5922 E. Cheny Rd. 602-949-0909
Cal Burbank, Bowmar Instr. Corp., 3407 W. Olive St. 213-843-4545
Cal Palo Alto, Testco, Inc., 941 Charleston Rd., #2 415-326-5320
Ga Stockbridge, Bowmar Instr., Box 508 404-474-1330
Mass Midway, Gallager Sls., 135 Main St. 617-533-7292
Mo St. Charles, Bowman Instrs., 2 Oak Forest, Rte. 4 314-447-5980
NJ Fairfield, Electra-Mec. Assocs., 345 Caplin Dr. 201-227-0585
NJ Matawan, Bowmar Instr. Corp., 13 Incline Pl. 201-526-0400
NY Clinton, Garret Air Supply, Lincoln Dr. 315-735-8341
NY Smithtown, Electra-Mec Assocs., 83 Landing Ave. 516-724-5979
Tex Fort Worth, W.P. Fralia, Box 12625 817-738-2002
Wash Seattle, Testco, Inc., Boeing Fld., Admin. Bldg. 206-762-8220
For: Can., Ottawa, Ont., Bowmar, 1257 Algoma Rd. 613-746-3100

BOWMAR/TIC, INC., 850 Lawrence Dr., Newbury Park, Calif., 91320, Tel: 805-498-2161, TWX: 910-336-1265; V.P. Mktg: H.W. Bauer
BOZAK, R.T. MFG. CO., Box 1166, Darien, Conn., 06820, Tel: 203-838-6521
BRADLEY INDS., Div. Richarson-Merrell, 11040 King St., Franklin Park, Ill., 60131, Tel: 312-455-3500, TWX: 910-227-3163; Sls. Mgr: D.K. Takacs
BRADLEY SEMICONDUCTOR CORP., 275 Welton St., New Haven, Conn., 06506, Tel: 203-787-7181; Pres: C.D. Bradley
BRADOHM, INC., 65 South Ave., Salamanca, N.Y., 14779, Tel: 716-945-2340; Sls. Mgr: R.H. Muntz
BRADY, W.H. CO., 710 W. Glendale Ave., Milwaukee, Wisc., 53201, Tel: 414-332-8100, TWX: 910-262-3151; Sls. Mgr: R.L. Blasko
BRAM METALLURGICAL-CHEM., 245 W. Chelten Ave., Phila., Pa., 19144, Tel: 215-GE-8-4900; Sls. Mgr: H.H. Bram

BRAMCO CONTROLS, Div. Ledex, College & South Sts., Piqua, Ohio, 45356, Tel: 513-773-8271; Sls. Mgr: D.H. Karstens .... Pgs. 1406,1523
Cal Palo Alto, O'Donnell Assocs., 1955B El Camino Real 415-327-9260
Cal Torrance, O'Donnell Assocs., 18053 Crenshaw Blvd. 213-323-9243
Fla Clearwater, W.B. Wimberly Co., 532 S. Ft. Harrison Ave. 813-446-7072
Fla Orlando, W.B. Wimberly Co., 500 S. Osceola St. 305-425-3083
Ill LaGrange, Bierhaus Sls., Inc., 1013 East 31st St. 312-354-5100
Mass Lexington, K.C. Stevens & Co., Inc., Box 24 617-862-1812
Mich Lathrup Village, R.C. Nordstrom & Co., Box 32 313-444-4417
Minn Minnetonka, T. H. Ayre Assoc., 5509 Eden Prarie Rd. 612-935-2191
Mo Kansas City, Automatic Gen'l. Elctrn. Sls., Inc., 6550-E Troost Ave. 816-333-8206
NY Liverpool, L.P. Garner & Assocs., Box 56 315-652-7911
NY Oceanside, Bittan Assocs., 400 Merrfield Ave. 516-678-6222
NC Raleigh, A.B. Andrews & Co., 333 Fayetteville St. 919-833-5565
Ohio Dayton, Dynel Co., Box 7, Centerville Br. 513-434-6467
Pa Philadelphia, V.S. Malta, Box 4007 215-836-5122
Pa Pittsburgh, R.F. Clark Co., Inc., 10517 Lindberg Ave. 412-242-9500
Tex Dallas, Elcom Co., Box 20313 214-352-5006

BRAND DIELECTRICS, INC., Route 203, N. Windham, Conn., 06256, Tel: 203-423-6321; Sls. Mgr: P.B. Harvey
BRAND-REX CO., Box 498, Willimantic, Conn., 06226, Tel: 203-423-7771, TWX: 710-440-2247; V.P. Mktg: J.P. O'Conner
BRANDYWINE FIBRE PRODS. CO., 1501 Popular St., Wilmington, Del., 19805, Tel: 302-OL-4-2431; Sls. Mgr: M.R. Stokes
BRANSON CORP., Box W, Denville, N.J., 07834, Tel: 201-625-0600, TWX: 710-987-8466; Sls. Mgr: C.G. Braun
BRANSON INSTRUMENTS CO., 76 Progress Dr., Stamford, Conn., 06904, Tel: 203-324-6721, TWX: 710-474-0893; Sls. Mgr: K.P. Hayes
BRANSON SONIC POWER, Sub. Smith Kline & French, Eagle Rd., Commerce Pk., Danbury, Conn, 06810, Tel: 203-744-0760; Sls. Mgr: B. Tyrrell
BRAUN, H., TOOL & INSTR. CO., 140 Fifth Ave., Hawthorne, N.J., 07506, Tel: 201-427-1773; Sls. Mgr: R.C. Boderck
BRELONIX, INC., 106 North 36th St., Seattle, Wash, 98103, Tel: 206-ME-3-1964; Sls. Mgr: H.W. Blake
BREVEL PRODS. CORP., Broad & 16th St., Carlstadt, N.J., 07072, Tel: 201-933-0220; Sls. Mgr: R. Parker
BREW RICHARD D. & CO., INC., 90 Airport Rd., Concord, N.H., 03301, Tel: 603-225-6605; Sls. Mgr: S. Dressler
BRIDGES FRANK ASSOCS., INC., 619 Hollywood Ave., Cherry Hill, N.J., 08034, Tel: 609-663-7676
BRIGHT STAR INDS., INC., 600 Getty Ave., Clifton, N.J., 07015, Tel: 201-772-3200; Sls. Mgr: P.P. Barnthouse
BRINKMANN INSTRS., INC., Cantiague Rd., Westbury, N.Y., 11590, Tel: 516-334-7500, TWX: 222-8254; Sls. Mgr: J. Brown
BRISTOL DIV, American Chain & Cable, Waterbury, Conn, 06720, Tel: 203-756-4451; Sls. Mgr: H.F. Mengel
BRITEC LTD., 17 Charing Cross Rd., London, W.C.2, England, Tel: 01-930-3070; Sls. Mgr: J.J. Lionnet
BRITISH INSULATED CALLENDER'S CABLES, LTD., 21 Bloomsbury St., London WC1B 3QN, Eng., Tel: 01-637-1300; Exec. Dir: A.E. Wernly
BRK ELCTRNS., 525 Rathbone Ave., Aurora, Ill., 60538, Tel: 312-892-8751; Sls. Mgr: W. Ogden
BROADVIEW INDS. CORP., 55 Broadfield Rd., Hempstead, N.Y., 11550, Tel: 516-486-1996; Sls. Mgr: M.J. Woltcheck
BRON-SHOE CO., 1313 Alum Creek Dr., Columbus, Ohio, 43209, Tel: 614-253-7996
BROOKFIELD ENGRG. LABS., INC., 240 Cushing St., Stoughton, Mass., 02072, Tel: 617-344-4310; Sls. Mgr: L.A. Di Corpo
BROOKFIELD WIRE CO., INC., Box 248, Brookfield, Mass., 01506, Tel: 617-867-6474, TWX: 617-867-6534; Sls. Mgr: J.L. Harrington
BROOKS INSTR. DIV., Emerson Elec. Co., Hatfield, Pa., 19440, Tel: 215-368-2000; Sls. Mgr: R. Edsall
BROOKS & PERKINS, INC., Advanced Structures Div., 12633 Inkster Rd., Livonia, Mich., 48151, Tel: 313-522-2000, TWX: 313-222-5669; Sls. Mgr: G. Cleland
BROOKS RESCH. & MFG., INC., 5612 Brighton Terr., Kansas City, Mo., 64130, Tel: 816-EM-3-6288
BROWER LABORATORIES, INC., 241 Crescent St., Waltham, Mass., 02154, Tel: 617-899-6515; Sls. Mgr: D. Campbell
BROWN-BRIDGE MILLS, INC., E. Water St., Troy, Ohio, 45373, Tel: 513-335-0561, TWX: 810-456-2902; Sls. Mgr: J.P. Wilt
BROWN MFG. CO., 2000 Dempster St., Evanston, Ill., 60204, Tel: 312-869-8800; Pres: J. Neuman
BROWNING LABS., Box 310, Laconia, N.H., 03246, Tel: 603-524-5454; Sls. Mgr: D.C. Crutcher
BRULIN & CO., 2920 Martindale Ave., Indianapolis, Ind., 46205, Tel: 317-923-3211; Sls. Mgr: F. Montovani
BRUNO-NEW YORK INDS. CORP., 636 Eleventh Ave., New York, N.Y., 10036, Tel: 212-582-4210
BRUNSWICK INSTRS., P.O. Box 813, New Brunswick, N.J., 08903, Tel: 201-247-5919; Sls. Mgr: E.J. Horodner
BRUSH BERYLLIUM CO., 17876 St. Clair Ave., Cleveland, Ohio, 44110, Tel: 216-486-4200; Mgr. Market Research: R.H. Rozek, V.P. Sls: H.G. Piper
BRUSH INSTRS. DIV., See Gould, Inc.
BRYANT COMPUTER PRODS., Div. Ex-Cell-O Corp., 850 Ladd Rd., Walled Lake, Mich., 48088, Tel: 313-624-4571, TWX: 810-232-1550; Sls. Mgr: R. Booher
BTU ENGRG. CORP., 179 Bear Hill Rd., Waltham, Mass., 02154, Tel: 617-894-6050; Pres: J.H. Beck

BUCHANAN ELEC. PRODS., Sub. Amerace Esna, 1065 Floral Ave., Union, N.J., 07083, Tel: 201-289-8200; Sls. Mgr: P. Vance ....Pgs. 2598,2599

(Terminal Blocks)

Ala Birmingham, J.E. Heusser, 620 Sundale 205-836-3896
Ariz Scottsdale, N.F. Ross, Box 187 602-945-7262
Cal Concord, P.W. Jasin Co., 3506 Skylark 415-686-0905
Cal La Mirada, H. Van Ysseldyk, 16261 Phoebe 213-921-7953
Colo Denver, P. A., 1645 Wazee 303-534-6798
Conn W. Hartford, L. Bell, Box 142 203-236-0395
Fla Jacksonville, Belcher, 8751 Atlantic 904-724-7811
Fla Miami, Belcher & Assoc., Box 7567 305-371-1700
Fla St. Petersburg, Belcher, 1900 1st 813-862-7575
Fla Winter Pk., Belcher & Assocs., Box 607 305-671-4841
Ga Atlanta, Belcher & Assocs., 34 Peachtree 404-525-4221
Haw Honolulu, W.E. Niven Specialty Prods., 956 Kawaiahao St. 808-531-0596
Ill Glen Ellyn, Andersen Elec. Sls., 799 Roosevelt Rd. 312-469-7805
Ill Wheaton, Andersen Elec. Sls., 1106 S. Gables 312-688-5056
Ind Indpls., W.E. Jobes, 1010 East 86th 317-846-0390
Iowa Cedar Rapids, Bertsch-Hunter Elec., 277 Sussex 319-377-6700
Ky Louisville, Fultz & Co., 1038 E. Main 502-583-9411
Ky Louisville, A. Pickens Co., 130 N. Spring 502-583-3636
La Baton Rouge, Strickland, 440 N. Foster 504-926-8188
La Shreveport, Strickland Assoc., Box 5081 318-861-6834
Md Pikesville, A.D. Wilson, Box 5733 301-SA-7-1424
Mass Framingham, H. Standish, 3 Wilson Dr. 617-879-1220
Mich Flint, Linder Assoc., 1821 Shamrock 313-789-1275
Mich Jenison, Linder Assoc., Box 112, 620 Edgeworth 616-457-9612
Mich Lansing, Linder, 1306 Ravenswood 517-489-0292
Mich Southfield, Linder, 24454 Telegraph 313-353-4334
Minn Mpls., Lee-Noonan Co., 4575 W. 77th 612-920-7851
Miss Jackson, Strickland, 2252 Wild Valley 601-366-6195
Mo Kirkwood, Martin Elec., 136 W. Adams 314-966-8659
Mo Raytown, Arehart-Barnes Sls., Box 9443 816-356-3488
Neb Lincoln, E. Taber & Sons, 3240 S. 31st 402-423-4420
NJ Berkeley Hgts., 37 Shadow La. 201-464-0334
NJ Ft. Lee, McKay-Burgoyne Elec. Sls., 1567 Palisade 201-461-7266
NJ Morristown, W.J. Waldron, 15 Pond Hill 201-538-5607
NM Albuquerque, T. Deskin, 116 Lomas 505-242-3581
NY Buffalo, A.C. Schultz Co., Box 2661 716-839-1010
NC Matthews, C.C. Niedringhaus, 2008 Reverdy 704-847-9288
Ohio Cleveland, Richardson-Champ, 3691 Lee 216-991-2885
Ohio Cleveland, V. O'Neill, 1090 Homeland 216-331-4273
Okla Moore, J. Morton & Assocs., 200 S. Classen 405-794-2157
Ore Portland, M. Gerrard, 522 M.W. 23 Ave. 503-224-0864
Pa Pittsburgh, M.F. Smith & Assocs., 2015 Swallow Hill Rd. 412-276-5363
Pa Oreland, W. Cusick Elec. Sls., 1240 Penn. 215-885-3633
Tenn Memphis, H. Beard, 2160 York Ave. 901-274-1744
Tex Dallas, J.E. Morton, 10015 Vistadale Dr. 214-341-1414
Tex Houston, McIver & Slavin Co., 6201 Wash. Ave. 713-861-3888
Utah Salt Lake City, B.E. Blomquist, 328 W. 2nd S. 801-363-3838
Va Bon Air, J. Thrower Co., Box 2971 703-272-3660
Wash Seattle, Tal Agencies, Inc., 1043 6th 206-624-3355
Wisc Milwaukee, Andersen Elec. Sls., 4858 N. Idlewild Ave. 414-332-2948

(Crimping Tools)

Cal Inglewood, W. Green, 4533F W. Imperial 213-674-8722
Ill Chicago, H. Dale, 600 W. Jackson Blvd. 312-332-0080
NJ Union, R. Leggott, 1065 Floral Ave. 201-289-8200

BUCK ENGRG. CO., Box 686, Farmingdale, N.J., 07727, Tel: 201-681-6200; Mktg. Mgr: C.V. Dowds

BUCKBEE-MEARS CO., 245 E. 6th St., St. Paul, Minn., 55101, Tel: 612-227-6371; Adv. Mgr: C.M. Lund

BUCKEYE BOBBIN DIV., Precision Paper Tube Co., 761 Sharon Dr., Westlake, Ohio, 44145, Tel: 216-871-9020 A. Johnson

BUCKEYE STAMPING CO., 555 Marion Rd., Columbus, Ohio, 43207, Tel: 614-443-9458; Sls. Mgr: R.E. Osborne

BUD RADIO, INC., 4605 E. 355th St., Willoughby, Ohio, 44094, Tel: 216-946-3200, TWX: 810-427-2604; Sls. Mgr: A.N. Haas

BUDD CO., 2450 Hunting Park Ave., Philadelphia, Pa., 19129, Tel: 215-225-9100

BUDWIG MFG. CO., P.O. Box 97, Ramona, Calif., 92065, Tel: 714-789-0900; Sls. Mgr: M. Zentz

BUFFALO FORGE CO., 490 Broadway, Buffalo, N.Y., 14204, Tel: 716-847-5109, TWX: 710-522-1177; V.P. Sls: C.W. Lockhart

BUHL OPTICAL CO., 1009 Beech Ave., Pittsburgh, Pa., 15233, Tel: 412-321-0076; Sls. Mgr: I.S. Stapsy

BULLOCK MAGNETICS CORP., 2805 Metropolitan Pl., Pomona, Calif., 91767, Tel: 714-593-3561; Mktg. Mgr: W.W. Bullock

BULOVA WATCH ELCTRNS. DIV. AMER. TIME PRODS., 61-20 Woodside Ave., Woodside, N.Y., 11377, Tel: 212-335-6000, TWX: 710-582-2637; Sls. Mgr: R. Ansell Pgs. 660,1366,1642

Ariz Phoenix, Toward Engrng., Box 15268 602-955-3193
Cal Encino, Cardinal Assoc., 161-61 Ventura Blvd. 213-788-4540
Cal Menlo Pk., Straube Assocs., 483 Willow Rd. 415-323-2476
Colo Boulder, Straube Assoc., Box 1649 303-443-8600
Fla Orlando, Perrott Assoc., 1607 Forsyth 305-275-1132
Ill Chicago, Comm. Engrs., 7106 N. Western 312-761-0548
Md Baltimore, J.R. Daniel, 1404 Bare Hills 301-825-3330
Mass Winchester, S.C. Hooker, 2 Winchester Pl. 617-729-5482
Minn Mpls., T. Bell, 5705 21st Ave. S. 619-729-4483
NY Mamaroneck, Cane Tech., 555 E. Boston Post 914-698-4411
Tex Richardson, C. Tinch, First Bank & Trust Bldg. 214-AD1-1322
Wash Seattle, J.J. Backer, 221 W. Galer 206-285-1300
EXP: N.Y. City, N.Y., C. Tennant, 100 Park Ave. 212-889-8530
For: Can., Ottawa, Ont., Canadian Micronics, Box 6157 613-235-1934

BULOVA WATCH CO., FREQ. CONTROL PRODS., Elctrns. Div., 61-20 Woodside Ave., Woodside, N.Y., 11377, Tel: 212-DE-5-6000, TWX: 710-582-2637; Sls. Mgr: W.J. Carnes ....Pgs. 1362-1365,1512

Ariz Phoenix, Toward Engrg., Box 15268-Arcadia Sta. 602-955-3193
Cal Menlo Park, Straube, 483 Willow 415-323-2476
Cal Woodland Hills, Interstate Mktg. Assoc., 22030 Ventura Blvd. 213-883-7606
Colo Boulder, Straube Assocs-Mountain States, Inc., Box 1649 303-443-8600
Fla Orlando, Perrott Assocs., 1607 Forsyth 305-275-1132
Ill Chicago, Comms Engrs., 7106 N. Western Ave. 312-761-0548
Iowa Cedar Rapids, J. R. Sls. Engrg., 3550 Cottage Grove Ave., S.E. 319-377-8211
Md Baltimore, Callas Elctrns., Inc., 6409 Frederick Ave. 301-744-7711
Mass Winchester, S.C. Hooker, Inc., Box 352 617-729-5482
Minn Mpls., T. Bell Inc., 5705 21st 619-729-4483
NJ Fairfield, Electra-Mec Assocs., 345 Kaplan 201-227-0585
NY Rochester, H.C. Johnson Agencies, Inc., 111 Mt. Hope Ave. 716-232-2688
Ohio Akron, Augey Natalino Assocs., 209 Harmony Hills 216-253-8136
Pa Philadelphia, Eastern Comps., Inc., 1349 W. Cheltenham Ave. 215-927-6262
Tex Dallas, Blackburn, 137 Walnut Hill Vlg. 214-351-9991
Wash Seattle, J.J. Backer Co., 221 W. Galer St. 206-285-1300
EXP: N.Y., C. Tennant, 100 Park 212-889-8530
For: Can, Ottawa, Ont., Canadian Micronics, Ltd., Box 6157 613-235-1934

BULOVA WATCH CO., SERVO PRODS. ELCTRNS. DIV., 61-20 Woodside Ave., Woodside, N.Y., 11377, Tel: 212-335-6000, TWX: 710-582-2637; Sls. Mgr: J.H. Floyd Pgs. 1865-1867

Ariz Phoenix, Toward Engrng., Box 15268 602-955-3193
Cal Hollywood, IFM-South, 3455 Cahuenga 213-HO-9-1641
Cal Menlo Park, Straube Assoc., 483 Willow 415-323-2476
Colo Boulder, Straube Assocs., Box 1649 303-443-8600
Conn Guilford, R. Whitehead Jr., Box 345 203-453-3762
Fla Orlando, Perrott Assocs., 1607 Forsyth 305-275-1132
Ill Chicago, Communications Engrs., 7106 N. Western 312-761-0548
Md Baltimore, Callas Elctrns., 6409 Frederick 301-744-7711
Minn Mpls., T. Bell, 5705 21st Ave. 619-729-4483
NY Mamaroneck, Cane Tech., 555 E. Boston Post 914-698-4411
NY Syracuse, Rep. Tech., 2002 Teall 315-437-2845
Pa Phila., Sencor, 2222 Glendale 215-342-0223
Tex Dallas, Blackburn, 137 Walnut Hill Vlg. 214-351-9991
EXP: N.Y. City, N.Y., C. Tennant, Sons, 100 Park Ave. 212-889-8530
For: Can, Ottawa, Ont., Can. Micronics, Box 6157 613-235-1934

BULOVA WATCH CO., Sys. & Instrs. Div., Green Acres Rd., W., Valley Stream, N.Y., 11581, Tel: 516-561-2600, TWX: 510-225-8409; Mgr. Mgr. Mktg/Sls: B.J. Kawecki

BULOVA WATCH CO., Timer Lab., Bulova Pk., Flushing, N.Y., 11370, Tel: 212-DE-5-6000, TWX: 212-672-0344; Sls. Mgr: A. Craig

Advertisement

Accutron Clocks and Cycle Timers, Programmers, movement accuracy 2 sec/day, self-powered by 1 year, 1.3 volt mini-battery. Black dial, 1" or 1-7/8", 12 or 24 hour, White hands and numerals, hack mechanism. Also with calendar dates from 0 to 999 days and can have contact closures from 1 per second to every 60 days and from 2 months to 5 years. About 1-1/4" cube in size and weighs from 33 to 100 grams.

BUNKER-RAMO CORP., Elctrn. Sys. Div., 31717 La Tienda Dr., Westlake Village, Cal, 91361, Tel: 213-889-2211, TWX: 910-494-1234; V.P. Mktg: F.J. Cunningham

BUNTING MAGNETICS CO., 9245 Cherry St., Franklin Park, Ill., 60131, Tel: 312-455-7050; Sls. Mgr: Dale J. Thortsen

BUREAU ENGRAVING, INC., Ind'l. Div., 219 N. Second St., Minneapolis, Minn., 55401, Tel: 612-339-8001, TWX: 910-576-2733; Sls. Mgr: M.A. Larson

BURGESS BATTERY/GOULD INC., Foot of Exchange St., Freeport, Ill., 61032, Tel: 815-232-2161; V.P.-Dir. Mktg: F.M. Skeer

BURGESS SWITCH CO., LTD., 777 Warden Ave., Scarborough, Ont., Can., Tel: 416-751-8282; Sls. Mgr: R.A.S. Dick

BURKE & JAMES, INC., 333 W. Lake St., Chicago, Ill., 60606, Tel: 312-372-5422; Sls. Mgr: J. Benedict

BURLING INSTR. CO., 21 River Rd., Box 298, Chatham, N.J., 07928, Tel: 201-635-9481; Sls. Mgr: A.F. Barrowclough

BURLINGAME SCI., Box 1754, Burlingame, Cal., 94010, Tel: 415-342-3806; Sls. Mgr: J.F. Bullock

BURLINGTON OPERS. DIV., Electronized Chems. Corp., S. Bedford St., Burlington, Mass., 01803, Tel: 617-272-2850, TWX: 710-332-0502; Sls. Mgr: C.A. Brown Jr.

BURMAC ELCTRNS., 80 Montauk Hwy., Lindenhurst, N.Y., 11757, Tel: 516-888-5200; Pres: N. Kjeldsen

BURNDY CORP., Richards Ave., Norwalk, Conn., 06852, Tel: 203-838-4444, TWX: 710-468-2546; Sls. Mgr: Alan Aune

BURNS ENGRG., INC., 5301 Edina Industrial Blvd., Minneapolis, Minn., 55435, Tel: 612-941-2882; Sls. Mgr: J.D. Burns

Advertisement

Platinum, Nickel & special RTD's. Interchangeability 1/4°F or 1/4% of temperature (Precision Series) or 3/4° F or 1/2% of temperature (Relia Bulb Series). Also 1/4°F Interchangeability over any span of 75°F or less. Thermocouples and specialized electronics. STOCK DELIVERY ON SEVERAL MODELS

BURR-BROWN RESCH. CORP., Int'l. Airport Ind'l. Pk., Tucson, Ariz., 85706, Tel: 602-294-1431, TWX: 910-952-1111; Sls. Mgr: L. Schick

BURROUGHS CORP., Elctrn. Comps. Div., Box 1226, Plainfield, N.J., 07061, Tel: 201-757-3400, TWX: 710-997-9539; Gen'l. Mgr: S. Kuchinsky

BURROUGHS CORP., OEM Sales, 1649 Wilshire Blvd., Los Angeles, Cal., 90017, Tel: 213-483-4520, TWX: 910-321-2494; Sls. Mgr: E.L. Lyons ....Pg. 338

Ala	Huntsville, 2315 S.W. Bob Wallace Ave.	205-539-4433
Ariz	Phoenix, 702 N. First St.	602-AL-4-5566
Ark	Little Rock, 1023 W. Third St.	501-FR-2-4121
Cal	Los Angeles, 1649 Wilshire Blvd.	213-483-4520
Cal	San Diego, 1065 - 14th St.	714-BE-9-9496
Cal	San Francisco, 1930 Market St.	415-UN-3-4062
Colo	Denver, 1035 Lincoln St.	303-MA-3-3284
Conn	Hartford, 580 Farmington Ave.	203-AD-3-9871
Del	Wilmington, 2611 Northeast Blvd.	302-PO-4-7200
DC	Washington, 1739 "H" St., N.W.	202-298-6060
Fla	Jacksonville, 3674 Beach Blvd.	305-EX-8-1551
Fla	Orlando, 124 E. Colonial Dr.	305-GA-2-0785
Ga	Atlanta, 961 W. Peachtree St., N.E.	404-873-5531
Haw	Honolulu, 1687 Kapiolani Blvd.	808-99-4171
Idaho	Boise, 915 Jefferson St.	208-342-6533
Ill	Chicago, 324 S. Michigan Ave.	217-WA-2-7600
Ill	Springfield, 1303 S. Sixth St.	217-528-3455
Ind	Indianapolis, 970 N. Meridian St.	317-ME-5-8682
Iowa	Cedar Rapids, 2712 - 1st Ave. N.E.	319-364-7171
Iowa	Sioux City, 709 Douglas St.	712-258-7552
Kans	Wichita, 2725 E. Douglas	913-MU-2-6536
Ky	Lexington, 361 Southland Dr.	606-277-2309
La	Baton Rouge, 649 Main St.	504-DI-2-4791
Me	Portland, 468 Forest Ave.	207-SP-3-8119
Md	Baltimore, 2519 N. Charles St.	301-TU-9-9665
Mass	Lexington, 92 Hayden Ave.	617-862-9821
Mich	Detroit, 2850 W. Grand Blvd.	313-875-2260
Mich	Lansing, 2121 E. Grand River Ave.	517-IV-5-9401
Minn	Minneapolis, 2109 Nicollet Ave.	218-FE-9-7891
Miss	Jackson, 146 E. Amite St.	601-FL-2-0835
Mo	Kansas City, 1514 Baltimore Ave.	816-VI-2-0610
Mo	St. Louis, 3408 Lindell Blvd.	314-652-0750
Neb	Omaha, 5006 Dodge St.	402-556-0700
NH	Manchester, 1261 Elm St.	603-NA-7-7686
NJ	Bloomfield, 465 Bloomfield Ave.	609-PI-8-2200
NJ	Paterson, 726 Market St.	609-AR-4-2866
NJ	Trenton, 1428 Brunswick Ave.	609-LY-9-4588
NM	Albuquerque, 420 Lead Ave., S.W.	505-247-1594
NY	Buffalo, 1508 Sheridan Dr.	716-877-4774
NY	New York, 605 Third Ave.	212-972-3000
NY	Syracuse, 617 W. Genesee St.	315-HA-2-7283
NY	W. Hempstead, 225 Hempstead Tpke.	516-IV-3-6625
NC	Raleigh, 205 W. Martin St.	919-TE-2-0317
ND	Fargo, 219 South 7th St.	701-AD-2-7135
Ohio	Cleveland, 3915 Carnegie Ave.	216-391-9500
Ohio	Columbus, 900 Michigan Ave.	614-224-7248
Ohio	Cincinatti, 1730 Tennessee Ave.	513-242-3790
Okla	Oklahoma City, 2925 United Founders Blvd.	405-843-9437
Okla	Tulsa, 724 S. Main St.	918-LU-7-5138
Ore	Portland, 1909 Southwest 6th Ave.	503-CA-6-7901
Pa	Philadelphia, 250 N. Broad St.	215-LO-8-1400
Pa	Pittsburgh, 2644 Banksville Rd.	412-343-3622
RI	E. Providence, 684 Warren Ave.	401-GE-4-1811
SC	Columbia, 2901 Millwood Ave.	803-252-9387
Tenn	Knoxville, 2120 Cumberland Ave.	615-524-1831
Tenn	Nashville, 1722 West End Ave.	615-255-7765
Tex	Dallas, 1914 N. Harwood St.	214-RI-8-9863
Tex	Houston, 2424 W. Holcombe Blvd.	713-666-2411
Utah	Salt Lake City, 154 South 4th, E.	801-DA-8-8947
Vt	Burlington, 1333 Shelburne Rd.	802-864-6861
Va	Roanoke, 815 S. Jefferson St.	703-DI-3-1537
Wash	Seattle, 2625 Third Ave.	206-MA-3-1780
WVa	Wheeling, 887 National Rd.	304-CE-2-0690
Wisc	Milwaukee, 2328 W. Capital Dr.	414-UP-3-8600

BURTEK, INC., Box 1677, Tulsa, Okla., 74101, Tel: 918-TE-6-4621; Sls. Mgr: J.A. Wessel

BURTON RESCH. LABS., Div. Burton Silverplating Co., 11240 Playa Ct., Culver City, Calif., 90230, Tel: 213-391-6325, TWX: 910-343-6582; Sls. Mgr: E.H. Cooper

BUSSCO ENGRG., 122 Penn St., El Segundo, Cal., 90245, Tel: 213-322-6580, TWX: 910-348-6295; Sls. Mgr: D. LeVantine

BUSSMANN MFG., McGraw-Edison Co., Univ. at Jefferson, St. Louis, Mo., 63107, Tel: 314-GA-1-1740; Sls. Mgr: N. Schmitz ....Pgs. 1890,1891

Cal	Los Angeles, 1004 East 4th St.	213-625-5046
Cal	San Francisco, 2166 Market St.	415-UN-3-2600
Colo	Littleton, 535 W. Davies Way	303-794-5361
Conn	Cheshire, 400 Westland Ave.	203-624-2440
Fla	Clearwater, 1863 Oakdale La., S.	813-531-5112
Ga	Chamblee, 3615 Fortingale Dr.	404-457-1356
Haw	Honolulu, Dougherty Enterprises, 1001 Dillingham Blvd.	531-7548
Ill	Chicago, 9 S. Clinton	312-DE-2-1893
Ind	Carmel, 11407 Dona Dr.	217-637-9606
Iowa	Davenport, 202 Forest Rd.	319-355-5400
Kans	Overland Pk., 7507 W. 101st Terr.	816-EM-3-3700
Ky	Louisville, Box 18085	502-451-7652
La	Metairie, 4208 Cleveland St.	504-887-1405
Md	Baltimore, 6308 Mossway	301-CH-3-1717
Mass	Winchester, Box 389	617-HA-6-2122
Mich	Berkley, 4029 Cornwall	313-WO-1-9704
Mich	Farmington, 32300 Bonnet Hill Rd.	313-WO-1-9704
Minn	Minneapolis, 5615 Concord Ave.	612-WA-6-3988
Minn	Minneapolis, 8140 30th Ave., N.	612-338-3845
Minn	Minneapolis, 7808 Unity Ave., N.	612-561-4841
Mo	St. Louis, 2536 W. University	314-421-1740
Neb	Omaha, 7648 Wright St.	402-391-1016
NJ	Newark, 169 Highland Ave.	201-484-3500
NY	Fairport, 11 N. Passage Passage	716-377-7591
NY	Syracuse, 701 N. Orchard Rd.	315-HO-8-1352
NC	Greensboro, 707 Pebble Dr.	919-299-3348
Ohio	Chesterland, 7678 Oak Hill Dr.	216-PA-9-4663
Ohio	Cincinnati, 7445 Fourwinds Dr.	513-241-1740
Ohio	Grove City, 2191 Hillswood Dr.	614-237-9810
Ohio	Shaker Hgts., 18730 Van Aken Blvd.	216-LO-1-4875
Ohio	Toledo, 4604 Northbrook Rd.	419-241-1141
Okla	Oklahoma City, 10321 Sunrise Blvd.	405-SK-1-4996
Okla	Tulsa, 2532 S. Owasso	918-RI-2-5914
Pa	Allentown, 839 South 12th St.	215-432-4696
Pa	Pittsburgh, 2500 Creekedge Dr.	412-371-3956
Pa	Radnor, Box 167	215-KI-6-0644
Pa	St. Davids, Box 147	215-KI-6-0644
Pa	Wexford, Grubbs Rd.	412-WE-5-1695
Tenn	Memphis, 800 Rosebanks Rd.	901-398-8972
Tex	Dallas, Box 1946	214-FL-7-8357
Tex	Houston, 10726 Cedar Creek	713-526-3101
Utah	Salt Lake City, 2112 E. 6320, S.	801-278-9759
Va	Hayes, Rte. 2, Box 36-A	703-642-5550
Wash	Seattle, 5300-3rd Ave., S.	206-RO-3-1350
Wisc	Milwaukee, 4857 N. Woodburn St.	414-964-3185

BY-BUK CO., 4326 W. Pico Blvd., Los Angeles, Calif., 90019, Tel: 213-937-3511; Sls. Mgr: R.C. Conner

BYCOSKI, CASMIR T., INC., 363 Capitol Ave., Hartford, Conn., 06106, Tel: 203-246-7464; Sls. Mgr: H.F. Russell

C-COR ELCTRNS., 60 Decibel Rd., State College, Pa., 16801, Tel: 814-238-2461; Pres: J.R. Palmer Pgs. 1280,1281

Ariz	Phoenix, R.A. Mayes, 4014 N. 7th	602-279-5243
Cal	No. Hollywood, Crown Elctrns., 5657 Lankershim Blvd.	213-877-3550
Cal	Los Altos, Astroel, Inc., 349 First St.	415-948-3636
Colo	Denver, R.A. Mayes Co., Box 10486	303-466-6311
DC	Wash., Eastern Instr., 5410 Indian Hd. Hwy.	301-839-3800
Fla	Orlando, Gra-Mar, Inc., 3113 Lawton Rd.	305-841-2330
Ga	Atlanta, P. J. Nahser Co., Inc., Box 28802	404-993-2726
Ill	Chicago, Comms. Engrs., 7106 N. Western	312-761-0548
Ind	Ft. Wayne, Comms. Engrs., 418 E. Berry	219-743-9866
Ind	Franklin, Comm. Engrs., 1624 Roberts	317-783-7143
Md	Baltimore, Eastern Instr., 1002 Ingleside	301-744-3675
Mass	Needham, Addelco Corp., 56 Pickering	617-444-4754
NM	Albuquerque, R. Mayes Co., 8016 Zuni	505-265-7989
NY	Great Neck, Eastern Instr., 300 Northern	516-466-9505
NY	Syracuse, Tesco Assocs., 2002 Teall Ave.	315-463-4566
NC	Burlington, P. Nahser Co., Inc., Box 432	919-226-8053
Ohio	Dayton, Comms. Engrs., 34 N. Clinton	513-434-6871
Pa	Phila., Eastern Instr., 613 Cheltenham	215-927-7777
Tex	Richardson, R.A. Mayes Co., Box 1021	214-235-3043
Va	Richmond, Eastern Instr., Inc., Ross Bldg.	703-644-6622
Wash	Seattle, R. S. Drake, 6133 Maynard	206-763-2755
EXP:	NY, N.Y., S. Ginsbury, 425 Park	212-689-5212
For:	Can, Downsview, Ont., Componetics, Ltd., 62 Alness St.	416-636-3673
For:	Can, Montreal, Que., Componetics, Ltd., 6420 Victoria Ave.	514-342-4112
For:	Can., Ottawa, Componetics, 1349 Bank	613-733-3781

C & D BATTERIES, Div. Eltra, Walton Rd., Plymouth Meeting, Pa., 19462, Tel: 215-828-9000, TWX: 510-660-8436; V.P. Mktg: H.E. Jensen

C-F ELECTRONICS, INC., 14707 Keswick St., Van Nuys, Calif., 91405, Tel: 213-781-3849; Sls. Mgr: B.M. Barton

C & K COMPONENTS, 103 Morse St., Watertown, Mass., 02172, Tel: 617-926-0800, TWX: 710-327-0460; Sls. Mgr: S. Trocki ....Pgs. 1892,1893

Ariz	Scottsdale, Engrg. Sls. Assoc., Box 544	602-945-5781
Cal	Los Altos, Ewing-Foley, Inc., Box 1107	415-941-4525
Cal	Los Angeles, Universal Comp., 2330 Westwood	213-474-1537
Conn	Madison, A & M Elctrn. Reps., Aileen	203-245-1031
Fla	Ft. Lauderdale, Beacon Mfg., 651 N.E. 45th	305-564-4298
Fla	Maitland, Beacon Mfg., Box 1278	305-647-3498
Ga	Atlanta, Beacon Mfg. Rep., 2285 Peachtree N.E.	404-351-3654
Ill	Chicago, Ellinger Sls., 6580 N. Northwest	312-763-1570
Iowa	Clarion, Ellinger Sls., 309 Fourth S.E.	515-532-3218
Md	Rockville, Quality Comp., Box 711, 13403 Grenoble	301-933-1623
Mass	Needham, A & M Elctrn. Reps., Box 73	617-444-8170
Mich	Royal Oak, R. Jackson, 200 S. Washington Ave.	313-542-5059
Minn	Hopkins, Beta Engrg., 128 Jackson W.	612-938-2551
Mo	St. Louis, Ellinger Sls., 4969 Bancroft	314-481-5568
NJ	Cherry Hill, Quality Comp., Box 586	609-428-6266
NY	Latham, L-Tron, Box 144, 24 Duncan	518-785-5032
NY	Mt. Vernon, D. Sonkin, 10 Fiske Pl.	914-668-9809
NY	Rochester, L-Tron Corp., 140 Keller St.	716-436-4410
NY	Skaneateles, L-Tron, Box 147	315-685-6172
SC	Santee, Beacon Mfg. Rep., Box 31	803-897-2670
Tex	Dallas, R.F. Kimball Co., 5531 Dyer St.	214-363-5432
Utah	Salt Lake City, Arrowhead, 1966 W. 6255 S.	801-298-2751
Wash	Seattle, Jon B. Jolly Co., Pier 59	206-624-2152
For:	Can., Pierrefonds, Que., Atkinson & Vail, 13189 Shelborne	514-626-6511

C-THRU RULER CO., 6 Britton Dr., Bloomfield, Conn., 06002, Tel: 203-243-0303; Sls. Mgr: J.R. Zachs

CABLE ELEC. PRODS., INC., 234 Daboll St., Providence, R.I., 02907, Tel: 401-781-5400; Sls. Mgr: F. Schwartz

CABLE SYS. & ASSEMBLY CO., INC., 68 Vine St., Everett, Mass., 02149, Tel: 617-387-7550; Sls. Mgr: E.F. Vecchia

Advertisement

Special Multi-Conductor Cable, RFI-EMI Shielding, Braided Cables & Harnesses, Inter Connecting Cables, Flexible & Semi Rigid R.F. Assemblies, Wire Cutting, Stripping and Marking, Molding & Potting, Custom Wire & Cable Processing

CABOT CORP., Stellite Div., 1020 W. Park Ave., Kokomo, Ind., 46901, Tel: 317-457-8411

CABTRON CORP., 1900 W. Kinzie St., Chicago, Ill., 60622, Tel: 312-829-4282; Sls. Mgr: D.V. Fury Pg. 2314

Ala	Huntsville, J. Highsmith, 3322 S. Memorial Pkwy.	205-881-3294
Ariz	Phoenix, Southwest Engrg., 208 E. Hatcher	602-944-1521
Cal	Downey, Wieler, 10842 S. Paramount	213-861-9223
Cal	La Jolla, Wieler, 2260 Calle Frecota	714-459-7712
Cal	Sunnyvale, Weiler, 405 S. Sunnyvale	408-736-6098
Conn	E. Hartford, Meas. Equip. Co., Box 8192	203-874-9222
Fla	Orlando, J. Highsmith, 2543 Industrial	305-293-5202
Ind	Indpls., Delta Sls., 1407 N. Illinois	317-631-4136
Md	Silver Spring, Ansell Engrg., 816 Thayer	301-588-4222
Mass	Wakefield, Meas. Equip. Co., 591 North	617-245-4870
Mich	Southfield, Sterling-Lowell, 21251 Civic Ctr.	313-354-6130
Minn	St. Paul, Electro Prods., N203 Griggs Midway	612-645-7887

Mo Kansas City, Prod. Automation, 8905 Manchester 816-763-2132
Mo St. Louis, Prod. Automation, 1573 N. Warson
NY Manhasset, Win-Cor Elctrn., 75 Plandome 516-627-9474
NY Syracuse, Midstate Resch., 327 Wellesley 315-478-8314
NC Charlotte, J. Highsmith, 3733 Monroe 704-333-7743
Ohio Cleveland, Systems Sls., 1299 W. 78th 216-651-7711
Pa Phila., Professional Svc., 12007 Ferndale
Pa Pittsburg, R.F. Clark, 10517 Lindberg 412-242-9500
Tex Dallas, Data Mktg., 10048 Monroe 214-358-4643
Tex Houston, Data Mktg., 3925C Dacoma St. 713-686-9627
Utah Salt Lake City, Applied Engrg. Prods., 6375 Emigration Canyon 801-364-4942
WashSeattle, Associated Ind., 3711 S. Hudson 206-723-5600

CADDEL-BURNS MFG. CO., INC., 40 E. 2nd St., Mineola, N. Y., 11501, Tel: 516-PI-6-2310 ....Pgs. 2484,2485

CADDOCK ELCTRNS., 3127 Chicago Ave., Riverside, Cal., 92507, Tel: 714-683-5361; Sls. Mgr: R. Caddock Pgs. 2824-2828
Ariz Phoenix, Toward Engrg., 4240 E. Clarendon 602-955-3153
Cal Tarzana, R. Capell, 18376 Ventura Blvd. 213-987-2233
MassWinchester, S.C. Hooker, 2 Winchester 617-792-5482
Minn Mpls., F.B. Hill, 6110 Excelsior Blvd 612-929-6727
Ore Portland, Almac-Stroum Elct., 8888 SW Canyon 503-292-3534
Tex Houston, Unidyne, Inc., 5700 Savoy La. 713-SU-2-3060
WashSeattle, Almac-Stroum Elct., 5811 Sixth, S. 206-763-2300
EXP: NY, Schenectady, Elbar Elct., Box 660 518-372-5841

CADILAC PLASTICS & CHEMS., Dayco Co., Box 810, Detroit, Mich., 48232, Tel: 313-869-9500

CAHNMAN HUGO N. ASSOCS., 125-10 Queens Bl., Kew Gardens, N.Y., 11415, Tel: 212-544-2424; Sls. Mgr: F. Sterne

Advertisement

Complete infrared heat processing equipment, stationary or conveyorized using the unique solar heater with the flat quartz radiant surface, with or without control panels.

CAI DIV. BOURNS INC., 550 W. Northwest Hwy., Barrington, Ill., 60010, Tel: 312-381-2400, TWX: 910-651-1904; Dir of Sls: G.J. Lohuis

CAIG LABS., INC., 455A Union Ave., Westbury, N.Y., 11590, Tel: 516-334-1940; Sls. Mgr: O. Lohkemper

CAL-POWER CORP., 140 Kansas St., El Segundo, Calif., 90245, Tel: 213-772-2171, TWX: 910-348-6678; Sls. Mgr: D. Harney

CAL-R, INC., Cal. Resistor Div., 1601 Olympic Blvd., Santa Monica, Cal., 90404, Tel: 213-451-9761, TWX: 910-343-6966; V.P. Sls: J. Waldal Pgs. 1537,1963,2349-2351,2830,2831
Ariz Phoenix, Toward Engrg., Box 15268 Arcadia Sta. 602-955-3193
Cal Los Altos, Westec Elctrns., 110 First 415-948-8880
Cal Santa Monica, Cal-R, 1601 Olympic 213-451-9761
Colo Boulder, Mile High Elctrns., 1828 Pine 303-444-5615
Ind Greenwood, Valentine Schillinger, Box 242 317-881-3547
Ill Chicago, J. Popp, 5719 W. Chicago Ave. 312-261-1259
Iowa Cedar Rapids, Engrg. Svc., 1026 3rd Ave. S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svc., 7830 State Line 913-649-4000
Md Rockville, Quality Comps., Box 711 301-933-1623
MassWinchester, Blake Assocs., 7 Lowell Ave. 617-729-7890
Minn Hopkins, Beta Engrg., 128 Jackson 612-928-2551
Mo St. Louis, Engrg. Svc., 6717 Vernon Ave. 314-726-2233
NY Fayetteville, M.P. Andrews 315-637-3144
NY Northport, Component Sls., Box 334 516-549-4301
Ohio Cleveland, Del Steffen, 21877 Euclid Ave. 216-486-7078
Ore Portland, R. Legg, 4475 S.W. Scholls Ferry 503-292-8824
Pa Glenside, Elcom Inc., 130 S. Easton 215-885-1325
Tex Dallas, Hillman Entprs., 3505 Turtle Creek 214-521-9907
EXP: Cal., Santa Monica, Trans World Trade, Box 1037 213-472-0444
EXP: N.Y., N.Y., Multiparts, 52 Wall St. 212-WH-4-4370
For: Can., Montreal, Que., Braydon Electro, 360 Montee De Liesse 514-748-6378
For: Can., Toronto, Ont., Braydon Electro, 1912A Avenue Rd.

CAL-R, INC., Capacitor Div., 1601 Olympic Blvd., Santa Monica, Cal., 90404, Tel: 213-451-9761, TWX: 910-343-6966; Sls. V.P: J.C. Waldal Pgs. 1537,1963,2349-2351,2830,2831
Ariz Phoenix, Toward Engrg., Box 15268 Arcadia Sta. 602-955-3193
Cal Los Altos, Westec Elctrns., 110 First 415-948-8880
Cal Santa Monica, Cal-R, 1601 Olympic 213-451-9761
Colo Boulder, Mile High Elctrns., 1828 Pine 303-444-5615
Ill Chicago, J. Popp, 5719 W.Chicago 312-261-1259
Ind Greenwood, Valentine Schillinger, Box 242 317-881-3547
Iowa Cedar Rapids, Engrg. Svc., 1026 3rd Ave. S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svc., 7830 State Line 913-649-4000
Md Rockville, Quality Comps., Box 711 301-933-1623
MassWinchester, Blake Assocs., 7 Lowell Ave 617-729-7890
Minn Hopkins, Beta Engrg., 128 Jackson Ave 612-928-2551
Mo St. Louis, Engrg. Svc., 6717 Vernon Ave. 314-726-2233
NY Fayetteville, M.P. Andrews 315-637-3144
NY Northport, Component Sls., Box 334 516-549-4301
Ohio Cleveland, Del Steffen, 21877 Euclid Ave. 216-486-7078
Ore Portland, R. Legg, 4475 S.W. Scholls Ferry 503-292-8824
Pa Glenside, Elcom, 130 S. Easton Rd. 215-885-1325
Tex Dallas, Hillman Entprs., 3505 Turtle Creek 214-LA-1-9907
EXP: N.Y., N.Y., Multiparts, 52 Wall St. 212-WH4-4370
EXP: L.A., Trans World Trade, 11973 San Vicente 213-472-0444
For: Can., Montreal, Que., Braydon, 360 Montee De Liesse Rd. 514-748-6378

CAL-R, INC., Thermonetics Div., 1601 Olympic Blvd., Santa Monica, Cal., 90404, Tel: 213-451-9761, TWX: 910-343-6966; V.P.Sls: J.C. Waldal Pgs. 1537,1963,2349-2351,2830,2831
Ariz Phoenix, Toward Engrg., Box 15268 602-955-3193
Cal Los Altos, Westec Elctrns., 110 First 415-948-8880
Cal Santa Monica, Cal-R, 1601 Olympic 213-451-9761
Colo Boulder, Mile High Elctrns., 1828 Pine 303-444-5615
Ill Chicago, J. Popp, 5719 W. Chicago 312-261-1259
Ind Greenwood, Valentine Schillinger, Box 242 317-881-3547
Iowa Cedar Rapids, Engrg. Svc., 1026 3rd Ave. S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svc., 7830 State Line 913-649-4000
Md Rockville, Quality Comps., Box 711 301-933-1623
MassWinchester, Blake Assocs., 7 Lowell Ave. 617-729-7890
Minn Hopkins, Beta Engrg., 128 Jackson Ave. 612-928-2551
Mo St. Louis, Engrg. Svc., 6717 Vernon Ave. 314-726-2233
NY Fayetteville, M.P. Andrews 315-637-3144
NY Northport, Component Sls., Box 334 516-549-4301
Ohio Cleveland, Del Steffen, 21877 Euclid Ave. 216-486-7078
Ore Portland, R. Legg, 4475 S.W. Scholls Ferry 503-292-8824
Pa Glenside, Elcom, 130 S. Easton Rd. 215-885-1325
Tex Dallas, Hillman Entprs., 3505 Turtle Creek 214-LA-1-9907
EXP: Cal., L.A., Trans World Trade, 11973 San Vicente 213-472-0444
EXP: N.Y., N.Y., Multiparts, 52 Wall St. 212-WH4-4370
For: Can., Montreal, Que., Braydon, 360 Montee De Liesse 514-748-6378

CALABRO UNITRACK, Div. Calabro Plastics, Inc., 8738 W. Chester Pike, Upper Darby, Pa., 19082, Tel: 215-789-3820; Sls. Mgr: A.D. Calabro

CALIBRATED CHARTS, Batavia, N.Y., 14020, Tel: 716-343-7353; Sls. Mgr: F.L. Swanson

CALICO DIV., California Instrs. Co., 5150 Convoy St., San Diego, Cal., 92111, Tel: 714-279-8620; V.P./Mktg: H.W. Clark ....Pg. 424
Ala Huntsville, Currie Aerospace, 2603 Artie 205-536-5650
Ariz Tempe, Recording Science, Box 27806 602-275-1372
Cal Downey, RDP Instrs., 11565-B Paramount 213-923-6784
Cal San Jose, RDP Instrs., Inc., 100 N. Winchester 408-248-0120
Colo Littleton, RADCO Elctrns., 2552 Ridge 303-794-4279
ConnHamden, Applied Meas., Box 5181 203-288-5288
Fla Orlando, Currie Aerospace, Box 13229 305-855-0843
Ill Chicago, SEA, Inc., 4210 E. Irving Pk. Rd. 312-282-6694
Ill Rosemont, Cozzens & Cudahy, 9501 W. Devon 312-825-1144
Ind Indianapolis, Cozzens & Cudahy, 647 Mulford Ct. 317-244-2456
Iowa Carmel, S E A, 620 S Range Line 317-846-2593
MassActon, Applied Meas., Box 316 617-263-2766
Minn Minneapolis, SEA, Inc., 7601 N. Kentucky 612-425-4455
Minn Mpls., Cozzens & Cudahy, 7450 France Ave. S. 612-920-1022
Mo St. Louis, Arentsen Elctrns., 701 Deauville Ct. 314-434-3605
NJ Fairfield, KLS Assocs., 387 Passaic 201-227-2900
NJ Hazlet, Mer Mon (2M) Elctrn. Instrum., Box 302 201-264-1851
NJ Rockaway, Data-Rep. Assocs., Box 245 201-625-2233
NM Albuquerque, Bennewitz, 9720 Candelaria NE 505-298-6775
NM Albuquerque, Recording Science, 1811 Carlisle NE 505-265-7631
NY Huntington Sta., Data-Rep., Box 164 516-423-7677
NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314
NC Winston-Salem, Currie Aerospace, Box 10329 919-725-1927
Ohio Medina, Cozzens & Cudahy, 735 South Ct. 216-725-5660
Pa Abington, Bach-Stewart, 947 Old York 215-927-2100
Pa Valley Forge, J.E. Cuesta & Co., Inc. 215-265-5800
Tex Austin, Sesco, 512 E. Riverside 512-444-6694
Tex El Paso, Recording Science, Box 4033 915-565-5530
Tex Houston, Sesco, 5757 Bellaire Blvd. 713-668-7840
Tex Richardson, Sesco, 300 N. Central Expwy. 214-231-9364
Va Annandale, Nine Assocs., 7753 Patriot 703-256-9105
WashSeattle, Arva, Inc., 1320 Prospect St. 206-622-0177
For: Can., Downsview, Ont., Electronetic Sys., 62 Alness 416-636-3673
For: Can., Ottawa, Ont., Electronetic Sys., 1342 Bank 613-733-3781
For: Can., Montreal, Quebec, Electronetic Sys., 6420 Victoria Ave. 514-342-4112

CALIFORNIA AVIONICS LABS., INC., Box 701, Palo Alto, Calif., 94302, Tel: 415-328-7999

CALIFORNIA COMPUTER PRODS., 2411 W. La Palma Ave., Anaheim, Cal, 92801, Tel: 714-821-2011, TWX: 910-591-1154; Sls. Mgr: R. Murray

CALIFORNIA ELCTRN. MFG. CO., Box 555, Alamo, Calif., 94507, Tel: 415-932-3911; Sls. Mgr: S.P. Cuff Pg. 1315
Cal Los Angeles, American Tech. Sls. Co., 1460 S. Sherbourne Dr. 213-659-3791
Cal Mountain View, Gado Instr. Sls., 655 Castro 415-961-2222
Colo Aurora, Bishop Entprs., 126 Del Mar Cir. 303-364-7361
ConnMiddletown, Mancib, Box 467 203-347-5629
Ga Atlanta, R.W. Allen, 1055 Stovall Blvd., N.E. 404-233-2361
Ill Elk Grove, Meter Makers, 2450 W. Lunt 312-439-5050
Kans Prairie Vlg., Engrg. Svc., 7830 State 913-649-4000
La Cedar Rapids, Engrg. Svc., 1026 Third 319-366-1591
Md Silver Sprg., R. Davies, 10 Old Post Off. 301-587-3910
MassBurlington, Mancib, A St. at Middlesex 617-272-9450
Mich Detroit, H. Teplitz, 26847 Grand River 313-537-9058
Minn Mpls., Pinkney, 957 Winnetka 612-544-3628

Mo St. Louis, Engrg. Svc., 6717 Vernon 314-649-4000
NY Utica, B. Hummel Co., 2224 Maynard 315-736-7821
Ohio Cleveland, Teplitz, 3945 Meadowbrook 216-371-2044
Ohio Dayton, H. Teplitz & Co., 3718 Salem 513-277-6531
Pa Jenkintown, Amtec, 730 Wash. Lane 215-549-2080
Utah Salt Lake Cy., Bishop Entprs., 2520 S. State 801-487-2551
Wash Seattle, Datacom, 2207-12 Fairview 910-325-5193
EXP: Can., Ville La Salle 650, Que., Electrodesign Ltd., 840 La Fleur 514-363-5120

CALIFORNIA FINE WIRE, 338 S. Fourth St., Grover City, Cal., 93433, Tel: 805-489-5144; Sls. Mgr: M.A. Greenelsh

CALIFORNIA INSTRS. CO., 5150 ConYoy St., San Diego, Cal., 92111, Tel: 714-279-8620; V.P./Mktg: H.W. Clark

CALITRONICS CORP., 44 Prospect St, Yonkers, NY, 10701, Tel: 914-YO-3-5900; Gen'l. Mgr: JJ Wilentchik

CALLINS INDS., Box C, Greenfield, Tenn., 38230, Tel: 901-235-2234, TWX: 810-590-3779; Sls. Mgr: F. Acuff

CALVERT ELCTRNS., INC., 220 E. 23rd St., New York, N.Y., 10010, Tel: 212-679-1340, TWX: 710-581-4088; Pres: M. Fudim

Advertisement

"The most comprehensive source in the U.S.A. for International, European and U.S.A. equivalent tubes and semiconductors. Highest quality produced in Europe exclusively for C.E.I. in the U.S.A." 220 East 23 St. N.Y., N.Y.

CAM-LOK DIV., Empire Prods., 9201 Blue Ash Rd., Cincinnati, Ohio, 45242, Tel: 513-791-5420; Sls. Mgr: D.L. Schmitt

CAMBRIDGE FILTER CORP., 7645 Seventh North Rd., Syracuse, N.Y., 13201, Tel: 315-457-1000; Sls. Mgr: D.E. Wendel

CAMBRIDGE MEMORIES, INC., 285 Newtonville Ave., Newtonville, Mass., 02160, Tel: 617-332-3100

CAMBRIDGE PLATING CO., INC., 39 Hittinger St., Belmont, Mass., 02178, Tel: 617-489-2750; Sls. Mgr: L. Tosi Jr.

CAMBRIDGE SYS., EG&G INC., 151 Bear Hill Rd., Waltham, Mass., 02154, Tel: 617-899-3710, TWX: 710-324-7648; Sls. Mgr: V. Cortina

CAMBRIDGE THERMIONIC, 445 Concord Ave, Cambridge, Mass, 02138, Tel: 617-491-5400, TWX: 710-320-6399; Sls. Mgr: W.G. Nowlin

CAMUSAT GUEGUEN TELECOM. INT'L., 2 Windward Ave., White Plains, N.Y., 10605, Tel: 914-949-3719; Sls. Mgr: G.N. Snider

Advertisement

Specializing in design, construction and world-wide installation of microwave point-to-point and troposcatter links, radio and TV towers, antennas and all associated infrastructure ready for your electronics. Standard tower and antenna designs or fabrication to your specs; civil engineering, logistical support. Installations in Africa, South America, Near East and Continental Europe.

CAMWIL, INC., 835 Keeaumoku, Honolulu, Haw., 96814, Tel: 946-1110; Sls. Mgr: L.B. Campbell

CANADIAN RESEARCH INSTITUTE, 85 Curlew Dr., Don Mills, Ont., Canada, Tel: 416-445-6363; Sls. Mgr: S. Vasquez

CANNON, C.F. CO., Springwater, N.Y., 14560, Tel: 716-669-2550; Sls. Mgr: A.W. Shriner

CANRAD PRECISION INDS., INC., 629 Fifth Ave., Pelham, N.Y., 10803, Tel: 914-738-0200; Sls. Mgr: O. Strongin

CAPACITOR SPECIALISTS, INC., Del Dios Hwy., Escondido, Cal., 92025, Tel: 714-747-4000; Sls. Mgr: F. Smelik

CAPCON, INC., 61 Stanton St., New York, N.Y., 10002, Tel: 212-OR-7-6400; Sls. Mgr: H. Stein

CAPITOL MACHINE & SWITCH CO., 87 Newtown Rd., Danbury, Conn., 06810, Tel: 203-744-3300, TWX: 710-456-0365; Sls. Mgr: A.E. Wilson ....Pg. 1896

Ariz Phoenix, Lange Assoc., 221 W. Seminole Dr. 602-942-0724
Cal Los Angeles, E. Landa, 1607 Pontius 213-879-0770
Cal Menlo Pk., Frauman Assocs., Box 969 415-322-8461
Cal San Diego, E. Landa, 3650 Clairemont 714-274-7242
Colo Denver, Franklin Sls. Co., 1924 S. Navajo 303-922-3623
Conn N. Haven, Comp. Rep., 14 Bowling Green 203-239-9762
Fla Orlando, F. Fausett, 2213 Merritt Pk. 305-424-0701
Ga Smyrna, F. Fausett, 145 W. Spring 404-436-5869
Ill Oak Pk., G. Petitt, 6332 Roosevelt 312-261-0342
Kans Overland Pk., Lowell, Kangas, Box 4116 913-888-3200
Mass Needham, Comp. Rep., 1116 Great Plain 617-444-2484
Mich Detroit, Heick & Ralph Assocs., 26847 Grand River Ave. 313-538-3350
Mo St. Louis, Lowell, Kangas & Assocs., Inc., Box 12526, Creve Coeur Sta. 314-647-1111
NJ Livingston, Varrelman-Gorman Co., 2 E. Northfield Rd. 201-992-2505
Ohio Cleveland, E. Frost, 30170 S. Woodland 216-831-1442
Pa Philadelphia, J. Biernbaum, Box 7142 215-635-1030
SC Greenwood, F. Fausett & Co., Stony Pt. 803-451-7847
Tex Dallas, Blackburn Assoc., Box 20073 214-351-9991
Wash Bellevue, Vantage, 300 120th 206-455-3460
For: Can., Montreal, Que., H.W. Brieger Sls. Co., 5253 Decarie Blvd. 514-482-0722
For: Can., Toronto, Ont., J.R. Tilton, Ltd., 51 McCormick St. 416-762-7571

CAPPS & CO., INC., 20 Addison Pl., Valley Stream, N.Y., 11580, Tel: 516-VA-5-4413; V.P. Sls: S. Gualtieri

CAPTOR CORP., 5040 S. County Rd. (25A), Tipp City, Ohio, 45371, Tel: 513-667-8484; Sls. Mgr: O.B. Bruns

CARBOLINE CO., 328 Hanley Ind'l. Ct., St. Louis, Mo., 63144, Tel: 314-MI-4-1000; Sls. Mgr: R.R. Rosenthal

CARBONARA, VICTOR E. INC., Instr. Engrg. Labs., 90 Harbor Rd., Port Washington, N.Y., 11050, Tel: 516-767-4680; Gen'l. Mgr: P.F. Weber

CARBONE CORP., 400 Myrtle Ave., Boonton, N.J., 07005, Tel: 201-DE-4-0700 G. Smith

CARBORUNDUM CO., Elec. & Elctrns. Br., Box 339, Niagara Falls, N.Y., 14302, Tel: 716-278-2521, TWX: 710-524-1657; Sls. Mgr: K.T. Robinson
Pgs. 1964-1967,2832-2834

Ala Huntsville, 20th Century Mktg., Box 6127 205-772-9237
Cal Palo Alto, O'Donnell Assoc., Inc., 1955 El Camino Real 415-327-9061
Cal Torrance, O'Donnell Assoc., Inc., 18053 Crenshaw Blvd. 213-323-9243
Colo Boulder, Intermountain Assoc., 1930 14 St. 303-449-1473
Fla Dunedin, W. J. Irvine Co., 1641 Santa Barbara Dr. 813-733-5382
Ill Berkeley, 5240 St. Charles Rd. 312-547-8800
Ill Chicago, T. B. Hunter, 5653 W. Irving Pk. 312-777-2500
Ind Indianapolis, Tech. Reps., 4000 Meadows 317-546-4967
Iowa Marion, C & M Sls., 888 10th St. 319-377-6313
Mass Needham, Comps/Packaging, 14 Oak St. 617-444-1259
Mass W. Springfield, 333 River St. 413-739-7361
Minn St. Paul, Cahill Assoc., 3000 Hudson Rd. 612-739-8445
NY Elmont, S. S. Egert, 146 Mencham Ave. 516-488-2255
Ohio Dayton, R. G. Sidnell, 3300 S. Dixie Dr. 513-293-1194
Pa Birchrunville, Jadelectronic, Box 126 215-647-5151
Tex Dallas, W. Reese Assoc., Box 24410 214-638-6575
Va Chesapeake, FBD Sls., 4316 Greenleaf Dr. 703-484-3162
EXP: Montreal 249, Que., Future Elctrns., 6655 Cote Des Neiges Rd. 514-735-5775

CARCO ELCTRNS., 1180 O'Brien Dr., Menlo Park, Calif., 94025, Tel: 415-321-8174; Sls. Mgr: Wm. Spont

CARDION COMMUNICATIONS, Long Island Expwy., Woodbury, N.Y., 11797, Tel: 516-921-7300, TWX: 510-221-2179; Sls. Mgr: R.C. Kallaway

CARDION ELCTRNS., Unit General Signal Corp., Long Island Expwy., Woodbury, N.Y., 11797, Tel: 516-921-7300, TWX: 510-221-2179; Mktg. Mgr: J.F. Riley

CARDWELL CONDENSER, 80 E. Montauk Hwy., Lindenhurst, N.Y., 11757, Tel: 516-TU-4-4300 N. Kjeldsen

CAREY ELCTRN. ENGRG. CO., 1880 Clifton Ave., Springfield, Ohio, 45505, Tel: 513-323-6300; Sls. Mgr: R.M. Carey, Jr.

CARGOCAIRE ENGRG. CORP., 8-10 Chestnut St., Amesbury, Mass., 01913, Tel: 617-388-3131, TWX: 617-388-1379; V.P. Sls: T. McCraine

CARLING ELECTRIC, 505 New Park Ave., W. Hartford, Conn., 06110, Tel: 203-233-5551, TWX: 710-425-0034; Sls. Mgr: R.H. Smith ....Pg. 1897

Cal Van Nuys, Pacific Switch Controls, Inc., 14048 Burbank Blvd. 213-873-4802
Ga Doraville, Switch Controls, Inc., 5299 Buford Hwy. 404-451-3258
Ill Wheaton, Carling Elec., Inc., 201 N. Gables Blvd. 312-653-1130
Tex Dallas, Texaswitch, Inc., 2942 Congressman La. 214-357-1768

CAROL CABLE CO. W., 2665 E. Del Amo Blvd., Compton, Cal., 90221, Tel: 213-636-9961; V.P, Pur: J.L. Weiss

CAROLINA MEDICAL ELCTRNS., INC., U.S. 52 Expwy., Box 307, King, N.C., 27021, Tel: 919-983-5132; Sls. Mgr: C.R. Jones

CARPENTER CO., 8030 N. Ridgeway, Skokie, Ill., 60076, Tel: 312-OR-6-0404; Sls. Mgr: S. Greenspan

CARPENTER MFG. CO., INC., Fairgrounds Dr., Manlius, N.Y., 13104, Tel: 315-682-9176

CARSON MFG. CO., 5453 N. Rural St., Indianapolis, Ind., 46220, Tel: 317-257-3191; Sls. Mgr: G.L. Lockwood

CARTER MFG. CORP., 23 Washington St., Hudson, Mass., 01749, Tel: 617-562-6987; Sls. Mgr: L.M. Burgess
Pgs. 2912,2913

Conn Glastonbury, C.K. Barton Assocs., Inc., 343 New London Tpke. 203-633-9417
Ill Chicago, Comm. Engrs., 7100 Northwest Ave. 312-761-0548
Mass Auburndale, C.K. Barton Assocs., Inc., 345 Auburn St. 617-332-2021
NJ Wood-Ridge, Podeyn & Schmidt, 207 Hackensack St. 201-438-2780
NY Great Neck, Podeyn & Schmidt, 420 Northern Blvd. 516-487-1173
Ohio Dayton, Bek Assocs., Inc., 330 Salem Ave. 513-278-1343
Tex Dallas, Southern Engrg. & Sls. Co., Box 47173 214-748-5760

CARTER MOTOR CO., 2707 W. George St., Chicago, Ill., 60618, Tel: 312-588-7700; Sls. Mgr: E.J. Mitchell

Advertisement

Carter FHP motors available in universal shunt PM and variable speed 1/100 to 1 HP. Gearmotors to 30 in.lbs. torque, speeds to 750 RPM, 12 to 230 VDC input. Highest quality, priced right, small orders welcome. DC to AC rotary converters 20 to 2000 watt sine wave output from 12 to 264 VDC input. Automatic standby models for emergency power. Frequency changers produce sine wave 50 or 60 hz unregulated.115 AC from 25 to 400 hz input. 20 to 2000 watt ratings. Our 40th year.

CARTER PRECISION ELEC. CO., 3401 W. Madison St., Skokie, Ill., 60076, Tel: 312-OR-4-0340, TWX: 910-223-3674; Sls. Mgr: R. Jenkins

CARTER SEMICONDUCTOR, 374 Bayview Ave., Amityville, N.Y., 11701, Tel: 516-598-0660, TWX: 510-224-6691; Sls. Mgr: J. Carter, Jr. ....Pg. 1795

Ariz Tempe, Saguaro Tech. Svc., 1000 E. Apache 602-275-0431
Cal Cupertino, Carter Semiconductor tor, 10470 Ainsworth 408-245-7884
Cal San Diego, Frugaletti Assoc., 3930 Ingraham 714-272-6769
Ill Northbrook, Jassen Assoc., 3495 Whirlaway 312-498-4260
Ind Indianapolis, J. L. Weber Agcy., 8150 Westfield 317-255-4117
Iowa Cedar Rapids, Engrg. Svc., 1026 3rd S.E. 319-366-1591
Kans Praire Village, Engrg. Svc., 7830 State Line 913-649-4000
Md Towson, C. H. Newson, 16 Skidmore
Mass Lexington, Contact Sls.
Mich Detroit, S. Greiner, 15318 Mack Ave. 313-882-7570
Minn St. Louis Pk., J. O'Brien, 2635 Lunn Ave. 612-920-3643
Mo St. Louis, Engrg. Svc., 6717 Vernon Ave. 314-726-2233
NJ Stratford, A. E. Luba, 3 Summit Rd. 609-784-5000
NY Amityville, Carter Semiconductor, 374 Bayview 516-598-0660
NY Northport, Halcon Assoc., Box 328 516-423-1818
Ohio Dayton, E. M. A., Box 191 413-433-2800
Tex Richardson, Thornton-Leepee Elctrn. Sls., 423 Melrose 214-231-6891

CARTER'S INK CO., 239 First St., Cambridge, Mass., 02142, Tel: 617-547-2950; Sls. Mgr: J. Rawding

CARY INSTRS., 2724 S. Peck Rd., Monrovia, Calif., 91016, Tel: 213-446-7181, TWX: 910-582-1613; Sls. Mgr: R. Haag

CATALYST RESCH. CORP., 6101 Falls Rd., Baltimore, Md., 21209, Tel: 301-DR-7-7100; Sls, Mgr: J.W. Kulp

CATON INDS., INC., 45 Walnut Ave., Clark, N.J., 07066, Tel: 201-382-9119; Sls. Mgr: O.J. Tamburr

CBS LABORATORIES, High Ridge Rd., Stamford, Conn., 06905, Tel: 203-327-2000; Sls. Mgr: Mark Simmons

CCA ELCTRNS. CORP., 716 Jersey Ave., Gloucester, N.J., 08030, Tel: 609-456-1716; Sls. Mgr: R. Sidwell

C. E. WIRE CO., 4011 McClure Ct., Fort Wayne, Ind., 46809, Tel: 219-747-0973; Sls. Mgr: C.E. Wire

C.B.C. INDS., INC., Box 346, Ft. Washington, Pa., 19034, Tel: 215-GA-3-2797; Sls. Mgr: C. Beckman

CE-JA SPRINGS, INC., 169 Day St., Newington, Conn., 06111, Tel: 203-522-2196; Gen'l. Mgr: G.J. Wassell

CEA, Div. Berkleonics, Inc., 1221 S. Shamrock, Monrovia, Cal., 91016, Tel: 213-359-9261; Mktg. Mgr: Dean Hughes .... Pgs. 672,673

Ala Huntsville, Mekco, Holiday Off. Ctr. 205-881-3721
Ariz Phoenix, J. Smith, 11032 N. 34th 602-942-7160
Cal Pasadena, Technisales, 3820 E. Colorado 213-792-5111
Cal Redwood City, Long, 505 Middlefield Rd. 415-369-3324
Colo Boulder, J. Smith, 310 Seminole Dr. 303-449-7509
Fla Orlando, Mekco Assocs., 3165 McCrory 305-841-2215
Kans Lenexa, Bard Assocs., 13100 W. 95th 913-888-2673
Md Betheseda, S & S Assocs., 7720 Wisconsin 301-654-1434
Mass Auburndale, Engineering Assoc. of N.E., Box 101 617-227-4301
Mich Farmington, Carter, McCormic & Peirce, 23995 Freeway Pk. 313-477-7700
Mo Crestwood, Bard, 50 Crestwood Exec. Ctr. 314-849-0080
NH Manchester, Engrg. Assoc. of N.E., 503 Donald [illegible]
NM Albuquerque, J. Smith, 401-B San Pedro, N.E. 505-255-2111
NC Burlington, Mekco Assocs., 1349 S. Church 919-226-7177
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster 513-278-5873
Pa Pittsburgh, Carter, McCormic & Peirce, 201 Penn Ctr. 412-824-3760
Tex Houston, Lear & Assocs., Box 26653 713-649-7727
Tex Richardson, Lear & Assoc., Box 1266 214-231-7696
Wash Seattle, Dewar Assocs., 6361 First Ave., S. 206-763-2233
EXP: Cal., L.A., Trans-World Tr., 11973 San Vicente 213-472-0444
For: Can., Lachine, Que., Microtech, 2625 Louis Pare 514-631-6859

CELANESE PLASTICS CO., Div. Celanese Corp., 550 Broad St., Newark, N.J., 07102, Tel: 201-877-2300, TWX: 710-995-4446; Sls. Mgr: J.E. Giordano

CELCO, Constantine Engrg. Labs., Co., 70 Constantine Dr., Mahwah, N.J., 07430, Tel: 201-327-1123, TWX: 710-988-1018; Sls. Mgr: E. Ryder .... Pg. 339

CELESTIAL COMPS., INC., Box 4216, Covina, Cal., 91722, Tel: 213-966-3576; Sls. Mgr: C. Burger

Advertisement

"Celestial produces resistor bobbins, bobbins with leads, coil forms, encapsulation cups, and all cylindrical custom high-precision miniature and microminiature electronic and instrument components of machined epoxy, plastics, and metals. Maximum 3/4" outside diameter, on Swiss Automatic Screw machines. Complete Secondary Department. Contact Sales Representatives or Factory direct."

CELLUPLASTICS, INC., Sub. Brockway Glass Co., Brockway, Pa., 15824; Pres: P.S. Holmquest

CELTIC INDS., INC., 14760 Keswick St., Van Nuys, Cal., 91405, Tel: 213-787-3615; Sls. Mgr: C. Haynoski

C.E.M. CO., INC., 24 School St., Danielson, Conn., 06239, Tel: 203-774-8571; Sls. Mgr: M. R. Rollinson

CENTER FOR TECHNICAL DEVELOPMENT, 517 E. Main St., Louisville, Ohio, 44641, Tel: 216-875-8892; Sls. Mgr: E.A. Presta

CENTERLINE SPECIALTIES, Box 656, Boulder, Colo., 80302, Tel: 303-443-9040; Sls. Mgr: B. Stark

CENTRAL ENGRG. CO., 2930 Anthony La., Minneapolis, Minn., 55418, Tel: 612-781-6557; Pres: L.E. Swanson

CENTRAL PLASTICS DISTS., 527 S. Wells St., Chicago, Ill., 60607, Tel: 312-786-0200; Pres: H.R. Greenwald

CENTRAL SCIENTIFIC CO., Div. Cenco Instr. Corp., 2600 S. Kostner Ave., Chicago, Ill., 60623, Tel: 312-277-8300; Sls. Mgr: L.A. Miller

CENTRAL TRANSFORMER CO., 850 W. Jackson Blvd., Chicago, Ill., 60607, Tel: 312-TA-9-1936; Sls. Mgr: M.R. Whitman

CENTRALAB, ELCTRNS., Globe-Union, 5757 N. Green Bay Ave., Milwaukee, Wisc., 53209, Tel: 414-228-1200, TWX: 910-262-3084; Sls. Mgr: K. Stephan Pgs. 1898,2348,2918

Ariz Phoenix, Toward Engrg., 4240 E. Clarendon 602-955-3193
Cal Los Angeles, Clemick-Neenan, 654 N. Sepulveda 213-476-1272
Cal Redwood City, Logan, 463 Brewster #5 415-369-6726
Colo Denver, Electro-Rep., 1051 S. Platte River 303-744-2821
Fla Orlando, Cartwright & Bean, 609 Colonial 305-425-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill NW 404-237-2273
Ill Des Plaines, Centralab, 2200 E. Devon 312-889-2900
Ind Indianapolis, L. DeVoe, 4010 Washington 317-283-1395
Iowa Cedar Rapids, J. Vrbik, 2818 A Ave.NE 319-365-0461
Kans Overland Pk., Lowell, Kangas, 6920 W. 82nd 913-888-3202
Md Elkridge, J. Bresson, 5600 Main 301-796-5220
Mass Needham, Centralab, 60 Dedham Ave. 617-444-4847
Mich Benton Harbor, R. Merchant, Box 591 616-925-4211
Mich Detroit, R. Merchant, 18411 W. McNichols 313-KE-5-6000
Minn Mpls., Centralab, 4901 W. 77th St. 612-920-4130
Mo St. Louis, Lowell, Kangas, Box 26 314-MI-7-1111
NJ Clifton, Centralab, 1010 Clifton 201-778-5900
NY Albany, Compar Albany, 6 Highland 518-489-7408
NY New York, Centralab 212-564-7540
NY Cicero, Compar Albany, 5850 Glendora 315-471-3356
NY Endwell, Compar Albany, 530 Verna 607-723-8743
NY Fairport, Compar Albany, 42 Wining Brook 716-271-2230
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-537-7965
Ohio Cleveland, M. Roth, 678 S. Green Rd. 216-EV-2-9090
Ohio Dayton, R. Siff, Box 7035, Sta. B 513-278-4779
Pa Narberth, J. Bresson, 107 Forrest Ave. 215-839-6770
Tenn Memphis, Cartwright & Bean, 560 S. Cooper St. 901-276-4442
Tex Dallas, R.E. Nesbitt Co., 2930 Merrell Rd. 214-357-4601
Tex Houston, R.E. Nesbitt Co., 4810 Hazard 713-JA-8-3811
Va Lynchburg, J. Bresson & Assoc., Box 4115 703-237-0829
Wash Seattle, J. J. Backer, 221 W. Galer St. 206-AT-3-6470
Wisc Milwaukee, Kiehm & Assoc., 1225 N. Water 414-276-4040

CENTRALAB SEMICONDUCTOR, Globe-Union, 4501 Arden Dr., El Monte, Cal., 91734, Tel: 213-579-0700, TWX: 910-587-3429; Mgr., Mktg. Grp: F.H. Angier Pgs. 1796-1798

Ariz Phoenix, Toward Engg., Box 15268 602-955-3193
Cal Huntington Beach, Clemick-Neenan, 711 Ocean 714-536-1732
Cal Los Altos, Recht, 900 N. San Antonio 415-941-0336
Cal Los Angeles, Clemick-Neenan, 654 N. Sepulveda 213-476-1272
Colo Denver, McLoud & Raymond, 2151 S. Grape 303-756-1589
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek 305-425-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill 404-237-2273
Ill Des Plaines, Centralab, 2200 E. Devon 312-827-4487
Ill Des Plaines, Coombs Assoc., 1001 E. Touhy 312-775-0170
Ind Indpls., L.M. DeVoe, 665 E. 61st 317-257-1227
Mass Lexington, Contact Sls., 49 Waltham 617-861-1550
Mich Detroit, G & H Sls., 24001 S. Field 313-358-1910
Minn Minneapolis, Furber Sls., 6500 Nicolett 612-861-1518
Mo St. Louis, Coombs, 11734 Lockland Indl. 314-542-3636
NJ Clifton, Centralab, 136 Lakeview 201-478-5300
NY Rochester, W.H. Zimmerman, 3100 Monroe 716-586-4450
NY Syracuse, W.H. Zimmerman, 112 DeWitt 315-474-4889
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-537-7965
NC Raleigh, Cartwright & Bean, 1016 Belfast 919-832-7128
Ohio Cleveland, M. Roth Sls., 678 S. Green 216-382-9090
Pa Glenside, Elcom Inc., 130 Easton 215-885-1325
Tenn Memphis, Cartwright & Bean, 560 S. Cooper 901-276-4442
Tex Dallas, R.E. Nesbitt, 2930 Merrell 214-357-4601
Tex Houston, R. Nesbitt Co., Box 66831 713-528-3811
Va Fairfax, Schibley Assoc., 10604 Warwick 703-591-3008
Wash Seattle, J. Backer Co., 221 W. Galer 206-285-1300
Wisc Milwaukee, Mueller Elctrn. Sls., 10721 W. Capital 414-464-4210
For: Toronto 18, Ont Can., Wilson Entprs., 386 Bering Ave. 416-231-7536

CENTRON ENGRG., 1518 W. 132nd St., Gardena, Cal., 90249, Tel: 213-321-3220; Sls. Mgr: N. Levesque Pg. 1299

Ariz Scottsdale, F. Board Assocs., Box 1906 602-949-9561
Ark Magnolia, J.V. Schoonmaker Co., Box 247 505-234-3778
Cal Burlingame, W. J. Purdy Co., 770 Airport Blvd. 415-347-7701
Cal Los Angeles, Black & Strong, 1728 S. LaCienega Blvd. 213-870-9191
Colo Littleton, W.J. Purdy Co., 1449 Littleton Blvd. 303-794-4283
Conn Meriden, P.R. Sturgeon Co., 99 Colony St. 203-237-1112
Ill Hinsdale, Hill-Gray Assoc., 2 Salt Creek La. 312-325-4810
Iowa Des Moines, T.L. Dowell, 4127 27th St. 515-255-6480
Kans Overland Pk., T.L. Dowell, 7208 W. 80th St. 913-649-6069
Md Baltimore, Trinkle Sls., 8745 Cimarron Cir.
Mass Chestnut Hill, P.R. Sturgeon Co., 1330 Boylston St. 617-734-7710
Mich Detroit, R.C. Merchant Co., 18411 W. McNichols 614-535-6000
Minn Minneapolis, M. Foster Co., 228 S. Cedar Lake Rd. 612-374-2612
Mo St. Louis, T.L. Dowell, 4753 Tital Ct. 314-892-2859
NJ Cherry Hill, 500 N. Kings Hwy. 609-667-3500
NM Albuquerque, C.T. Carlberg & Assocs., Box 3177, Sta. D 505-265-1579
NY Syracuse, Mar-Com Assocs., 2002 Teall Ave. 415-437-2992
Ohio Dayton, Neal Bear Co., 1563 E. Dorothy La. 513-299-3566
Pa Allison Pk., Trinkle Sls., 3947 Summer Rd.
Tenn Memphis, Cartwright & Bean, 560 S. Cooper 901-276-4442
Tex Dallas, J.V.Schoonmaker Co., 2995 Ladybird La. 214-357-8481

CENTURY COIL CORP., 1522 N. Clybourn Ave., Chicago, Ill., 60610, Tel: 312-664-2395; Sls. Mgr: W.R. Williamson

CENTURY DATA SYSTEMS, 1270 N. Kraemer Blvd., Anaheim, Cal., 92806, Tel: 714-632-7111

CENTURY ELEC. CO., 1806 Pine St., St. Louis, Mo., 63166, Tel: 314-CE-1-4920, TWX: 314-044-7191; V.P. Sls: J. Bolton

CENTURY FASTENER CORP., 20 Grand Ave., Brooklyn, N.Y., 11205, Tel: 212-UL-2-6440; Sls. Mgr: G. Stieglitz

CENTURY STRAND, INC., 3 Entin Rd., Clifton, N.J., 07014, Tel: 201-472-7777; Sls. Mgr: L. Kellermann

CERAC, INC., Box 597, Butler, Wisc., 53007, Tel: 414-781-5525

CERAM CORP., 5345 Timken Sq., La Mesa, Calif., 92041, Tel: 714-463-9211

CERAMASEAL, INC., Sub. Interpace Corp., Box 25, New Lebanon Center, N.Y., 12126, Tel: 518-794-6101; Sls. Mgr: G.D. Sawin

CERAMIC MAGNETICS, INC., 87 Fairfield Rd., Fairfield, N.J., 07006, Tel: 201-227-4222; Mktg. Mgr: J.A. Mecca

CERMETRON CORP., 10439 Roselle St., San Diego, Cal., 92121, Tel: 714-453-1354; Sls. Mgr: G. Scott cont'd

Advertisement

Cermetron Corp. manufactures high alumina substrates for the hybrid microelectronics industry. Snap-a-parts and micro substrates as small as .010 square are a specialty. Any custom order delivered in 2-3 weeks. Any standard item 4 to 7 days. Delivery. 96% and 99.5% AL203

CERRO CORP., 300 Park Ave., New York, N.Y., 10022, Tel: 212-MU-8-8822, TWX: 212-867-5894; Pres: R.P. Koenig

CERRO WIRE & CABLE CO., Div. Cerro Corp., 285 Nicoll St., New Haven, Conn., 06504, Tel: 203-772-2250, TWX: 710-465-2149; Sls. Mgr: E.S. Reed

CES ELCTRNS., 2968 Avenue Z, Brooklyn, N.Y., 11235; Sls. Mgr: S. Chase

CETRON ELCTRN. CORP., 715 Hamilton St., Geneva, Ill., 60134, Tel: 312-232-4140; Sls. Mgr: R.C. Hendricksen

CGS/DATAMETRICS, 127 Coolidge Hill Rd., Watertown, Mass., 02172, Tel: 617-924-8505; Sls. Mgr: H. Gray

CGS/LAWRENCE, Ind'l. Blvd., Southampton, Pa., 18966, Tel: 215-355-5500; Sls. Mgr: T. Burcaw

CGS UNITS, INC., 73 Saginaw Dr., Rochester, N.Y., 14623, Tel: 716-244-2080; Sls. Mgr: R.B. Taylor

CHADWICK-HELMUTH CO., INC., 111 E. Railroad Ave., Monrovia, Calif., 91016, Tel: 213-358-4567; Sls. Mgr: B. Minteer

CHALCO ENGRG. CORP., 15126 S. Broadway, Gardena, Cal., 90247, Tel: 213-FA-1-0121, TWX: 910-346-7026; Sls. Mgr: J. Cox

CHAMBERLAIN MFG. CORP., 845 Larch, Elmhurst, Ill., 60126, Tel: 312-279-3600; Dir. Mktg: H. Prince

CHANNEL INDS., 839 Ward Dr., Santa Barbara, Cal., 93105, Tel: 805-967-0171; Sls. Mgr: R.M. Callahan

CHANNELLOCK, INC., S. Main St., Meadville, Pa., 16335, Tel: 814-336-1175; Sls. Mgr: W.A. DeArment

CHASE BRASS & COPPER CO., 20600 Chagrin Blvd., Cleveland, Ohio, 44122, Tel: 216-283-3900, TWX: 216-486-5689

CHASE METAL SERVICE DIV., 20600 Chagrin Blvd., Cleveland, Ohio, 44122, Tel: 206-283-3900; V.P. Sls: D.S. Soliday

CHASE-SHAWMUT CO., 374 Merrimac St., Newburyport, Mass., 01950, Tel: 617-462-6662, TWX: 710-347-0264; Sls. Mgr: H.E. Pike

CHASE & SONS, INC., 19 Highland Ave., Randolph, Mass., 02368, Tel: 617-963-2600; Sls. Mgr: L.P. Graham

CHASSIS-TRAK, INC., 525 S. Webster Ave., Indianapolis, Ind., 46219, Tel: 317-359-5407; Sls. Mgr: J.R. Young

CHATHAM CONTROLS CORP., 33 River Rd., Chatham, N.J., 07928, Tel: 201-635-8892; Sls. Mgr: D.C. Perst

CHATILLON JOHN & SONS, 83-30 Kew Gardens Rd., Kew Gardens, N.Y., 11415, Tel: 212-847-5000; Sls. Mgr: N. Lavenda

CHEM AERO, INC., 231 E. Lomita Blvd., Wilmington, Cal., 90744, Tel: 213-775-2581, TWX: 910-345-6267; Sls. Mgr: H.N. Lee

CHEMALLOY ELCTRNS., Box 10, Santee, Cal., 92071, Tel: 714-448-5715; Sls. Mgr: S. Freedman

CHEMCUT CORP., 500 Science Pk., State College, Pa., 16801, Tel: 814-238-0514

CHEMELEC PRODS., INC., 8 Fellowship Rd., Cherry Hill, N.J., 08034, Tel: 609-424-1470; Pres: F.O. Dutton

CHEMICAL COMMERCE, 123 Sussex Ave., Newark, N.J., 07103, Tel: 201-621-9652; Owner: R. Handel

CHEMICAL MICRO MILLING CO, Box 770, Camden, N.J., 08101, Tel: 609-964-2030, TWX: 710-892-0731; Sls. Mgr: F.D. Kronslak

CHEMICAL PRODS. CORP., King Philip Rd., E. Providence, R.I., 02914, Tel: 401-434-1770, TWX: 401-438-2607; Pres: H.B. Allison

CHEMPLAST, INC., 31-150 Dey Rd., Wayne, N.J., 07470, Tel: 201-696-4700, TWX: 710-988-5834; Exec. V.P., Sls. Mgr: M. Powell, Jr.

CHEMTRONICS, INC., 1260 Ralph Ave., Brooklyn, N.Y., 11236, Tel: 212-NA-9-1300; Sls. Mgr: A. Friedman

CHERRY ELECTRICAL PRODS., 3623 Sunset Ave., Waukegan, Ill, 60085, Tel: 312-689-7600, Ext. 7703, TWX: 910-235-1572; Sls. Mgr: D. Grady ....Pg. 1899

Ala Huntsville, Powertronics, Box 3384 205-852-6347
Cal Palo Alto, Abbott Engrg., 2450 El Camino Real 415-327-0830
Cal Torrance, O'Donnell, 18053 Crenshaw Blvd. 213-323-9243
Colo Broomfield, Arrowhead Sls., Box 335 303-222-6462
Conn Meriden, Electro-Products Sls., Box 92 203-235-4040
Fla Belleair Bch., Consultants for Industry, 211 Howard Dr. 813-595-1486
Ind Ft. Wayne, Menze Sls., Box 9178 219-747-5616
Mass Waltham, Electro-Products Sls., Box 121 617-899-1570
Mich Troy, McPhail, 1820 Stephenson Hwy. 313-689-6444
Mich Westland, Miltimore Sls., 34142 Fountain 313-261-8117
Minn St. Paul, Cahill, 3000 Hudson Rd. 612-739-8445
Mo Kansas City, Thro Industrial Sls., Box 7244 913-362-2533
NJ Ft. Lee, S. Justin, Box 1068 201-947-4371
NJ Pitman, Colrud Co., 601 Ardmore Ave. 609-589-5866
NM Albuquerque, Crown Engrg., 2129 San Mateo, N.E. 505-265-2066
NY Rochester, W.J. Andres, 39 Saginaw Dr. 716-244-2445
NC Thomasville, Powertronics, Box 403 919-476-4257
Tex Dallas, Reese Assoc., Box 24410 214-638-6575
Tex Houston, Reese Assoc., Box 26247 713-621-3134
Va Lynchburg, Powertronics, 5633 White Oak Dr. 703-239-6085
Wash Seattle, Jas. J. Backer Co., Box 9327 206-205-1300
Wisc Pewaukee, D. Herrick, 220 Sussex St. 414-691-2770

CHERRY RIVET DIV., Townsend Co., P.O. Box 2157, Santa Ana, Calif., 92707, Tel: 714-545-5511, TWX: 910-595-1500; Sls. Mgr: D.J. Sauser

CHESAPEAKE INSTR. CORP., Shadyside, Md., 20867, Tel: 301-867-2151; Mktg. Mgr: J.F. Luckey

CHICAGO CONDENSER CORP., 3255 W. Armitage Ave., Chicago, Ill., 60647, Tel: 312-227-7070; Sls. Mgr: P. Philips

CHICAGO DYNAMIC INDS., Precision Prods. Div., 1725 W. Diversey Blvd., Chicago, Ill., 60614, Tel: 312-935-4600; Sls. Mgr: J.M. Early ....Pg. 1900

Cal Burbank, Weightman, 1226 W. Olive 213-VI-9-2435
Cal Menlo Pk., Weightman & Assocs., 120 Santa Margarita 415-325-2885
Colo Aurora, Bishop Entprs., 126 Del Mar Cir. 303-364-7361
Conn Waterbury, Coakley, Boyd & Abbett, 820 Hamilton Ave. 203-756-8766
Fla Orlando, W. Lehmann Co., Box 20275 305-841-4901
Ga Atlanta, W. Lehmann Co., Box 52786 404-237-0600
Ill Rolling Meadows, Sumer, 5105 Tollview 312-392-7370
Ind Fort Wayne, Sumer, Inc., 2211 S. Calhoun 219-744-4331
La New Orleans, Glidden Eng. & Equip. Co., Box 10442 504-721-4763
Md Glen Arm, Billis Sls. Co., Box 94H-40, Ravenhurst Cir. 301-592-7047
Mass Needham, Coakley, Boyd & Abbett, 1424 Highland 617-444-5470
Mich Deroit, L. Dickelman, 18315 W. Seven Mile 313-255-3300
Minn Mpls., M. Foster, 228 S. Cedar Lake 612-374-2612
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood Plaza 314-962-0111
NJ Cherry Hill, J. Billis Sls., 14 Galway 609-HA-8-3651
NJ Wayne, S.A.M. Assocs., 18 Tilghman 201-684-7682
NY Albany, Compar-Albany, 6 Highland Ave. 518-489-4777
NY Jamaica, S.A.M. Assocs., 150-08 87th 212-OL-8-8881
NC Greensboro, L & D, Inc., Box 7243 919-292-3201
Ohio Cleveland, L. Dickelman, 28829 Chagrin 216-831-1039
Tex Dallas, Glidden Engrg. & Equip. Co., 8609 N.W. Plaza Dr. 214-EM-3-6539
Tex Houston, Glidden Engr. & Equip. Co., 7728 Long Pt. Rd. 713-681-1415
Utah Salt Lake Cy., Bishop Entprs., 2520 S. State 801-487-2551
Wash Seattle, R. Johnston, 1011 N.E. 69th 206-514-5170
EXP: N.Y., Westbury, Minthorne Int'l. Co., 2200 Shames Dr. 212-895-3120
For: Ville Lasalle 650, Que., Electrodesign, Ltd., 840 Lafleur 514-363-5120

CHICAGO LOCK CO., 4275 W. Belmont Ave., Chicago, Ill., 60641, Tel: 312-282-7177; Sls. Mgr: E.L. Lovelace Pg. 1901

NY New Rochelle, 271 North Ave. 914-636-1311

CHICAGO MINIATURE LAMP WORKS, 4433 N. Ravenswood Ave., Chicago, Ill., 60640, Tel: 312-784-1020, TWX: 910-221-5445; Sls. Mgr: W. Bofhoven ....Pg. 1443

Ariz Phoenix, Howe & Howe Sls., Box 10497 602-264-7971
Cal No. Hollywood, CMLC, 10213 Riverside Dr. 213-877-0158
Cal San Francisco, CMLC, 115 New Montgomery St. 415-391-1098
Colo Denver, Nelson Co., 1294 S. Bannock St. 303-733-5528
Conn New Haven, Gerber Sls., Box 2917, 29 Whalley Ave. 203-777-6279
Fla N. Miami Bch., Cartwright & Bean, 20100 N.E. 25th Ct. 305-945-2962
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek 305-425-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill Pl., N.W. 404-237-2273
Ill Chicago, CMLW, 4433 N. Ravenswood Ave. 312-784-1020
Iowa Atlantic, Koenig-Myers Assoc., 300 Linn St. 712-243-3342
Kans Shawnee Mission, Koenig-Myers Assoc., 5500 Buena Vista Dr., Box 374 913-432-8300
La Metarie, Cartwright & Bean, 7010 Magnolia Ct., Box 73336 504-887-0482
Mass E. Longmeadow, Gerber Sls., 24 Maple Ct. 413-525-3059
Mass Waltham, Gerber Sls., 176 Second Ave. 617-891-8040
Mich Detroit, R.C. Merchant, 18411 W. McNichols 313-535-6000
Mich St. Joseph, R.C. Merchant, 505 Pleasant St. 616-983-7378
Minn Minneapolis, M. Foster Co., 228 S. Cedar Lake Rd. 612-374-2612
Mo Maryland Hgts., Koenig-Myers Assoc., 2721 Beloit Dr. 314-739-1655
NJ Cherry Hill, Trinkle Sls., 500 N. Kings Hwy. 609-667-3500
NY DeWitt, F. W. Taylor Co., 4455 E. Genesee St. 315-446-0422
NY Pt. Washington, T.M.A., Inc., Box 735 516-767-2432
NC Charlotte, Cartwright & Bean, 25 Harwyn Dr. 704-537-7965
NC Raleigh, Cartwright & Bean, 1016 Belfast Dr. 919-832-7128
Ohio New Bremen, T. Shelby & Co., 17 S. Walnut St. 419-629-6511
Tenn Memphis, Cartwright & Bean, Box 4760 901-276-4442
Tex Dallas, Techno, Box 20544 214-357-9213
Wash Seattle, J.J. Backer Co., 221 W. Galer St. 206-285-1300
EXP: Ill., Chicago, E.D. Magnus & Assoc. Inc., 5715 N. Lincoln Ave. 312-334-1503
For: Can., Scarborough, Ont., Lake Engrg., 123 Manville Rd. 416-751-5980

CHICAGO RIVET & MACH. CO., 950 S. 25 Ave., Bellwood, Ill., 60104, Tel: 312-LI-4-5100, TWX: 312-547-7316; Sls. Mgr: W.O. Shineflug

CHICAGO SWITCH, 2035 W. Wabansia Ave., Chicago, Ill., 60647, Tel: 312-489-5500; Sls. Mgr: M. Podgorski Pg. 1902

Cal Santa Clara, Richards, 2938 Scott 408-246-5860
Cal Venice, Coplan Assocs., 4206A Glencoe 213-397-2166
Fla Indian Rocks Bch., Tech-Rep., Box 425 813-595-2834
Fla Melbourne, Tech-Rep., Box 2095 305-723-9140
Ga Jonesboro, Tech-Rep., Box 955 404-753-0111
Ill Rolling Meadows, Sumer, 5105 Tollview 312-392-7370
Iowa Cedar Rapids, Engrg. Svc., 1026 3rd Ave., SE 319-366-1591
Kans Prairie Vlg., Engrg. Svc., 7924A State Line 913-649-4000
Mass Newton Upper Falls, Brookdale/Richter Engrg., 1214 Chestnut 617-244-6969
Mich Southfield, J. Montgomery, 19400 W. Ten Mile 313-358-2616
Minn Mpls., Sumer, 7710 Computer 612-920-8414
Mo St. Louis, Engrg. Svc., 6717 Vernon 314-726-2233
NJ Riverton, Given Assocs., Box 183 609-829-7249
NY Port Wash., P. D. Aaron, Box 511 516-767-2600
NY Syracuse, Nycom, 2002 Teall 315-437-8343
Ore Beaverton, N. R. Schultz Co., Box 156 503-646-1345
Tex Addison, Campion Sls., Box 396 214-239-9196
Wash Bellevue, N. Schultz, 305-112th Ave., NE 206-GL-4-5224
For: Can., Scarborough, Ont., D. Randall, 1710 Midland 416-751-7911

CHICOPEE MFG. CO., Cornelia, Ga., 30531, Tel: 404-778-2281, TWX: 404-778-4450; Gen'l. Mgr: W.J. Shortt

CHISSO CORP., 3-2 Marunouchi 2-Chome, Chiyoda-Ku, Tokyo 100, Japan, Tel: Tokyo 231-4571, TWX: TK 2554 Chisso

CHOMERICS, INC., 77 Dragon Ct., Woburn, Mass., 01801, Tel: 617-935-4850, TWX: 710-393-0173; Sls. Mgr: K. Dunne

CHRISTIE ELEC., 3404A W. 67th St., Los Angeles, Cal., 90060, Tel: 213-750-1151, TWX: 910-321-3867; V.P: F. Benjamin .... Pgs. 674,675
Ala Huntsville, Ridge Instr., 7220 Governors, W. 205-837-1761
Ariz Phoenix, R.A. Mayes, 4014 N. 7th St. 602-279-5243
Cal Diablo, Thomas Assocs., Box 684 415-837-8411
Cal Los Angeles, Halbar Assocs., 3261 W. 4th 213-387-8283
Colo Denver, R.A. Mayes Co., Box 10486 303-466-6311
Fla Orlando, Ridge Instr. Co., 2227 Seely Dr. 305-293-4711
Ga Atlanta, Ridge Instr., 3094 McCully, NE 404-939-1554
Haw Honolulu, Victor Kim Elctrns., 623-25 South St. 507-132
Ill Chicago, K. Meyers, 7256 W. Touhy 312-774-6440
Ind Indianapolis, K. Meyers, 3512 Rockville 317-243-6681
Iowa Cedar Rapids, Engrg. Svcs., 1026 Third, SE 319-366-1591
Kans Prairie Vlg., Engrg. Svcs., 7924-A State Line 913-649-4000
Md Silver Spg., L. White, 1110 Fidler La. 301-585-3141
Mass Lexington, W.M. Hague, 10 Muzzey St. 617-862-5700
Mich Farmington, Carter, McCormic & Pierce, 23995 Freeway Pk. 313-477-7700
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NJ Ridgewood, Instr. Sls. Co., Box 403 201-445-5210
NM Albuquerque, R. Mayes, 8016 Zuni, SE 505-265-7989
NY Clarence, Rep. Tech., Inc., Box 156 716-684-6250
NY Syracuse, Rep. Tech., Inc., 2002 Teall Ave. 315-437-2845
NC Winston Salem, L.G. White, Box 2356 919-725-3612
Ohio Cleveland, Carter, McCormic & Pierce, 21380 Lorain 216-333-5650
Ohio Dayton, Carter, McCormic & Pierce, Box 1472 513-278-5873
Pa Narberth, L. White-Keystone, 100 Essex 215-664-6505
Pa Pittsburgh, Carter, McCormic & Pierce, 201 Penn Ctr. 412-824-3760
Tenn Oak Ridge, Ridge Instr., 164 Ridgeway Ctr. 615-483-1311
Tex Richardson, C. Tinch, First Bank & Trust 214-231-1322
Va Arlington, Gans-Fryling, 2030 - 16th St., N. 703-527-3262
Wash Bellevue, A. Smith Co., 405 - 166 S.E. 206-746-6770
Wisc Milwaukee, K. Meyers, 4359 S. Howell 414-482-1313
EXP: Cal., L.A., Trans-World Trade, 11973 San Vicente 213-472-0444

CHRONETICS, INC., 500 Nuber Ave., Mt. Vernon, N.Y., 10550, Tel: 914-699-4400, TWX: 710-560-0014; Sls. Mgr: S. Gordon .... Pg. 425
Ala Huntsville, Brennan Assocs., Box 1074 205-536-7425
Ariz Phoenix, Barnhill Assocs., 537 E. Osborn Rd. 602-263-1250
Cal Sherman Oaks, Winsor Dynamics, Box 5500 213-989-3631
Cal Woodside, Winsor Dynamics, 195 Greer Rd. 415-854-4870
Colo Denver, Barnhill Assocs., 1170 S. Sheridan Blvd. 303-934-5505
Conn Hamden, J & J Assocs., 965 Dixwell Ave. 203-624-7800
Fla Clearwater, Brennan Assocs., Inc., Box 5006 813-446-5006
Fla Orlando, Brennan Assocs., Box 13026 305-425-8161
Ill Chicago, L.F. Green & Assocs., 5218 W. Diversey Ave. 312-286-6824
Ind Indianapolis, L.F. Green & Assocs., 1111 E. 54th St. 317-253-2087
Md Silver Spring, Q.E.D. Elctrns., Inc., 850 Sligo Ave. 301-JU-8-8134
Mass Burlington, J & J Assocs., 12 Cambridge St. 617-899-0160
Minn Minneapolis, L.F. Green & Assocs., 6225 University Ave. 612-781-1611
NM Albuquerque, Barnhill Assocs., 827 Pennsylvania, N.E. 505-265-7766
NY Dewitt, DB Assocs., Box 14 315-446-0220
NY Mt. Vernon, Q.E.D. Elctrns., Inc., 500 Nuber Ave. 914-664-0080
Tex Houston, Barnhill Assocs., 3810 Westheimer 713-621-0040
Tex Richardson, Barnhill Assocs., 312 N. Central Expwy. 214-231-2573
Wash Seattle, H. Levinson Co., 1211 E. Denny Way 206-EA-3-5100

CHRONO-LOG CORP., 2583 W. Chester Pike, Broomall, Pa., 19008, Tel: 215-EL-6-6771; Sls. Mgr: D. Biberman Pg. 340
Ala Huntsville, Reynolds & Assoc., 904 Bob Wallace Ave., S.W. 205-536-1941
Ariz Phoenix, R.A. Mayes Co., 4014 N. 7th St. #6 602-279-5243
Cal Los Angeles, Thorson Co., 6824 Melrose Ave. 213-WE-7-0790
Cal Palo Alto, Thorson Co., 2443 Ash St. 415-DA-1-2414
Cal San Diego, Thorson Co., 444 Olive St. 714-CY-8-8385
Cal Tustin, Thorson Co., 17461 Irvine Blvd. 714-544-5121
Colo Denver, R. A. Mayes Co., Box 10486 303-466-6311
Fla Ft. Lauderdale, Reynolds & Assocs., 161 S.W. 75th St. 305-581-6611
Fla Melbourne, Reynolds & Assocs., 822 E. Strawbridge Ave. 305-727-3205
Fla Orlando, Reynolds & Assocs., Box 8877 305-424-3836
Ga Atlanta, Reynolds & Assoc., 175 W. Wieuca Rd. 404-252-5360
Mass Needham, Wild & Assocs., 570 Hillside Ave. 617-HI-4-2366
Minn St. Paul, De Beck Assoc., 2119 Grand Ave. 612-690-1557
NJ Mountainside, J. J. Wild, Inc., Box 1217 201-654-3272
NM Albuquerque, R.A. Mayes Co., 8016 Zuni Rd. 505-265-7989
NY Hastings on Hudson, Wild & Assocs., Box 266 914-963-3803
NY Jericho, J. J. Wild, Inc., 400 Jericho Tpke. 516-WA-1-7100
Ohio Worthington, Ohio Instr. Co., 505 Whitney Ave. 614-885-0743
Pa Southampton, Wild & Assocs., 80 Second St. Pike 215-EL-7-6645
Tex Richardson, R. A. Mayes Co., Box 1021 214-235-3043
Va Arlington, H.J. Heffernan Co., 1123 N. Irving St. 703-JA-2-6666
Wash Seattle, Thorson Co., 909 N.E. 43rd St. 206-ME-2-0710
For: Can., Don Mills, Ont., York Instrs., 1262 Don Mills Rd. 416-445-1255

CHRONOMATIC DIV., Illinois Tool Works, 110 W. Providencia Ave., Burbank, Cal., 91502, Tel: 213-846-4731; Sls. Mgr: C. Jones

CHU ASSOCS., INC., P.O. Box 387, Whitcomb Ave., Littleton, Mass., 01460, Tel: 617-456-3282; Sls. Mgr: I.M. Faigen

CIMCO WIRE & CABLE, 250 W. Crescent Ave., Allendale, N.J., 07401, Tel: 201-DA-7-2522; Pres: W.J. Indoe .... Pg. 2996
Ariz Scottsdale, OEM Specialties, 6625 E. MacDonald Dr.
Cal Hawthorne, Falmat, Inc., 13125 Yukon Ave.
Fla Altamonte Springs, Grose Assoc., Box 536
Ill Chicago, Kennedy Engrg., 6713 N. Oliphant Ave.
Mass Weston, F.C. Talbot Co., Box 366
Mich Birmingham, Comp./Insulation, 610 N. Woodward
Minn Minneapolis, W. Schmitt Assoc., 4522 Excelsior Blvd.
Mo St. Charles, Metal Craft Supply Co., 23 North Dr.
NJ Montclair, E.B. Hinck, Box 201 201-716-2625
NC Charlotte, B. Jackson Co., 4632 Randolph Rd.
Ohio Cleveland, Component/Insulation Corp., 14235 Detroit
Pa Glenside, Precision Elctrns., Inc., 1601 Church Rd.
Pa Pittsburgh, J.W. Kight Co., 4 Longfellow Rd.
Tex Dallas, R.E. Nesbitt Co., 2930 Merrell Rd.
For: Can., Montreal, Que., Allied Elctrn. Sls., 5350 Montclair

CINCH DIV. TRW INC., 1501 Morse Ave., Elk Grove Village, Ill., 60007, Tel: 312-439-8800, TWX: 910-222-1796; Sls. Mgr: K.E. Myers ...... Pgs. 2600-2609
Cal Monterey Pk., 887 S. Atlantic Blvd. 213-282-8416
Cal Mountain View, 2680 Bayshore Frontage Rd. 415-969-2252
Cal Tustin, 17501 Irvine Blvd. 714-838-4392
Fla Boca Raton, 1499 S.W. 5th Ave. 305-399-4884
Fla Orlando, 5360 Diplomat Cir. 305-645-2503
Ill Elk Grove Village, 1982 Lunt Ave. 312-437-5110
Ind Indianapolis, 2511 E. 46th St. 317-547-9411
Mass Reading, 100 Main St. 617-944-3020
Mich Detroit, 2832 E. Grand Blvd. 313-873-1150
Minn Minneapolis, 7615 Metro Blvd. 612-941-4353
Mo St. Louis, 8000 Bonhomme 314-727-7370
NJ Ft. Lee, 530 Main St. 201-947-7600
NY Millbrook, Box AD 914-677-3488
NY Syracuse, Pickard Bldg., E. Molloy Rd. 315-454-9268
Ohio Dayton, 1250 W. Dorothy La. 513-298-9862
Pa Glenside, 1601 Church Rd. 215-887-7520
Tex Dallas, 1066 W. Mockingbird La. 214-637-6650
Wash Seattle, 2320 N. 45th St. 206-633-3160

CINCH-GRAPHIK, Div. TRW INC., 200 S. Turnbull Canyon Rd., City of Industry, Cal., 91744, Tel: 213-333-1201, TWX: 910-584-1861; Pres: G.C. Morse Pg. 1297
(Refer to Cinch, Div. TRW INC for Sales Office Information)

CINCH MFG. CO., A Div. of TRW INC., 1501 Morse Ave., Elk Grove Village, Ill., 60007, Tel: 312-439-8800, TWX: 910-222-1796; Sls. Mgr: J. Hermacinski Pgs. 2600-2609
(Refer to Cinch, Div. TRW INC for Sales Office Information)

CINCH-MONADNOCK, Div. TRW INC., 18300 E. Valley Blvd., Box 1222, City of Industry, Cal., 91747, Tel: 213-964-6581, TWX: 910-584-1303; Sls. Mgr: C.M. Miller
(Refer to Cinch Div. TRW INC for Sales Office Information)

CINCH-NU LINE, Div. TRW INC., 1015 S. Sixth St., Minneapolis, Minn., 55415, Tel: 612-339-8301, TWX: 910-576-2748; Gen'l Sls. Mgr: E.R. Schmidt Pg. 2610
(Refer to Cinch Div. TRW INC. for Sales Office Information)

CINCINNATI FAN & VENTILATOR CO., 6516 Wiehle, Cincinnati, Ohio, 45237, Tel: 513-531-1742, TWX: N/A; Pres: G.B. Klee

CINCINNATI SUB-ZERO PRODS., 2612 Gilbert Ave., Cincinnati, Ohio, 45206, Tel: 513-751-8810; Sls. Mgr: L.M. Doherty

CINTRA INC., Sub/Physics Int'l Co., 1089 Morse Ave., Sunnyvale, Cal., 94086, Tel: 408-734-3630, TWX: 910-339-9225; Mktg. Mgr: P. Kertesz

CINTRA PHYSICS INT'L., 1089 Morse Ave., Sunnyvale, Cal., 94086

CIRCLE "F" INDUSTRIES, Box 591, Trenton, N.J., 08604, Tel: 609-392-3141; Pres: E. Laskin

CIRCLE SEAL CORP., Circle Seal Ctr., Box 3666, Anaheim, Cal., 92803, Tel: 714-774-6110, TWX: 910-591-1147; Exec. Sls. Mgr: C. Siebert, Jr.

CIRCON CORP., Santa Barbara Airport, Goleta, Cal., 93017, Tel: 805-967-0404; Sls. Mgr: K.C. Jensen Pg. 2937
Ariz Phoenix, Jensen Tools & Alloys, 4117 N. 44th St.
Fla Miami, Elctrn. Equip., 2701 N.W. 42nd Ave.
NY Binghamton, Stack Ind'l. Elctrns., 45-49 Washington 607-723-6326
NY Hempstead, Davis Elctrns., 204 Main St. 516-483-9200
NY New York, Terminal-Hudson Elctrns., 236 W. 17 212-243-5200
Pa Cornwells Heights, H. Mann, 977A Bristol Pike 215-639-6200
Pa Phila., Techni-Tool, 1216 Arch St. 212-569-4457

CIRCUIT POWER, INC., 227 Main St., Portland, Conn., 06480, Tel: 203-342-2520; Sls. Mgr: P.C. Hooper Pgs. 676,677
Cal Los Altos, Cain & Co., 175 S. San Antonio 415-948-6533
Cal Los Angeles, Cain & Co., 522 S. Sepulveda 213-476-2251
Conn Milford, Westwood Assocs., 125 Cherry St. 203-878-8528
Ill Mt. Prospect, Cain, 1203 Ironwood Dr. 312-253-3578
Mass Reading, Geder, 39 Cross St. 617-944-3105
NJ Montville, G & A Sls., 8 Brittany Rd. 201-227-3926
NY Cortland, RJC Assocs., 26 Morningside Dr. 607-753-3909
Ohio Reynoldsburg, Cain, 1467 Graham Rd. 614-861-2119
Pa Lafryette Hill, M. Lader, 628 Ridge Pike 215-825-3177
Tex Dallas, Cain, 8609 N.W. Plaza Dr. 214-369-2897
Va Woodbridge, M. Lader, 1561 Randall Ct. 202-296-2497

CIRCUIT-STIK, INC., 1518 W. 132 St., Gardena, Cal., 90249, Tel: 213-321-3220; Sls. Mgr: D. Harper Pgs. 1298,1299
Ariz Scottsdale, F. Board Assocs., Box 1906 602-949-9561

Ark Magnolia, J.V. Schoonmaker Co., Box 247 505-234-3778
Cal Burlingame, W.J. Purdy Co., 770 Airport Blvd. 415-347-7701
Cal Los Angeles, Black & Strong, 1728 S. Lacienega Blvd. 213-870-9191
Colo Littleton, W.J. Purdy Co., 1449 Littleton Blvd. 303-794-4283
Conn Meriden, P.R. Sturgeon Co., 99 Colony St. 203-237-1112
Ill Hinsdale, Hill-Gray Assoc., 2 Salt Creek La. 312-325-4810
Iowa Des Moines, T.L. Dowell, 4127 27th St. 515-255-6480
Kans Overland Pk., T.L. Dowell, 7208 W. 80th St. 913-649-6069
Mass Chestnut Hill, P.R. Sturgeon Co., 1330 Boylston St. 617-734-7710
Mich Detroit, R.C. Merchant Co., 18411 W. Mc Nichols 614-535-6000
Minn Mpls., M. Foster Co., 228 S. Cedar Lake Rd. 612-374-2612
Mo St. Louis, T.L. Dowell, 47531 Tital Ct. 314-892-2859
NJ Cherry Hill, Trinkle Sls., 500 N. Kings Hwy. 609-667-3500
NM Albuquerque, C.T. Carlberg & Assocs., Box 3177, Sta. D 505-265-1579
NY Syracuse, Mar-Com Assocs., 2002 Teall Ave. 415-437-2992
Ohio Dayton, Neal Bear Co., 1563 E. Dorothy La. 513-299-3566
Tenn Memphis, Cartwright & Bean, 560 S. Cooper 901-276-4442
Tex Dallas, J.V. Schoonmaker Co., 2995 Ladybird La. 214-357-8481

CIRCUIT STRUCTURES LAB., Div. Lincoln Instr. Co., Inc., 3200 N. San Fernando Blvd., Burbank, Calif., 91504, Tel: 213-849-6341; Sls. Mgr: F. Criswell

CIRCUIT TECHNOLOGY, 160 Smith St., Farmingdale, N.Y., 11735, Tel: 516-293-8686; Sls. Mgr: M. Spitz

CIRCUITS, INC., 59 Deming Rd., Berlin, Conn., 06037, Tel: 203-828-3526; Sls. Mgr: G.A. Johnson

CITIES SVC. CO., Chester Cable Opers., Oakland Ave., Chester, N.Y., 10918, Tel: 914-469-2141, TWX: 914-469-9801; Sls. Mgr: H.J. Coffey ....Pg. 2997

Ariz Scottsdale, Bennewitz Assocs., Inc., 532 Brown Ave. 602-947-7379
Cal Los Angeles, Gamson Sls., 774 E. Pico Bl. 213-747-9331
Colo Denver, Bennewitz Assocs., Inc., 2801 E. Colfax Ave. 303-399-1132
Fla Orlando, ECA Assocs., 2213 Merritt Pk. Dr. 305-424-0701
Ill Elk Grove Vill., Knoblock & Assocs., Box 67 312-593-5940
Ind So. Whitley, Warner, Kesler & Assocs., Box 338 219-723-5353
Kans Shawnee Mission, Kathrinus, Kelly, Boswell & Co., 5460 Buena Vista 913-722-0000
Ky Ft. Mitchell, G. W. Thelen, 3273 New Orleans 606-341-8181
Mass Whitman, G.G. Magnuson, 44 Candlewick La. 617-447-5364
Minn Mpls., S. Clothier, 7400 Lyndale Ave., S. 612-869-3231
Mo St. Louis, Kathrinus, Kelly, Boswell, 2427 S. Brentwood Bl. 314-962-5627
NJ Haddonfield, Keefe Elctrn., 13-15 S. Haddon 609-429-4650
NM Albuquerque, Bennewitz Assocs., Inc., 9720 Candelaria, N.E. 505-298-6775
NY Brooklyn, J. D. Coury, 162 92nd St. 212-836-7387
NY Great Neck, Cooper-Simon, 38 Middle Neck Rd. 516-487-1142
NY Rochester, B. H. Tollefson Assocs., 110 Allen Creek Rd. 716-271-4141
NY Woodmere, I. G. Strauss, 1047 Roselle Pl. 516-374-5273
NC Charlotte, B. Jackson, 4632 Randolph Rd. 704-366-6678
Ohio Cleveland, Electro Com, 8761 Snow Rd. 216-886-2404
Pa Delmont, T. F. Laslo & Assocs., 411 Manor 412-468-5045
Tex Dallas, R. E. Nesbitt, 2930 Merrell Rd. 214-357-4601
Tex Houston, R. E. Nesbitt Co., 4810 Hazard 713-528-3811
Wisc Milwaukee, Gentron Co., 5810 W. Oklahoma Ave. 414-543-8110
For: Can., Montreal 260, Que., Future Elctrns. Corp., 4310 Girouard Ave. 610-481-7701

CITIES SERVICE CO., Pigments & Specialties Div., 60 Wall St., New York, N.Y., 10005, Tel: 212-422-1600, TWX: 710-581-5069

CITY CHEMICAL CORP., 132 West 22nd St., New York, N.Y., 10011, Tel: 212-929-2723; Sls. Mgr: E.W. Colle

CLAIREX ELCTRNS., 560 S. Third Ave., Mt. Vernon, N.Y., 10550, Tel: 914-664-6602; Sls. Mgr: G.A. Smith Pgs. 1636,1637

Cal Culver Cy., E. Roberts, 9601 W. Jefferson 213-870-9561
Cal Palo Alto, E. Roberts, 800 San Antonio 415-324-1671
Conn Bethel, A.L. Livera, 5 Brookwood 203-748-4639
Ill Chicago, L-Tec, Inc., 5808 Higgins Ave. 312-286-1500
Mass S. Braintree, Bordewieck Sls. Engrg., 221 Grove St. 617-843-0845
Mich Detroit, Hilltronics, 13720 Puritan 313-342-3243
Minn Mpls., Heimann, 5603 Lyndale 612-861-6051
NY Mt. Vernon, 560 S. Third Ave. 914-664-6602
NY Spring Vly., Technimat, 12 Briar 914-356-5030
Ohio Chardon, Clairex Elctrns., 11599 Forest 216-285-3415
Pa Media, Reeves, 2973 N. Providence Rd. 215-LO-6-6709

CLARE, C.P. & CO., 3101 Pratt Blvd., Chicago, Ill., 60645, Tel: 312-262-7700; V.P. Sls: F.H. Bihler Pgs. 1662-1674

Ala Huntsville, C.P. Clare, Box 5307 205-534-4538
Cal Mountain View, 2680 Bayshore Frontage Rd. 415-968-2831
Cal Santa Ana, Box 11240 714-835-4114
Colo Littleton, Regan & Assoc., 2485 W. 2nd Ave. 303-936-7280
Fla Ft. Lauderdale, 3081 E. Commercial 305-771-0711
Ill Chicago, C.P. Clare & Co., 3101 W. Pratt Blvd. 312-262-7700
Ind Ft. Wayne, Baehr, Greenleaf, 1917 Fairfax 219-447-2251
Iowa Des Moines, C.P. Clare, 501 Merle Hay Tower 515-276-4147
Md Baltimore, 6229 N. Charles St. 301-377-8010
Mass Needham, DeVeer Sls. Engrg., 1492 Highland 617-444-4200
Mich Mt. Clemens, 111 Lodewyck 313-468-1784
Minn Minneapolis, 4725 Excelsior Blvd. 612-920-3125
NY Great Neck, 525 Northern Blvd. 516-466-2100
NY Fayetteville, C.P. Clare, Box 213 315-422-0347
NY Rochester, C.P. Clare, 3700 East Ave. 716-385-2190
NC Charlotte, R.W. Chapman, 4732 Old Pineville 704-525-2421
Ohio Cincinnati, Baehr, Greenleaf, 9505 Montgomery 513-891-3827
Ohio Cleveland, Baehr, Greenleaf, 14700 Detroit 216-221-9030
Ohio Columbus, Baehr, Greenleaf, Box 5722 614-486-4046
Ohio Xenia, Baehr, Greenleaf, 925 Factory 513-426-5485
Pa Ft. Wash., C.P. Clare & Co., 1000 Off. Ctr. 215-643-5321
Pa Pittsburgh, C.P. Clare, Box 4499 412-923-1744
Pa Erie, Foster-Mc Clinton, 2131 W. 8th St. 814-455-9111
Pa Pittsburgh, Foster-McClinton, Manor Oak Two, 1910 Cockran 412-561-4803
Tex Dallas, R.E. Nesbitt Co., 2930 Merrell Rd. 214-357-4601
Tex Houston, Getty-Eads-Adair, Box 36503 713-781-3005
Tex Houston, R. Nesbitt, 4208 Mt. Vernon 713-528-3811
Wash Bellevue, 4511 141st Pl. S.E. 206-747-5600
WVa Huntington, Foster-Mc Clinton, 17 Pembroke La. 304-736-5161
Wisc Wauwatosa, Larsen Assocs., 10855 W. Potter 414-258-0529
For: Can., Montreal, Que., C.P. Clare Can. Div., 3300 Cavendish 514-482-9750
For: Can, Toronto, Ont., C.P. Clare Canada, Ltd., 61 Industry St. 416-762-8154

CLARE-PENDAR CO., Box 785, Post Falls, Idaho, 83854, Tel: 208-773-4541; Mktg. Mgr: S.F. Meyer

CLARK CRYSTAL, Div. of Valpey Fisher, 344 Boston Post Rd., Marlborough, Mass., 01752, Tel: 617-481-0821; Sls. Mgr: F.L. Nobles

CLARK, DAVID CO., 360 Franklin St., Worcester, Mass., 01604, Tel: 617-PL-6-6218; Sls. Mgr: J.H. Givan

CLARKE - HESS, Comm. Resch. Corp., 43 W. 16th St., New York, N.Y., 10011, Tel: 212-255-2940; Sls. Mgr: K.K. Clarke ....Pg. 426

Ala Huntsville, J.L. Highsmith, 3322 S. Memorial 205-881-3294
Cal Los Altos, Systems Mktg. Conslts., One 1st St. 415-941-4777
Cal Newport Beach, Tekmark-West, 4301 Birch 714-540-4412
Cal San Diego, Tekmark-West, Box 17156 714-277-0993
Cola Aurora, Bishop Entprs., 126 Del Mar Cir. 303-364-7361
Conn Hamden, Applied Meas., 2531 Whitney 203-288-5288
Fla Orlando, J.L. Highsmith, 2543 Ind'l. Blvd. 305-293-5202
Ill Chicago, P. Lind Elctrns., 5483 N. Northwest Hwy. 312-774-1246
Ind Indpls., P. Lind Elctrns., 3969 Meadows 317-547-9178
Md Ellicott Cy, Applied Engrg. Conslts., 9051 Baltimore Nat'l Pike 301-465-1272
Mass Acton, Applied Meas., 86 Hayward 617-263-2766
Mich Royal Oak, Satullo, 4514 N. Woodward 313-549-3910
Minn Circle Pines, P. Lind Elctrns. 612-786-5770
NY N.Y., Clarke-Hess Comm. Resch., 43 W. 16th 212-255-2940
NY Syracuse, Tesco, 2002 Teall 315-463-4566
NC Charlotte, J.L. Highsmith, 3733 Monroe 704-333-7743
Ohio Cleveland, Satullo, 16801 Euclid 216-486-2800
Ohio Dayton, Satullo, 2801 Far Hills 513-293-7061
Pa Phila., Applied Engrg. Conslts., 8605 Bayard 215-247-9007
Tex Dallas, Airep Elctrns., 6300 N. Central 214-363-5291
Tex El Paso, Bishop Entprs., 5128 Camino De La Vista 915-584-8886
Utah Salt Lake Cy., Bishop Entprs., 2520 S. State 801-487-2551

CLARKSON LABS., INC., 1450 Ferry Ave., Camden, N.J., 08104, Tel: 609-WO-6-5200; Sls. Mgr: N.M. Gover

CLAROSTAT MFG. CO., INC., Washington St., Dover, N.H., 03820, Tel: 603-742-1120, TWX: 710-297-4455; Sls. Mgr: H. Taylor

CLARY CORP., Precision Instrs. Div., 320 W. Clary Ave., San Gabriel, Calif., 91776, Tel: 213-287-6111; Sls. Mgr: H. Medalie

CLAUSS CUTLERY CO., P.O. Box 667, Fremont, Ohio, 43420, Tel: 419-332-7344; V.P: J.A. Hart, Jr. Pgs. 2933-2936

CLEAN ROOMS CONSTR., Box 275, Westminster, Cal., 92683, Tel: 714-894-1214

CLEMENS MFG. CO., 630 S. Berry Rd., St. Louis, Mo., 63122, Tel: 314-WO-1-7228; Sls. Mgr: J. Clemens

CLEMENTS MFG. CO., 6656 S. Narragansett Ave., Chicago, Ill., 60638, Tel: 312-767-7900; Sls. Mgr: J.B. Handy

CLEVELAND ELCTRNS., INC., 17877 St. Clair Ave., Cleveland, Ohio, 44110, Tel: 216-692-1600; Mktg. Mgr: M.K. Smith

CLEVELAND ELCTRNS., INC., 17877 St. Clair Ave., Cleveland, Ohio, 44110, Tel: 216-692-1600; Sls. Mgr: B. Martin

CLEVELAND MICA CO., 1360 Hird Ave., Lakewood, Ohio, 44107, Tel: 216-226-1360; Sls. Mgr: W.D. Burton

CLEVELAND REFRACTORY METALS DIV., Chase Brass & Copper Co., 28850 Aurora Rd., Solon, Ohio, 44139, Tel: 216-248-0300; Prod. Mgr: M.E. McCann

CLEVELAND VIBRATOR CO., 2828 Clinton Ave., Cleveland, Ohio, 44113, Tel: 216-241-7157; Sls. Mgr: J.F. Driscoll

CLIFTON DIV., Litton Sys., Marple at Brdway., Clifton Hgts., Pa., 19018, Tel: 215-622-1000, TWX: 510-669-8217; Pres: A. Georgia

CLIMATRONICS CORP., 1324 Motor Pkwy., Hauppauge, N.Y., 11787, Tel: 516-234-2772; Sls. Mgr: T. Schreiber

CLINTON INSTR. CO., Boston Post Rd., Clinton, Conn., 06413, Tel: 203-669-7548; Pres: H.H. Clinton

CLIPPARD INSTR., INC., 7350-90 Colerain Rd., Cincinnati, Ohio, 45239, Tel: 513-521-4261; Sls. Mgr: R. Smith

CLOVER INDS. DIV., GTI Corp., 600 Young St., Dept. 4, Tonawanda, N.Y., 14150, Tel: 716-693-1331; Sls. Mgr: A.V. Cosentino

CML-MACARR, INC., Sub. Tenney Engrg., Inc., 167 National Rd., Edison, N.J., 08817, Tel: 201-287-2810, TWX: 710-998-0560; Sls. Mgr: T. Gordon Pgs. 661-668

Cal Costa Mesa, Meas. Assocs., 2955B Harbor 714-540-7160
Cal Palo Alto, Mauldin, 200 California Ave. 415-326-5291
Cal Sunnyvale, Meas. Assocs., Box 2162 408-739-7785
Fla Orlando, Datarep, Box 5929 305-855-8945
Fla Pompano Bch., Datarep, Box 5277 305-781-9279
Ill Chicago, L. Green, 5218 W. Diversey 312-286-6824
La New Orleans, Young Engrg., Box 50327 504-522-6216

Md Ellicot Cy., Gans-Fryling, 9516 Michaels Way 301-837-6311
Md Silver Spring, Brimberg, 814 Thayer 301-588-7790
Mass Attleboro, Elctrn Sls. New England, Box 276 617-222-4078
Mich Detroit, H. Teplitz, 26847 Grand River Ave. 313-537-9058
Minn Mpls., L. Green, 6225 Univ. Ave. 612-781-1611
Mo Florissant, Marsland Assocs., Box 567 314-831-0015
NJ Englewood Cliffs, Power Conversion & Contras, Box 1251 201-569-0015
NY Woodbury, Sweeney & Co., #5 Fox Meadow 516-692-4222
NC Winston-Salem, RADCO Co., 614 Nissen Bldg.
Ohio Cleveland, H. Teplitz & Co., 3945 Meadowbrook 216-371-2044
Ohio Dayton, H. Teplitz & Co., 3718 Salem 513-277-6531
Pa Fairview Village, Acromatix, Box 271 215-279-0377
Tex Dallas, True Technology, 12016 Fieldwood 214-AD-9-7741
Va Arlington, Gans-Fryling, 1030 16th 703-527-3262
Wash Seattle, Delcom Sls., 11937 Marine View 206-248-0090
Wisc Waukesha, L.F. Green, 830 Plateau 414-786-3678

CMS DIV. INSTRUMATICS, 15516 Industrial Pkwy., Cleveland, Ohio, 44135, Tel: 216-267-9020; Sls. Mgr: G.E. Gregory, Jr.

CO-OPERATIVE INDS., INC., 100 Oakdale Rd., Chester, N.J., 07930, Tel: 201-879-5151, TWX: 510-235-1277; Sls. Mgr: V.C. Bonardel

COAST COIL CO., 5333 W. Washington Blvd., Los Angeles, Calif., 90016, Tel: 213-936-6188; Sls. Mgr: W.L. Queen .... Pg. 2487

COAST ELCTRNS., 1305 Fifth St., Manhattan Beach, Cal., 90266, Tel: 213-376-6328; Sls. Mgr: G.F. Hammel

COAX DEVICES INC., Box 234-EEM, Chelsea, Mass., 02150, Tel: 617-884-6983; Sls. Mgr: S. Rosen

COBEHN, INC., 226 Passaic Ave., Fairfield, N.J., 07006, Tel: 201-226-6675; Sls. Mgr: D.F. Cook

COBER ELCTRNS., INC., 7 Gleason Ave., Stamford, Conn., 06902, Tel: 203-327-0003; Mktg. Mgr: B. Zarkower .... Pgs. 600,601

Ariz Phoenix, Hytronic Meas., 1017 N. Third 602-253-6104
Cal Los Altos, J. Stone, 339 S. San Antonio 415-948-4563
Cal Westlake Vlg., 3 DBM, 5388 Sterling Ctr. 213-899-2300
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
DC Wash, Eastern Instr., 5410 Indian Head 202-333-8880
Md Baltimore, Eastern Instr., 1002 Ingleside 301-744-3675
Mass Waltham, Meas. Conslts., 195 West 617-899-4400
Mich Ypsilanti, Micro Sls., 650 Greenlawn 313-482-1229
NM Albuquerque, Hytronic Meas., 205 San Pablo, S.E. 505-268-3941
NY DeWitt, DB Assocs., Inc., Box 14 315-446-0220
NY Great Neck, Eastern Instr., 300 Northern 516-466-9505
Ohio Dayton, Micro Sls., 1250 W. Dorothy 513-298-3033
Pa Phila., Eastern Instr., 613 Cheltenham 215-927-7777
Utah Salt Lake City, Hytronic Meas., 2022 S. Main 801-466-4924
Va Richmond, Eastern Instr., Ross Bldg. 202-333-8880
For: Vancouver, B.C., Can., Canadian Dynamics, Ltd., 8264 St. George St. 604-325-6014
For: Calgary 21, Alberta, Can., Canadian Dynamics, Ltd., 122-17 Ave., S. E. 403-265-6500
For: Tokyo, Japan, Industrial Imports, Box 1271-Central P.O.

CODEX CORP., 15 Riverdale Ave., Newton, Mass., 02195, Tel: 617-969-0600; V.P. Mktg: J. Rothrock

COGNITRONICS CORP., 333 Bedford Rd., Mt. Kisco, N.Y., 10549, Tel: 914-666-2941, TWX: 710-571-2177; Sls. Mgr: I.B. Goldberg

COHN, SIGMUND, 121 S. Columbus Ave., Mt. Vernon, N.Y., 10553, Tel: 914-664-5300, TWX: 710-562-0112; Sls. Mgr: R. Cohn

COHU ELCTRNS., INC., San Diego Div., Box 623, San Diego, Calif., 92112, Tel: 714-277-6700, TWX: 910-335-1244; Gen. Sls. Mgr: R.J. Schlicht

COIL CO. OF AMER., 221 Washington St., Northvale, N.J., 07647, Tel: 201-768-3434; Sls. Mgr: B.M. Gottlieb

Advertisement

CUSTOM DESIGN A PROBLEM TO YOU? TRANSFORMERS, SOLENOIDS, POWER SUPPLIES, COILS SATURABLE REACTORS, MAGNET AMPLIFIERS, TOROIDS Random, Bobbin & Toroidal winding for all applications. ELECTRO-MAGNETS ELECTRO-VIBRATORS Write for prices to your exact specifications.

COIL WINDING EQUIP. CO., INC., Railroad Plaza, Oyster Bay, N.Y., 11771, Tel: 516-WA-2-5660; Sls. Mgr: H. George

COLBER CORP., 26 Buffington St., Irvington, N.J., 07111, Tel: 201-375-3004

COLE-HERSEE CO., 20 Old Colony Ave., S. Boston, Mass., 02127, Tel: 617-268-2190, TWX: 617-269-3930; Sls. Mgr: M.B. Onwood

COLE INSTR., Div. F.H. Cole Enterprises, 2034 Placentia Ave., Costa Mesa, Cal., 92627, Tel: 714-642-8080; Sls. Mgr: C.B. Arnone

COLE-PARMER INSTR. CO., 7425 N. Oak Park Ave., Chicago, Ill., 60648, Tel: 312-647-0272; Sls. Mgr: J.C. Parmer

COLEMAN CABLE & WIRE CO., 1900 N. Fifth Ave., River Grove, Ill., 60171, Tel: 312-456-4000

COLEMAN INSTRS., 42 Madison St., Maywood, Ill., 60153, Tel: 312-345-7500; Sls. Mgr: E.W. Dixon

COLLECTRON CORP., 304 East 45th St., New York, N.Y., 10017, Tel: 212-689-7120, TWX: 710-581-6581; Sls. Mgr: R.B. Coombs

COLLINS ELECTRONICS, INC., Old Love Point Rd., Stevensville, Md., 21666, Tel: 301-643-5055; Sls. Mgr: F.F. Johnson

COLLINS, G.L. CORP., 5875 Obispo Ave., Long Beach, Calif., 90805, Tel: 213-630-3121, TWX: 910-346-6707; Sls. Mgr: G.D. Collins

COLLINS RADIO CO., Cedar Rapids, Iowa, 52406, Tel: 319-395-1000, TWX: 319-366-5917 C.I. Rice

COLLINS RADIO CO., Dallas, Tex., 75207, Tel: 214-AD-5-9511, TWX: 214-231-1495; V.P. Mktg: T.A. Campobasso

COLLINS RADIO CO., Comps. Mktg., Newport Beach, Calif., 92663, Tel: 714-833-0600, TWX: 910-595-1705

COLONIAL ALLOYS, Ridge Ave. & Crawford, Phila., Pa., 19129, Tel: 215-GE-8-2272; Sls. Mgr: S.L. Cohn

COLOR/CRAFT ANTENNA CORP., 13434 Raymer St., N. Hollywood, Calif., 91605, Tel: 213-875-2334; Sls. Mgr: R. Raynor

COLORADO INSTRS., INC., 1 Park St., Broomfield, Colo., 80020, Tel: 303-466-1881; Sls. Mgr: J.G. Zisch

COLORADO VIDEO, INC., Box 928, Boulder, Colo., 80302, Tel: 303-444-3972; Sls. Mgr: G. Southworth

COLUMBIA COMPONENTS, Sub. Computer Instrs., 60 Madison Ave., Hempstead, N.Y., 11550, Tel: 516-483-8200, TWX: 510-222-4189; Sls. Mgr: L. Eagle Pg. 2742

Cal Los Angeles, E. Landa, 1607 Pontius 213-879-0770
Cal Menlo Pk., Frauman, Box 969 415-322-8461
Fla Eau Gallie, J.J. Smith, Box 1506 305-254-4206
Ill Chicago, Lightner Assoc., 6322 N. Milwaukee 312-SP-4-1500
Md Pimonium, Barn Hill & Assoc., 1931 Greenspring Dr. 301-252-5610
Mo Kansas City, Automatic General Elctrn., 6550 E. Troast 816-333-8206
NY Huntington, Andrews & Andrews, 140 E. Main 516-692-8686
NY Rochester, Semple, 21 Edgewater La. 716-342-1413
Ohio Fairborn, Technical Assoc., Box 388 513-878-2484
Utah Salt Lake City, Cannon Eng. & Sls., 2250 E. 17th S. 206-454-2514

COLUMBIA ELEC. MFG. CO., 4519 Hamilton Ave., Cleveland, Ohio, 44114, Tel: 216-361-8060; Sls. Mgr: H.W. Sussman

COLUMBIA ELETRN. CABLES, 11 Cove St., New Bedford, Mass., 02740, Tel: 617-999-4455; Sls. Mgr: S. Rudolph .... Pgs. 2998-3005

Ariz Phoenix, J. Morgan, 364 E. Virginia 602-279-1047
Cal L.A., Columbia Elctrn. Cables, 1950 Naomi 213-747-5283
Cal San Fran., Tech. Sls., 1485 Bay Shore 415-467-1434
Colo Denver, Nelson Co., 1294 S. Bannock 303-733-5528
Fla No. Miami, Winfield Elctrn., 666 N.E. 125th 305-751-5566
Ga Atlanta, Winfield/Southeast Co., 2991 D N. Druid Hills Rd., N.E. 404-636-3023
Haw Honolulu, G. Piety Factors, Box 2903 808-810-185
Ill Chicago, B.J. Golbos, 2140 E. Lunt Av. 312-439-4148
Ind Indianapolis, F. McSweeney, 2555 E. 55th 317-255-3777
Kans Leawood, Gowler & Menezes, Box 6007 913-649-8050
Md Baltimore, E. K. P., 1626 Forest Pk. 301-757-3170
Mass Needham, Coakley, Boyd & Abbett, 1424 Highland 617-444-5470
NY N. Bellmore, L. Keller, 1680 Newbridge 516-785-2826
NY Rochester, J. Brown Elctrn., 157 Rawlinson 716-266-2728
NY Yonkers, J. Brown Elctrn., 207 Rosedale 914-779-7330
NC Raleigh, Winfield/Southeast, 4909 Carteret 404-636-3023
Ohio Richfield, N. Bear Corp., 3435 Streets Boro 216-659-3331
Ore Salem, M. K. Widdekind Co., 3292 Sunnyview Ave., N.E.
Pa Easton, E. K. P., 1346 Spring Garden 215-252-6373
Pa Erie, Nebco Assocs., 1564 W. 42nd St. 814-863-2111
Pa Doylestown, E.K.P., 334 W. Court 215-345-1523
Pa Monroeville, Nebco Assocs., 1974 Gregory 412-824-2111
Tex Dallas, J. Mc Kinney Sls., 1303 Chemical St. 214-631-9450
Tex Bellair, J. Mc Kinney Sls., Box 1026 713-665-3653
Utah Salt Lake City, Nelson Co., Box 1871 303-733-5528
Wash Seattle, M. K. Widdekind, 815 W. Ewing 206-284-8020

COLUMBIA RESCH. LABS., Macdade Blvd. & Bullens La., Woodlyn, Pa., 19094, Tel: 215-532-9464; Sls. Mgr: J. Sarty

COLUMBIA TECH., Humiseal Div., Dept. 77, 26-60 Bklyn-Queens Expwy., Woodside, N.Y., 11377, Tel: 212-932-0800; Sls. Mgr: V. Leibmann Pgs. 2478,2479

Cal Alhambra, M.W. Riedel Co., 2215 W. Valley Blvd. 213-283-7694
Fla Orlando, Jaeger, 999 Woodcock Rd. 305-841-1511
Ill Elmwood Pk., Malovac, 1726 N. 76th Ct. 312-654-4110
Kans Bonner Springs, Impala, Inc., 600 E. Front St. 913-441-2154
Md Timonium, Barnhill, 1931 Greenspring Dr. 301-252-5610
Mass Shrewsbury, Betronic Assocs., 19 St. James Rd. 617-338-6507
NJ Livingston, H. Thaw, 46 Springbrook Rd. 201-992-2711
NY Rochester, Gislason, 617 Case Bldg. 716-454-4741
Ohio Willoughby, A.H. Baier, 4399 Industrial Pk. 216-946-6080
Tex Dallas, R. D. Spooner, 3520 Timberview Rd. 214-357-0556
Va Lynchburg, Barnhill & Assoc., Box 1104 703-384-2062
Wash Kirkland, R.R. Chase & Assoc., Box 548 206-454-2514

COLUMBIA WIRE PRODS. CO., 4045 N. Rockwell St., Chicago, Ill., 60618, Tel: 312-267-3160; Asst. Mgr: C. Leska

COLUMBUS ELEC. MFG. CO., 621 N. Hamilton Rd., Columbus, Ohio, 43219, Tel: 614-237-8441; Pres: F.G. McCloskey

COM-IV, Blue Hills Ave., Bloomfield, Conn., 06002, Tel: 203-242-0761; Mktg. Mgr: P. Dolan

COMAR ELECTRIC, 3349 Addison St., Chicago, Ill., 60618, Tel: 312-588-2410, TWX: 910-221-5198; Sls. Mgr: D. Haines .... Pgs. 1676-1681

Ala Huntsville, Col-Ins. Co., Box 4246 205-539-8327
Cal Los Angeles, Eisner-Rambo Co., 2526 Hyperion Ave. 213-664-2928
Cal San Carlos, D.H. Ross Co., 1095 Industrial Rd. 415-591-4411
Colo Boulder, A.L.S. Elctrns., 1932 14th St. 303-447-2436
Conn Rocky Hill, Walworth Controls Co., 472 Old Main St. 203-529-6806
Fla Orlando, Col-Ins Co., Box 13189 305-423-7615
Ga Marietta, Col-Ins Co., 200 Carrington Way 404-422-8327
Ill Glenview, Nero Elctrn. Sls. Corp., 2108 Valley Lo La. 312-729-5075
Ind Ft. Wayne, R.J. Haffey Co., Box 5212 219-748-1150
Ind Indianapolis, Delta Sls., Inc., 1407 N. Illinois St. 317-631-4136

Mass Lynnfield, Walworth Controls Co., Box 27 617-334-4200
Mich Lathrup Village, R.C. Nordstrom & Co., Box 32 313-444-4417
Minn Mpls., A.J. Warner, 4927 34th Ave. S. 612-729-7371
Mo Kansas City, R.R. Burton Sls. Co., 1016 Baltimore Ave. 816-471-2850
NM Albuquerque, A.L.S. Elctrns., Box 11626 505-268-9600
NY Buffalo, R.W. Mitscher Co., Inc., 496 Ellicott Sq. 716-854-2517
NY Fayetteville, R.W. Mitscher Co., Inc., 51 Ely Dr. 315-446-4540
NY Pittsford, R.W. Mitscher Co., Inc., 22 Latchmere Ct. 716-381-9115
NY Rockville Ctr., Willgold Elctrn. Sls. Corp., 100 N. Village Ave. 516-764-4022
NY Salt Pt., R.W. Mitscher Co., Inc., Rte. 82 914-266-5975
NC Winston-Salem, Col-Ins Co., Box 5597 919-765-3650
Ohio Cincinnati, Hiltebrant Greenleaf Co., 4315 Simco La. 513-661-0969
Ohio Cleveland, Hiltebrand Greenleaf Co., 20412 Center Ridge Rd. 216-333-5480
Okla Tulsa, J.A. Green, Box 911 918-RI-2-4657
Pa Philadelphia, V.S. Malta Co., Box 4007 215-836-5122
Tenn Nashville, R.W. Mitscher Co., Inc., 2508 Stones River 615-883-2220
Tex Dallas, J.A. Green, 7118 Envoy Ct. 214-ME-1-7450
Tex Houston, J.A. Green, 3400 Montrose 713-JA-6-2959
Va Virginia Bch., R.W. Mitscher Co., Inc., 3100 Basin Ct. 703-464-9039
Wash Seattle, Bergford Assocs., 5600 California Ave., S.W. 206-937-6664
Wisc Milwaukee, Nero Elctrns. Sls. Corp., 2831 N. 49th St. 414-873-7275
COMCO PLASTICS, INC., 98-36 C. Jamaica Ave., Richmond Hill, N.Y., 11418, Tel: 212-849-9000; Sls. Mgr: J.C. Steele
COMDEL, INC., Beverly Airport, Beverly, Mass., 01915, Tel: 617-927-3144; Sls. Mgr: R. Dionne
COMGENERAL CORP., 4518 Taylorsville Rd., Dayton, Ohio, 45424
COMMANDER LABS., INC., 1177 W. Washington Ave., Escondido, Calif., 92025, Tel: 714-746-7400, TWX: 910-322-1141; Gen. Mgr: M.L. Gosack
COMMERCIAL ELEC. HEATING DEVICES & MFG., INC., 1008 E. Garvey Blvd., Monterey Park, Cal., 91754
COMMERCIAL ELCTRNS., INC., 880 Maude Ave., Mountain View, Cal., 94040, Tel: 415-969-1910
COMMUNICATION ELCTRNS., Div. Watkins-Johnson Co., 6006 Executive Blvd., Rockville, Md., 20852, Tel: 301-881-3300, TWX: 710-824-9603; Sls. Mgr: C.L. Byrom
COMMUNICATIONS CO., INC., Box 520, Coral Gables, Fla., 33134, Tel: 305-445-2671; Sls. Mgr: F.R. Macklin
COMMUNICATIONS TECH. CORP., 2237 Colby Ave., Los Angeles, Cal., 90064, Tel: 213-478-5061; V.P.-Sls: G. Gillemot
COMMUNICATIONS TRANSISTOR CORP., 301 Ind'l. Way, San Carlos, Cal., 94070, Tel: 415-591-8923, TWX: 910-376-4893; Sls. Mgr: M. Mallinger
COMMUNITYPE CORP., 767 5th Ave. (GM Bldg.), New York, N.Y., 10022, Tel: 212-758-4230; Pres: H.D. Berardo

COMPONENT RESCH., 1717 19th St., Santa Monica, Cal., 90404, Tel: 213-393-3755, TWX: 910-343-6864; Sls. Mgr: S. Kellerman ....Pgs. 2352-2373
Tex Dallas, Stasco, 13310 Spring Grove Ave. 214-239-5054
EXP: Cal., Beverly Hills, M. Stewart & Co., 204 S. Beverly Dr. 213-272-0103
COMPONENT SPECIALTIES, 9143 E. La Rosa Dr., Temple City, Cal., 91780, Tel: 213-283-0015; Sls. Mgr: D.R. Heins
COMPONENTS CORP., 2857 N. Halsted St., Chicago, Ill., 60657, Tel: 312-327-6566, TWX: 910-221-5308; Sls. Mgr: J. Emma
COMPONENTS CORP., 106 Main St., Denville, N.J., 07834, Tel: 201-627-0290; Sls. Mgr: J.B. Minter

Advertisement

Miniature, regulated high voltage power supplies for nuclear instrumentation in satellites, missiles, high altitude balloons, etc. Transistorized, ruggedized - 70°F to 200°F as required. Decade counters, readouts. DIGIK-LIPS' - printed circuit plug-in connectors. PROFESSIONAL' - electronic test equipment line for transistors, diodes, tantalum capacitors.

COMPONENTS, INC., Biddeford, Me., 04005, Tel: 207-282-5111, TWX: 710-229-1559; Sls. Mgr: K.J. Keller
COMPONENTS SPECIALTIES, INC., 39 St. Marys Pl., Freeport, N.Y., 11520, Tel: 516-TN-8-9100; Sls. Mgr: J.M. Silver
COMPOSITE MICROCIRCUITS, 130 First Ave., Waltham, Mass., 02154, Tel: 617-891-9090; Sls Mgr: W.A. Strauss, Jr.
COMPU-LITE CORP., 17796 Sky Pk. Cir., Irvine, Cal, 92664, Tel: 714-546-9045; Sls. Mgr: R. Faulstick
COMPU-SYSTEMS CO., Audubon Rd., Wakefield, Mass., 01880, Tel: 617-245-8800; Sls. Mgr: R.A. Fredrickson
COMPUTER ART SVC., 40 Nassau Terminal Dr., New Hyde Pk., N.Y., 11040, Tel: 516-328-1905; Sls. Mgr: R.J. Ryan
COMPUTER AUTOMATION, INC., 895 W. Sixteenth St., Newport Beach, Calif., 92660, Tel: 714-642-9630, TWX: 910-596-1377; Sls. Mgr: R.H. Drew
COMPUTER CENTRAL, Box 5194, Seven Oaks Sta., Detroit, Mich., 48235, Tel: 313-837-5515; Sls. Mgr: E. Tann

COMPUTER COMPS., 88-06 Van Wyck Expwy., Jamaica, N.Y., 11418, Tel: 212-AX-1-3500; Sls. Mgr: H. Weinberg ....Pg. 1661
Ariz Phoenix, Engrg. Liaison Assocs., 3509 N. 42nd Ave.
Cal Hollywood, Engrg. Liaison, 3360 Barham 213-469-2283
Cal San Carlos, Comp. Assocs., 850 Montgomery La. 415-5919656
Conn N. Haven, Forsberg Sls., 22 Broadway 203-239-5111
Ill Morton Grove, E. Flaxman, 9202 Waukegan 312-965-3988
Mass Brockton, Forsberg Sls., 646 Summer 617-522-6300
NY N.Y., Computer Comps., 88-06 Van Wyck Expwy. 212-291-3500
NY Rochester, R. Kennedy, 30 Saginaw Dr. 716-271-6322
NY Hyde Pk., R. Kennedy, Green Tree Dr., N. 914-229-2269
Ohio Cleveland, Comps. Inc., 7461 N. Linden La. 216-842-2737
Ohio Cincinnatti, Comps. Inc., 11820 Knoll Spgs. 513-721-2997
Wash Seattle, Allied Agencies, 1818 Westlake N. 206-284-4082
EXP: N.Y., Multiparts, 52 Wall St. 212-944-4372
COMPUTER COMPONENTS INT'L, 3804 Burns Rd., Palm Beach Gardens, Fla., 33403, Tel: 305-622-1620; Sls. Mgr: J. Obot
COMPUTER CONVERSIONS CORP., 6 Dunton Ct., East Northport, N.Y., 11731, Tel: 516-261-3300; Sls. Mgr: S.J. Renard

Advertisement

CCC manufactures a complete line of low cost, solid state, shaft and synchro to digital or DC ($295), and digital or DC to synchro converters for the military and commercial market. Other related products are digital phase meters ($295), digital angle indicators ($595), digital data converters, computer modulators and demodulators. Data communications products include O.E.M. 300 and 1200 Baud modems, teletype interfaces and a new revolutionery electro optical data link and associated hi-speed multiplexer. Evaluation units supplied on request. Write for further information and free data conversion chart.

COMPUTER DEVICES OF CALIF., 11925 Burke St., Santa Fe Springs, Cal., 90670, Tel: 213-723-6593; Sls. Mgr: R. Irani ....Pg. 1583
Ariz Phoenix, Jarko Assocs., 2032 N. 27th Ave. 602-272-2684
Cal Mountain View, Repex, Inc., 2015 Latham St. 415-969-9200
Cal Santa Fe Springs, Computer Devices of Cal., 11925 Burke St. 213-723-6593
Colo Denver, Camel Elctrns., 5503 E. Evans Ave. 303-757-6191
Conn Old Saybrook, M.L. Assocs., 5 Ruth Dr. 203-388-9718
Fla Palm Beach Gardens, Trainor Sls., 10475 Riverside Dr. 305-844-9791
Il Des Plaines, Martec & Assocs., 1616 Linden 312-296-3331
Mass Marlboro, M.L. Assocs., 96 Helen Dr. 617-485-6190
Mich Birmingham, J.C. Hofstetter Co., 700 Maple, E. 313-642-0590
Minn St. Paul, W.E. Taubert, 985 Cypress 612-776-1285
NJ Cherry Hill, R.E. Winter Assocs., 1213 Forge Rd. 609-429-0696
NY Huntington Sta., Duda Assocs., 24 Edison Dr. 516-427-5863
NY Sodus, A.E. Decew Agency, 27 State St. 315-483-3261
NC Charlotte, G.M. Johnston & Assocs., 7001 Old Forge Dr. 704-364-0722
Ohio Dayton, J.C. Hofstetter Co., 3300 S. Dixie Dr. 513-298-0662
Ohio Medina, J.C. Hofstetter Co., 5168 Valley View Dr. 216-241-4880
Okla Tulsa, Dynamic Comp. Sls., Box 4573 918-749-1689
Tenn Chattanooga, G.M. Johnston & Assocs., Box 4151 615-877-7779
Tex Dallas, A.G. Muller, Box 8011 214-368-6713
Wash Bellevue, Repex, Inc., 10777 Main St. 206-455-2778

Advertisement

Home of Rapid-Syn Steppers. Available from stock are steppers in sizes 8, 11,15, 18,20, 23 and 34 with step angles of 1.8°, 5°, 7.5°, 15°, 45° and 90°. Also available from stock is a complete line of solid state drivers, pulse sources, gearheads, inertia dampers, heat sinks and 72 RPM synchronous motors. Send all your stepper inquiries to Computer Devices of Calif. "The only real home steppers evers had."

COMPUTER DEVICES, 63 Austin Blvd., Commack, N.Y., 11725, Tel: 516-543-4220; Sls. Mgr: E.S. Wendolkowski Pgs. 2739-2741
Ala Huntsville, Beacon Elctrn., Box 4307 205-881-5031
Ariz Scottsdale, Erskine, Box 1586 602-947-7255
Cal Arcadia, Mar-Land Entprs., Box 101 213-681-9440
Cal Los Altos, H. Stout Assocs., 200 Third St. 415-948-3265
Fla Ft. Lauderdale, Beacon Elctrn., 651 N.E. 45th 305-564-4298
Fla Maitland, Beacon Elctrn. Assocs., Box 1278 305-647-3498
Ga Atlanta, Beacon Elctrn., 2285 Peachtree 404-351-3654
Mass Needham, Garrettson Co., 10 Kearney 617-449-2640
NJ Tenafly, Garrettson, 121 Oak 201-568-2354
NY Utica, B.D. Hummel, 2224 Maynard 315-736-7821
NY White Plains, Garrettson, Box 149 914-725-3133
NY Williston Pk., Garrettson, 275 Hillside 516-PI-7-6610
Pa Phila., Garrettson, 92-14 Masland 215-HO-4-2275
EXP: N.Y., Larchmont, Montclair Elctrns., 7 Woodland 914-834-8905
For: Can., Rexdale, Ont., Aero Sls. Eng., 4 Racine 416-249-9139
COMPUTER DIODE, Pollitt Dr., Fair Lawn, N.J., 07410, Tel: 201-797-3900, TWX: 710-988-2241; Sls. Mgr: J.S. LaBruna
COMPUTER DYNAMICS, 245 E. Elm St., Torrington, Conn., 06790, Tel: 203-482-7621

COMPUTER INSTRS., 92 Madison Ave., Hempstead, N.Y., 11550, Tel: 516-483-8200, TWX: 510-222-4189 Pgs. 2914,2915
INSTRUMENTATION & CONTROLS DIV.
Ala Huntsville, Int'l. Sci. Instr., Box 2091 205-837-1601
Ariz Phoenix, Gramer, 110 W. Camelback 602-279-1231
Cal N. Hollywood, Comp. Sls., 11484 Oxnard 213-980-3400
Cal San Diego, Comp. Sls., 12696 Pacato N. 714-291-5799
Cal Sunnyvale, Servo-Data, 844 Bremerton 408-739-7895
Colo Denver, Camel Elctrns., 5303 E. Evans 303-757-6191
Conn Waterbury, Selmark Assocs., 36 Plaza 203-754-3060
Fla Eau Gallie, J.J. Smith, Box 1506 305-254-4206
Ill Rolling Meadows, Sumer, Inc., 5105 Tollview 312-392-7370
Ind Ft. Wayne, Sumer, Inc., 1430 Dividend Dr. 219-484-9588
Iowa Cedar Rapids, Palatine Engrg., 720 3rd Ave. S.E. 319-365-8071
Kans Andover, Palatine Engrg., 1722 N. Terry 316-683-7512
Kans Overland Pk., Palatine Engrg., 7520 W. 63rd 913-262-5643
La Baton Rouge, Pan Tech Engrg., 1956 Dallas 504-927-2057

Md Greenbelt, J.E. Cuesta, 8501 Glendale Rd. 301 552-1200
Mass Waltham, Selmark Assocs., 181 West St. 617-899-8110
Mich Birmingham, J. Hofstetter, 700 Maple E. 313-642-0590
Minn Minneapolis, R.J. Sls., 7100 S. France 612-922-1425
Mo St. Louis, Palatine Engrg., 8622 St. Charles Rock
NY Binghamton, A & D Devices, 25 Pearl 607-722-7155
NY Rochester, A & D Devices, 830 Linden 716-LU-6-8033
NY Verona, A & D Devices, R.F.D. #1 315-337-7321
Ohio Dayton, J. Hofstetter, 3300 S. Dixie Dr. 513-298-0662
Ohio Medina, J. Hofstetter, 5168 Valley View Dr. 216-241-4880
Pa Valley Forge, J.E. Cuesta 215-265-5800
Tex Arlington, Pan Tech Engrg., 600 Ave. H, E. 817-261-4111
Tex Houston, Pan Tech Engrg. Co., Box 22491 713-623-0640
Wash Seattle, Gillette & Assocs., Box 99035 206-284-3344

COMPONENTS DIV.
Ala Huntsville, Int'l. Sci. Instrs., Box 2091 205-837-1601
Ariz Phoenix, Gramer & Co., 110 W. Camelback 602-279-1231
Cal N. Hollywood, Comp. Sls., 11484 Oxnard St. 213-980-3400
Cal Sunnyvale, Servo-Data, 844 Bremerton 408-739-7895
Colo Denver, Camel Elctrns., 5303 E. Evans 303-757-6191
Conn Waltham, Selmark Assocs., 191 West St. 617-899-8110
Fla Dunedin, J.J. Smith, Box 627 813-733-0032
Fla Eau Gallie, J.J. Smith, Box 1506 305-254-4206
Fla Ft. Lauderdale, J.J. Smith, 5748 N.E. 27th 305-781-1522
Ill Mt. Prospect, Sumer, Inc., 401 E. Prospect 312-392-7370
Ind Ft. Wayne, Sumer, Inc., 1430 Dividend Dr. 219-484-9588
Kans Overland Pk., Palatine Engrg., 7520 W. 63rd 913-262-5643
Mass Waltham, Selmark Assocs., 191 West St. 617-899-8110
Mich Birmingham, J. Hofstetter, 700 Maple E. 313-642-0590
Minn Mpls., R.J. Sls., 7100 S. France Ave. 612-922-1425
Mo St. Louis, Palatine Engrg., 8622 St. Charles Rock 314-426-7055
NJ Cherry Hill, Monteiro Assocs., 95 W. Gate 609-428-5551
NJ E. Orange, Masin-Esco, 263 Central Ave. 201-674-6505
NY Massapequa Pk., Metro Tech., 103 Ponewood 516-798-1066
NY Rochester, A & D Devices, 830 Linden 716-586-8033
NY Verona, A & D Devices, RD No. 1 315-337-7321
Ohio Dayton, J. Hofstetter, 3300 S. Dixie Dr. 513-298-0662
Ohio Medina, J. Hofstetter, 5168 Valley View 216-241-4880
Tex Garland, Carter Assocs., Box 87 214-276-7151
Utah Salt Lake City, Cannon Engrg., 768 E. 9th S. 801-328-3205
Wash Seattle, Gillett & Assocs., Box 99035 206-284-3344

COMPUTER LABS, 1109 S. Chapman St., Greensboro, N.C., 27403, Tel: 919-292-6427, TWX: 510-922-7954; Sls. Mgr: D.W. Brockman .... Pgs. 342,343,1279
Ala Huntsville, Mekco Assocs., Holiday Off. Ctr. 205-881-3721
Ariz Phoenix, R.A. Mayes Co., 4014 N. Seventh St. 602-279-5243
Cal Encino, Cardinal Assocs., 16161 Ventura Blvd. 213-788-4540
Colo Denver, R.A. Mayes Co., Box 10486 303-466-6311
Conn Hamden, J & J Assocs., 965 Dixwell Ave. 203-624-7800
Fla Orlando, Mekco Assocs., 3165 McCrory Rd. 305-841-2215
Ill Wheaton, Engrg. Prods., 25 W485 Geneva Rd. 312-653-6826
Md Wheaton, K-G Elctrns., 11151 Veirs Mill Rd. 301-946-4055
Mass Burlington, J & J Assocs., 12 Cambridge St. 617-272-2606
Minn St. Paul, Engrg. Prods., 717 Raymond Ave. 612-646-8819
NJ Fairfield, KLS Assocs., 387 Passaic Ave. 201-227-2900
NY Binghamton, A & D Devices, 25 Pearl Ave. 607-722-7155
NY Rochester, A & D Devices, 320 N. Wash. St. 716-586-8033
NY Verona, A & D Devices, Rd 1
NC Burlington, Mekco Assocs., 1349 S. Church St. 919-226-7177
Pa King of Prussia, Rivco, Box 338 215-265-5211
Tex Dallas, R.A. Mayes Co., 421 Rorary 214-235-3043
For: Can., Ottawa, Ont., Datagraphics, 1505 Laperriere Ave. 613-722-3489

COMPUTER MATE, INC., 150 Calk de Los Molinos, San Clemento, Cal, 92672, Tel: 714-492-6360; Sls. Mgr: J. Taylor
COMPUTER MEAS., 1645 W. 135th St., Gardena, Cal., 90249, Tel: 213-532-9752; Sls. Mgr.: W.R. McQuiston
COMPUTER MECHANISMS, 495 Washington Ave., Carlstadt, N.J., 07072, Tel: 201-438-1770, TWX: 710-989-0111 D.G. Demmert
COMPUTER METHODS, 470 Mamaroneck Ave., White Plains, N.Y., 10605, Tel: 914-428-0400; Sls. Mgr: L. Rydell

COMPUTER POWER SYS., See CPS

COMPUTER PRODS., Box 23849, Ft. Lauderdale, Fla., 33307, Tel: 305-933-5561; Sls. Mgr: D.S. Wiper Pg. 341
Ala Huntsville, J. King, 11004 Vivian 205-859-2387
Cal Cupertino, B.J. Wolfe Entprs., Box 718 408-252-5010
Cal No. Hollywood, B.J. Wolfe Entprs., 10760 Burbank 213-877-5518
Fla Satellite Beach, Scientific Sys. Svc., Box 2519 305-262-7527
Pa Abington, Bach-Stewart, 947 Old York 215-927-1200
Pa Pittsburgh, Compugraph, Box 15055 412-366-5056

COMPUTER PRODS. INT'L., INC., 3446 De La Cruz Blvd., Santa Clara, Calif., 95050, Tel: 408-246-9323; Pres: N. Syed
COMPUTER TERMINAL SYS., 52 Newtown Plaza, Plainview, N.Y., 11803, Tel: 516-293-6611; Sls. Mgr: R.J. Bruno
COMPUTER TEST CORP., 3 Computer Dr., Cherry Hill, N.J., 08034, Tel: 609-424-2400; Sls. Mgr: R.L. Whipple

Advertisement

COMPUTER TEST CORPORATION/A Subsidiary of Computest Corp manufactures a complete line of manual and automatic memory element, array and system testers and distributes Ramsey Automatic Core Handling Equipment. CTC welcomes the opportunity to assist you in planning your memory test facilities. Call, write or wire your requirements for thoughtful response.

COMPUTERIZED ELCTRN. EDUCATION, 214 Long La., Upper Darby, Pa., 19082, Tel: 215-734-1414; Sls. Mgr: J. Charles
COMPUTRONICS ENGRG., 4949 Hollywood Blvd., Los Angeles, Calif., 90027, Tel: 213-876-1944; Sls. Mgr: J.B. Stanton
CONAP, INC., 184 E. Union St., Allegany, N.Y., 14706, Tel: 716-372-9650; Sls. Mgr: T.W. Sheedy
CONAX CORP., Sub. Esterline Corp., 2300 Walden Ave., Buffalo, N.Y., 14225, Tel: 716-684-4500; Mktg. Mgr: R. Frantom
CONCORD CONTROL, 1282 Soldiers Field Rd., Boston, Mass., 02135, Tel: 617-254-5106; Dir. Mktg: R.F. Goulet

CONCORD ELCTRNS., 37 Great Jones St., Dept. JE, New York, N.Y., 10012, Tel: 212-777-6571, TWX: 710-581-4930; Sls. Mgr: J. Gardner ....Pg. 2611
Cal El Segundo, Saxon Assoc., Box 517 312-772-4743
Cal Fremont, H. Foraker, Box 1325 415-657-2213
Colo Denver, Camel Elctrns., 5303 E. Evans Ave. 303-757-6191
Fla Miami Bch., L. Hass Co., 1826 NE 150th St. 305-949-9143
Ill Morton Grove, E. Flaxman Co., 9202 Waukegan Rd. 312-965-3988
Iowa Cedar Rapids, Snider Sls. Co., 2042 Franklin Ave., N.E. 319-362-4410
Kans Leawood, Vasen Sls. Co., 8005 Ensley La. 816-842-1760
Mass Woburn, Jalco Assocs., Box 97 617-227-1515
Minn Mpls., Hasse & Assocs., 4159 Thomas Ave. N. 612-588-0551
NY Utica, B. Davis Assocs., 107 James St. 315-724-5773
For: Can., Downsview, Ont., Kaytronics Engrg., 1001 Finch Ave., W. 416-638-5511
For: Can., Montreal, Que., Kaytronics Engrg., 58000 Monkland Ave. 514-489-9335

CONCORD ELCTRNS., Concord Comm. Sys., 1935 Armacost Ave., Los Angeles, Cal., 90025, Tel: 213-820-1441; Sls. Mgr: R.E. Yellin
CONDENSER PRODS. CORP., Box 997, Brooksville, Fla., 33512, Tel: 904-796-3562; Pres: G. Randolph
CONDOR PACIFIC INDS. CALIF., 8740 Remmet Ave., Canoga Park, Cal., 91304, Tel: 213-882-0550; Sls. & Mktg. Mgr: E.J. Smith
CONDUCTORLAB, INC., Main St., Groton, Mass., 01450, Tel: 617-448-5922; Sls. Mgr: G.G. Mills
CONDUCTRON CORP., 2600 North 3rd St., St. Charles, Mo., 63301, Tel: 314-723-1515, TWX: 910-760-1723; Sls. Mgr: R.J. Augustine
CONECTRIX, INC., 201 N. Gables, Wheaton, Ill., 60187, Tel: 312-653-1460, TWX: 910-252-4401; Sls. Mgr: M.L. Cross
CONFORMING MATRIX CORP., Box 37, Sta. "G", Toledo, Ohio, 43601, Tel: 419-729-3777; Sls. Mgr: D. Molly
CONKLIN INSTR. CORP., Main St., Pleasant Valley, N.Y., 12569, Tel: 914-635-2136
CONNECTICUT HARD RUBBER CO., 407 East St., New Haven, Conn., 06509, Tel: 203-777-3631, TWX: 710-465-0264; Sls. Mgr: G.A. Proctor

CONNECTOR CORP., 6025 N. Keystone, Chicago, Ill., 60646, Tel: 312-539-3108 ....Pgs. 2612,2613
Cal Altadena, D. Wagner, Box 485 213-681-4060
Ill Chicago, Bauman Sls., 6025 N. Keystone 312-539-3108
La New Orleans, G. V. Peck Co., Box 8087 504-282-1553
Mass Needham, Coakley, Boyd & Abbett, 1424 Highland Ave. 617-444-5470
Mich Jackson, E.H. Jordon, 2024 Glenn Dr. 517-782-0694
NJ Collingswood, Kaygar Assocs., Box 134 317-849-1801
NY DeWitt, A. Bowser, 4317 E. Genesee St. 315-446-5920
NY Great Neck, R.E. Breuer, One Barstow 516-466-3030
NY Snyder, H.J. Sapecky, 4541 Main St. 716-839-4170
NC Raleigh, J. Nagle, 3939 Glenwood 919-782-0213
Okla Tulsa, G. V. Peck Co., 729 W. 5th St. 918-585-5853
Tenn Nashville, J. Smith, 2508 Stones River Ct. 615-883-2220
Tex Dallas, G. Peck, 210 Casa Linda Plaza 214-328-3511
Va Virginia Beach, C. Bludau, 3100 Basin Ct. 703-464-0500

CONNECTOR INDS. AMER., 639 N. Wayne Ave., Cincinnati, Ohio, 45215, Tel: 513-733-3680; Sls. Mgr: K.C. Neal
CONNECTROL CORP., Div. Gen'l. Staple Co., 380 Second Ave., New York, N Y, 10010, Tel: 212-674-4370; Sls. Mgr: G. Magnifico
CONNECTRON CORP., 13936 Saticoy St., Van Nuys, Cal, 91402, Tel: 213-989-3701; Sls. Mgr: R. Jones
CONNOLLY & CO., INC., 914 N. Rengstorff Ave., Mt. View, Calif., 94040, Tel: 415-967-6988, TWX: 910-379-6930; Pres: W.E. Connolly
CONNOR SPRING & MFG. CO., 1729 Junction Ave., San Jose, Cal., 95112, Tel: 408-297-4685; Sls. Mgr: R.H. Lind

CONNOR-WINFIELD CORP., Winfield, Ill., 60190, Tel: 312-231-5270; Sls. Mgr: J. Hoag ....Pgs. 1376,1377
Cal Encino, CDH, 18075 Ventura Blvd. 213-345-3111
Cal Menlo Pk., Frauman, 1010 Doyle St. 415-322-8461

CONRAC CORP., 330 Madison Ave., New York, N.Y., 10017, Tel: 212-687-3330, TWX: 710-581-3065; Pres: D.H. Putnam
CONRAC DIV., Conrac Corp., 600 N. Rimsdale Ave., Covina, Calif., 91722, Tel: 213-966-3511
CONRAC CORP., Turner Div., 909 17th St. N.E., Cedar Rapids, Iowa, 52402
CONSOLIDATED CERAMICS & METALIZING, Box 352, Flemington, N.J., 08822; Pres: J.E. Comeforo
CONSOLIDATED CONTROLS CORP., 2338 Alaska Ave., El Segundo, Calif., 90245, Tel: 213-679-0127, TWX: 910-325-6205; Sls. Mgr: J.J. Ghiglia
CONSOLIDATED OHMIC DEVICES, 115 Old Country Rd., Carle Pl., N.Y., 11514, Tel: 516-741-1500, TWX: 510-222-3789; Mktg. Mgr: E. Berman

cont'd

cont'd

Advertisement

Con Ohmic manufactures all types of thermocouple reference junctions, T/C reference ovens, T/C scanners and switches, T/C Signal Conditioner Amplifiers and temperature transmitters, Liquid Level Sensors and Indicators (continuous and point level). Devices are built to withstand most stringent environments.

CONSOLIDATED PRODS., B & B Elctrns. Div., 17360 S. Gramercy Pl., Gardena, Calif., 90247, Tel: 213-321-1956; Sls. Mgr: D. Smith

CONSOLIDATED REACTIVE METALS, 116 Hoyt Ave., Mamaroneck, N.Y., 10543, Tel: 914-698-2300, TWX: 710-566-1112; Sls. Mgr: R. Gordon ....Pg. 3014
Tex Richardson, C. Price, 1306 Glen Cove 214-AD-1-4321

CONSOLIDATED RESISTANCE AMER., 44 Prospect St., Yonkers, N.Y., 10701, Tel: 914-YO-3-5900

CONSOLIDATED RESISTANCE SLS., 44-46 Prospect St., Yonkers, N.Y., 10701, Tel: 914-YO-3-5900; Gen'l. Mgr: J.J. Wilentchik

CONSOLIDATED TRANSFORMERS UNLTD., 1039 E. Valley Blvd., San Gabriel, Cal., 91776, Tel: 213-283-9071, TWX: 910-589-3382; Sls. Mgr: M.S. Coleman

CONSOLIDATED WIRE & ASSOC. CORPS., 1633 S. Clinton St., Chicago, Ill., 60616, Tel: 312-421-4441; Sls. Mgr: J.G. Mann ....Pgs. 3006-3013
Cal Encino, Goldberg-Mitchell Sls., 17046 Burbank 213-986-0400
Colo Broomfield, Arrowhead, R.R. I, Box 335 303-222-6462
Fla Lutz, S.K. Wallace Assocs., Box 67 813-949-1817
Ga Atlanta, H.J. Odom, 715 Flamingo 404-PL-3-8463
Haw Honolulu, Earl Assocs., 1638 Kona St. 808-949-6953
Ill Chicago, R.R. Hutmacher, 6668 N.W. Hwy. 312-631-3248
Ind Zionsville, J. Keith & Assoc., Box 65 317-873-4079
Kans Overland Pk., Lowell, Kangas & Assoc., Box 4116 913-TU-8-3200
Mass Wellesley Hills, Johnson, 471 Wash. St. 617-235-3977
Mich Royal Oak, Mid-Continent Sls., Box 735 313-646-9092
Minn Mpls., J.E. Anderson, 5231 Humboldt 617-823-6459
Mo St. Louis, T. Lowell, Box Creve Coeur Br. 314-MI-7-1111
NM Albuquerque, Arrowhead Sls., Box 243 505-268-9706
NY Buffalo, Maury Farber, 220 Delaware 716-856-3543
NY Hewlett, J. Kirshbaum, 1533 Peninsula 516-FR-4-0111
NC Matthews, M.F. Hager, Box 423 847-9262
Ohio Cleveland, J.O. Olsen, 16201 Shaker 216-752-5444
Pa Phila., H. Lewis Co., 1801 Penn. Blvd. 215-LO-7-2068
Tenn Memphis, A.F. Howard, 5960 Brierdale Cove OL 9-0704
Tex Dallas, E. L. Wilks Co., Box 34466 214-242-5321
Utah Salt Lake Cy., Arrowhead, 49 W. Malvern 801-487-3444
Wash Seattle, Fleehart & Sullivan, 10109 Aurora 206-522-1533
EXP: Ill., Chicago, O. Mallegg, 400 W. Madison 312-FR-2-4868
For: Can., Montreal, Que., Atlas Elctrns., Ltd., 3333 Cavendish Blvd. 514-489-8495
For: Can., Toronto, Ont., Atlas Elctrns., Ltd., 50 Wingold Ave. 416-781-6174

CONSTANT VOLTAGE CO., 4114 N. Ravenswood Ave., Chicago, Ill., 60613, Tel: 312-327-2700

CONSTANTA CO. OF CAN., 280 Regina Ave., Montreal, Can., Tel: 514-766-8569

Advertisement

Manufacturer of metal film and carbon film resistors size from 1/10 Watt to 5 Watt, with temperature co-efficient 25, 50, 100 and up to 500PPM. Special temperature can be matched to 2PPM. Constanta also manufactures R-C modules, resistor networks and special electrical assembly, tailor made to the customer's specification.

CONTACT, INC., P.O. Box 6, Hudson, N.H., 03051, Tel: 603-883-7708; Sls. Mgr: J.H. Ward

CONTINENTAL CONNECTOR, 34-63 56th St., Woodside, N.Y., 11377, Tel: 212-899-4422, TWX: 710-582-2565; Sls. Mgr: G.H. Palmquist Pgs. 2614,2615
Cal Los Altos, Continental Connector Corp., Box R 415-948-0211
Cal Los Angeles, Continental Connector Corp., 4054 W. Beverly Blvd. 213-381-2285
Ind Mishawaka, C. Given Co., 921 E. 3rd St. 219-BL-5-1614
Mass Chestnut Hill, M. Ross, 21 Thornton Rd. 617-469-0674
Minn Minneapolis, C.D. Hagen, Continental Connector Corp., 4522 Excelsior Blvd. 612-926-0515
Pa Langhorne, Continental Connector Corp., 105 E. Maple Ave. 215-757-1728
For: Can., Willow Dale, Ont., Continental Connector Corp., 480 McNicoll Ave., Unit 2 416-499-0842

CONTINENTAL DATA SYS., 40 W. 4th St., Dayton, Ohio, 45402, Tel: 513-222-8626; Sls. Mgr: H.E. Folkerth

CONTINENTAL ELEC., 325 Ferry St., Newark, N.J., 07105, Tel: 201-344-4051; Sls. Mgr: A.W. Peterson

CONTINENTAL ELCTRNS., 302 McGuinness Blvd., Brooklyn, N.Y., 11222, Tel: 212-383-3331; Pres: A.A. Sylvane

CONTINENTAL ELCTRNS. MFG., Sub. Resalab, Box 17040, Dallas, Tex., 75217, Tel: 214-381-7161, TWX: 214-899-8694; Sls. Mgr: T.B. Moseley

CONTINENTAL RENTALS DIV., Continental Leasing, 175 Middlesex Tpke., Bedford, Mass., 01730, Tel: 617-275-0850; Sls. Mgr: D. Fletcher

CONTINENTAL RUBBER WORKS, Sub. Continental Copper & Steel, Erie, Pa., 16512, Tel: 814-452-5261; Sls. Mgr: J.C. Marvil

CONTINENTAL WIRE & CABLE, Gulton Rd., Box 1863, York, Pa., 17405, Tel: 717-792-2644, TWX: 510-657-4847; Sls. Mgr: H.L. Goodwin

CONTINENTAL-WIRT ELCTRNS. CORP., 550 Davisville Rd., Warminster, Pa., 18974, Tel: 215-355-7080, TWX: 510-667-1875; Sls. Mgr: B.S. Lifson ....Pg. 1895
Cal Redwood City, W. Hickey Sls., 175-5th 415-368-3849
Cal Van Nuys, Shephard Comps., 16152 Covello St. 213-787-4610
Colo Denver, L.G. Moss, Box 26172 303-985-9815
Colo Greeley, G. Moss Elctrns., 1530-13th Ave. 303-353-1452
Fla Hollywood, Comar Sls., 4315 Polk St. 305-961-5167
Ga Kennesaw, K & E Assocs., Blue Springs Pk. 404-974-4264
Ill Chicago, G. Mcl Cole, 6514 W. Higgins 312-774-3535
Ind Angola, Southern Sls., 105 Lakeshore Dr. 219-665-3961
Ind Ft. Wayne, W. Dillon, 6710 Kanata Ct. 219-484-8268
Ind Indpls., Southern Sls., 1111 E. 54th St. 317-253-3359
Ky Louisville, Southern Sls., 212 Republic Bldg. 502-583-6902
Md Pikesville, L. Cohen, Box 5929 301-484-6376
Mass Needham, A & M Elctrn. Reps., 1492 Highland Ave. 617-444-8170
Mich Detroit, D. Poulin, 17222 E. Warren 313-886-4990
Minn St. Paul, E. Melius, 3758 N. Dunlap 612-484-8541
Mo St. Louis, E. Hill, 915 Buder Bldg. 314-621-1818
NJ Haddon Township, A. Wetterhahn, 201 W. Cuthbert 609-858-3003
NM Albuquerque, Electro Rep., 1051 S. Platte River Dr. 303-744-2821
NY Elmont, F.E. Schmitt, 311 Meacham 516-437-8150
NY Elmont, S.S. Egert, 146 Meacham 516-488-2255
NY Rochester, D. Ekwortzell, 179 Hillary Dr. 716-889-4849
NY Syracuse, W.A. Franklin Sls. Corp., 2 Standish Terr. 315-446-1120
NY Whitesboro, H. Lessman, 42 Glenridge Rd. 315-736-5460
Ohio Cincinnati, G. Herrick, 2209 Losantiville 513-351-4441
Ohio Westlake, G. Herrick, 845 Canterbury 216-871-8855
Ore Portland, Van Voorhees, 4415 N.E. Sandy 503-287-6633
Tex Dallas, Stasco, 13310 Spring Grove Ave. 214-239-5054
Va Chesapeake, F.B.D. Sls., 4316 Greenleaf 703-484-3162
Wisc Madison, W. Uhalt, 150 S. Marquette St. 608-244-1623
For: Can., Weston, Ont., C. Pipe, 65 Waterford 416-249-1766
EXP: N.Y., N.Y., Roburn Agencies, 345 W. 14th 513-294-1648

CONTROL DATA, Circuits Div., 3965 Meadwobrook Rd., Minneapolis, Minn., 55426, Tel: 612-935-0366; Gen. Mgr: W.W. Lindemann

CONTROL DATA CORP., Magnetic Components Div., 2300 Berkshire La., Minneapolis, Minn., 55427, Tel: 612-545-2851, TWX: 910-576-3434; Sls. Mgr: W.J. Orndorff

CONTROL ELCTRNS. CO., INC., 153 Florida St., Farmingdale, N.Y., 11735, Tel: 516-694-0125; Sls. Mgr: H. Goldstein ....Pg. 2743
Cal Sherman Oaks, R.T. Assocs. 213-788-7588
Ill Chicago, LGS Elctrn., 5642 W. Diversey 312-622-8183
Md Laurel, VPI, 13001 Mistletoe 301-792-7631
Mass W. Medway, J. Gallagher, Box 343 617-533-7292
NJ E. Brunswick, VPI, 44 Fresh Pond Rd. 201-821-8977
NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343
Tex Dallas, Texas Avionics Co., 4515 Prentice St. EM 8-3566
Wash Bellevue, Farwest Elctrns., 12410 S.E. 32nd St.
EXP: N.Y., Hicksville, Emec, 55 E. Old Country 516 WE-1-3700

Advertisement

Control Electronics manufactures a complete line of delay line products. These products include ultrasonic dispersive and non-dispersive, subminiature (Dual-in-Line), audio, magnetostrictive, lumped constant, distributed, varible, multitapped and others.

CONTROL EQUIP. CORP., NEW ENGLAND, 171 Lincoln St., Lowell, Mass., 01852, Tel: 617-459-0573; Pres: O.W. Ryden

CONTROL LOGIC, 3 Strathmore Rd., Natick, Mass., 01760, Tel: 617-655-1170, TWX: 710-386-6677; Sls. Mgr: George R. Grumbles

CONTROL PRODS. CORP., 4431 W. Division St., Chicago, Ill., 60651, Tel: 312-235-1131

CONTROL PRODS., INC., Box 72, E. Hanover, N. J., 07936, Tel: 201-887-9400; Sls. Mgr: J.R. Nile

CONTROL SCI. CORP., 4810 Beauregard St., Alexandria, Va., 22312, Tel: 703-354-1500; Sls. Mgr: E.R. Hommet

CONTROL SYS. RESCH., INC., 1811 Main St., Pittsburgh, Pa., 15215, Tel: 412-782-4460, TWX: 710-664-4203; Sls. Mgr: N.J. Antonuccio

CONTROL TECHNOLOGY CO., 41-16 29th St., L.I.C., N.Y., 11101, Tel: 212-EM-1-2133; Sls. Mgr: H. Cooper Pgs. 1868,1869
Cal Los Angeles, American Tech. Sls. Co., 1460 S. Sherbourne Dr. 213-659-3791

CONTROLCRAFT CORP., 213 Main St., West Chicago, Ill., 60185, Tel: 312-231-7511; Sls. Mgr.: T. McCollum

CONTROLLED ENVIRONMENT EQUIP. CORP., 1029 Chestnut St., Newton Upper Falls, Mass., 02164, Tel: 617-969-1090; Sls. Mgr: R.D. Peck

CONTROLLED POWER CORP., Industrial Park Dr., Farmington, Mich, 48024, Tel: 313-477-8000; Sls. Mgr: H. Tazzia

CONTROLOTRON CORP., 176 Central Ave., Farmingdale, N.Y., 11735, Tel: 516-249-4400; Sls. Mgr: J. Segall

CONTROLS CO. OF AMERICA, 9655 Soreng Ave., Schiller Park, Ill., 60176, Tel: 312-NA-5-9000; Sls. Mgr: G.A. Heinemann

CONTROLS CO. OF AMERICA, Control Switch Div., 1420 Delmar Dr., Folcroft, Pa., 19032, Tel: 215-LU-6-7500, TWX: 510-669-2136; Sls. Mgr: G.M. Ballee

CONVERSION CHEM. CORP., 210 E. Main St., Rockville, Conn., 06066, Tel: 203-872-0541, TWX: 710-435-2336; Sls. Mgr: G.B. Rynne

COOK ELEC. CO., 6201 Oakton St., Morton Grove, Ill., 60053, Tel: 312-967-6600, TWX: 312-222-9092; Mgr. Sls. Engrg: R.H. Troxell ....Pg. 1903
Ariz Phoenix, Lange Assocs., 221 W. Seminode 602-942-0724
Cal Inglewood, V & L Assocs., 3412 W. Century Blvd. 213-671-7688
Cal Menlo Park, Frauman, Box 969 322-8461
Colo Denver, Robbins & Assocs., Box 20296 399-6618
Fla Orlando, Elctrn. Engrg., 601 N. Fern Creek 305-425-8284
Ga Atlanta, G. Duckett Sls., Box 29067 404-451-3529
Ill Chicago, E. Magnus, 5715 N. Lincoln Ave. 334-1503
Ill Chicago, Rinaldi, Inc., 6319 N. Central Ave. 763-4848
Iowa Cedar Rapids, Palatine Engrg., 720 3rd Ave., S.E. 319-365-8071
Kans Overland Pk., Palatine Engrg., 7520 W. 63rd St. 913-262-5643

Kans Andover, Palatine Engrg., 1722 N. Terry La. 316-683-7512
Md Baltimore, Milan Assocs., 7215 York Rd. 825-1120
Mass Acton, Nation-Neenan, 53 Mohawk 263-5577
Mass Sherborn, Naton-Neenan, 42 Old Field 617-235-1966
Mass Sudbury, Naton-Neenan, Box 203 893-0914
Minn Mpls., C. Gibb, 1311 W. 25th St. 612-377-1200
Mo St. Louis, Palatine Engrg., 1573 N. Warson 314-426-7055
NC Greensboro, G. Duckett Sls., Box 22002 919-273-4617
NJ Ft. Lee, S. Justin Assocs., Box 1068
NY Binghamton, Canavan-Scanlon, 116 State 607-724-7720
NY Rochester, Canavan-Scanlon, 50 Telco 716-442-0720
NY Syracuse, Canavan-Scanlon, 23 Eastern 315-463-9161
Ohio Cleveland, D. Steffen, 904 E. 222nd St. 261-5055
Ohio Dayton, D. Steffen, 1201 Hempstead Rd. 293-3145
Tex Dallas, T. M. Curtis Co., Inc., 5635 Yale Blvd. 361-1666
Wisc Milwaukee, Star Engrg., 7328 W. Burdick 543-3469
EXP: Ill., Chicago, E. Magnus, 5715 N. Lincoln 312-334-1503

COOK ELECTRIC CO., Data-Stor/Tech-Center Div., 6201 Oakton St., Morton Grove, Ill., 60053, Tel: 312-967-6600, TWX: 910-223-3654; Sls. Mgr. E.L. Washburn ....Pg. 1903

COOKE ENGRG. CO., 900 Slaters La., Alexandria, Va., 22314, Tel: 703-548-3889; Sls. Mgr: J. Lancaster

COOKE VACUUM PRODS., 13 Merritt St., S. Norwalk, Conn., 06854, Tel: 203-853-9500; Sls. Mgr: J.P. Santucci

COOPER, JOSEPH B. & SONS, INC., 180 Varick St., New York, N.Y., 10014, Tel: 212-255-3131; Pres: I.I. Cooper

COORS PORCELAIN CO., 600 Ninth St., Golden, Colo., 80401, Tel: 303-279-6565; Sls. Mgr: F.W. Waterman

COPAR CORP., 5744 West 77th St., Oak Lawn, Ill., 60459, Tel: 312-581-1133; Sls. Mgr: R.W. Schmidt

COPPERWELD STEEL CO., Wire & Cable Div., Glassport, Pa., 15045, Tel: 412-664-7131, TWX: 710-794-4806; Gen Mgr. Sls: M.E. Brown

CORAL MAGNETICS CO., Div. Tele-Craft Elctrns., 125 Schmitt Blvd., Farmingdale, N.Y., 11735, Tel: 516-694-4300; Sls. Mgr: R. Michalski

CORD SPECIALTIES CO., 9239 Cherry St., Franklin Park, Ill., 60131, Tel: 312-625-8323; Sls. Mgr: R.H. Stellman

CORDOVER, CARL & CO., 104 Liberty Ave., Mineola, N.Y., 11501, Tel: 516-PI-7-5150; Sls. Mgr: C. Cordover

CORE-TRONICS, INC., 241 N. Day St., Orange, N.J., 07050, Tel: 201-673-7660; Sls. Mgr: G. Sossin

CORICONE CORP., 3605 Long Beach Blvd., Long Beach, Cal., 90807, Tel: 213-426-9404

CORKPAK CO., INC., 70 Argyle Ave., New Rochelle, N.Y., 10804, Tel: 914-NE-2-1713; Sls. Mgr: F.H. Paulmann, Sr.

CORNELL-DUBILIER ELCTRNS., Div. Fed. Pacific Elec. Co., 150 Ave. L, Newark, N.J., 07101, Tel: 201-589-7500; Dir. Sls: J.M. Kaplan

CORNING GLASS WORKS, Elctrn. Prods. Div., Houghton Pk., Corning, N.Y., 14830, Tel: 607-962-4444, TWX: 510-252-1384; Sls. Mgr: R.E. Rahill Pgs. 2374,2375,2836,2837
Cal Orange, 500 S. Main St. 714-541-5275
Cal Sunnyvale, 363 Taaffe Ave. 408-732-5050
Ill Chicago, 1470 Merchandise Mart 312-337-6600
Md Hyattsville, Lowery Assocs., 6200 Annapolis
NY New York, 717 Fifth Ave. 212-752-1100
NC Raleigh, 3900 Electronics Dr. 919-876-1100
Pa Bradford, 550 High St. 814-362-5571
Pa Broomall, Lowery, 2801 W. Chester Pike 215-356-5300
EXP: Fla., Coral Gables, 4685 Ponce de Leon 305-666-3334
EXP: N.Y., Corning, Box 2000 607-962-4444
For: Can., Leaside, Ont. 416-421-1500

CORNING GLASS WORKS, FLUIDIC PRODUCTS DEPT., Corning, N.Y., 14830, Tel: 607-962-4444; Sls. Mgr: T. Dincher

CORNING GLASS WORKS, LAB. PRODS. DEPT., Corning, N.Y., 14830, Tel: 607-962-4444, TWX: 510-252-1384; Sls. Mgr: R.T. Cahill

CORNING GLASS WORKS, Memory Prods. Dept., 3900 Electronics Dr., Raleigh, N.C., 27602, Tel: 919-828-0511; Sls. Mgr: H.S. Craumer

CORNING GLASS WORKS, Tech. Prods. Div., Corning, N.Y., 14830, Tel: 607-962-4444, TWX: 510-252-1384

CORNING GLASS WORKS, TELEVISION PRODS. DIV., Corning, N.Y., 14830, Tel: 607-962-4444, TWX: 510-252-1384; Sls. Mgr: C.A. Francik

CORRUGATED PAPER PRODS., INC., 300 Babylon Tpke., Roosevelt, N.Y., 11575, Tel: 516-379-8200; Sls. Mgr: L.S. Wagner

CORVAIR DIODE, Corvair Elctrns., 150 - 5th Ave., New York, N.Y., 10011, Tel: 212-255-7007; Sls. Mgr: L. Van Hoff

CORVAIR ELCTRNS, 150 Fifth Ave., New York, N.Y., 10011, Tel: 212-255-7007; Sls. Mgr: S. Kass

COSMIC PLASTICS, 12314 Gladstone St., San Fernando, Calif., 91342, Tel: 213-365-3249; Sls. Mgr: C.H. Luh

COSMICAR OPTICAL CO., LTD., 424, Higashi-Oizumimachi, Nerima-Ku, Tokyo, Japan, Tel: 03-921-1441; Sls. Mgr: N. Amano ....Pg. 1643
NY NY, Asahi Optical (America) Inc., 31 E. 28th 212-532-4876

COSMO PLASTICS CO., 3239 West 14th St., Cleveland, Ohio, 44109, Tel: 216-861-5594, TWX: 810-421-8444; Sls. Mgr: B. Gordon

COTO-COIL CO., INC., 57 Pavilion Ave., Providence, R.I., 02905, Tel: 401-941-3355; Sls. Mgr: R.L. Bellem Pgs. 1682,1683
Cal Palo Alto, P. Nurches, 941 Charleston 415-DA-6-7842
Cal Pasadena, P. Nurches, 2396 E. Foothill 213-MU-1-8957
Md Baltimore, R.L. Wilkinson, 707 Stevenson 301-377-7800
NJ Sparta, Eastern Elctrn., 23 Fern Dr.
NY Brookline, Eastern Elctrn., 1 Montana Pl. 212-763-5180
Ohio Cincinnati, J. Olsen, 5539 Stokeswood Ct. 513-922-2176
Ohio Cleveland, J. Olsen, 16201 Shaker 216-752-5444
Pa Glenside, R.L. Wilkinson, 245 Keswick 215-424-8400
Pa Pittsburgh, J. Olsen Co., 104 Elatan Dr. 412-279-2550
RI Providence, M. Paisner, 532 Elmgrove 401-831-4539
Wash Seattle, H. Levinson, 1211 E. Denny Wy. 206-323-5100
EXP: N.Y., N.Y., Coto-Coil, 13 E. 40th St.

COTTRELL PAPER CO., INC., 10 Purchase St., Fall River, Mass., Tel: 518-885-7510; Sls. Mgr: J.T. Cottrell, Jr.

COUCH S.H. DIV., ESB Inc., 36 River St., Boston, Mass., 02126, Tel: 617-298-4147; Sls. Mgr: B.W. Gray Pg. 1675
Ariz Scottsdale, Mercury Engrg. Sls., Box 3130 602-945-1927
Cal Van Nuys, R.J. Homer, 14436 Sherman 213-781-1236
Colo Denver, I. W. Strong, 635 Canosa 303-292-6900
Conn Essex, Conn. Valley Ent., Box 188 203-767-1128
Fla Windermere, R. Attaway, Box 433, Lake Butler 305-876-2349
Ill Wheaton, H.J. Batha, 310 S. Dorchester 312-668-4740
Mich Grand Rapids, Elko Sls., 3119 Midland 616-949-1451
Mich Grosse Pointe Woods, Elko Sls., 970 N. Oxford 313-884-7893
Iowa Cedar Rapids, Snider Sls., 2042 Franklin 319-362-4410
Minn Mpls., Int'l. Sls. Co., 8703 Beard Rd. 218-881-6683
Mo St. Louis, Pem Sls., 9537 Lackland 314-427-7200
NY Hicksville, Elec. Mfrs. Svcs., 10 Balsam Dr. 516-485-4321
NY Syracuse, H.R. Murray, 6585 Kinne 315-446-5555
NC Winston-Salem, Radco, 614 Nissen Bldg. 919-722-9671
Ohio Mentor, R.R. Stone & Assocs., Box 47 216-946-6766
Ore Portland, J.W. Eckersley, 3150 S.W. Hamilton St. 503-246-3183
Pa Phila, Technicraft Co., 7028 Ridge 215-483-4700
Tex Dallas, Hillman Ent., 3505 Turtle Creek 214-521-9907
For: Can., Port Credit, Ont., Leonard Elec., Ltd., 1008 Rangeview Rd. 274-3454

COULTER ELCTRNS., INC., 590 West 20th St., Hialeah, Fla., 33010, Tel: 305-885-0131, TWX: 810-848-8696; Pres: J.R. Coulter, Jr.

COUNTIS INDS., Box 1444, San Luis Obispo, Cal., 93401, Tel: 805-544-1770; Sls. Mgr: T.J. Countis

COX & CO., INC., 215 Park Ave., S., New York, N.Y., 10003, Tel: 212-OR-4-4727, TWX: 710-581-2839; Sls. Mgr: E.V. Cox, Jr. ....Pg. 1968
Cal No. Hollywood, J. Edwards Co., 4101 Lankershim Blvd. 213-877-9603
Mo Overland, Eugene Hitt & Assoc., 9537 Lackland Rd. 314-426-2322
NJ Moorestown, A.A. Foley Assocs., Box 155 201-NO-3-4545
NY Syracuse, Lenard Co., 132 Burnet Ave. 315-GR-9-9191
Ohio Cincinnati, P. C. Bach Corp., 2209 Losantiville Rd. 513-731-3822
Tex Dallas, B. McClung & Co., Box 34447 214-241-3655
Vt Vergennes, M. Benton 802-877-2656
Wash Seattle, Associated Inds., 3711 S. Hudson St. 206-723-5600

CPS, 722 E. Evelyn Ave., Sunnyvale, Calif., 94086, Tel: 408-738-0530 Ext. 26; V.P. Mktg: F. Martin ......Pg. 669
Ga Atlanta, Scien. Instrs. & Sls., Box 11628 404-237-7106
Md Silver Spring, Sel-Tronics, 721 Ellsworth 301-588-7866
Mass Burlington, Tekdata Inc., 11 A St. 617-592-4893
Mich Detroit, Dietrich Co., 600 Michigan Bldg. 313-961-4540
NJ Rockaway, Data-Rep. Assocs., Box 245 201-625-2233
NY Huntington Sta., Data-Rep., Box 164 516-423-7677
NY Schenectady, N. Alexander, Box 2529, Upper Union 518-377-0581
Ohio Cleveland, L. Dietrich, 316 Marion Bldg. 216-781-1855
Ohio Dayton, Lowry Dietrich Co., 333 W. 1st 513-223-6042
Pa Norristown, Data-Rep. Assocs., Box 349 215-279-8210
Pa Pittsburgh, Lowry Dietrich, 90 Clairton 412-892-2992

CRAIG SYS. CORP., 360 Merrimack St., Lawrence, Mass., 01842, Tel: 617-688-6961, TWX: 710-342-0765; Dir. Mktg: A.E. Koptuck

CRAMER DIV., Conrac Corp., Old Saybrook, Conn., 06475, Tel: 203-388-3574; Gen. Sls. Mgr: J. Moor

CRANE PACKING CO., 6400 Oakton St., Morton Grove, Ill., 60053, Tel: 312-YO-6-6400; Sls. Mgr: R.S. Campbell

CRATEX RUBBERIZED ABRASIVES, 1600 Rollins Rd., Burlingame, Calif., 94010, Tel: 415-697-1600; Sls. Mgr: J.C. Craven, Jr.

CRESTRONICS, 744 Rocky Loop, Box S, Crestline, Cal., 92325, Tel: 714-338-1722; Sls. Mgr: R.W. Torell

CRIMPCO ENGRG., 7341 Canoga Ave., Cangoga Park, Calif., 91304, Tel: 213-884-0540; Sls. Mgr: J. Klein

CROSS, H. CO., 365 Park Ave., Weehawken, N.J., 07087, Tel: 201-863-1134; Sls. Mgr: G. McClary

CROVEN, LTD., Div. W. Kidde & Co., Inc., 500 Beech St., Whitby, Ont., Can., Tel: 416-668-3324, TWX: 610-384-2750; Sls. Mgr: R.E. Dix ....Pg. 1378
Cal Millbrae, Melvin Sls. Co., 113 El Camino Real
Cal Sepulveda, R.L. Assocs., Box 2255
Cal Van Nuys, R.L. Assocs., 14401 Gilmore St.
Colo Denver, Walter Engrg., 880 Bonnie Brae 303-777-5585
Fla Maitland, Ellis & Assocs., Box 1261 305-644-9014
Ill Chicago, T. Hunter, 5653 W. Irving Pk. 312-SP-7-2500
Ind Ft. Wayne, Scott Elctrns., 124 W. Wash. 219-743-1586
Md Baltimore, C. Emrich, Rolling Rd. & Wilkens Ave.
Mass Natick, Naton-Neenan, 20 Strawberry Hill 617-235-1966
Minn St. Paul, Countryman Assocs., 1821 Univ. Ave. 612-645-9151
NJ Haddonfield, Mesa Tech., Box 466 609-429-4675
Mo Kansas Cy., K.S.W. Assocs., 7546 Troost 816-363-5651
NY Buffalo, Quality Comps., 4541 Main St.
NY Melville, T X Sls., 900 Walt Whitman 516-271-5850
NC Greensboro, L & D, Inc., Box 7243
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-861-2626
Tex Dallas, Stevens Sls., Box 34493

CROWELL MFG. CORP., 115 Clifton Pl., Brooklyn, N.Y., 11238, Tel: 212-638-2080; Mgr: E.W. Nielsen

CROWN INT'L., Sub. Int'l. Radio & Elctrns. Corp., Box 1000, Dept. EEM, Elkhart, Ind., 46514, Tel: 219-523-4919, Ext. 21M; Sls. Mgr: C. Moore ....Pg. 951
Cal Los Angeles, Marshank, 7422 Melrose 213-938-2591
Cal San Carlos, Dobbs/Stanford, Box 546 415-592-5928
Colo Denver, McLoud & Raymond Co., Box 22044 303-756-1589
Fla Hollywood, Firestone & Assocs., Box 6937 305-688-2521
Ga Atlanta, Fidelicom, Box 29741 404-633-3117
Ill Oaklawn, J. Gill, 5309 W. 105th St. 312-425-1555
Ind Carmel, F. Weeks Sls., Box 491 317-846-0296
Mass Newton Ctr., B. Ente Sls., 558 Commonwealth 617-244-2585

Mich Livonia, Elias Elct., 32401 W. Eight Mile 313-477-2022
Minn Mpls., Fulton Elctrns., 4428 Zane Ave., N. 612-537-7076
Mo St. Louis, Forristal-Young, 7110 Oakland 314-645-2360
NJ Freehold, Metrorep, Box 782 201-462-1221
NJ Somerville, Eldiserco, 52 Meadowbrook 201-359-6492
Tex Irving, Dobbs/Stanford, Box 1601 214-252-5502
Wash Seattle, W. Lanphear, 4031 Stone Way N 206-633-4900
EXP: N.J. Summit, N. Christensen, 382 Springfield 201-273-3833
EXP: N.Y. Roslyn, Telesco Int'l., 1044 Northern 516-484-4920

CROWN METAL PRODUCTS CO., Wyano, Pa., 15695, Tel: 412-872-8720; Sls. Mgr: K.S. Williams

CRUCIBLE STEEL CORP., Magnet Div., Box 88, Pittsburgh, Pa., 15230, Tel: 502-769-1333; V.P. Mktg: R.E. Boode

CRYOTRONICS, INC., W. Main St., High Bridge, N.J., 08829, Tel: 201-638-6112, TWX: 201-280-4020; Sls. Mgr: J.B. Malaker

CRYPTOGRAPHICS, INC., 416 Third Ave., New York, N.Y., 10016, Tel: 212-OR-7-2710

Advertisement

Cryptographics Inc. specializes in:
...PRECISION ENGRAVING ON PLASTICS & METAL
...WIRE & TUBE MARKING
...HOT STAMP MARKING ON PLASTICS & METAL
...IMPRINTING & MARKING ON ALL TYPES OF ELECTRONIC EQUIPMENT
We offer a complete service, for all your Marking--Engraving--Imprinting needs, to your specifications. Prompt service and delivery when promised, reasonably priced.

CRYSTAL NETWORK PRODS. CORP., 818 Parade St., Erie, Pa., 16503, Tel: 814-525-0124; Sls. Mgr: R.H. Tuznik

CRYSTAL OPTICS RESCH., INC., 3680 S. State St., Ann Arbor, Mich., 48104, Tel: 313-663-2481; Sls. Mgr: J.C. Smith

CRYSTAL RESCH., INC., 42 Concord La., Cambridge, Mass., 02138, Tel: 617-547-4001; Sls. Mgr: R.M. McFarland

CRYSTAL TECHNOLOGY, 2510 Old Middlefield Way, Mountain View, Cal, 94040, Tel: 415-961-9311; Sls. Mgr: Bob Carlson

CRYSTALONICS DIV., Teledyne, Inc., 147 Sherman St., Cambridge, Mass., 02140, Tel: 617-491-1670, TWX: 710-320-1196; Sls. Mgr: T.J. Paradise

CRYSTEK DIV., Whitehall Elctrns., 1000 Crystal Dr., Ft. Myers, Fla., 33901, Tel: 813-936-2109, TWX: 510-951-6388; Sls. Mgr: G.T. Gay

CTS OF ASHVILLE, See CTS Corp.

CTS OF BERNE, See CTS Corp.

CTS OF BROWNSVILLE, See CTS Corp.

CTS OF CANADA, See CTS Corp.

CTS CORP, 905 N. West Blvd., Elkhart, Ind., 46514, Tel: 219-293-7511, TWX: 810-294-2256; Sls. Mgr: R.A. Stackhouse Pgs. 1373-1375,1538,1894,2829,2910,2911

Ala Huntsville, SECO, Inc., Box 1486 205-534-1035
Ariz Phoenix, Hecht, Henschen & Assoc., 2435 E. Univ. Dr. 602-275-4411
Cal Burlingame, J. Logan, 844 Stanton 415-697-6100
Cal S. Pasadena, CTS Corp., 1010 Sycamore 213-254-9141
Cal San Diego, Dawson, 7969 Engineer 714-278-9260
Colo Denver, Elctrn. Comps. Sls., Box 22011 303-771-6200
Conn North Haven, CompRep, 22 Broadway 203-239-9762
Fla Ft. Laud., Orbe, Inc., 1520 N.E. 63rd 305-833-3341
Fla St. Petersburg, Orbe, Inc., 4110 Central 813-894-0687
Ill Sandwich, CTS Knights, 101 E. Church 815-786-8411
Ind Elkhart, CTS Corp., 905 N. West Blvd. 219-293-7511
Kans Leawood, Poly-Onics, 4434 W. 90th 913-648-4173
Mass Needham, CompRep, 1116 Great Plain 617-444-2484
Mich Southfield, J. L. Montgomery, Inc., 19400 W. Ten Mile Rd. 313-358-2616
Minn Mpls., J. Lee, 4241 Toledo 612-920-1525
Minn Mpls., R.W. Marshall, 6106 Excelsior 612-929-0457
Mo Hazelwood, Poly-Onics, Inc., 47 Village Sq. Shopping Ctr. 314-837-0597
NJ Cherry Hill, CTS Corp., Box 322 609-424-1207
NM Albuquerque, Elctrn. Comp., 1811 Carlisle 505-256-9831
NY Jamaica, S-J Sls., 148-05 Archer 212-291-3232
NY Rhinebeck, CTS Corp., Box 386 914-876-6717
NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343
NC Skyland, CTS of Asheville, Mills Gap 704-684-6451
Ohio Cincinnati, Baehr, Greenleaf & Assoc., 9505 Montgomery Rd. 513-891-3827
Ohio Cincinnati, Sheridan, 10 Knoll Crest, Box 37646 513-761-5432
Ohio Cleveland, Baehr, Greenleaf & Assoc., 14700 Detroit 216-221-9030
Ohio Cleveland, Sheridan Assocs., Box 4457 216-524-8120
Ohio Columbus, Baehr, Greenleaf & Assoc., Box 5722 614-486-4046
Ohio Dayton, Sheridan Assocs., Box 37 513-277-8911
Ohio Xenia, Baehr, Greenleaf & Assoc., 925 Factory Rd. 513-426-5485
Ore Portland, Richard Legg Co., Box 25327 503-292-8824
Pa Pittsburgh, Covert & Newman Co., 300 Mt. Lebanon Blvd. 412-563-0303
Pa Pittsburgh, Sheridan Assocs., 201 Penn Ctr. Blvd. 412-243-6655
Tex Addison, Parvin Sales Co., Box 307 214-239-9148
Utah Salt Lake Cy., Elctrn. Comp., 445 E. 2nd 801-355-5327
For: Can., Streetsville, Ont., CTS Of Can., Ltd., 80 Thomas St. 416-826-1141
For: P.R., San Juan, Moriss Saliss, Box 2307 809-764-1842

CTS KEENE, See CTS Corp.

CTS KNIGHTS, See CTS Corp.

CTS MICROELECTRONICS, CTS Corp.

CULVER STEARNS MFG. CO., Sub. Roanwell Corp., 354 Franklin St., Worcester, Mass., 01604, Tel: 617-753-6304; Sls. Mgr: F. H. Malboeuf

CUNNINGHAM, Sub. Gleason Works, 10 Carriage St., Honeoye Falls, N.Y., 14472, Tel: 716-624-2000; Dir. Mktg: R.W. Robson ....Pg. 322

Ala Huntsville, Gentry, 2109 W. Clinton Ave. 205-534-9771
Conn Hamden, Instr. Conslts., 2381 Whitney 203-248-4174
Fla Orlando, Gentry Assocs., 550 N. Bumby 305-841-7740
Ga Atlanta, C. S. Smith, Jr., 4275 Wendell S.W. 404-691-5900
Ill Chicago, Scien. Sls., 7132 N. Harlem 312-775-7594
Ill Berkeley, R. T. Sls., 5440 St. Charles 312-544-6700
Ind Indianapolis, Scien. Sls., 5555 N. Tacoma 317-253-4606
Ind Indianapolis, J. O. Goetz, 5941 Brendonridge N. 317-545-5638
Md Bethesda, Bartlett, 4405 East-West Hwy. 301-656-3061
Mass Waban, Instrument Conslts., Inc., Box 25 617-969-9881
Mich Detroit, R. Milsk, 19375-95 James Couzens Hwy. 313-342-6660
Minn Mpls., Scien. Sls., 5100 Edina Ind'l. Bl. 612-941-2215
Minn Mpls., HMR Inc., 9 E. 22nd St. 612-335-7734
Mo St. Louis, Scien. Sls., 1760 S. Brentwood 314-968-1133
Mo Ellisville, J. L. Grunder, 118 Carmel Woods 314-277-7558
NM Albuquerque, C. Schmidt, 9611 Acoma, S.E. 505-298-2415
NY White Plains, Bartlett, 470 Mamaroneck Ave. 914-949-6476
NC Burlington, Gentry, 116 E. O'Neal Ave. 919-227-2581
Pa Pittsburgh, J. Wolfson, 201 Penn Ctr. 412-823-8400
Pa Wayne, Bartlett, 130 W. Lancaster Ave. 215-688-7325
Tex Houston, Scien. Sls., 6400 Westpark 713-781-2711
Tex Richardson, Scien. Sls., 777 S. Central 214-231-6541
Utah Granger, J.F. Hurlbut, 3817 W. 3280 S. 801-299-4321
Wash Seattle, Paratech, Box 5427 206-784-6447
Wisc Milwaukee, N. Central Sls., 2820 E. Layton 414-481-2930
EXP: Can., Willowdale, Ont., Video Comps., 31 Glenelia 416-222-1757
For: Can., Toronto, Ont., Simtec Inds., Box 38 416-425-6118
For: Can., Montreal, Que., Simtec Inds., 3400 Metropolitan E. 514-728-4527

CURTIS DEV. & MFG., 3278 N. 33rd St., Milwaukee, Wisc., 53216, Tel: 414-445-1817, TWX: 910-262-3125; Sls. Mgr: H.G. DeBruine

CURTIS INSTRS., INC., 200 Kisco Ave., Mt. Kisco, N.Y., 10549, Tel: 914-666-2971, TWX: 710-571-2163; Sls. Mgr: S. Charleston ....Pg. 427

Cal Long Beach, Cairns Engrg. Sls. Co., 122 W. Fifth St. 213-432-7444
Cal Santa Clara, Richards Assocs., 2938 Scott Blvd. 408-246-5860
Colo Littleton, 1449 W. Littleton Blvd., 303-798-4573 213-670-1700
Ind Ft. Wayne, McDonald Sls. Co., Box 2848 219-745-9214
Md Timonium, Heller-Freedman Assoc., Box 293 301-252-4780
Mass Brookline, Harman Assocs., 251 Harvard St. 617-232-6687
Minn Minneapolis, E.C. Elctrn. Sls., 10108 Abbott Ave., S. 218-888-0102
NM Albuquerque, Aztec Enterprises, 3202 Candelaria Rd., N.E. 505-345-3441
NY Greenvale, B. D. Aaron, Inc. 516-621-0630
NY Syracuse, Rep. Tech., Inc., 2002 Teall Ave. 315-437-2845
Pa Media, W. Reeves Assocs., Inc., 2973 N. Providence Rd. 215-LO-6-6709
Tex Dallas, Techno Assocs., 2324 Shore Crest Rd. 214-FL-7-9213
Wash Seattle, J.J. Backer Co., 221 W. Galer 206-285-1300
Wisc Waukesha, J.C. Morkin Sls. Co., 1317 Garfield Ave. 414-542-5129

CUSTOM COIL CO., Box 2624, Zanesville, Ohio, 43701, Tel: 614-452-6973; Sls. Mgr: D. Young

CUSTOM COMPS., Div. Lauriat Corp., 21 Passaic Ave., Fairfield, N.J., 07006, Tel: 201-227-5340; Sls. Mgr: G.E. Mortensen

CUSTOM COMPONENTS, INC., P.O. Box 248, Caldwell, N.J., 07006, Tel: 201-227-5340; Sls. Mgr: J. Mortensen

CUSTOM ELCTRNS., Browne St., Oneonta, N.Y., 13820, Tel: 607-432-3880, TWX: 510-241-8292; Gen. Mgr: Mr. W.P. Harris

CUSTOM MATERIALS, INC., Alpha Ind'l. Pk., Chelmsford, Mass., 01824, Tel: 617-729-5020, TWX: 617-256-6686; Sls. Mgr: J.E. Leard

CUSTOM SCI. INSTRS., INC., Box A, Whippany, N.J., 07981, Tel: 201-538-8500; Sls. Mgr: H.J. Bultman, Jr.

CUTLER-HAMMER, 4201 N. 27th St., Milwaukee, Wisc., 53201, Tel: 414-442-7800, TWX: 414-273-4327; Sls. Mgr: W.G. Cudlip

CYBEREX INC., 4399 Industrial Pkwy., Willoughby, Ohio, 44094, Tel: 216-946-1784; Sls. Mgr: D.C. Griffith

CYBERMATICS, INC., 2460 Lemoine Ave., Ft. Lee, N.J., 07024, Tel: 201-461-6171; Sls. Mgr: J. Doyle

CYCLE-DYNE, INC., Sub. Axel Elctrns., Inc., 134-20 Jamaica Ave., Jamaica, N.Y., 11418, Tel: 212-AX-1-3907, TWX: 710-582-2618; Sls. Mgr: G.W. McCook

Advertisement

Complete induction heating equipment for soldering, brazing, hermetic sealing, crystal growing, zone refining, and epitaxial deposition. Self contained units from 1 through 60KW feature integral RF Transformers, solid state power supplies, and minimum input water requirements.

CYCLE EQUIP. CO., P.O. Box 307, Los Gatos, Calif., 95030, Tel: 408-356-5555; Sls. Mgr: H. Allen

CYCLE TRANSFORMER CORP., 177 Main St., West Orange, N.J., 07052, Tel: 201-731-7440; Sls. Mgr: P.M. Brubaker

CYCLO-TRONICS, INC., 3858 N. Cicero Ave., Chicago, Ill., 60641, Tel: 312-282-6141; Pres: D. Goldware

D-CEMCO, INC., 3200 N. San Fernando Blvd., Burbank, Calif., 91504, Tel: 213-849-6341; Sls. Mgr: F. Criswell

D-VEL RESCH. LABS., INC., 555 Bedford Rd., Bedford Hills, N.Y., 10507, Tel: 914-666-5197; Sls. Mgr: D. Velzy

DABURN ELCTRNS. & CABLE CORP., 2360A Hoffman St., Bronx, N.Y., 10458, Tel: 212-295-0050; Sls. Mgr: W.J. Epstein ....Pgs. 3032,3033

Ala Birmingham, F.C. Nickerson, Box 9679 205-853-2852
Cal Belmont, Elctrn. Mktg., 1048 Continental Way

Cal San Mateo, Elctrns. Mktg., 3327 Caxton 415-341-6666
Cal Whittier, DeAngelo & Rothman
Colo Aurora, A.E.S., Inc., 12891 E. Nevada Cir. 303-366-0208
Conn Waterbury, Anderson Sls., 133 Mansfield 203-753-2487
Fla Tampa, F.C. Nickerson, Box 13126 813-833-4321
Fla Oldsmar, F.C. Nickerson, Box 40 813-855-4209
Ga Decatur, F.C. Nickerson, 1244 Clairmont 404-377-1575
Mass Boston, Anderson Sls., 177 State St. 617-227-2980
Mo Kansas City, Nevco, Inc., 1715 Baltimore 816-421-1751
Mo St. Louis, Nevco, 2427 Brentwood 314-962-5629
NY Liverpool, L. Dunnigan Co., 107 Riverine Rd. 315-622-2133
NC Charlotte, F.C. Nickerson, 5817 Haddington 704-537-2855
Wisc Milwaukee, Mueller Elctrn., 10721 W. Capitol 414-464-4210
EXP: N.Y., N.Y., Roburn Agencies, 345 W. 14 212-989-5939
For: Can., Rexdale, Ont., Abbey Elctrns., Ltd., 1 Daybar Ave. 416-249-8431

DACO INSTR. CO., INC., Merritt Blvd., Trumbull, Conn., 06611, Tel: 203-375-5871, TWX: 710-453-1095; Pres: A. Stauber .... Pgs. 1444,2783

DAHLSTROM MFG. CORP., Special Prods. Div., Jamestown, N.Y., 14701, Tel: 716-487-0111, TWX: 716-484-9480; Sls. Mgr: E.E. Anderson

DAICO INDS., INC., Box 5225, Compton, Cal., 90220, Tel: 213-631-1143; Sls. Mgr: P. Nooteboom Pg. 1556
Cal Los Altos, H. Stout Assocs., 200 Third St. 415-948-3265
Mass Cochituate, Micronics Assocs., Box 162 617-653-8229
Mo Hazelwood, Penzer-Mankus Assocs., 400 Brookes La. 314-731-4334
NJ Red Bank, Dynamic Sls., Box 834 201-747-5353
NY Syracuse, Syracuse Tech. Reps., Box 47 315-488-0222
Tex Dallas, Roberts Sls. Co., 9704 Lanward Dr. 214-348-4283

Advertisement

COAXIAL SWITCHES offered by DAICO INDUSTRIES employ sophisticated diode and reed configurations to provide high CW and peak power capability. FAIL SAFE diode switch designs are available to speeds of 20 nanoseconds. Computer interface logic to drive multi-position switches is also offered.

DALE ELCTRNS., INC., Sub. Lionel Corp., 1342 28th Ave., Box 609, Columbus, Neb., 68601, Tel: 402-564-3131, TWX: 910-626-8314; V.P. Mktg: I.E. Gates Pgs. 1539,2838-2849,2916,2917
Ariz Phoenix, Williams & Assocs., 2250 N. 16th St. 602-254-6085
Cal Santa Fe Springs, J. S. Heaton Co. S., 13901 S. Carmenita Rd. 213-944-7996
Cal Menlo Pk., J.S. Heaton Co., 3723 Haven Ave. 415-369-4671
Colo Denver, Williams & Assocs., 4971 Jackson St. 303-388-4391
Fla Palm Beach Gardens, W.J. Reasor & Assoc., Box 12601 305-622-1267
Fla Tampa, W.J. Reasor & Assoc., Box 10135 813-877-2886
Ill Chicago, D.J.M. Elctrn. Sls., Inc., 5356 N. Milwaukee Ave. 312-774-1212
Ind Ft. Wayne, Scott Elctrns., Inc., 124 W. Washington 219-743-1586
Ind Indianapolis, Scott Elctrns., Inc., 1300-02 N. Pennsylvania St. 317-635-8951
Ky Louisville, Scott Elctrns., Inc., 334 Francis Bldg. 502-583-3220
Md Towson, R.L. Wilkinson, 707 Stevenson La. 301-377-7800
Mass Wakefield, Kaelber & Mack, Inc., 37 Hillcrest Rd. 617-245-9359
Mich Detroit, Burcaw Co. & Assoc., 18236 W. McNichols Rd. 313-533-7700
Minn Minneapolis, Merrill Franklin Co., 7710 Computer Ave. 612-920-8014
Mo Kansas City, R. Deane, 10825 McGee St. 816-942-0130
NJ Fairlawn, Kaelber & Mack, Inc., 9-09 Walsh Pl. 201-797-7782
NM Albuquerque, Williams & Assoc., 420 Washington, S.E. 505-255-1638
NY Buffalo, M. Farber Assoc., 220 Delaware Ave. 716-856-5526
NY Manhasset, Kaelber & Mack, 75 Plandome Rd. 516-627-6620
NC Charlotte, J. Rudisill Assoc., 1225 Harding Pl. 704-377-6901
Ohio Cincinnati, Scott Elctrns., 9505 Montgomery Rd. 513-791-2513
Ohio Cleveland, Scott Elctrns., 1836 Euclid Ave. 216-861-2626
Ohio Columbus, Scott Elctrns., 79 E. State St. 614-228-2313
Ohio Dayton, Scott Elctrns., 517 Hulman Bldg., 120 W. 2nd St. 513-223-2652
Ore Beaverton, Arneson Assocs., 4175 S.W. Cedar Hills Blvd. 503-646-3416
Pa Glenside, R.L. Wilkinson, Box 215 215-424-8400
Pa Pittsburgh, Scott Elctrns., 1050 Freeport Rd. 412-781-3112
Tex Dallas, E. F. Aymond Co., 4300 N. Central Expwy. 214-826-7620
Wash Seattle, Arneson Assocs., 5950 6th Ave. 206-762-7664
EXP: Columbus, Neb., Dale Elctrns., Inc., 1342 28th Ave. 402-564-3131

DALE ELCTRNS., INC., Yankton Div., E. Hwy. 50, Box 180, Yankton, S.D., 57078, Tel: 605-665-9301; Sls. Mgr: F. Coe .... Pgs. 1584,1906,2488,2489,2618,2619
Ariz Phoenix, Williams Assocs., 2250 N. 16th St. 602-254-6085
Cal Menlo Pk., J.S. Heaton Co., 3723 Haven Ave. 415-369-4671
Cal Santa Fe Springs, J.S. Heaton Co. South, 13901 S. Carmenita Rd. 213-944-7996
Colo Denver, Williams Assocs., 4971 Jackson St. 303-388-4391
Fla Palm Beach Gardens, W.J. Reasor & Assocs., Box 12601 305-622-1267
Fla Tampa, W.J. Reasor & Assocs., Box 10135 813-877-2886
Ill Chicago, D.J.M. Elctrns. Sls., Inc., 5356 N. Milwaukee Ave. 312-774-1212
Ill Chicago, Matthews-Midwest Co., 5439 W. Lawrence Ave. 312-725-1500
Ind Ft. Wayne, Scott Elctrns., Inc., 124 W. Washington 219-743-1586
Ind Indianapolis, Scott Elctrns., Inc., 1300-02 N. Pennsylvania St. 317-635-8951
Ky Louisville, Elctrns., Inc., 334 Francis Bldg. 502-583-3220
Md Towson, R.L. Wilkinson, Inc., 707 Stevenson La. 301-377-7800
Mass Wakefield, Kaelber & Mack, Inc., 37 Hillcrest Rd. 617-245-9359
Mich Detroit, Burcaw Co. & Assoc., 18236 W. McNichols Rd. 313-533-7700
Minn Minneapolis, Merrill Franklin Co., 7710 Computer Ave. 612-920-8014
Mo Kansas City, R. Deane, 10825 McGee St. 816-942-0130
NJ Fairlawn, Kaelber & Mack, Inc., 9-09 Walsh Pl. 201-797-7782
NM Albuquerque, Williams Assocs., 420 Washinton St., S.E. 505-255-1638
NY Buffalo, M. Farber Assocs., 220 Delaware Ave. 716-856-5526
NY Manhasset, Kaelber & Mack, Inc., 75 Plandome Rd. 516-627-6620
NC Charlotte, J. Rudisill Assocs., 1225 Narding Pl. 704-377-6901
Ohio Cincinnati, Scott Elctrns., 9505 Montgomery Rd. 513-791-2513
Ohio Cleveland, Scott Elctrns., 1836 Euclid Ave. 216-861-2626
Ohio Columbus, Scott Elctrns., 79 E. State St. 614-228-2313
Ohio Dayton, Scott Elctrns., 517 Hulman Bldg. 513-223-2652
Ore Beaverton, Arneson Assocs., 4175 S.W. Cedar Hills Blvd. 503-646-3416
Pa Glenside, R.L. Wilkinson, Inc., Box 215 215-424-8400
Pa Pittsburgh, Scott Elctrns., 1050 Freeport Rd. 412-781-3112
Tex Dallas, E. F. Aymond Co., 4300 N. Central Expwy. 214-826-7620
Wash Seattle, Arneson Assocs., 5950 6th Ave. 206-762-7664
EXP: Nebr., Columbus, Dale Elctrns., 1342 28th Ave. 402-564-3131

DALES, FRANKLIN CO., 180-85 E. Mill St., Akron, Ohio, 44308, Tel: 216-762-7236; Sls. Mgr: G.A. Meidlinger

DALMO VICTOR, Textron Div., 1515 Industrial Way, Belmont, Calif., 94002, Tel: 415-591-1414, TWX: 910-376-4400; Mktg. Mgr: S.F. Piper

DAMON CORP., Elctrns. Div., 115 4th Ave., Needham Hgts., Mass., 02194, Tel: 617-449-0800, TWX: 710-325-6916; Sls. Mgr: N. Roy .... Pg. 1379
Cal N. Hollywood, Jewett, 13111 Ventura 213-789-8103
Cal San Carlos, Component Assoc., 850 Montgomery La., Box 516 415-591-9656
Conn Norwalk, Eastern Tech, Box 122 203-846-9133
Fla St. Petersburg, Kirkwood, 3530 First Ave., N. 813-894-8240
Kans Mission, Inland Assoc., 6047 Howe Dr. 913-362-2366
NM Albuquerque, ALS Elctrns., Box 11626 505-298-2575
NY Tuckahoe, Spectrum Sls., 65 Circuit 914-793-1660
NY Utica, B.D. Hummel, 2224 Maynard 315-736-7821
Ohio Dayton, Downs Engrg. Co., 1435 DeLynn Dr. 513-885-2238
Pa Bala Cynwd, E-Tech Corp., Box 52 215-667-5110
Va Springfield, E-Tech, 6615 Backlick Rd. 703-451-6500
Wash Seattle, B. Hirsh, 4013 Lary Way, NW 206-783-3423
For: Can., Ville Lasalle, Que., Elecrodesign Ltd., 840 Lafleur 514-363-5120

DANA LABS., INC., 2401 Campus Dr., Irvine, Calif., 92664, Tel: 714-833-1234, TWX: 910-595-1136; Sls. Mgr: B. Weitz

DANCO METAL PRODUCTS, INC., 24020 Detroit Rd., Westlake, Ohio, 44145, Tel: 216-871-2300; Sls. Mgr: D.E. Evans

DANIELS, C.R., INC., Daniels, Md., 21033, Tel: 301-465-1200, TWX: 710-862-1884; Sls. Mgr: J.W. Smith

DANTE ELEC. MFG. CO., Bantam, Conn., 06750, Tel: 203-JO-7-5307; Sls. Mgr: J.J. Dante

DANTRONICS, 3175 Hafner Ct., St. Paul, Minn., 55112, Tel: 612-484-2108; Sls. Mgr: R. Jackson

Advertisement

Dantronics manufactures a versatile low cost transistor analyzer (995.00). Other products include a leakage tester, custom RAM and ROM testers, dynamic and static shift register testers. Also included in our product line is the PET (Programmable Event Timer) which is a programmable digital clock that can be programmed for events to occur at any time of the day. Immediate replies to inquiries.

DARLING, R.E. CO., INC., 3749 N. Romero Rd., Tucson, Ariz., 85705, Tel: 602-887-2400, TWX: 910-952-1190; Sls. Mgr: W.A. Sylvester

DARRAH ELEC. CO., INC., 5914 Merrill Ave., Cleveland, Ohio, 44102, Tel: 216-631-0912; Sls. Mgr: R: Darrah

D.A.T.A., INC., 32 Lincoln Ave., Orange, N.J., 07050, Tel: 201-673-8030, TWX: 710-994-5839; Sls. Mgr: J.P. Fischer

DATA ACCESS SYS., INC., 503 Rte. 10, Mt. 19, Dover, N.J., 07801, Tel: 201-361-2345; Sls. Mgr: R. Swendeman

DATA-CONTROL SYSTEMS, Commerce Dr., Danbury, Conn., 06810, Tel: 203-743-9241, TWX: 710-456-0376; Sls. Mgr: J.S. Lombardo .... Pg. 345
Ala Huntsville, TA Instr., Box 4088 205-881-8494
Cal Sunnyvale, Tech. Mktg. Assoc., 355 W. Olive Ave. 408-736-3687
Cal Westminister, Data-Control Sys., 7150 Fenwick La. 714-894-4471
Colo Denver, Space Sys. Sls. & Engrg., 5810 W. 38th Ave. 303-424-5574
Conn Danbury, Data-Control Sys., Commerce Dr. 203-743-9241
Fla Orlando, TA Instr., Box 14125 305-843-3030
Ill Des Plains, Marsland Assoc., 1000 Executive Way 312-298-2620
Ind Indpls., Marsland Assoc., 3734 Carrollton Ave. 317-924-3568
Md Wheaton, K-G Elctrns., 11151 Biers Mill Rd. 301-946-4055
Mich Detroit, Electro Sls. Assocs., 11211 Morang Dr. 313-526-8800
Minn Minneapolis, Marsland Assoc., 231 N. Edgewood Ave. 612-545-4481
Mo Florissant, Marsland Assoc., 100 St. Francois St., Ste. 112 314-831-0015
NJ Ft. Lee, Tech. Mktg. Assoc., 4 Horizon Rd. 201-224-6911
NJ Merchantville, Megargel-Himmelstein, 6705 Park Ave. 609-662-3081
NM Albuquerque, Space Sys. Sls. Engrg., Box 9063 505-247-0458
NY E. Syracuse, Ossman Instrs., 6666 Old Collamer Rd. 315-473-6666

Ohio Cleveland, Electro Sls. Assocs., 851 E. 22nd St. 216-261-5440
Pa Pittsburgh, Electro Sls. Assocs., 210 Penn Ctr. Blvd. 412-371-9449
SC Spartanburg, TA Instrs., Box 1983 803-585-3864
Tex Houston, Data-Mktg. Assocs., 3925-C Dacoma St. 713-686-9627
For: Can., Ottawa, Ont., Datacord Sys., Ltd., Box 176, Terminal A 613-722-0332

Advertisement

Data-Control Systems offers complete "Turn Key" systems or individual instrumentation hardware for the data acquisition, data reduction, and date communications marketplace. At present, the company offers complete end-to-end systems capability, starting with output of a transducer, to generating computer compatible tapes, including multiplexing, transmission, storage, reduction and conversion to digital format. Computer controlled and manually operated PCM decommutation systems are also available. In the data transmission field, DCS equipment plays a vital role in system testing, bit synchronization, PSK demodulation, DM demodulation, etc.

DATA DELAY DEVICES, 253 Crooks Ave., Clifton, N.J., 07011, Tel: 201-772-1106; Sls. Mgr: N. Lupi Pgs. 2744,2745
Cal Torrance, Mitronics Inds., 18039 Crenshaw Blvd. 213-323-7934
Cal Palo Alto, Mitronics Inds., 201 Town & Country Vill. 415-326-9822
Fla Orlando, W. M. Jones Co., 2317 E. South St. 305-424-6598
Md Towson, W. M. Jones Co., Box 5490 301-823-5721
Mass Hampden, Conelmark Assocs., Box 132 413-566-8944
Mich Jackson, E. H. Jordan & Assocs., 2024 Glen Dr. 517-782-0694
NJ Cranford, Martech Assocs., 15 Alden St. 201-272-5510
NY Huntington L.I., Martech Assocs., 60 Bayview Dr. 516-271-7611
Va Woodbridge, W. M. Jones Co., 104 3rd Ave. Marmumsco Vill. 703-494-6701

Advertisement

We manufacture, Design, Develop:
- Electromagnetic Delay lines fixed; variable, lumped, distributed, electrically variable.
- Filters Low-Pass, High-Pass, Band-Pass
- Inductors, Fixed, variable, toroids, electrically variable
- Oscillators, Low-Freq. modular
- Magnetostrictive Delay Lines

DATA DEVICE CORP., See DDC

DATA DISC INC., Computer Prods., 686 W. Maude Ave., Sunnyvale, Cal., 94086, Tel: 408-732-7330, TWX: 910-373-1248; V.P: J. Shortal

DATA DISC, Video Div., 686 Maude Ave., Sunnyvale, Cal., 94086, Tel: 408-732-7330, TWX: 910-373-1248

DATA DISPLAY PRODUCTS, 8036 Westlawn Ave., Los Angeles, Cal., 90045, Tel: 213-641-1232; Sls. Mgr: Q. Lodhie

DATA DYNAMICS DIV., Elctrn. Counters, Inc., 240 Humphrey St., Englewood, N.J., 07631, Tel: 201-567-5300; Sls. Mgr: L. Rosendahl

Advertisement

PULSE GENERATORS
Model 5101 50 MHz General Purpose
Model 5102 50 MHz for IC Testing
Model 5103 200 MHz General Purpose
Model 5109 10 MHz General Purpose
Model 5113 50 MHz Variable Rise and Fall Time
Model 5114 10 MHz MOS Pulse Generator
Pulse Generator Systems, Word Generators, Digital Timing and Control Equipment. Systems designed to customer specifications. Call or write for a demonstration.

DATA GRAPHICS, 8402 Speedway Dr., San Antonio, Tex., 78230, Tel: 512-342-9486; Sls. Mgr: D. Forest Pg. 346
Ariz Scottsdale, Bennewitz Assocs., Inc., 532 N. Brown Ave. 602-947-7379
Cal Los Altos, Sys. Mktg. Conslt., Box 1376 415-941-4777
Cal Newport Bch, Tekmark West, Inc., 4301 Birch St. 714-540-4412
Cal San Diego, Tekmark West, Inc., Box 17156 714-227-0993
Colo Denver, Bennewitz Assocs., Inc., 2801 E. Colfax Ave. 303-399-1131
Conn Hamden, Equip. Sls. Co., Inc., 3013 Dixwell 203-248-5581
Ill Chicago, Data Elctrns., 5505 N. Menard Ave. 312-774-1452
Kans Leavenworth, McGraw Engrg. Co., 512 McDonald Rd. 913-651-2929
Md Annapolis, Hayden Assoc., 16 Decatur Ave. 202-296-6059
Mass Bedford, Equip. Sls. Co., 30 Shawsheen Ave. 617-275-7730
Mich Detroit, Electro Sls. Assocs., 11211 Moran 313-526-8800
Minn Minneapolis, Data Elctrns., 821 Second Ave. 612-377-8383
Mo Florissant, McGraw Engrg. Co., 3225 Parker Rd. 314-831-0342
NJ Glassboro, Eastern Elctrn. Sls. Co., Box 473 609-589-3022
NY Bklyn, Eastern Elctrn. Sls. Co., 1 Montana Pl. 212-763-5180
NM Albuquerque, Bennewitz Assocs., Inc., 9720 Candelaria, N.E. 505-298-6775
Ohio Cleveland, Electro Sls. Assocs., 851 E. 22nd St. 216-261-5440
Ohio Dayton, Electro Sls. Assocs., Overlook Br., Box 3122 513-426-5551
Pa Pittsburgh, Electro Sls. Assocs., 201 Penn Ctr. Blvd. 412-371-9449
Tex Houston, Sci. Sls. Co., 6400 W. Park 713-781-2711
Tex Richardson, Sci. Sls. Co., 777 S. Central Expwy. 214-231-6541
Wash Seattle, Delcom Sls. Co., 11937 Marine View Dr., S.W. 206-248-0090

DATA PRECISION, Audubon Rd., Wakefield, Mass., 01880, Tel: 617-246-1600; Sls.Mgr: T. Bakey

Advertisement

Equipped with the newest Tri-Phasic automatic zero conversion techniques and other 1971 features the Data Precision 5 1/2 and 4 1/2 decimal digital multimeters provide all the features of the expensive units at a fraction of their cost. With a basic d.c. accuracy of 0.004% of range the model 2540, 5 1/2 digit unit without extra cost options measures full range d.c. volts, a.c. volts, ohms, and ratio. The standard unit also automatically ranges, provides both isolated BCD outputs and remote control inputs. At better than 0.01% accuracy the 4 1/2 digit model 2440 has the same features. Option include an extremely low level preamp and rechargeable battery operation capability.

DATA PRODUCTS, 8455 E. Prentice, Englewood, Col., 80110, Tel: 303-771-1230; Sls. Mgr: G.M. Herzfeld

DATA PRODS. CORP., 6219 De Soto Ave, Woodland Hills, Calif., 91364, Tel: 213-887-8000; Sls. Mgr: J. Ogg

DATA RECORDING SYS., Sub. Newell Inds., 795 Kifer Rd., Sunnyvale, Cal., 94086, Tel: 408-732-7540; V.P. Mkt: W.H. Collins

DATA SYS. ENGRG., 1620 E. Ball Rd., Anaheim, Cal., 92805, Tel: 714-535-2894, TWX: 213-860-9110; Sls. Mgr: D.A. Pritchard

DATA TECHNOLOGY, Digital Instrs. Grp., 1050 E. Meadow Cir., Palo Alto, Cal., 94303, Tel: 415-321-0551, TWX: 910-373-1186; Sls. Mgr: F.J. Burge ....Pg. 429
Ala Huntsville, Gentry Assocs., 2109 Clinton W. 205-534-9771
Ariz Phoenix, Moxon Elctrns., 15 N. 40th Pl. 602-273-7363
Cal Los Angeles, Moxon Elctrns., 2311 Pontius 213-272-9311
Cal Sunnyvale, Moxon Elctrns., 1259 Birchwood 408-734-4352
Cal San Diego, Moxon Elctrns., 2054 Garnet 714-274-6525
Colo Littleton, Aztec Entprs., 1449 W. Littleton 303-798-4573
Fla Orlando, Gentry Assocs., 550 N. Bumby 305-841-7740
Ill Chicago, L. F. Green, 5218 W. Diversey 312-286-6824
Ind Indianapolis, L. F. Green, 1111 E. 54th St. 317-253-2087
Iowa Cedar Rapids, Engrg. Svc., 1026 3rd Ave. S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svc., 7924A State Line 913-649-4000
Md Wheaton, K-G Elctrns., 11151 Veirs Mill 301-946-4055
Mass Newtonville, H. J. Schuft Co., 815 Washington 617-527-5304
Mich Detroit, Electro Sls., 11211 Morang 313-526-8800
Minn Mpls., L. F. Green, 6225 University N.E. 612-781-1611
Mo St. Louis, Engrg. Svc., 6717 Vernon Ave. 314-726-2233
NJ Freehold, Moxon Elctrns., Box 649 201-446-4820
NM Albuquerque, Aztec Entprs., 829 Penn. N.E. 505-255-2440
NY N. Syracuse, KLM Assocs., 401 S. Main St. 315-458-6214
NY New Hartford, KLM Assocs., 1 Nouvelle Pk. 315-735-8525
NY Rochester, KLM Assocs., 39 Saginaw Dr. 716-442-0820
NC Burlington, Gentry Assocs., 116 E. O'Neal 919-227-2581
Ohio Cleveland, Electro Sls., 851 E. 222nd St. 216-261-5440
Ohio Dayton, Electro Sls., Box 3122 513-426-5551
Pa Pittsburgh, Electro Sls., 201 Penn Ctr. Blvd. 412-371-9449
Tex Irving, Noakes Engrg., Box 968 214-638-3569
Wash Seattle, H. Levinson, 1211 E. Denny Way 206-323-5100

DATA TECHNOLOGY CORP., Digital Systems Gr., 1050 E. Meadow Cir., Palo Alto, Cal., 94303, Tel: 415-321-0551, TWX: 910-373-1186; Sls. Mgr: F.J. Burge

DATA TECHNOLOGY INC., Sub. Allen-Bradley Co., 65 Grove St., Watertown, Mass., 02172, Tel: 617-924-1773; Sls. Mgr: B. George

DATACOM, INC., Box 278, Ft. Walton Bch., Fla., 32548, Tel: 904-242-3113, TWX: 510-730-7693; Dir. Mktg: T.D. Jaye ....Pg. 344
Ala Huntsville, Mekco, Holiday Off. Ctr. 205-881-3721
Cal No. Hollywood, O'Halloran, 10700 Ventura Blvd. 213-877-0173
Cal Palo Alto, O'Halloran, 3921 E. Bayshore Dr. 415-326-1493
Cal San Diego, O'Halloran, 3760 Midway Dr. 714-224-2824
Colo Engelwood, PLS Assocs., 8080 E. Union 303-771-0140
Fla Orlando, Mekco, 3165 McCrory Rd. 305-841-2215
Md Green Belt, J. E. Cuesta, 8501 Glendale Rd. 301-552-1200
Mich Detroit, Electro Sls., 11211 Morang Dr. 313-886-2280
Nev Las Vegas, O'Halloran 361-5084
NM Albuquerque, PLS Assocs., 4300 H Silver S.E. 505-255-2330
NC Burlington, Mekco, 1349 S. Church St. 919-226-7177
Ohio Cleveland, Electro Sls. , 851 E. 222nd St. 216-261-5440
Ohio Dayton, Electro Sls., Box 3122 513-426-5551
Pa Pittsburgh, Electro Sls., 201 Penn Center Blvd. 412-371-9449
Pa Valley Forge, J. E. Cuesta 215-265-5800
Utah Salt Lake City, PLS Assocs., 5219 Major St. 801-262-2866

DATACRAFT CORP., Box 23550, Ft. Lauderdale, Fla., 33307, Tel: 305-933-2651, TWX: 510-956-3096; Sls. Mgr: R.F. McCullough

DATADYNE CORP., Valley Forge Ctr.-Bldg. 37A, King of Prussia, Pa., 19406, Tel: 215-265-1793; Sls. Mgr: J. Riggs

DATAK CORP., 85 Highland Ave., Passaic, N.J., 07055, Tel: 201-773-3399; Sls. Mgr: C. Cay ....Pg. 1445
Ariz Phoenix, W.B. Knight, 444 W. Camelback
Cal Millbrae, Polach & Bensinger, 231 Millbrae 415-697-2525
Cal Inglewood, W.B. Knight, Box 400
Colo Denver, Elctrn. Sls., Inc., 4783 S. Tucker 303-756-4148
Conn Wallingfd., Adams-McGregor, 77 Bayberry 203-269-0225
Ill Oak Pk., Jackman Sls., 6332 W. Roosevelt Rd.
Ill River Forest, Petitt Co., 349 N. Ashland 312-369-9040
Mass Scituate, K. Walsh, Box A 617-545-2213
Md Kensington, F-M Elctrns., 3519 Raymoor Rd. 301-949-1707

NJ Montclair, Comp. Marketers, Inc., 109 Valley Rd. 201-746-6717
NJ Teaneck, Comp. Mktrs., 571 Sunderland 201-TE-6-9595
NM Albuquerque, J.F. Quirk, Box 8738-C 255-6981
Ohio Cleveland, C.H. Dolfuss, Jr. & Co., 2108 Payne Ave. PR 1-1270
Ohio Dayton, C.H. Dolfus, Jr. & Co., 5160 Woodbury Dr.
Ore Lake Oswego, McMillan Elctrns., 16679 S.W. Maple Cir. 503-636-7954
Pa Havertown, F-M Elctrns., 206 Bewley Rd. HI 6-1961
RI Lincoln, Adams-McGregor, 66 Lakeview 401-726-1300
SC Taylors, H.C. Norman, Bridgewood Dr.

DATALIGHT INC., 77 Dudleytown Rd., Bloomfield, Conn., 06002, Tel: 203-243-2554, TWX: 710-425-2390; Sls. Mgr: R. Anderson
DATALOGIC SYS., INC., Merrimac, Mass., 01860, Tel: 617-346-8131; V.P., Mktg: P. Kirshman
DATAMETRICS CORP., 7632 Gloria Ave., Van Nuys, Calif., 91406, Tel: 213-989-3840; Pres: G. White
DATANETICS CORP., 2828 Spreckles La., Redondo Beach, Cal, 90278, Tel: 213-542-4355, TWX: 910-344-7356; Sls. Mgr: R.F. Hoover
DATAPAC, INC., 3839 S. Main St., Santa Ana, Cal., 92707, Tel: 714-546-7781, TWX: 910-595-7781; Sls. Mgr: B. Garrett
DATAPROBE, INC., 290 Huyler St., So. Hackensack, N.J., 07606, Tel: 201-489-5588; Sls. Mgr: B. Kelly

DATAPULSE, See Systron Donner Corp.

DATASCAN, INC., 1111 Paulison Ave., Clifton, N.J., 07013, Tel: 201-478-2800; Sls. Mgr: D.E. Schwartz Pg. 428
Cal Los Altos, Sys. Mktg. Conslt., One First St. 415-941-4777
Cal Los Angeles, Cain & Co., 522 S. Sepulveda Blvd. 213-476-2251
Colo Littleton, Cropley, Inc., 1523 E. Easter Cir. 303-794-4231
DC Washington, Sonco, 4720 Montgomery La. 301-654-5226
Fla Orlando, Lee Assocs., Inc., 200 E. Marks St. 305-241-4445
Ill Chicago, Data Elctrns. Co., Inc., 5505 N. Menard Ave. 312-774-1452
Mass Newton Center, Daner-Buchler, Inc., 684 Commonwealth Ave. 617-969-4650
Mich Farmington, Anderson Elctrns., Inc., 30785 Grand River Ave. 313-476-9161
Mo Florissant, McGraw Engrg., Box 511 314-831-0342
NJ Ft. Lee, Tech. Mktg. Assoc., 4 Horizon Rd. 201-224-6911
Ohio Dayton, B. Hocker & Assoc., 1400 Devereaux Dr. 513-298-8638
Pa King of Prussia, Sonco, 107 Town Ctr. Rd. 215-265-3250
Pa Pittsburgh, R.F. Clark Co., 10517 Lindberg Ave. 412-242-9500
Tex Arlington, Packard-Speairs Co., 803 Ave. H, E. 817-261-4424
Wash Seattle, Del Com Sls., 11937 Marine View Dr., S.W. 206-248-0090
For: Can., Ville La Salle 650, Que., Electrodesign, Ltd., 840 La Fleur

DATATRON, INC., 1562 Reynolds Ave., Santa Ana, Cal, 92711, Tel: 714-540-9330, TWX: 910-595-1589; Sls. Mgr: C.J. Davis, Jr.
DATUM, INC., 170 E. Liberty Ave., Anaheim, Calif., 92801, Tel: 714-879-3070, TWX: 910-592-1289; Sls. Mgr: N.L. Dawirs
DAUBERT CHEM. CO., 709 Enterprise Dr., Oak Brook, Ill., 60521, Tel: 312-582-1000; V.P: W.A. Spencer
DAVIDSON ELCTRN. DEV. CO., 2211 Peninsular Dr., Erie, Pa., 16506, Tel: 814-833-9818; Pres: A.R. Davidson

Advertisement

Davidson designs and builds to your requirements: automatic test equipment, data acquisition systems, automatic adjust equipment, and special devices for the electrical and electronic industry.

DAVIES, HARRY MOLDING CO., 4920 W. Bloomingdale Ave., Chicago, Ill., 60639, Tel: 312-622-8966; Sls. Mgr: R.C. Appleby
DAVIS ELEC. CO., Box 38, Cape Girardeau, Mo., 63701, Tel: 314-ED-5-5547; Pres: B.D. Davis
DAVIS & HEMPHILL, INC., 2000 Furnace Ave., Elkridge, Md., 21227, Tel: 301-796-2290; Sls. Mgr: M.B. Davis, Jr.
DAVIS J.W. & CO., P.O. Box 35313, Dallas, Texas, 75235, Tel: 214-352-8405; Sls. Mgr: J.W. Davis
DAYMARC CORP., Bear Hill Rd., Waltham, Mass., 02154, Tel: 617-894-2105, TWX: 710-324-6469; Sls. Mgr: N.J. Cedrone

DDC, Dept. 21, 100 Tec St., Hicksville, N.Y., 11801, Tel: 516-433-5330, TWX: 510-221-1874; Sls. Mgr: G. Heller Pgs. 347,1282
Ariz Scottsdale, OEM Specialties, 6625 E. Mac Donald 602-946-4617
Cal Culver City, Axinn Assocs., 5235 Sepulveda 213-390-3517
Cal Palo Alto, Axinn Assocs., 777 Welch 415-328-8562
Conn Hartford, Instr. Assocs., Inc., 234 Murphy Rd. 203-525-9367
DC Wash., Powell-Pendergraph, 7979 Old Georgetown 301-656-4535
Fla Maitland, EIR, Inc., Box 943 305-644-9595
Ill Wilmette, Crest Assocs., 505 4th St. 312-256-5202
Mass Bedford, Instr. Assocs., 175 Middlesex 617-275-0700
Minn Mpls., Heimann Co., 5603 Lyndale 612-861-6051
Mo St. Louis, PEM Sls., 9451 Lackland 314-427-7200
NM Albuquerque, A.L.S. Elctrns., Box 11626 505-268-9600
NY Great Neck, Meas. Technology, Inc., 295 Northern Blvd. 516-482-3500
NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343
Ohio Medina, McShane, Box 523 216-725-4568
Pa Pittsburgh, Automated Equip. & Engrg., 648 Center Ave. 412-931-7616
Pa Hatboro, Powell-Pendergraph, 206 Mill 215-887-1135
Tex Austin, A. Barnes Co., Box 9748 512-454-4371
Tex Houston, A. Barnes Co., 3801 Kirby 713-523-7333
Tex Richardson, A. Barnes Co., 740 S. Sherman 214-235-4541
Wash Seattle, Seatronics, Inc., 5616 4th Ave., S. 206-767-4330
For: Can., Downsview, Ont., Componetics, Ltd., 62 Alness St. 416-636-3673
For: Can., Montreal, Que., Componetics, Ltd., 6420 Victoria Ave. 514-342-4112
For: Can., Ottawa, Ont., Componetics, Ltd., 1342 Bank St. 613-733-3781

DE COURSEY ENGRG. LAB., 11828 W. Jefferson, Culver City, Cal., 90230, Tel: 213-EX-7-9668; Pres: W.E. De Coursey

Advertisement

Manufacturing of Custom Active and Passive Electrical Filters. MIL or Commercial Filters low frequency through to 50 MegHtz.
High Pass, Low Pass,
Band and Noise Rejection Filters.
Also small Power Supplies & Toroidal Coils.

DE SOTO ELEC. PRODS., Box 239, De Soto, Mo., 63020, Tel: 314-586-3381; Sls. Mgr: G.H. Solomon
DE-STA-CO DIV., Dover Corp., 350 Midland Ave., Detroit, Mich., 48203, Tel: 313-868-5080; V.P. Sls: W.D. Rogerson
DE-TEC-TRONIC CORP., 2512 N. Halsted St., Chicago, Ill., 60614, Tel: 312-327-3962; Sls. Mgr: E.L. Manderson
DEARBORN ELCTRNS., INC., Sub. Sprague Elec. Co., P.O. Box 530, Orlando, Fla., 32802, Tel: 305-838-3011; Mktg. Mgr: C.T. Little

DEARBORN WIRE & CABLE CO., 9299 Everhouse Dr., Rosemont, Ill., 60018, Tel: 312-696-0090; Distr. Sls. Mgr: A.H. Bruning ....Pgs. 3015-3031

DECALCRAFT, Rte. 309, Hatfield, Pa., 19440, Tel: 215-822-0517; Sls. Mgr: N.R. Hill
DECIBEL PRODS., INC., 3184 Quebec St., Dallas, Tex., 75247, Tel: 214-631-0310; Sls. Mgr: K.M. Parsons
DECKER CORP., 101 Monument Rd., Bala-Cynwyd, Pa., 19004, Tel: 215-MO-4-6700; Pres: M.M. Decker
DECOR ELCTRNS. CORP., 4711 East 5th St., Austin, Tex., 78702, Tel: 512-EV-5-0277; Sls. Mgr: P.J. Anderson
DEE ELEC. CO., 2501 N. Wayne Ave., Chicago, Ill., 60614, Tel: 312-477-5500; Sls. Mgr: C. Schultz
DEFENSE ELCTRNS., INC., Rockville, Md., 20854, Tel: 301-762-5700, TWX: 710-828-9783; Dir. Mktg: R.N. Blackwood
DEFIANCE CIRCUIT CORP., 12 Shepard St., Lawrence, Mass., 01843, Tel: 617-688-1856, TWX: 710-342-1246; Sls. Mgr: E.T.C. Farley
DEHART MFG. CO., 2 Noble St., Norristown, Pa., 19401, Tel: 215-279-8190; Pres: J.D. Howie

DEL ELCTRNS. CORP., 250 E. Sandford Blvd., Mt. Vernon, N.Y., 10550, Tel: 914-699-2000, TWX: 710-562-0130; Sls. Mgr: Walter Young Pgs. 678-680,2377
Ala Huntsville, Grady Duckett Sls., Box 503 205-881-1213
Cal Burlingame, Compar-San Franc., 820 Airport 415-347-5411
Cal Encino, King-Way Assocs., 17100 Ventura 213-478-4124
Colo Littleton, Hilleary Assocs., 2552 Ridge Rd. 303-794-4279
Conn Hamden, Compar New England, 2531 Whitney Ave. 203-288-9276
Fla Winter Pk., Grady Duckett Sls., Box 59 305-424-3466
Ga Atlanta, Grady Duckett Sls., Box 29067 404-451-3529
Ill Des Plaines, Coombs Assocs., 1001 E. Touhy 312-298-4830
Ill Elmhurst, Scott Assocs., 663 Fairview 312-279-5681
Md Silver Spring, R. Davies Assocs., 10 Old Post Off. Rd. 301-587-3910
Mass Burlington, TriTek Inc., 165A Bedford St. 617-272-4550
Mass Newton Highlands, Compar New England, 88 Needham St. 617-969-7140
Mich Detroit, D. Poulin Co., 17222 E. Warren 313-886-4990
Mich Garden Cy., James & Assocs., 28469 Bock 313-425-1235
Minn Mpls., Scott Elctrn. Sls., 5209 W. 60th. 612-939-2985
Mo St. Louis, Coombs Assocs., 11734 Lackland Ind'l Dr. 314-542-3636
Mo St. Louis, R. Sebright, 7120 W. Florissant 314-261-0055
NJ Nutley, I. Brill, 326 Hillside 201-667-0653
NM Albuquerque, Recording Science, 1811 Carilsle 505-265-7631
NY Albany, Compar Albany, 6 Highland Ave. 518-489-7408
NY Albany, J.A. Reagan Co., 6 Highland 518-489-4777
NY Binghamton, J.A. Reagan, 528 Crestmont 607-723-9661
NY New Hartford, J. Reagan, 41 Woodberry 315-732-3775
NY Rochester, J. Reagan, 891 Monroe 716-473-2115
NC Greensboro, Grady Duckett, Box 22002 919-273-4617
Ohio Cincinnati, F.J. Campisano, Box 11043 513-662-1616
Ohio Fairborn, Tech. Assocs., Box 388 513-878-2484
Pa Ardmore, Martin Elec. Co., 118 Valley Rd. 215-649-6332
Pa Pittsburgh, A. McArn Co., Box 11127 412-366-1533
Tex El Paso, Recording Science Assocs., Box 4033 915-565-5530
Tex Richardson, Athans Sls. Co., Box 134 214-241-7791
For: Can., Downsview, Ont., BRH Assocs., Ltd., 580 Supertest Rd. 416-630-4025
For: Can., Ville La Salle, Que., Electrodesian, 840 La Fleur 514-363-5120

DELAVAN MFG CO, Electro-Sonics Div, 811 Fourth St, West Des Moines, Iowa, 50265, Tel: 515-274-1561
DELBERT BLINN. CO., Box 2007, Pomona, Calif., 91766, Tel: 714-623-1257; Sls. Mgr: H.A. Manning

DELCO ELCTRNS. DIV., General Motors Corp., 700 E. Firmin St., Kokomo, Ind., 46901, Tel: 317-459-2175, TWX: 317-452-5747; Gen. Sls. Mgr: A.B. Goodspeed Pgs. 1800,1801
Cal El Segundo, 354 Coral Cir. 213-772-5181
Ill Chicago, 5151 N. Harlem Ave. 312-775-5411
NJ Union, Box 1018, Chestnut Sta. 201-687-3770
EXP: N.Y., New York, GMOO, 767 Fifth Ave. 212-486-5000

DELCO ELCTRNS. DIV., General Motors Corp., Milwaukee Oper., 7929 S. Howell Ave., Milwaukee, Wisc., 53201, Tel: 414-762-7000, TWX: 414-322-8370; Sls. Mgr: R.G. Brown
DELCON DIV., Hewlett-Packard Co., 333 Logue Ave., Mt. View, Calif., 94040, Tel: 415-969-0880, TWX: 910-379-6490; Sls. Mgr: L. Collmann

DELEVAN DIV., COIL PRODS., American Precision Inds., 270 Quaker Rd., E. Aurora, N.Y., 14052, Tel: 716-652-3600; Sls. Mgr: F. Riehle ....Pgs. 1585,2490
Ariz Phoenix, Toward Engrg., Box 15268 Arcadia Sta. 602-955-3193
Cal Los Angeles, L-Tronix, 1617 W. Colorado 213-CL-6-2224
Cal Redwood City, Long, 505 Middlefield 415-EM-9-3324
Colo Denver, Walter-Engrg., 880 Bonnie Brae 303-777-5585
Fla Oviedo, Conley & Assoc., Box 668 305-365-3283

Fla Tampa, Conley & Assoc., Box 18662 813-933-3183
Ind Ft. Wayne, W.W. Bieberich, Box 1050 219-432-2537
Iowa Cedar Rapids, Lorenz Sls., 4403 First SE 319-366-0774
Kans Leawood, H. Heyde, 9221 Wenoga 913-MI-9-8628
Md Towson, J. Dougherty Sls., 320 Hillen Rd. 301-823-0431
Mass Boston, P.J. Engrg., 360 N. Beacon St. 617-924-5950
NJ Cranford, Martech Assoc., Box 181 201-272-5510
NJ Haddonfield, Thomas Assocs., 138 Haddon 609-854-3011
NY Endicott, Tech-Mark, 101 Jefferson Ave. 607-748-7473
NY Fairport, Tech-Mark, 19 Valley Brook 716-377-5531
NY Huntington, Martech, 60 Bayview 516-271-7611
Ohio Cleveland, C. Robinson, 5010 Mayfield 216-381-9049
Ohio Dayton, C. Robinson, 11 W. Monument Bldg. 513-222-0832
Ore Portland, D. Weber, 1226 S.E. 7th Ave. 503-234-7671
Tenn Nashville, R. Mitscher, 2508 Stone River 615-883-2220
Tex Houston, P.J. Scalon 713-466-6889
Tex Richardson, P. Scanlon, Box 70 214-231-4661
For: Can., Montreal, Que., J. Weiss, 5725 Monkland 514-489-6887
DELL OPTICS CO., INC., 9226 Kennedy Blvd., N. Bergen, N.J., 07047, Tel: 201-869-7300; Sls. Mgr: K. Feuer
DELSEN TESTING CORP., 719 W. Broadway, Glendale, Calif., 91204, Tel: 213-245-8517; Sls. Mgr: W.S. Whyte
DELTA DESIGN, 8000 Fletcher Pkwy., La Mesa, Cal, 92041, Tel: 714-465-4141, TWX: 910-322-1343; Sls. Mgr: C.M. Self
DELTA ELCTRN. CONTROL, 1701 Pomona St., Costa Mesa, Cal., 92627, Tel: 714-646-7776; Pres: C.W. Jobbins
DELTA ELCTRNS., 4206 Wheeler Ave., Alexandria, Va., 22304, Tel: 703-751-3133, TWX: 710-832-1151; Sls. Mgr: W.H. Cottles
DELTA PLASTICS CO., Sub. S-G-L Inds., Inc., 776 Creek Rd., Bellmawr, N.J., 08031, Tel: 609-931-5750; Sls. Mgr: R.J. Hoffman Jr.
DELTA PRODUCTS, INC., P.O. Box 1147, Grand Junction, Colo., 81501, Tel: 303-242-9000; Sls. Mgr: K.D. Braa
DELTA SONICS, 12918 Cerise Ave., Hawthorne, Cal, 90250, Tel: 213-772-1409; Sls. Mgr: J.B. Halbert
DELTA-TRONICS CORP., 1710 E. Princess Dr., Tempe, Ariz., 85281, Tel: 602-966-9380; Sls. Mgr: J.M. Harris

DELTROL CONTROLS, 2745 S. 19th St., Milwaukee, Wisc., 53215, Tel: 414-671-6800; V.P. Sls: F. Wolf, G. Shepherd ....Pg. 1692
Cal Los Angeles, Cummings & Assoc. 213-340-6035
Cal Menlo Pk., J. Heaton Co. 415-369-4671
Colo Denver, Ruby Sls., Corp. 303-755-1714
Conn Thomaston, Nelson & Schoonmaker 203-283-5959
Fla No. Miami, Winfield Elctrns. 305-751-5566
Ga Atlanta, Winfield/Southeast 404-636-3023
Ill Chicago, Deltrol Controls 312-544-5505
Ind Ft. Wayne, W. Bieberich Co. 219-432-2537
Md College Pk., Shiplett-Warrington Assoc. 301-864-5757
Mich Flint, Kent & Assoc. 313-233-0380
Mich Rochester, Kent & Assoc. 313-651-1890
Minn St. Paul, Mesa Co. 612-645-8676
Mo Kansas City, M-C Sls. 816-842-4640
NJ Englewood, Rudy Sls. Corp. 201-567-5880
NJ Stratford, A. E. Luba & Assoc. 609-784-5000
Mo St. Louis, G. Fixman 314-725-5219
NY Rochester, Deltrol Controls 716-473-3340
Ohio Cleveland, D. Steffen & Assoc. 216-261-5055
Ohio Dayton, D. Steffen & Assoc. 513-293-3145
Okla Tulsa, T. J. Ray Co. 918-627-1515
Tex Dallas, Carey & Assoc. 214-363-7813
Tex Houston, Carey & Assoc. 713-869-3623
Tex San Antonio, Carey & Assoc. 512-736-2581
Wash Seattle, Almac/Stroum Elctrns. 206-763-2300
Wisc Wauwatosa, F.C. DuBois & Assoc. 414-774-3100
For: Can., Toronto, Ont., Power Svc. Prods. 416-239-2977

DELTRON, INC., Wissahickon Ave., N. Wales, Pa., 19454, Tel: 215-699-9261, TWX: 510-661-8061; Sls. Mgr: M. Kraus ....Pgs. 682-685
Ala Huntsville, Int'l. Sci. Instrs., Box 2091 205-837-1601
Ariz Scottsdale, Vinson, Box 966 602-947-7371
Cal Pasadena, P. Nurches, 2396 E. Foothill 213-681-8957
Colo Denver, Vinson Assocs., 2145 S. Clermont 303-757-5151
Conn Hamden, J & J Assocs., 965 Dixwell 203-624-7800
Fla Orlando, Truex Assocs., 3165 McCroy 305-841-8931
Ill Northfield, Torkelson Assocs., 540 W. Frontage 312-446-9085
Ind Indianapolis, Torkelson Assocs., 3512 Rockville Rd. 317-244-7867
Iowa Cedar Rapids, Engrg. Svcs., 1026 3rd, SE 319-366-1591
Kans Prairie Vlg., Emgrg. Svcs., 7830 State Line 913-649-4000
La New Orleans, Glidden Engrg. & Equip., Box 10442 504-835-6204
Md Kensington, Elctrn. Mktg., 1150 Huff Ct. 301-881-5300
Mass Burlington, J & J Assocs., 12 Cambridge 617-272-2606
Mich Detroit, WKM Assocs., 1474 E. Outer Dr. 313-892-2500
Minn Mpls., Torkelson Assocs., 4820 W. 77th St. 612-920-1046
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NM Albuquerque, Vinson Assocs., Box 3827 505-265-5991
NY Clarence, Rep Tech, Box 156 716-684-6250
NY Syracuse, Rep. Tech, 2002 Teall Ave. 315-437-2845
NY Tuckahoe, Spectrum Sls., 65 Circuit 914-793-1660
N.C. Winston-Salem, Radco Co., 614 First Union Nat'l Bank Bldg. 919-722-9671
Ohio Cleveland, WKM Assocs., 16141 Puritas 216-267-0445
Ohio Dayton, WKM Assocs., 6073 Far Hills 513-434-7500
Ore Tigard, McLaren-Topp, 12750 SW Pacific Hwy. 503-639-1136
Pa King of Prussia, Elctrn. Mktg., 210 Goddard 215-265-1600
Pa Pittsburgh, WKM Assocs., 90 Clairton 412-892-2953
Tex Dallas, Glidden Engrg. & Equip., 8609 NW Plaza, Dr. 214-363-6539
Tex Houston, Glidden Engrg. & Equip., 7728 Long Point Rd. 713-681-1415
Wash Bellevue, McLaren-Topp, Box 250 206-746-5750
For: Can., Montreal, Que., Ind'l. Elctrns. & Automation Co., Box 306 514-935-7262
DEMEX, INC., 2130 Jefferson, Kansas City, Mo., 64108, Tel: 816-421-3181, TWX: 910-771-2067; Sls. Mgr: J. Clawson
DENISON, R.B., INC., 103 Broadway, Bedford, Ohio, 44146, Tel: 216-232-8200; Sls. Mgr: W.H. Houghton
DENNIS CHEM. CO., 2701 Papin St., St. Louis, Mo., 63103, Tel: 314-PR-6-1868; V.P. Mktg: D.J. Edwards
DENNISON MFG., 300 Howard St., Framingham, Mass., 01701, Tel: 617-879-0511; Pres: P.B. Hamilton
DENSON ELCTRNS. CORP., P.O. Box 122, Rockville, Conn., 06066, Tel: 203-875-5198; Sls. Mgr: A. Denson
DENTON VACUUM, INC., Cherry Hill Ind'l. Ctr., Cherry Hill, N.J., 08034, Tel: 609-424-1012; Sls. Mgr: D. Baum
DENTRONICS, INC., 60 Oak St., Hackensack, N.J., 07601, Tel: 201-343-9405; Sls. Mgr: D. Hayes
DERINGER METALLURGICAL CORP., 1250 Town Line Rd., Rte 60, Mundelein, Ill., 60060, Tel: 312-566-4100, TWX: 910-685-4321; Sls. Mgr: P.H. Loeffler
DESCO MFG. CO., 1530 Flower St., Glendale, Calif., 91201, Tel: 213-241-9560; Sls. Mgr: J.A. MacDonald
DESIGN AUTOMATION, INC., 809 Massachusetts Ave., Lexington, Mass., 02173, Tel: 617-862-8998; Sls. Mgr: N.O. Sokal
DESIGN ELEMENTS, 1356 Norton Ave., Columbus, Ohio, 43212, Tel: 614-294-2694; Sls. Mgr: G. Gerhard
DESIGN PRODS. CORP., Electronics Div., 1925 W. Maple Rd., Troy, Mich., 48084, Tel: 313-647-1770; Sls. Mgr: R.A. Joss
DESMAN ELCTRNS., 315 Child St., Rochester, N.Y., 14611, Tel: 716-235-4440; Sls. Mgr: R.R. Goeltz
DESPATCH OVEN CO., P.O. Box 1320, Minneapolis, Minn., 55440, Tel: 612-331-1873; Sls. Mgr: E.M. Burud
DESTRON CO., 25914 Chalmette La., Rolling Hills Est, Cal, 90274, Tel: 213-FR-8-3450
DETECTO SCALES, INC., 540 Park Ave., Brooklyn, N.Y., 11205, Tel: 212-MA-4-6100; Sls. Mgr: M. Rapp
DETROIT DIESEL ALLISON DIV., General Motors Corp., 13400 W. Outer Dr., Detroit, Mich., 48228, Tel: 313-531-7100; Sls. Mgr: E.B. Lewis
DETROIT TESTING LAB., 12800 Northend Ave., Detroit, Mich., 48237, Tel: 313-398-2100; Div. Mgr: E.J. Colosimo
DEUTSCH CO., Elctrn. Comps. Div., Municipal Airport, Banning, Calif., 92220, Tel: 714-849-6701, TWX: 714-825-7210; V.P. Sls: H. Comeau
DEUTSCH FASTENER CORP., 7001 W. Imperial Hwy., Los Angeles, Cal., 90045, Tel: 213-649-1400, TWX: 910-328-6119
DEUTSCH RELAY DIV., 65 Daly Rd., East Northport, NY, 11731, Tel: 516-864-6000, TWX: 510-226-0233; Sls. Mgr: J.R. Cushman
DEVCO ENGRG., Control Sys. Div., Pier La., W. Caldwell, N.J., 07006, Tel: 201-CA-8-0321; Sls. Mgr: R.S. West
DEVELCO, INC., 8 Van Tassel Ct., Norwalk, Conn., 06851, Tel: 203-847-7720; Pres: R.L. Seidman
DEVICE SEALS, INC., 11684 Tuxford St., Sun Valley, Calif., 91352, Tel: 213-768-6770; Sls. Mgr: G.J. Foley
DE VILBISS CO., THE, 300 Phillips Ave., Toledo, Ohio, 43601, Tel: 419-474-5411; Sls. Mgr: F.P. Flitner
DEVONICS INC., Box 7158, San Diego, Cal., 92107, Tel: 714-224-3494
DI-ACRO, Div. Houdaille Inds., Inc., 316 8th Ave., Lake City, Minn., 55041, Tel: 612-345-3331; Sls. Mgr: E.T. Moe
DI/AN CONTROLS, INC., 944 Dorchester Ave., Boston, Mass., 02125, Tel: 617-288-7700, TWX: 710-333-0174; Sls. Mgr: H.R. Smith, Jr.
DIAL PRODS. CO., 19-21 Cottage St., Bayonne, N.J., 07002, Tel: 201-HE-7-0720; Sls. Mgr: L. Podraza

DIALIGHT CORP., 60 Stewart Ave., Brooklyn, N.Y., 11237, Tel: 212-497-7600, TWX: 710-584-5487; Sls. Mgr: P. Malecka ....Pgs. 1446,1447
Ariz Phoenix, J. Berman, 2101 W. Shangri La 602-944-3361
Cal Inglewood, J. Berman, 8295 S. La Cienga 213-678-1281
Cal Oakland, F. Moulthrop, 1530 E. 12 St. 415-261-7676
Colo Denver, R. Bowen, 1440 S. Santa Fe 303-722-4641
Fla N. Miami, Cartwright & Bean, 20100 NE 25th 305-945-2962
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek Ave. 305-425-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill, NW 404-237-2273
Ill Hinsdale, Hill-Gray, 2 Salt Creek La. 312-325-4810
Ind Angola, Southern Sls. Co., 105 Lakeshore Dr. 219-665-3961
Ind Ft. Wayne, Paul Sls. Co., 3501 Fairfield Ave. 219-744-0589
Ind Indpls., Southern Sls., 1111 E. 54 St. 317-253-3359
Ky Louisville, Southern Sls., 212 Republic Bldg. 502-583-6902
La Metarie, Cartwright & Bean, 7010 Magnolia 504-887-5225
Md Hyattsville, L.D. Lowery, 6200 Annapolis 301-773-4977
Mass Newtonville, C. Segel, 133 Beaumont 617-969-6900
Mich St. Joseph, R. C. Merchant, 505 Pleasant 616-983-7378
Mich Detroit, R. C. Merchant, 18411 W. McNichols 313-535-6000
Minn St. Paul, R.G. Ragon, 1136 W. Larpenteur 612-488-0201
Mo Kansas City, K & M Sls., 1627 Main St. 816-471-1355
NJ Pompton Lakes, R. Horne, 235 Wanaque 201-835-7400
NM Albuquerque, Electro-Rep., 3211 Silver, SE 505-256-1749
NY Cazenovia, A. Perkins, 3394 East 315-682-5005
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-333-6457
Ore Portland, Almac/Stroum, 8888 SW Canyon 503-292-3534
Pa Broomall, L. Lowery, 2801 W. Chester Pike 215-356-5300
Tenn Memphis, Cartwright & Bean, 560 S. Cooper 901-276-4442
Tex Dallas, Texport Co., 2837 Anode St. 214-358-3435
Tex Houston, Texport Co., 8811 Gaylord 713-464-2828
Utah Salt Lake City, R. Bowen, 1380 W. North Temole 801-364-4632
Wash Seattle, S.N. Stroum, 5811 Sixth Ave., S. 206-763-2300
EXP: N.Y., N.Y., Roburn Agencies, 349 W. 14 St. 212-989-5939
DIAMOND REPEATER CO., 55 Main St., Madison, N.J., 07940, Tel: 201-377-8880; Sls. Mgr: R.R. Erickson

cont'd

cont'd ——— Advertisement ———

Data & Telegraph coupling repeaters. Operational modes, determined by external connections, include single-line, HDX, FDX, HUB, inverse neutral, line/computer, and computer/line.

Solid-state data & teleprinter drivers and solid-state relays with complete input/output isolation. Wide speed range.

Signal operated motor controls, remotely operated switchers, faceplate distributors, specialized power supplies, etc.

Teleprinters for export.

Cable Address - Diamond - TLX 138732

DIAMONITE PRODS. MFG. CO., Div. U.S. Ceramic Tile Co., Shreve, Ohio, 44676, Tel: 216-567-4211; Sls. Mgr: R.C. Mulligan

DICE, J.W. CO., 16 Highwood Ave., Englewood, N.J., 07631, Tel: 201-569-0471; Pres: M. Strain

DICKSON ELCTRNS. CORP., Box 1390, Scottsdale, Ariz, 85252, Tel: 602-947-2231, TWX: 910-950-1292; Sls. Mgr: J. Feijoo

DIELECTRIC MATERIALS CO., 1811 W. Bryn Mawr Ave., Chicago, Ill., 60626, Tel: 312-561-6891; Sls. Mgr: H.D. Isenberg

DIELECTRIC SCIENCES, 111 Terrace Hall Ave., Burlington, Mass, 01803, Tel: 617-272-8960; Sls. Mgr: J.A. Goldlust

DIETZ, HENRY G. CO., INC., 14-26 28th Ave., Long Island City, N.Y., 11102, Tel: 212-RA-6-3347; Sls. Mgr: M. Pheasey

DIETZGEN, EUGENE CO., 2425 N. Sheffield Ave., Chicago, Ill., 60614, Tel: 312-549-3300; Exec. V.P: W.C. Dietzgen

DIGI-DATA CORP., 4315 Baltimore Ave., Bladensburg, Md., 20710, Tel: 301-277-9378; Mktg. Mgr: G.R. Eakins

DIGIAC CORP., Ames Ct., Plainview, N.Y., 11803, Tel: 516-GE-3-7800; Sls. Mgr: V. Randazzo

——— Advertisement ———

We have a new name, expanded product line, and manufacturing capabilities. For information concerning Pulse Generators, Power Supplies, Digital Computer Training Devices, call Digiac.

DIGITAL DATA SYS., 18819 Bryant St., Northridge, Cal., 91324, Tel: 213-886-5711; Pres: D.R. Juilfs

DIGITAL DEV. CORP., 5575 Kearny Villa Rd., San Diego, Calif., 92123, Tel: 714-278-9920; Dir. Mktg: J. Honig

DIGITAL DISPLAYS, Box 24, Mendham, N.J., 07945, Tel: 201-543-7653

DIGITAL EQUIP. CORP., 146 Main St., Maynard, Mass., 01754, Tel: 617-897-5111, TWX: 710-347-0212; Sls. Mgr: T.G. Johnson ....Pg. 348

Ala	Huntsville, 3322 Memorial Pkwy., S.W.	205-881-7730
Ariz	Tempe, 307 E. Southern	602-967-1618
Cal	Anaheim, 801 E. Ball Rd.	714-776-6932
Cal	Oakland, 7850 Edgewater Dr.	415-326-5640
Cal	Palo Alto, 560 San Antonio Rd.	415-326-5640
Cal	W. Los Angeles, 1510 Cotner Ave.	213-479-3791
Colo	Denver, 2305 S. Colorado Blvd.	303-757-3332
Conn	Meridan, 240 Pomeroy Ave.	203-237-8441
Fla	Orlando, 6990 Lake Ellenor Dr.	305-851-4450
Ga	Atlanta, 2815 Clearview Pl.	404-458-3133
Ill	Northbrook, 1850 Frontage Rd.	312-498-2500
Ill	Rockford, 500 S. Wyman St.	815-965-5557
Ind	Indianapolis, 21 Beechway Dr.	317-243-8341
Md	Riverdale, 6811 Kenilworth	301-779-1600
Mass	Cambridge, 899 Main St.	617-491-6130
Mass	Waltham, 15 Lunda St.	617-891-1030
Mass	Maynard, 146 Main St.	617-897-5111
Mich	Ann Arbor, 230 Huron View Blvd.	313-761-1150
Minn	Mpls., 8030 Cedar, S.	612-884-4092
Mo	Maryland Hgts., 115 Progress Pkwy.	314-872-7520
NJ	Palisades Pk., 95 Cedar La.	201-871-4984
NJ	Parsippany, 1259 Rte. 46	201-335-3300
NJ	Princeton, Rt. One	609-452-2940
NM	Albuquerque, 6303 Indian School, NE	505-296-5411
NY	Centereach, 1919 Middle Country Rd.	516-585-5410
NY	Rochester, 130 Allens Creek Rd.	716-461-1700
NC	Durham, 2704 Chapel Hill Blvd.	919-489-3347
Ohio	Dayton, 3101 Kettering Blvd.	513-299-7377
Ohio	Willoughby, 35104 Euclid Ave.	216-946-8484
Ore	Tigard, 13015 S.W. Pacific Hwy.	503-639-8632
Pa	Pittsburgh, 400 Penn Ctr. Blvd.	412-243-8500
Pa	Paoli, Station Square 3	215-647-4900
Tenn	Knoxville, 5731 Lyons View Dr., S.W.	615-588-6571
Tex	Dallas, 8855 N. Stemmons Frwy.	214-638-4880
Tex	Houston, 3417 Milam St.	713-524-2961
Utah	Salt Lake City, 431 South 3rd East	801-328-9838
Wash	Bellevue, 1521 130th N.E.	206-454-4058
Wisc	Milwaukee, 2825 N. Mayfair Rd.	414-453-3400

DIGITAL GEN'L. CORP., Univ. Cir. Resch. Ctr., 11000 Cedar Ave., Cleveland, Ohio, 44106, Tel: 216-721-0440; V.P. Mktg: P.E. Hunter

DIGITAL PRODS., 335 W. Seventh St., San Pedro, Calif., 90731, Tel: 213-831-0351, TWX: 910-345-6796; Pres: D.H. Ransom, Sr.

DIGITECH DATA INDS., INC., 66 Grove St., Ridgefield, Conn., 06877, Tel: 203-438-3731; V.P: B.E. Worne

——— Advertisement ———

Digitech Data Industries, Inc.
Designs and Manufactures:
1. Telegraph Typewriter Test Instruments
2. Telegraph Word Generators
3. Data Signal Pattern Generators
4. Telegraph Circuit Distortion Measuring Equipment
5. Digital Data Signal Analyzers
6. Bit Error Rate Testers
7. ACCESS, Automated Quality Monitoring System
8. CHEKMATE, Automatic/Semi-Automatic Data Communications Diagnostic Center
9. Solid State Relays
10- Data Synchronizing Terminals
11- Custom "Tech Controls" plus Audio and DC Patch Cabinets

DIGITRAN CO., Div. Becton-Dickinson & Co., 855 S. Arroyo Pkwy., Pasadena, Cal., 91105, Tel: 213-449-3110, TWX: 910-588-3794; Sls. Mgr: R.N. Alexander ....Pgs. 1904,1905

Ala	Huntsville, Beacon Elctrn., Box 4307	205-881-5031
Ariz	Phoenix, Howe & Howe, 4109 N. 18 St.	602-264-7971
Cal	Los Altos, Shannon Assoc., 1 First St.	415-941-2217
Cal	San Diego, Celtec Co., 8799 Balboa Ave.	714-279-7961
Colo	Denver, Todd Assocs., 1393 S. Inca St.	303-777-4381
Fla	Ft. Laud., Beacon Elctrn., 651 NE 45th St.	305-564-4298
Fla	Maitland, Beacon Elctrn. Assocs., Box 1278	305-647-3498
Ga	Atlanta, Beacon Elctrn., 2285 Peachtree, NE	404-351-3654
Ill	Chicago, Sci. Sls., 7132 N. Harlem Ave.	312-775-7594
Ind	Indpls., R.O. Whitesell, 6691 E. Washington St.	317-359-9283
Ind	Ft. Wayne, R.O. Whitesell & Assocs., 3426 Taylor St.	219-432-5591
Iowa	Cedar Rpds., H.R. Brown, 3400 Indian Rd., SE	319-366-0635
Ky	Louisville, R.O. Whitesell & Assocs., 3620 Lexington Rd.	502-893-7303
Md	Rockville, Marktron, 651 Lofstrand La.	301-762-6210
Md	Towson, Marktron, 202 W. Penns. Ave.	301-825-8222
Mich	St. Joseph, R.O. Whitesell, Shepard & Benning Bldg.	616-983-7337
Mass	Waltham, Digitran, G. Arnold	617-969-8806
Mich	Southfield, R.O. Whitesell & Assocs., 25100 Evergreen Rd.	313-358-2020
Minn	Mipls., Sci. Sls., 5100 Edina Ind. Blvd.	612-941-2215
Mo	St. Louis, Sci. Sls., 1760 S. Brentwood Blvd.	314-968-1133
NJ	Moorestown, Digitran, J. Long	609-424-3883
NJ	Summit, Digitran, B. O'Brien	201-273-6140
NM	Albuquerque, Data Handling Co., 209 San Pablo, S.E.	505-268-0928
NY	Buffalo, Telesco, 395 Cleveland Dr.	716-834-1026
NY	Vestal, Telesco, 609 Harvard St.	607-729-6339
Ohio	Cincinnati, R.O. Whitesell & Assocs., 1172 W. Galbraith	513-521-2290
Ohio	Cleveland, R.O. Whitesell & Assocs., 21139 Lorain Ave.	216-333-2585
Ohio	Dayton, R. O. Whitesell, 4133 S. Dixie	513-298-9546
Okla	Tulsa, Allied Comps, Box 4768	918-939-2848
Ore	Beaverton, Arneson Assocs., Inc., 4175 S.W. Cedar Hills Blvd.	503-646-3416
Pa	Pittsburgh, R.O. Whitesell & Assocs., 201 Penn Ctr. Blvd.	412-242-0100
Tex	Dallas, Allied Comps., Inc., Box 38009	214-348-6660
Tex	Houston, Allied Comps., 6400 Westpark Dr.	713-782-5406
Wash	Seattle, Arneson Assocs., 5950 6th Ave.	206-762-7664
For:	Can., Montreal, Que., Deskin Sls., 1565 Louvain St., W.	514-384-1420
For:	Can., Toronto, Ont., Deskin Sls., 78 Six Point Rd.	416-239-4329
For:	Can., Vancouver, B.C., Deskin Sls., 1641 Venables St., W.	604-253-6396

DIGITRON CORP., 2544 W. Main St., Norristown, Pa., 19401, Tel: 215-277-5800 ....Pg. 349

Cal	Hollywood, IFM-South, 3455 Cahuenga Blvd.	213-469-1641
Cal	Redwood City, Caltronic Assocs., 2449 Harding Ave.	415-365-2545
Conn	Meriden, Abbott-Allison Co., Inc., Box 467	203-237-9232
Ill	Chicago, Data Elctrns. Co., Inc., 5505 N. Menard Ave.	312-774-1452
Ind	Indianapolis, Data Elctrns. Co., Inc., Box 50084	317-547-2329
La	New Orleans, IBL Engrg. & Sls., Inc., 1472 Calhoun St.	504-895-4793
Md	Silver Spring, L.G. White & Co., Inc., 1110 Fiddler La.	301-585-3141
Mass	No. Andover, Abbott-Allison Co., Inc., Box 96	617-245-0250
Mich	Detroit, Electro Sls. Assoc., 10745 Morang Dr.	313-886-2280
Minn	Minneapolis, Data Elctrns. Co., Inc., 8633 Harrison Cir.	612-881-6386
NJ	Ft. Lee, K.E. Hughes Co., Inc., 2175 Lemoine Ave.	201-944-1600
NY	Fayetteville, Comps. for Ind., 416 Franklin St.	315-637-9601
NY	Lancaster, Comps. for Ind., 22 Biscayne Dr.	716-684-6336
NC	Matthews, W.K. Hile Co., 833 W. John St.	704-847-9125
Ohio	Cleveland, Electro Sls. Assocs., 851 E. 22 St.	216-261-5440
Ohio	Dayton, Electro Sls. . Assoc., Box 3122, Overlook Br.	513-426-5551
Okla	Tulsa, IBL Engrg. & Sls., Inc., 5149 E. 31st St.	918-936-6305
Ore	Portland, J.E. Edstrom Co., 407 S.W. 11th Ave.	503-227-5311
Pa	Narberth, L.G. White-Keystone, Inc., 100 Essex Ave.	215-664-6505
Pa	Pittsburgh, Electro Sls. Assoc., 201 Penn Ctr. Blvd.	412-371-9449
Tex	Austin, IBL Engrg. & Sls., Inc., 1903 W. 34th St.	513-452-2064
Tex	Dallas, IBL Engrg. & Sls., Inc., 219 Preston Royal Ct.	214-363-2921
Tex	Houston, IBL Engrg. & Sls., Inc., 3403 Audubon #5	713-523-8360
Wisc	Milwaukee, Data Elctrns. Co., Inc., Box 979	414-645-1550
EXP:	N.Y., New York, Hamos Co., 242 W. 30th St.	212-524-4411

DIGITRONICS CORP., 1 Albertson Ave., Albertson, N.Y., 11507, Tel: 516-484-1000, TWX: 510-223-0607; V.P. Mktg: K. Whitehouse

DILECTRIX CORP., Sub. Nayvar Corp., 69 Allen Blvd., Farmingdale, N.Y., 11735, Tel: 516-249-7800, TWX: 510-224-6419; Sls. Mgr: M. Latorra

DILLON, W.C. & CO., 14620-EP Keswick St., Van Nuys 340, Calif., 91407, Tel: 213-786-8812, TWX: 910-495-1807; Dir. Sls: G.A. Dillon

DIMCO-GRAY CO., 207 East 6th St., Dayton, Ohio, 45402, Tel: 513-224-1913; Sls. Mgr: R. Cramer

DIMENSIONAL CONTROL MACHINERY CO., P.O. Box 504, Salem, Ohio, 44460, Tel: 216-337-3485; Sls. Mgr: L.E. Lance

DIONICS, INC., 65 Rushmore St., Westbury, N.Y., 11590, Tel: 516-997-7474, TWX: 510-222-0974; Sls. Mgr: G.R. Seaton

DIPLOHMATIC DIV., Harry Levinson Co., 1211 E. Denny Way, Seattle, Wash., 98122, Tel: 206-323-5100, TWX: 910-444-2154; Sls. Mgr: H. Levinson

——— Advertisement ———

Diplohmatic Div. supplies a unique "Set and Forget" potentiometer, either in wirewound or cermet. Wirewound available to 25KO, Cermet to 1 Megohm.

DISPLAY DEVICES, INC., Box 667, Encinitas, Cal., 92024, Tel: 714-753-0113; Sls. Mgr: C. Ross Pg. 1450

Ariz Phoenix, Thorson Co., 2505 E. Thomas 602-956-5300
Cal L.A., Cutlass Elctrns., 8921 S. Sepulveda 213-776-6476
Cal Santa Clara, Nova-Tronix, 1659 Scott 408-243-9530
Conn Branford, W. McCoy Co., 892 Main St. 203-488-2012
Fla Orlando, Scott & Assocs., Box 20341 305-841-4840
Fla Boynton Bch., Scott, Box Drawer U 305-732-7040
Ill Glen Ellyn, Repwood, Inc., 260 Sunset 312-469-2344
Md Towson, Kraft Elctrn., 510 Woodbine 301-828-5838
Mich Plymouth, Romarc, Box 257 313-455-0300
Minn St. Paul, Northport Engrg., 2027 Grand 612-698-3841
Mo St. Louis, Aerotronics, Box 10236 314-739-3947
NJ Lake Hiawatha, Component Sls., Box 197 210-227-3986
NM Albuquerque, Thorson, 5921 B Loma NE 505-265-5655
NY Northport, Comp. Sls., Box 334 516-549-4301
NY Syracuse, C.W. Foring, Box 175 315-478-2149
NC Winston-Salem, Dula Assocs., Box 5316 919-723-4205
Pa Radnor, W. Cordray, One Radnor Sta. 215-687-1366
Tex Dallas, Thorson, 7700 Carpenter Frwy. 214-631-5440
Tex Houston, Thorson Co., 6655 Hillcroft 713-771-3504

DISPLAY POWER SYS. CORP., Drawer 5, Carmel, N.Y., 10512, Tel: 914-225-8411

Advertisement

High voltage power supplies for photomultiplier tubes, cathode ray tubes, and laser systems. Regulated or unregulated; miniature modules or rack mounted; AC or DC input. Standard units or custom to your specifications; from 100 volts to 300 KV. Fast Delivery.

DIT-MCO INTERNATIONAL, Div. Xebec Corp., 5612 Brighton Terr., Kansas City, Mo., 64130, Tel: 816-363-6288; Sls. Mgr: W.C. Comer, Jr.

DITTMORE-FREIMUTH CORP., 2517 E. Norwich St., Milwaukee, Wisc., 53207, Tel: 414-483-5100

DIVERSIFIED ELCTRNS., Box 6231, Evansville, Ind, 47712, Tel: 812-424-2288; Sls. Mgr: M.J. Fisher Pgs. 1684,1685

Conn Meriden, Abbott-Allison Co., Inc., Box 467 203-237-9232
DC Washington, Wright Co., Inc. 202-296-0979
Fla Orlando, R.J. Cheney, Box 14678 305-843-4491
Ind Indpls, Quad-El Co., Box 33099 317-783-2618
Md Gaithersburg, Wright Co., Inc., Box 128 202-296-0979
Minn St. Paul, Knox Assocs., Inc., Box 8065 612-488-5402
Mo Hazelwood, J. Lockwood Assoc., Box 98 314-838-6600
NY Elmhurst, Wilson Assocs., Box 52 212-899-0929
NC Charlotte, L.P. Spoon Co., 307 Lincoln 704-372-3287
Ohio Cleveland, S. Vereb & Assocs., Box 4424 216-271-2006
Wisc Milwaukee, N Koerner, 5537 N. Argyle 414-372-7650

DIVISION LEAD CO., Div. Century Display, 7742 W. 61st Pl., Summit, Ill., 60501, Tel: 312-RE-5-8600; Sls. Mgr: J. LaCerra

DIXIE DIAMOND TOOL, 6875 Southwest 81st St., Miami, Fla., 33143, Tel: 305-665-1123; Sls. Mgr: E.J. Marcus

DIXON CORP., Metacom Ave., Bristol, R.I., 02809, Tel: 401-253-7500; Pres: J.M. Feeley

DIXON SINTALOY, INC., 535 Hope St., Stamford, Conn., 06906, Tel: 203-348-3764 L. Morris

DIXSON, INC., Box 1449, Grand Junction, Colo., 81501, Tel: 303-242-8863; Mgr: W.E. Boulton

DIXSON INC., Meter Div., Box 2111, Grand Junction, Colo., 81501, Tel: 303-242-8863; Sls. Mgr: K. Rogers Pgs. 430,431

Cal Danville, Straube Assocs., 401 S. Hartz Ave. 415-837-8151
Cal Long Beach, Kirk-Anderson Sls., 4102 E. 7th St. 213-433-4929
Cal Menlo Park, Straube Assocs., 483 Willow 415-323-2476
Colo Boulder, Straube Assocs., Box 1649 303-443-8600
Ill Morton Grove, E. Flaxman, 9202 Waukegan Rd. 312-965-3988
Md Silver Spring, Globe Assocs., 8121 Georgia Ave. 301-587-0060
Mass Waltham, Conti-Younger, 181 West St. 617-891-4582
Mo Grandview, L. R. Harry, Box 588 816-763-3634
Mo St. Louis, L. R. Harry, 11722 Studt Ave. Box 12608 314-872-3183
NJ Oaklyn, A. Wetterhahn, 201 W. Cuthbert Blvd. 609-858-3003
NY Mount Vernon, D. Sonkin Assocs., 10 Fiske Pl. 213-433-4929
NY Rochester, L. G. Marchese, 999 Ridge Rd. E. 716-342-7664
Ohio Cincinnati, J. O. Olsen, 5539 Stokeswood Ct. 513-922-2176
Ohio Cincinnati, J. O. Olsen, 12119 Marwood La. 513-771-6667
Ohio Cleveland, J. O. Olsen, 16201 Shaker Blvd. 216-752-5444
Pa Pittsburgh, J. O. Olsen, 104 Elatan Dr. 412-279-2550
Pa Pittsburgh, J. O. Olsen, 1843 Maydell St. 412-341-8391
Tex Dallas, Ruby Sls., Box 9894 214-6630
Wisc Milwaukee, E. Flaxman, 1225 Water St.

DOALL CO., 254 N. Laurel Ave., Des Plaines, Ill., 60016, Tel: 312-824-1122; Sls. Mgr: Rothenberger

DOERR ELECTRIC CORP., 1201 Doerr Way, Cedarburg, Wisc., 53013, Tel: 414-377-0500, TWX: 26744; V.P. Mktg: J.H. Park

DOHRMANN DIV., Envirotech, 1062 Linda Vista Ave., Mountain View, Cal., 94040, Tel: 415-968-9710, TWX: 910-379-6972; Sls. Mgr: J.A. McNulty Pgs. 592-594,1969

Colo Boulder, Infotronics, Box 2209 303-449-8800
Del Wilmington, Infotronics, 206 E. Ayre St. 302-998-0176
Ill Des Plaines, Infotronics, 2510 Dempsters St. 312-827-7440
Tex Houston, Infotronics, 4252 Richmond Ave. 713-621-6671

DOLAN-JENNER INDS., INC., 10 Ingalls Ct., Melrose, Mass., 02176, Tel: 617-662-8200; Sls. Mgr: B.J. Dolan

Advertisement

MICRO-OPTIC fiber optic controls PHOTO-OPTIC light sources/receivers FIBER-LITE fiber optic illuminators. Complete fiber optic line with 120 variations available from stock - custom designed glass or plastic fiber optic components with or without interfacing lamps, photosensors l.e.d.'s, amplifiers and outputs.
"The product proven fiber optics company that works your field and talks your language".

DOLIN METAL PRODS., INC., 475 President St., Brooklyn, N.Y., 11215, Tel: 212-596-1400; Sls. Mgr: A. Gorlin

DOLINKO & WILKENS, INC., 1901-7 Summit Ave., Union City, N.J., 07087, Tel: 201-867-6630; Sls. Mgr: L. Dolinko

DOLPH, JOHN C. CO., New Rd., Monmouth Junction, N.J., 08852, Tel: 201-DA-9-2333; Sls. Mgr: J.D. Mayes

DONMAR PRODS., INC., Box 10125, Denver, Colo., 80210, Tel: 303-935-4676; Sls. Mgr: E.B. Koch

DONNELLY MFG. CO., P.O. Box 71, Waltham, Mass., 02154, Tel: 617-893-5700; Vice Pres: W.E. Jones

DORAN MFG. CO., 1033 Bader St., Cincinnati, Ohio, 45225, Tel: 513-681-5424; Sls. Mgr: Q.J. Gindele

DORIC SCI. CORP., 7601 Convoy Ct., San Diego, Calif., 92111, Tel: 714-277-8421; Sls. Mgr: A. Frowiss

Advertisement

Doric digital measurement instruments for low level voltage and current measurements and physical data readout. Thermocouple, thermistor, platinum and RTD temperature readout and multipoint selection, conditioning. Strain, pressure, force, torque, load, weight, RPM and horsepower measurement and computations. BCD digital and analog outputs, .01%. Nixie display; $550-$1500 price. Detailed catalogs and nationwide Rep. Call 714-277-8421 collect.

DORMEYER INDS., 3418 Milwaukee Ave., Chicago, Ill., 60641, Tel: 312-283-4000; Pres: A.F. Dormeyer

DORNE & MARGOLIN, INC., Sub. Dynaport Elctrns., 2950 Veterans Memorial Hwy., Bohemia, N.Y., 11716, Tel: 516-585-4000, TWX: 510-228-6502; V.P. Mktg: B. Van Hulse

DORSETT ELCTRNS., Div. Labarge, Inc., Box 36, Tulsa, Okla., 74101, Tel: 918-836-5501, TWX: 910-845-2146; V.P. Sls: T.R. Wright

DOUGLAS ELECTRONICS, INC., 718 Marina Blvd., San Leandro, Cal., 94577, Tel: 415-483-8770; Sls. Mgr: R. Jones ....Pgs. 1300-1303

DOUGLAS RANDALL DIV., Walter Kidde, 6 Pawcatuck Ave., Pawcatuck, Conn., 02891, Tel: 203-599-1750; Sls. Mgr: E.J. Goehring .... Pgs. 1381,1686,1687

Ala Huntsville, Powertronics, Box 3384 205-852-6347
Cal Los Altos, The Parsons Co., One First St. 415-941-4745
Cal Van Nuys, R.L. Assocs. 213-780-1666
Fla Maitland, Ellis, Box 1261 305-645-1101
Ill Chicago, Ropek-Cahill, 5439 W. Division 312-287-7292
Ind Indianapolis, Reichold, 3520 Dudley Ave. 317-783-1178
Md Timonium, Barnhill, 1931 Greenspring 301-252-5610
Mass Braintree, R. F. Duffy, Box 328 617-335-7724
Mich Grand Rapids, Reichold, 14 Weston, SE 616-459-4445
Minn St. Paul, Cahill, 3000 Hudson Rd. 612-739-8445
NY Great Neck, F. Tylinski, 425 Northern 516-HN-6-9070
NY Rochester, M.C. Matthews Co., Box 612 716-271-2143
NC Raleigh, Powertronics, 2454 Medway Dr. 919-834-6947
Ohio Parma, M.C. Matthews, 6917 Regency 216-843-6649
Pa Glenside, Elcom, Inc., 130 S. Easton Rd. 215-885-1325
Tex Dallas, R. Martin, Box 64513 214-358-3704
Tex Houston, R. Martin, Box 19291 713-468-3877
For: Can., Willowdale, Ont., F. Taylor, 12 Howard 416-222-6924

DOW CHEMICAL CO., Box 1682, Midland, Mich., 48640, Tel: 517-636-1000; Adv. Mgr: R.F. Dalton

DOW CORNING CORP., Electrical/Electronic Mktg., Midland, Mich., 48640, Tel: 517-636-8000, TWX: 810-266-9006; Sls. Mgr: J.W. Hayden

DOW-KEY, Div. of Kilovac Corp., Box 4422, Santa Barbara, Cal., 93103, Tel: 805-684-4560, TWX: 910-336-1141; V.P. Mktg: B.J. Washisko Pgs. 1688-1691,1744,1745,2428

Ariz Tempe, Wiltronics, Inc. 602-966-4417
Cal Los Angeles, Rep Assocs. 213-274-8485
Cal San Francisco, Electro Pacific 415-776-8582
Conn Hamden, Compar New England 203-288-9276
Fla Orlando, Holcombe Sls. Agency 305-855-2455
Ga Atlanta, Holcombe Sls. Agency 404-233-2837
Ill Chicago, Gassner & Clark 312-764-6121
Iowa Cedar Rapids, Brown-Flanders Eng. 319-366-0635
Kans Leawood, Vasen Sls. Co. 913-649-0679
Md Towson, Burgin-Kreh Assoc. 301-661-1120
Mass Newton Highlands, Compar New England 617-969-7140
NJ Riverton, Given Assocs. 609-829-7249
NM Albuquerque, Data Handling Co. 505-268-0928
NY Buffalo, R.F. Lamb Co. 716-874-4900
NY Great Neck, L.I., Trionic Assocs. 516-466-2300
NY Kingston, R. F. Lamb Co. 914-338-8833
NY Rochester, R.F. Lamb Co. 716-544-5580
NY Syracuse, R.F. Lamb Co. 315-454-2469
NC Charlotte, DGW, Inc. 704-334-7090
NC Winston-Salem, DGW, Inc. 919-723-4205
Ohio Cincinnati, Components, Inc. 513-721-2997
Ohio Cleveland, Components, Inc. 216-842-2737
Tex Richardson, Norvell Assocs. 214-357-6451
Va Lynchburg, Burgin-Kreh Assocs. 703-845-5600
Wash Bellevue, A. Smith 206-746-6770
EXP: Mass., Plainville, TEKNIS 617-969-7140
For: Can., Ottawa, Ont., Whittaker Elctrns. 613-224-1221
For: Can., Roxboro, Que., Whittaker Elctrns. 514-683-3621
For: Can., Weston, Ont., Whittaker Elctrns. 416-247-7454
For: Can., W. Vancouver, B.C., Whittaker Elctrns. 604-926-3411

DRAKE MFG., 4626 N. Olcott Ave., Harwood Hgts., Ill., 60656, Tel: 312-867-7227, TWX: 910-221-0236; Sls. Mgr: J. Krutek, V.P. ....Pgs. 1448,1449

Cal Inglewood, V & L, 3412 W. Century Blvd. 213-671-7688
Cal Menlo Pk., Straube, 483 Willow Rd. 415-323-2476
Colo Boulder, Straube Assocs., Inc., Box 1649 303-443-8600
Conn N. Haven, Comp. Rep., 22 Broadway 203-239-9762
Fla N. Miami, Winfield Elctrn., 1875 N.E. 149th St. 305-751-5566

Ga Atlanta, Winfield/Southeast, 2991-D N. Druid Hills Rd., N.E. 404-636-3023
Ill Chicago, G. Mc. L. Cole, 6514 W. Higgins 312-774-3535
Ind Ft. Wayne, W.W. Bieberich, Box 1050 219-432-2537
Kans Shawnee Mission, Koenig-Myers, Box 374 913-432-8300
Md Baltimore, Kaufholz Assoc., Box 6232 301-488-6561
Md Maryland Hgts., Koenig-Myers, 2721 Beloit 304-739-1655
Mass Needham, Comp. Rep., 1116 Great Plains 617-444-2484
Mich St. Joseph, Whitesell & Assoc., Shepard & Benning Bldg. 616-983-7337
Mich Southfield, Whitesell, 25100 Evergreen Rd. 317-359-9283
Minn Minneapolis, C.E. Bohlig Co., Box 16095 612-922-7011
NY New York, H. Smith, 259 W. 14th St. 212-242-2398
NY Rochester, B.H. Tollefson, 110 Allens Creek 716-271-4141
NY W. Winfield, B. Tollefson, Box 142 315-822-5647
Ohio Cleveland, Goory Sls., 19555 Henry 216-331-2055
Ohio Medina, J. Podolny, Box 565 216-723-1546
Pa Newtown Sq., Kaufholz Assocs., Box 273 215-356-5000
Tex Dallas, Techno Assocs., Box 20544 214-357-9213
Utah Morgan, Straube, RFD 1 (Highlands) 801-829-6448
Wash Seattle, F. Haight Co., 3212 Eastlake Ave. 206-322-1818
Wisc Madison, W.E. Uhalt, 150 S. Marquette 608-244-1623
EXP: Ill., Chicago, E. Magnus, 5715 N. Lincoln 312-334-1503
For: Can., Toronto, Ont., Atlas Elct., 50 Wingold 416-781-6174

DRAKE, R.L., CO., 540 Richards St., Miamisburg, Ohio, 45345, Tel: 513-866-2421; Sls. Mgr: P.W. Drake

DRANETZ ENGRG. LABS., 1233 North Ave., Plainfield, N.J., 07062, Tel: 201-755-7080; Sls. Mgr: A. Ackerman Pgs. 433-438,1870,1871

Ala Huntsville, Ridge Instr., 7220 Governors Dr. W. 205-837-3211
Ariz Tempe, Tari Engrg., Box 27806 602-258-0571
Cal San Diego, Qualtronics, 3731 6th Ave. 714-291-3991
Cal Sunnyvale, Waldman Assoc., 1094 W. Evelyn Ave. 408-245-2500
Cal Woodland Hills, H.F. Richardson, 4851 Almidor Ave. 213-888-1731
Fla Maitland, Greenstein Assoc., 1205 Winston Rd. 305-831-5380
Ga Atlanta, Ridge Instr., 3094 McCulley Dr. 404-939-1554
Haw Honolulu, Aloha Assocs., Waikiki Imperial Towers, 225 Liluokalani Ave. 808-922-3819
Ill Chicago, Megatek, 1915 N. Harlem Ave. 312-889-1277
Md Elicott City, Gans-Fryling, Inc., 9516 Michaels Way 301-837-6311
Mass Attleboro, Elctrn. Sls., Box 276 617-222-4078
Minn Hopkins, Megatek, 128 N. Jackson St. 612-935-5243
NJ Fairfield, K L S Assoc., 387 Passaic Ave. 201-227-2900
NY Kings Park, K L S Assocs. 212-233-4849
NY Syracuse, DB Assocs., Box 14 315-446-0220
Ohio Cleveland, Electro Sls., 851 E. 222nd St. 216-261-5440
Ohio Dayton, Electro Sls., Box 3122 513-426-5551
Pa Norristown, Data-Rep. Assocs., Box 349 215-279-8210
Pa Pittsburgh, Electro Sls., 201 Penn Ctr. 412-371-9449
Tenn Oak Ridge, Ridge Instr., 140 E. Division Rd. 615-483-1311
Tex Richardson, Lear Assocs., Inc., Box 1266 214-231-7696
Va Arlington, Gans-Fryling, 2030 16th St., N. 703-527-3262
Wash Seattle, Datacom Assocs., 2207 Fairview E. 206-329-2989
For: Can., Kanata, Ont., W. Kenwood Controls & Equip. Ltd., Box 127 613-836-4202

Advertisement

Dranetz Engineering Laboratories is expert in the field of AC Measurements including Impedance, Admittance, Phase Angle, Voltage and Directivity under pulsed or CW conditions over wide dynamic ranges of Frequency and Magnitude. Analog or Digital outputs are available. Individual instruments or complete systems as required.

DRESSEN-BARNES ELCTRNS., 250 N. Vinedo Ave., Pasadena, Cal., 91107, Tel: 213-681-0643, TWX: 910-588-3780; Sls. Adm. Mgr: W.H. Beal Pgs. 686-690

Ala Birmingham, Technical Mktg. Inc., Box 5971 205-871-5431
Ariz Phoenix, Williams-Assocs., 2250 N. 16th 602-254-6085
Cal Los Altos, E. Landa Co., Box 639 415-948-0564
Cal Pasadena, Dressen-Barnes, 250 N. Vinedo 213-795-7731
Cal San Diego, Vistronics, Box 20094 714-283-3946
Colo Denver, Williams-Assocs., 4971 Jackson 303-388-4391
Fla Hallandale, Tech. Mktg., Box 127 305-563-8585
Fla Orlando, Tech. Mktg., 1511 E. Robinson 305-843-2500
Fla St. Petersburg, Tech. Mktg., Box 13196 305-843-2500
Ga Marietta, Tech. Mktg., Box 1152 404-435-0079
Ill Wheaton, Engrg. Prods., 25 W. 485 Geneva Rd. 312-653-6826
Kans Tonganoxie, Impala Inc. 816-931-8895
Md Rockville, Eastronics, 14616 Southlawn 301-762-8445
Mass Bedford, D. Greene Org., Box 290 617-275-6400
Minn St. Paul, Engrg. Prods., 717 Raymond 612-646-8819
Mo Kansas City, Impala, 8905 Manchester 913-299-9622
NM Albuquerque, Williams, 420 Washington, S.E. 505-255-1638
NY Binghamton, A & D Dev., Country Club Rd. 607-797-3236
NY Hartsdale, Comp. Sls., 221 E. Hartsdale 914-725-1050
NY Rochester, A & D Devices, 320 N. Wash. 716-586-8033
NY Verona, A & D Devices, Rd. 1 315-337-7321
NC Greensboro, Tech. Mktg., Box 6664 919-274-2570
Tex Dallas, Stevens Sls. Co., Box 34493 214-350-2476
Wash Seattle, Avionics-Liaison, 6770 Perimeter S. 206-707-3870

DRI-CLAVE CORP., 54 Kinkel St., Westbury, N.Y., 11590, Tel: 516-333-2800; Sls. Mgr: A. Spencer

DRIVER, WILBUR B. CO., 1875 McCarter Hwy., Newark, N.J., 07104, Tel: 201-481-3100; V.P. Mktg: C. Phayer

DUAL-LITE CO., Simm La., Newtown, Conn., 06470, Tel: 203-426-2585; Sls. Mgr: D.H. Locke

DUBOIS CHEMS., Div/W.R. Grace Co., DuBois Tower, Cincinnati, Ohio, 45202, Tel: 513-762-6000; Sls. Mgr: A. Thompson

DU-CO CERAMICS CO., 900 Main St. Extension, Saxonburg, Pa., 16056, Tel: 412-352-1511, TWX: 412-855-5350; Sls. Mgr: W.R. Golya

Advertisement

Precision ceramics in steatite, cordierite, alumina, porcelain and other special compositions in the form of tubes, rods, washers, bushings, bobbins and special shapes made to customer specifications. Complete facilities are available for notching, slotting, turning, tapping and other exacting machining operations.

DUDEK & BOCK SPRING MFG. CO., 5100 W. Roosevelt Rd., Chicago, Ill., 60650, Tel: 312-379-4100; Sls. Mgr: S.E. Wittek

DU KANE CORP., 2900 DuKane Dr., St. Charles, Ill., 60174, Tel: 312-JU-4-2300; Acting Sls. Mgr: J.M. Stone

DUMONT ELECTRON TUBES, Div. of Fairchild Camera & Instr. Corp., 750 Bloomfield Ave., Clifton, N.J., 07015, Tel: 201-773-2000, TWX: 710-989-7149; Sls. Mgr: E. Swenarton

DUMONT OSCILLOSCOPE LABS., INC., 40 Fairfield Pl., W. Caldwell, N.J., 07006, Tel: 201-228-3665, TWX: 710-734-4308; Sls. Mgr: P. Zagaria

DUMORE CO., 1300 17 St., Racine, Wisc., 53403, Tel: 414-633-8221; Gen'l. Sls. Mgr: C.A. Oostman

DUNCAN ELCTRNS., INC., Sub. Systron Donner Corp., 2865 Fairview Rd., Costa Mesa, Cal., 92626, Tel: 714-545-8261, TWX: 910-595-1128; Mktg. Mgr: R.E. Darringer

DUNTON, M.W. CO., 350 Kinsley Ave., Providence, R.I., 02903, Tel: 401-331-3600; Sls. Mgr: J.J. Carter

DUOTONE CO., INC., Box 1168, S. Miami, Fla., 33143, Tel: 305-665-1121; Sls. Mgr: S. Nester

DURA MAGNETICS, INC., 5506 Schultz Dr., Sylvania, Ohio, 43560, Tel: 419-882-0591; Sls. Mgr: D.C. Kuchers

Advertisement

ALNICO, CERAMIC, RUBBER PERMANENT MAGNETS - Over 500 standard sizes and shapes. Complete abrasive grinding and cutting facilities. MAGNETIC PRODUCTS FROM STOCK OR MADE TO YOUR REQUIREMENT - Magnetic separators, holding devices; conveyor, paint and plating racks; insulated magnets. CATALOG UPON REQUEST.

DURA PLASTICS N.Y., INC., 49 Richmondville Ave., Westport, Conn., 06880, Tel: 203-227-9588; Sls. Mgr: J.F. Layman

DURAKOOL, INC., 1010 N. Main St., Elkhart, Ind., 46514, Tel: 219-264-1116; Sls. Mgr: K.L. Considine

DURAMARK, INC., 2 Secatoag Ave., Port Washington, N.Y., 11050, Tel: 516-883-6868, TWX: 510-223-0817; Sls. Mgr: H. Pagorek

DURAMIC PRODS., INC., Sub. of Kawecki Berylco Inds., Inc., 430 Commercial Ave., Palisades Park, N.J., 07650, Tel: 201-947-8313; Prod. Mgr: C.A. Olmo

DURANT DIGITAL INSTRS., Cutler Hammer Co., 625 N. Cass St, Box 748, Milwaukee, Wisc., 53201, Tel: 414-271-9300, TWX: 414-273-4559; Sls. Mgr: J.K. McGinley ....Pg. 1316

Ala Birmingham, J. Spader, 2805 Crescent 205-879-1366
Cal Los Angeles, 1710 N. La Brea Ave. 213-876-4000
Colo Denver, Vinson Assoc., 2145 S. Clermot 303-757-5151
Conn Stamford, 1116 Summer St. 203-327-1750
Fla Clearwater, H. Gross, 314 S. Missouri 813-446-6649
Ill Chicago, Durant Co., 6270 W. North Ave. 312-237-1222
Kans Mission, 5845 Horton 913-262-2199
Md Baltimore, Durant Co., 320 Hillen Rd. 301-825-6626
Mass Wakefield, 544 Salem St. 617-246-0024
Mich Detroit, Durant, 26847 Grand River 313-535-3630
Minn Minneapolis, 4510 W. 77th St. 612-926-0919
Mo St. Louis, 8118 Page Blvd. 314-423-3431
NY Rochester, Durant Co., 474 Thurston Rd. 716-328-5700
NC Charlotte, 4200 Park Rd. 704-525-3149
Ohio Cincinnati, Durant, Roselawn Ctr. Bldg. 513-531-5073
Ohio Cleveland, Durant, 24800 Chagrin Blvd. 216-464-8787
Ore Beaverton, N.R. Schultz Co., Box 156 503-646-1345
Pa Bala-Cynwyd, 7 Heather Rd. 215-664-0336
Tex Houston, 3303 Louisiana 713-528-7864
Wash Bellevue, N. Schultz, 309-112th Ave. 206-454-5224
Wisc Milwaukee, 622 N. Cass St. 414-271-9300
For: Can. London, Ont., Wainbee, 349 Ridout 519-433-7881
For: Can. Toronto, Ont., Wainbee, 121 City View 416-248-5621
For: Can. Montreal, Que., Wainbee, 675 Orly 514-636-4870

DURANT MFG. CO., 625 N. Cass St., Milwaukee, Wisc., 53201, Tel: 414-271-9300, TWX: 910-262-3307; Sls. Mgr: J.K. McGinley

DUREZ PLASTICS DIV., Hooker Chem. Corp., 1921 Walck Rd., N. Tonawanda, N.Y., 14120, Tel: 716-695-1600, TWX: 710-262-1266; Sls. Mgr: E.F. Borro

DURIRON CO., INC., 425 N. Findlay St., Dayton, Ohio, 45401, Tel: 513-254-5344; V.P. Sls: W.D. Halloran

DUTREX INDS., INC., 150 Fifth Ave., New York, N.Y., 10011, Tel: 212-777-8100; Sls. Mgr: H.H. Friedman

DYNA MAGNETIC DEVICES, INC., 200 Frank Rd., Hicksville, N.Y., 11802, Tel: 516-681-5100; Sls. Mgr: J.F. Parker

DYNA TECHNOLOGY INC., Sub. Ecological Science Corp., 2201 East 7th St, Sioux City, Iowa, 51102, Tel: 712-252-1821; Dir. Mktg: D.E. Anderson

DYNACHEM CORP., 13000 E. Firestone Blvd., Santa Fe Springs, Cal., 90607

DYNACOOL MFG. CO., INC., 1 Russell St., Saugerties, N.Y., 12477, Tel: 914-246-4902; Sls. Mgr: L. Gould, Jr.

DYNACOR, Div. Vectrol, Inc., 1010 Westmore Ave., Rockville, Md., 20850, Tel: 301-424-6900; Sls. Mgr: R. Mitchell

DYNAGE, 1331 Blue Hills Ave., Bloomfield, Conn., 06002, Tel: 203-243-0315, TWX: 710-425-6063; Sls. Mgr: Peter J. Klein ....Pgs. 692-700
Ariz Phoenix, Meas. Consits., Box 11099 602-264-1279
Cal Burbank, Tech. Sources, 2104 W. Magnolia 213-849-6864
Cal Los Altos, Sys. Mktg. Consits., Box 1376 415-941-4777
Conn Bristol, E-P-R, 281 Vera Rd. 203-584-2202
Fla Orlando, Datarep, Box 5929 305-855-8945
Ill LaGrange, Bard Assocs., LaGrange Ind'l. Pk. 312-354-0660
Ind Indpls., Bard Assocs., 4000 Meadows 317-547-3113
Mass Concord, E-P-R, 1113 Lexington Rd. 617-259-8429
Mich St. Clair Shores, J. Thorpe, 28915 Harper 313-779-6363
Minn Mpls., Bard Assocs., 4640 W. 77th 612-922-8233
Mo Kansas City, PAC, Box 11584 816-761-3313
NY Buffalo, R. Mitscher, Ellicott Square Bldg. 716-652-3835
NY Elmont, Crane & Egert, 146 Meacham Ave. 516-488-2100
Ohio Dayton, Midwest Mktg., 137 Lakeview 513-433-2511
Pa Paoli, Stitzer Assocs., 24 State Rd. 215-644-5500
NC Raleigh, R. Mitscher, Box 10541 919-828-0575
Tex Dallas, Merit Co., 10030 Monroe St. 214-352-8040
Va Alexandria, W. Brown, 325 First 703-836-1800
For: Can., Toronto, Ont., Advance Tech., Box 307 416-333-5535

DYNAIR ELCTRNS. INC., 6360 Federal Blvd., San Diego, Calif., 92114, Tel: 714-582-9211, TWX: 910-335-2040; Sls. Mgr: D.A. Keller

DYNALEX, INC., 885 Front St., Burbank, Cal., 91502, Tel: 213-849-2221

Advertisement

DYNALEX is an industry leader in advanced data handling and instrumentation equipment. A complete product line of synchro and analog-to-digital converters, multiplexers, controllers and signal conditioning amplifiers is manufactured by Dynalex. These products complement the proven capability in data acquisition and control systems for commercial, industrial and defense applications.

DYNALCO CORP., 4107 N.E. 6th Ave., Ft. Lauderdale, Fla., 33308, Tel: 305-563-8461; Sls. Mgr: B. Rogers

DYNALOY, INC., 7 Great Meadow La., Hanover, N.J., 07936, Tel: 201-887-9270; Sls: H. Gallop

DYNAMIC AIR ENGRG., 620 E. Dyer Rd., Santa Ana, Calif., 92705, Tel: 714-540-1000; Sls. Mgr: H.E. Lever

DYNAMIC CONTROLS CORP., 8 Nutmeg Rd., S. Windsor, Conn., 06074, Tel: 203-289-6807, TWX: 710-425-1994; Sls. Mgr: T. Farkas

DYNAMIC DATA CORP., 1183 Chesapeake Ave., Columbus, Ohio, 43212, Tel: 614-488-7073; Pres: V.L. Bell

DYNAMIC GEAR, 4571 N.W. 8th Ave., Ft. Lauderdale, Fla., 33309, Tel: 305-565-9421, TWX: 510-955-9848; Sls. Mgr: T.J. Smith

DYNAMIC INSTR. CORP., OEM Div., 115 E. Bethpage Rd., Plainview, N.Y., 11803, Tel: 516-694-6000, TWX: 510-224-6482; Sls. Mgr: J.J. Gildea ....Pgs. 681,1586
Ariz Scottsdale, Runyon, 6825 E. Thomas 602-947-5711
Cal Mt. View, Repex, 2015 Latham St. 415-969-9200
Cal Pasadena, Electro-Mechanical Instrs., 1388 E. Walnut St. 213-MU-1-2748
Conn Bloomfield, Zaslow Sls., 6 Newberry Rd. 203-242-7781
Conn Milford, Zaslow Sls., 49 Clark St. 203-878-1094
Fla Miami Beach, Geartner Assocs., 350 Lincoln Rd. 305-531-0200
Ill Northfield, Adcon Assocs., 466 Central Ave. 312-466-6486
Ind Ft. Wayne, McDonald Sls. Co., Box 2848 219-745-9214
Mass Lowell, Zaslow Sls., 339 Middlesex St. 617-458-8452
Mass Northbor, Zaslow Sls., 371 Howard St. 617-393-8150
Minn Minneapolis, JosCo Sls., 4815 W. 77th St. 612-927-5858
NJ Pompton Lakes, R. Horne Assocs., 2282 Hamburg Tpke. 201-835-7400
NY Hicksville, S. Goodman, 4A Midland Ave. 516-931-7022
NY Syracuse, Naylor Elec., 1718 Erie Bl., E. 315-GR-2-9183
Pa Glenside, C.A. Briggs, 114 Keswick Ave. 215-885-2244
Tex Dallas, R.F. Kimball, 5531 Dyer St. 214-363-5431
For: Can., Pointe Claire 730, Que., Aeromotive Engrg. Prods., 147 Hymus Blvd. 514-695-6413
For: Can., Toronto, Ont., Aeromotive Engrg. Prods., Ltd., 1912 A. Avenue Rd. 416-783-4288

DYNAMIC PRECISION CONTROLS, 449 E. Main St., Hagerstown, Ind., 47346, Tel: 317-489-4431

DYNAMIC SYS. ELCTRNS. CORP., 1310 W. 23rd St., Tempe, Ariz., 85281, Tel: 602-967-8644, TWX: 910-950-1941; Sls. Mgr: M. Mougel

DYNAMICS INSTR. CO., 583 Monterey Pass Rd., Monterey Pk., Cal., 91754, Tel: 213-283-7773; Mktg. Mgr: D.E. Cantrell ....Pg. 432
Ala Huntsville, ALMEGA, Holiday Off. Ctr. 205-881-6635
Ariz Phoenix, J. Smith, 11032 N. 34th 602-942-3233
Colo Boulder, J. Smith, Box 3257 303-449-7509
Ill Chicago, P. Lind Elct., 5483 N. Northwest Hwy. 312-774-1246
Kans Levenworth, McGraw Engrg., 512 McDonald Rd. 913-651-2929
Mo Florissant, McGraw Engrg., Box 511 314-831-0342
Minn Circle Pines, P. Lind Elct., 10104 Sunset Rd. 612-786-5770
NJ Ridgewood, Hansen Assocs., Box 806 201-652-7055
NM Albuquerque, J. Smith, Box 8412 505-255-2111
NY Huntington Sta., Hansen, 20 Rolling Hills 212-947-0379
NY Lyons Falls, A & D Devices, Inc., Box 365 315-337-7321
NY Rochester, A / D Devices, 320 N. Washington 716-586-8033
Ohio Cleveland, Instr. Sys., 21877 Euclid 216-486-0782
Ohio Dayton, Instr. Sys., 3481 Office Pk. 513-293-8095
Ore Portland, McLaren-Topp, 5319 S.W. Westgate 503-297-2248
Wash Bellevue, McLaren-Topp, Box 250 206-746-5750

DYNAMICS RESCH. CORP., 50 Concord St., Wilmington, Mass., 01887, Tel: 617-658-6100, TWX: 710-347-0291; Sls. Mgr: A.W. Siff

DYNAPAR CORP., Louis Allis Div., Litton Inds., 1675 Delany Rd., Gurnee, Ill., 60031, Tel: 312-662-2666, TWX: 910-262-3160; Sls. Mgr: J. Appelgren

DYNARAD, INC., 1416 Providence Hwy., Norwood, Mass., 02062, Tel: 617-762-7930; Sls. Mgr: S. Rubin Pg. 439
Ala Huntsville, J.P. Stoddard, Box 1062 205-852-5292
Cal Placentia, K'Son Corp., 743 Dunn Way 714-524-1700
DC Wash., Harrison Engrg. Svc., Box 5510 202-363-2697
Fla Orlando, Physimetrics, 999 Woodcock 305-841-4959
Ga Atlanta, Physimetrics, 3376 Peachtree 404-261-8720
Mass Norwood, Dynarad, Inc., 1416 Providence Hwy. 617-762-7930
NM Albuquerque, Southwestern Eng'g. & Equip. Co., 707 First Nat'l Bank Bldg. E. 505-265-6775
NY Hauppauge, Barnett Assocs., 550 Smithtown By-Pass 516-724-0202
Tex Dallas, Southwestern Eng'g. & Equip. Co., 6300 N. Central Expwy. 214-363-6501

DYNASCAN CORP., 1801 W. Belle Plaine Ave., Chicago, Ill., 60613, Tel: 312-327-7270; Mkt. Mgr: M.E. Bond

DYNASIL CORP. AMERICA, Box D, Berlin, N J, 08009, Tel: 609-767-4600

DYNASONICS CORP., Box 672, Pipestone, Minn., 56164, Tel: 507-825-5441; Sls. Mgr: B. Brual

DYNATECH CORP., 1225 E. Wakeham, Santa Ana, Cal., 92702, Tel: 714-547-6559; Sls. Mgr: E.L. Krause

DYNATRONIC CABLE ENGINEERING CORP., 136 San Fernando, Los Angeles, Cal., 90031, Tel: 213-225-5611, TWX: 910-321-4155; Sls. Mgr: J.B. Miller

DYNATRONIC CABLE ENGRG., Sub. National Wire & Cable, 136 San Fernando Rd., Los Angeles, Cal., 90031, Tel: 213-225-5611, TWX: 910-321-4155; Sls. Mgr: J.B. Miller

DYNISCO DIV., Microdot, Inc., 20 S. West Pk., Westwood, Mass., 02090, Tel: 617-326-8210; Sls. Mgr: R.T. Carrara

DYNOGRAPHIC ELCTRNS. CORP., 57 Bloomingdale Rd., Hicksville, N.Y., 11801, Tel: 516-WE-5-8080; Sls. Mgr: L. Zimmerman

DYONICS, INC., 71 Pine St., Woburn, Mass., 01801, Tel: 617-935-5900; Sls Coord: A.A. Ierubino

DYTRO CORP., 63 Tec St., Hicksville, N.Y., 11801, Tel: 516-822-2130; Sls. Mgr: M. Raphael ....Pg. 440
Ariz Phoenix, Cleveland Entprs., 1018 E. Indian School 602-264-1969
Cal No. Hollywood, Crown Elctrns., 5657 Lankershim 213-877-3550
Cal San Mateo, Dayton Assocs., Box 1461 415-967-9417
Colo Littleton, Cleveland Entprs., Box 209 303-771-6242
Mass Waltham, Instr., Control & Meas., 223 Cresent 617-891-8059
Mich Detroit, H. Teplitz, 26847 Grand River 313-537-9058
NM Albuquerque, Cleveland Entprs., 2633 Texas N.E. 505-298-7671
NY Bronx, Bradley, 130 Van Cortlandt Ave., W. 212-KI-9-8500
Ohio Cleveland, Teplitz, 3945 Meadowbrook 216-371-2044
Ohio Dayton, H. Teplitz, 3718 Salem 513-277-6531
Tex Houston, Leeco, 7727 Arrowhead 713-649-7727
Tex Richardson, Leeco, Box 1266 214-231-7696

DYTRONICS CO., 4800 Evanswood Dr., Columbus, Ohio, 43229, Tel: 614-885-3303; Sls. Mgr: P.A. Ryan Pg. 441
Ariz Phoenix, Hyer Assocs., 3003 N. Central Ave. 602-275-7524
Cal Downey, Wieler, 10842 S. Paramont 213-861-9223
Cal Sunnyvale, Wieler, 405 S. Sunnyvale 408-736-6098
Colo Denver, Hyer, 2335 S. Inca 303-936-4681
Fla Ft. Lauderdale, Beacon Elctrn., 651 N.E. 45th 305-564-4298
Fla Maitland, Beacon Elctrn., 540 S. Maitland 305-647-3498
Ga Atlanta, Beacon Elctrn., 2285 Peachtree Rd., N.E. 404-351-3654
Ill Des Plaines, Marsland Assoc., 1000 Executive Way 312-775-1309
Ind Indpls., Marsland, 3734 Carrollton 317-924-3568
Mass Waltham, Elctrn. Comps., 611 Trapelo 617-894-6921
Minn Mpls., Marsland, 231 N. Edgewood 612-545-4481
Mo St. Louis, Marsland, 100 St. Francois 314-831-0015
NJ Englewood, Central, 44 N. Dean 201-568-0808
NM Albuquerque, Hyer, 6401 Acoma, S.E. 505-265-5961
NY Buffalo, Angus Instr., 961B Maryvale Dr. 713-633-4210
NY New York, J. Plasencia, 521 Fifth Ave. 212-867-8084
NY Plainview, Central, 11 Commercial 516-433-0808
Ohio Medina, McShane, 124 Washington, W. 216-725-4568
Pa Paoli, T. Griffin Co., 46 Darby Rd. 215-644-7710
Tex Dallas, Airep Elctrns., 6300 N. Central Expwy. 214-363-5291

E-H RESCH. LABS., INC., Dept. A., 515 11th St., Oakland, Cal., 94604, Tel: 415-834-3030, EXT.319, TWX: 910-366-7258; Sls. Mgr: D. Carney ....Pgs. 442-447
Ala Huntsville, BCS Assocs., Box 1273 205-881-6220
Ariz Phoenix, Hytronic Meas., 1017 N. Third 602-253-6104
Cal Burbank, E-H Resch. Labs., 99 E. Magnolia 213-849-6508
Cal Oakland, E-H Research Labs., Box 1289 415-834-3030
Colo Denver, Hytronic Meas., Inc., 4940 E. 39th 303-388-4081
Conn W. Hartford, Instr. Dynamics, 345 N. Main 203-233-5503
Fla Orlando, BCS Assocs., 940 N. Fern Creek 305-843-1510
Ill Chicago, Carter Elctrns., 4919 W. 63rd 312-585-5485
Ill Elk Grove Vlg., E-H Research Labs., 700 Nicholas 312-439-2701
Md Baltimore, E-H Research Labs., Box 5630 301-532-7400
Md Silver Spgs., Brimberg, 814 Thayer
Mass Wakefield, Instr. Dynamics, Lakeshore Off. Pk. 617-245-5100
Mich Detroit, WKM Assocs., 1474 E. Outer 313-892-2500
Minn Mpls., Carter Elctrns., 1025B Evergreen 612-544-9393
Mo St. Louis, Carter Elctrns., 400 Brooks 314-731-2237
NJ Camden, QED Elctrns., 2916 Federal
NJ Union, SBM Assocs., 1519A Stuyvesant 201-687-8737
NM Albuquerque, Hytronic Meas., 205 San Pablo 505-268-3941
NY Pleasantville, SBM Assocs., 28 Hobby 914-769-1811
NY Rochester, SBM Assocs., 800 Linden 716-381-8330

NC Greensboro, BCS Assocs., Box 6426 919-273-1918
Ohio Cleveland, WKM Assocs., 16141 Puritas 216-267-0445
Ohio Dayton, WKM Assocs., 6073 Far Hills 513-434-7500
Ore Portland, McLaren-Topp, 5319 S.W. Westgate 503-297-2248
Pa Pittsburgh, WKM Assocs., 90 Clairton 412-892-2953
Tex Dallas, Data Mktg., 10048 Monroe 214-358-4643
Tex Houston, Data Mktg., 3925C Dacoma 713-686-9627
Wash Bellevue, McLaren-Topp, Box 250 206-746-5750
Wisc Milwaukee, Carter Elctrns., 6400 W. Capitol

E & M LABS., 5388 Sterling Ctr. Dr., Westlake Village, Cal., 91360, Tel: 213-889-1470, TWX: 910-494-1953; Sls. Mgr: J. Cole ....Pg. 1557
Ala Huntsville, Currie Aerospace Assoc., Box 1424 205-536-5650
Ariz Phoenix, Jarko Assocs., 2032 N. 27th Ave. 602-272-2684
Cal Sunnyvale, Waldman Assocs., 1094 W. Evelyn Ave. 408-245-2500
Cal Westlake Village, 3 DBM, Inc., 5388 Sterling Ctr. Dr. 213-889-2300
Fla Orlando, Currie Aeorspace Assoc., Box 13229 305-855-0843
Ill Park Ridge, RF Specialists, 118 W. Higgins Rd. 312-698-2044
Ind Indianapolis, R.F. Specialists, 6410 Woodwind Dr. 317-783-7630
Mass Lexington, Zieco Inc., 18 Muzzey St. 617-861-8300
Minn Minneapolis, R.F. Specialists, 4542 4th St. N.E. 612-560-1222
NJ Englewood, Central Assocs., Inc., 44 N. Dean St. 201-568-0808
NJ Merchantsville, Megargel/Himmelstein Assoc., 6705 Park Ave. 609-662-2081
NY No. Syracuse, Naco Elctrns., S. Bay Rd. 315-699-2651
NY Plainview, Central Assocs., Inc., 11 Commercial St. 516-433-0808
NY Schenectady, Naco Elctrns., 1032 Merlin Dr. 518-785-3750
NY Utica, Naco Elctrns. Corp., 2631 Edgewood Rd. 315-732-1801
NC Winston-Salem, Currie Aerospace Assoc., Box 10329 919-725-1927
Tex Dallas , Sterling Elctrns. Corp., 11111 N. Central Ewy. 214-369-3481
Va Alexandria, Vanguard Engrg. Sls., 2110 Wilkinson Pl. 703-768-1660
Wash Seattle, Datacom Assoc., 2207 Fairview E. 206-329-2989

E-T-A PRODS. CO. AMERICA, 6284 N. Cicero Ave., Chicago, Ill., 60646, Tel: 312-545-1553; Sls. Mgr: E. Roger
E-TRONICS, 5901 Noble Ave., Van Nuys, Cal., 91401, Tel: 213-787-5581, TWX: 910-495-1759; Sls. Mgr: F. Black
EV/GAME, INC., 80 Commercial St., Freeport, N.Y., 11520, Tel: 516-378-0440; Sls. Mgr: I. Seaman

E-Z HOOK, TEST PRODS., Div. of Tektest, Inc., Box 1405, Arcadia, Cal., 91006, Tel: 213-285-6154, TWX: 910-582-1614; Sls. Mgr: C. Haskin ....Pgs. 2621-2623
For: Can., Downsview, Ont., L. Finkler, 25 Toro Rd. 416-630-9103

E-Z WAY PRODS., INC., Box 17196, Tampa, Fla., 33612, Tel: 813-971-1961; Sls. Mgr: J. Schiffer
EAGLE ELEC. MFG. CO., 23-10 Bridge Plaza, S., L. I. C., N.Y., 11101, Tel: 212-ST-4-9200; Sls. Dir: J. Ludwig
EAGLE MAGNETIC CO., Box 24283, Indianapolis, Ind., 46224, Tel: 317-297-1030; Sls. Mgr: J.L. Coddington
EAGLE-PICHER INDS., INC., Electronics Div., "C" & Porter Sts., Joplin, Mo., 64801, Tel: 417-623-8000, TWX: 910-774-4508; Mgr. Conts: J.A. Black

EAGLE-SIGNAL DIV., E.W. Bliss Co., 736 Federal St., Davenport, Iowa, 52803, Tel: 319-326-8111, TWX: 910-525-1213; Mktg. Mgr: P.R. Anderson Pgs. 1317,1693
(Timer-Counter Prods. Reps.)
Ala Birmingham, McConnell Sls. & Engr. Co., Box 5825 205-871-3501
Ariz Scottsdale, J.T. Aldrich Co., Box 1299 602-945-8598
Cal Burlingame, Campbell & George Co., 840 Mahler 415-697-2965
Cal Los Angeles, Hundley, 3282 Fletcher Dr. 213-255-7111
Colo Denver, D.E. Bond, 5505 E. Evans Ave. 303-756-1234
Fla Ft. Lauderdale, Ward Engrg., 1718 N.E. 28 305-564-4883
Fla Jacksonville, Ward Engrg., 2727 Phyllis 904-388-7656
Fla Orlando, Ward Engrg., 7040 Lake Ellenor 305-851-0725
Ga Atlanta, B. Fancher, 4226 Pleasantdale 404-448-7078
Ill Chicago, Kelburn Engrg. Co., 6545 N. Olmsted Ave. 312-775-5722
Ill Moline, J. Otis & Assocs., 4520 River Dr. 309-762-3276
Ind Indianapolis, Kelburn Engrg, Box 40251 317-846-5574
La Baton Rouge, Thompson Equip., Airbase Ave. 504-355-6663
La New Orleans, Thompson Equip. Co., 4020 Thalia St. 504-822-1336
Md Baltimore, H.M. Wood, 2117 Eastern Ave. 301-276-1505
Mass Norwood, Gibson Engrg., 90 Broadway 617-769-3600
Mich Detroit, R.D. Ernest, 12818 Puritan 313-861-7311
Mich Grand Rapids, Mackinaw Engrg. Co., 4071 Lake Michigan Dr. 616-453-6361
Minn Mpls., Hallock Co., 5316 Excelsior Blvd. 612-920-6100
Mo Kansas City, Conrow Co., 3300 Wyoming St. 816-531-6065
Mo St. Louis, R. Greene, 1830 S. Hanley Rd. 314-644-2666
Neb Omaha, J. Otis, 8990 W. Dodge 402-397-2189
NJ Hackensack, C. Ribble, 31 di Carolis Ct. 201-342-2602
NY Buffalo, Munhall Co., 14 Lafayette Sq. 716-856-1212
NC Charlotte, B. Fancher, Box 1503 704-376-1753
Ohio Cleveland, J.L. Finnicum & Assoc., 1495 Warren Rd. 216-226-7076
Ohio Dayton, Thal-Mor, 3232 Encrete La. 513-298-9939
Okla Okla City, C.B. Anderson Elec., Box 761 405-751-2771
Okla Tulsa, C.B. Anderson Elec., 6708 E. 13 St. 918-836-4661
Ore Portland, Branom Instr., 6019 N.E. Union 503-285-9861
Pa Havertown, W.F. Keegan, 614 Darby Rd. 215-528-6640
Pa Monroeville, H.A. Deevers, 409 Beatty Rd. 412-372-7900
Tex Addison, L. Elliot Co., 701 N. Dooley Rd. 214-239-8533
Tex Missouri City, L. Elliot Co., Box 428 713-499-1571
Utah Salt Lake City, C.W. Silver, 550 W. 7th St., S. 801-355-5377
Wash Seattle, Branom Instr., 2137 Second Ave. 206-622-7320
WVa Charleston, Skaff Engrg. Co., 3418 Staunton Ave., S.E. 304-342-0131
Wisc New Berlin, Kelburn Engrg. Co., 13330 W. Sunny View Dr. 414-786-5630
EXP: N.Y., Melville, Rocke Int'l., 80 Marcus Dr. 516-694-7800

EAI, See Electronic Assocs.
EALING CORP., 2225 Massachusetts Ave., Cambridge, Mass., 02140, Tel: 617-491-5870; Adv. Mgr: James T. Gillett
EASTCRAFT CORP., Box 876, Melbourne, Fla., 32901, Tel: 305-723-3058; Sls. Mgr: N.P. Dodd

EASTERN AIR DEVICES, INC., 385 Central Ave., Dover, N.H., 03820, Tel: 603-742-3330, TWX: 510-297-4454; Sls. Mgr: A.P. Harris ....Pgs. 1588,1589
Cal L.A., Winters & Co., 11766 W. Pico 213-879-9045
Cal Los Altos, Servo-Data, 1485 Cedar 415-964-1325
Fla Winter Pk., Hawkins-Hutto, 501 Park 305-647-7407
Ill Chicago, Croyden Elctrns., Inc., 1915 N. Harlem 312-237-4343
Ind Ft. Wayne, Croyden Elctrns., 618 E. State 219-484-9622
Md Baltimore, Comp. Sls., Inc., 7 Church La. 301-484-3647
Mass Waltham, Selmark Assocs., 181 West 617-899-8110
Minn St. Paul, Ragon, 1136 W. Larpenteur 612-488-0201
NY NY, Haber-Ramp, 2315 Broadway 212-799-4040
NY No. Syracuse, L. D. Allen, Inc., Box 205 315-458-7470
NY Rochester, H. Johnson, 111 Mt. Hope 716-232-2688
Ohio Cincinnati, Croyden Elctrns., 4201 Victory 513-751-1313
Ohio Cleveland, G.T. Wright, Box 2950 216-331-8656
Pa Pittsburgh, H. Johnson, Box 13127 412-923-2877
Tex Dallas, Blair Engrg., 10034 Monroe 214-FL-2-2556

EASTERN CHEM. CORP., 3rd & Greenwich Sts., Reading, Pa., 19601, Tel: 215-376-7326; Sls. Mgr: L.W. McCord
EASTERN CO., 19 Readington Rd., North Branch, N.J., 08876, Tel: 201-722-6671; Sls. Mgr: H. Buser
EASTERN DELTA CORP., 29-09 S. Broadway, Fair Lawn, N.J., 07410, Tel: 201-797-4200; Sls. Mgr: F. Steele
EASTERN INDS. DIV., LFE Corp., 100 Skiff St., Hamden, Conn., 06514, Tel: 203-248-3841; Sls. Mgr: J.F. Duffy
EASTERN MARKING MACH. CORP., 30 Alabama Ave., Island Pk., N.Y., 11558, Tel: 516-889-9090; Sls. Mgr: L. Sherman
EASTERN SPECIALTY CO., 3619 N. Eight St., Philadelphia, Pa., 19140, Tel: 215-BA-8-0500; Sls. Mgr: E.P. Cornely
EASTMAN CHEM. PRODS., Sub. Eastman Kodak Co., Kingsport, Tenn., 37662, Tel: 615-247-0411, TWX: 810-574-5174 R.C. Dubberly
EASTRON CORP., 25 Locust St., Haverhill, Mass., 01830, Tel: 617-373-3824; Sls. Mgr: W.E. Slusher
EBERLINE INSTR. CORP., Instr. Div., Box 2108 - Airport Rd., Santa Fe, N.M., 87501, Tel: 505-982-1881, TWX: 910-985-0678; Sls. Mgr: R.A. Gray
E.B.L. CO, 78 Tolland St., R., East Hartford, Conn., 06108, Tel: 203-289-5428

EBY, HUGH H. CO., Div. REDM Corp., 4701 Germantown Ave., Phila., Pa., 19144, Tel: 215-DA-4-7000, TWX: 710-670-0452; Dir. Adm: W.A. Telmosse ....Pg. 2620
Ariz Tucson, Hamilton Reps., 9800 N. Oracle 602-326-6461
Cal Hollywood, Westaironics, Inc., 1800 N. Hollywood Ave. 213-466-6201
Cal San Leandro, Wm. Parks Assocs., 15102 Chapel Ct. 415-357-4240
Colo N. Glenn, Hamilton Reps., 10465 Melody 303-466-6061
Fla Palm Bch. Gdns., J. F. Griffin, 3902 Burns 305-848-4611
Ga Atlanta, J. E. Joyner, Box 10678 404-758-7496
Ill Morton Grove, E. Flaxman, 9202 Waukegan 312-965-3988
Md Towson, J-H Electrn. Sls. Co., Box 6844 301-825-4440
Mass Natick, G. Rosen, 563 Worcester Rd. 617-655-2211
Minn Hopkins, Grayden & Flemmer, Hamilton Rd. 612-941-1120
NY Jamaica, S-J Sls., 148-05 Archer Ave. 212-291-3232
NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343
Ohio Cleveland, Components, 7461 N. Linden 216-842-2737
Pa Dresher, Precision Elctrns., Limekiln Pke 215-646-8383
Tex Dallas, Roberts Sls., 9704 Lanward 214-348-4283

EBY SLS. CO., 148-05 Archer Ave., Jamaica, N.Y., 11435, Tel: 212-AX-1-3232, TWX: 212-479-4634; Sls. Mgr: B. Braun
ECHO SCIENCE CORP., 2555 Charleston Rd., Mountain View, Cal., 94040, Tel: 415-961-7145
ECHO SCIENCE CORP., 171 N. Santa Anita Ave., Pasadena, Cal., 91107, Tel: 213-449-8707, TWX: 910-588-3287; Sls. Mgr: B.E. Dody
ECKEL INDS., INC., 155 Fawcett St., Cambridge, Mass., 02138, Tel: 617-491-3221; Sls. Mgr: A. Eckel
ECONOMY FUSE DIV., Federal Pacific Elec. Co., 2070 Maple St., Des Plaines, Ill., 60016, Tel: 312-299-2211; Sls. Mgr: R.A. Pasco
E.C.P. CORP., 4726 Superior Ave., Cleveland, Ohio, 44103, Tel: 216-391-0444; Sls. Mgr: B.E. Deahl

ECTRON CORP., 8133 Engineer Rd., San Diego, Cal., 92111, Tel: 714-278-0600; Sls. Mgr: J.W. JaQuay Pg. 1283
Ariz Phoenix, Aztec Enter., 15 N. 40th Pl. 602-267-8103
Cal Los Angeles, Sci. Devices, 8621 Bellanca Ave. 213-641-4800
Cal Mtn. View, Sci. Devices, 655 W. Evelyn 415-964-4230
Colo Littleton, Aztec Enter., 1449 W. Littleton Blvd. 303-798-4573
Conn Hamden, Applied Meas., 2531 Whitney 203-288-5288
Fla Orlando, FM Assocs., 4018 Mortier 305-851-4710
Ill Des Plaines, Marsland, 1000 Executive Way 312-775-1309
Ind Indpls., Marsland, 3734 Carrollton 317-924-3568
Mass Acton, Applied Meas., 86 Hayward 617-646-7250
Mich Royal Oak, Satullo, 4514 N. Woodward 313-549-3910
Minn Mpls., Marsland, 231 N. Edgewood 612-545-4481
Mo Florissant, Marsland, 100 St. Francis 314-831-0015
NJ East Orange, Friedman, 110 Halsted 201-673-2500

NM Albuquerque, Aztec Entprs., 829 Penn., NE 505-255-2440
NY Cortland, RJC Assocs., 26 Morningside 607-753-3909
NC Greensboro, FM Assocs., 904 Montrose 919-294-2754
Ohio Cleveland, Satullo, 16801 Euclid 216-486-2800
Ohio Dayton, Satullo, 2801 Far Hills 513-293-7061
Pa King of Prussia, Letronix, 251 W. DeKalb 215-265-1020
Tex Richardson, A. Barnes, 740 S. Sherman 214-235-4541
Va Springfield, Dyna Rep., 5265 Port Royal 703-321-8630
Wash Seattle, Arva, 1320 Prospect 206-622-0177
For: Can., Scarborough, Ont., J. DeGroot, Box 241 416-264-2991

EDAL INDS., INC., 4 Short Beach Rd., E. Haven, Conn., 06512, Tel: 203-467-2591; Sls. Mgr: R. Cowles

EDC DATA COMPS. CORP., Box 279, Massapequa, N.Y., 11758, Tel: 516-798-5656; Sls. Mgr: R. Winston

EDC (ELECTRO DEV.), Box 100, Lynnwood, Wash., 98036, Tel: 203-743-1313, TWX: 910-449-2855; Sls. Mgr: O.W. Sailer

EDCRAFT INDS., INC., 620 Commerce Rd., Linden, N.J., 07036, Tel: 201-925-7760; Sls. Mgr: L.J. Edwards

EDER INSTRUMENT CO., INC., 2293 N. Clybourn Ave., Chicago, Ill., 60614, Tel: 312-327-2131

E.D.I. INC., Box 66, Cairo, Ill., 62914, Tel: 618-734-1694; Sls. Mgr: G. Huckleberry

Advertisement

E.D.I. Inc manufactures prototype printed circuits for commercial & industrial applications, offering same day service on small orders. A special order form, available upon request, has been prepared with a simplified formula for determining prices without requesting quotes.

EDISON ELCTRNS. DIV., McGraw-Edison (Daven/Meas. Prods.), Dept. EEM 71, Manchester, N.H., 03103, Tel: 603-669-0940, TWX: 710-220-1747; V.P., Mktg: George McCarthy

EDISON, THOMAS A. INSTR. DIV., McGraw Edison Co., 36 Lakeside Ave., W. Orange, N.J., 07051, Tel: 201-736-1000, TWX: 201-736-2940; Sls. Mgr: R.R. Schramm

EDISON, T.A., INSTR. DIV., McGraw Edison Co., Box 8364, Ft. Lauderdale, Fla., 33310, Tel: 305-565-3311, TWX: 510-955-9859; Mktg Mgr: G.M. Kling

EDITORS & ENGRS., Box 68003, New Augusta, Ind., 46268, Tel: 317-291-3100; V.P-Sls: T.V. Surber

EDKO ELCTRNS., INC., 397 Bedford Ave., Brooklyn, N.Y., 11211, Tel: 212-EV-4-2746; Pres: M.R. Coe

EDMONT-WILSON, 3157 Walnut St., Coshocton, Ohio, 43812, Tel: 614-622-4311; Sls. Mgr: R.M. Thomas

EDMUND SCIENTIFIC CO., 555 Edscorp Bldg., Barrington, N.J., 08007, Tel: 609-547-3488; Pres: N.W. Edmund

EDNALITE CORP., OCVI Instr. Div., 200 N. Water St., Peekskill, N.Y., 10566, Tel: 914-737-4100

EDO WESTERN CORP., 2645 S. 2nd W., Salt Lake City, Utah, 84115, Tel: 801-486-7481; Sls. Mgr: J.W. Harfard

EDSYN, INC., 15954 Arminta St., Van Nuys, Cal., 91406, Tel: 213-989-2324 Ext. 33; Sls. Mgr: N. Norvell Pg. 2938

EDWARDS CO. INC., 90 Connecticut Ave., Norwalk, Conn., 06856, Tel: 203-838-8441; Sls. Mgr: F.F. Keating

EDWARDS HIGH VACUUM, 430 S. Service Rd., W., Oakville, Ont., Can., Tel: 416-845-3437; Sls. Mgr: F.R. Barnes

EDWARDS HIGH VACUUM, 3279 Grand Is. Blvd., Grand Island, N.Y., 14072, Tel: 716-773-7552, TWX: 710-260-1350; V.P: W.E. Henneman

EEMCO DIV., Datron Sys., 4585 Electronics Pl., Los Angeles, Cal., 90039, Tel: 213-247-7060, TWX: 910-497-2269; Sls. Mgr: G. Hasencamp Pgs. 1590,1591

Cal Palo Alto, Mauldin Co., 437 Calif. 415-326-5291
Conn Hamden, Northeast Eng., 3013 Dixwell
Fla Orlando, Dost Assoc., Box 17057 305-295-4440
Fla Orlando, Bohman, 6990 Lake Ellinor 305-851-3630
Ga Atlanta, Brown Assoc., 1771 Tully
Ill Park Ridge, R.F. Specialists, 118 W. Higgins 312-698-2044
Ind Indpls., R.F. Specialists, 6410 Woodwind 317-783-7630
Md Baltimore, R. Wilkinson, 707 Stevenson 301-DR-7-7800
Mass Danvers, Northeast Eng., 5 Elm 617-774-3010
Mass So. Natick, Wm. Beaver, 41 Indian Ridge 617-655-1529
Mich Southfield, G & H Sls., 24001 Southfield 313-358-1910
Minn Mpls., Nelson & Son, 4005 W. 65th St. 612-920-3414
Md St. Louis, D.D. Eng., Box 12821 314-432-3728
NY Manhasset, Northeast Eng., 124 Trumbell
Ohio Cleveland, G & H Sls., 9701 Brookpark 216-661-7229
Ohio Columbus, G & H Sls., Box 27280 614-231-4433
Pa Glenside, R. Wilkinson, Box 215 215-HA-4-8400
Tex Bellaire, E. Aymond, Box 1064 713-467-5356
Tex Dallas, E. Aymond, 4300 N. Central Expwy. 214-826-7620
Va Falls Church, R. Wilkinson, Box 218 703-JE-2-6076
Wash Kirkland, R. Chase, Box 548 206-454-2514

E.F.E. LABS., INC., Horsham Valley Ind'l. Ctr., Horsham, Pa., 19044, Tel: 215-OS-2-2400; Sls. Mgr: R. Laub

EG & G, INC., 35 Congress St., Salem, Mass., 01970, Tel: 617-745-3200, TWX: 710-347-6741; Sls. Mgr: S. Rubinovitz

EG&G, INC., Electro-Optics Div., 35 Congress St., Salem, Mass., 01790, Tel: 617-745-3200, TWX: 617-321-0170; Sls. Mgr: S. Rubinovitz

EHRENREICH PHOTO-OPTICAL INDUSTRIES INC., Instrument Div., 623 Stewart Ave., Garden City, N.Y., 11530, Tel: 516-248-5200; Sls. Mgr: I.H. Feldman

E.I. DUPONT DENEMOURS & CO., 1007 Market St., Wilmington, Del., 19898, Tel: 302-PR-4-2421

EICO ELECTRONIC INSTRUMENT CO., INC., 283 Malta St., Brooklyn, N.Y., 11207, Tel: 212-949-1100; Sls. Mgr: P.A. Portnoy

EIMAC, Div. Varian Assocs., 301 Industrial Way, San Carlos, Calif., 94070, Tel: 415-592-1221, TWX: 910-376-4893; Mktg. Mgr: J.R. Quinn

EIP, INC., 2353 De La Cruz Blvd., Santa Clara, Cal., 95052, Tel: 408-244-7975; Sls. Mgr: B. Hilliard Pg. 448

Ala Huntsville, Gentry Assocs., 2109 W. Clinton 205-534-9771
Ariz Phoenix, Williams Assocs., 2250 N. 16th 602-254-6085
Cal Los Altos, J. Stone, 339 S. San Antonio Rd. 415-948-4563
Cal Van Nuys, C. Swift, 15236 Burbank Blvd. 213-989-1133
Conn Hamden, Instr. Conslts., 2381 Whitney Ave. 203-248-4174
Colo Denver, Williams Assocs., 4971 Jackson 303-388-4391
Fla Orlando, Gentry Assocs., 550 N. Bumby 305-841-7740
Ill Chicago, Berndt Asso., 6200 N. Hiawatha 312-283-0713
Kans Leawood, Poly-Onics, 4434 W. 90th Terr. 913-648-4173
Md Kensington, Elctrn. Mktg., 11501 Huff Ct. 301-881-5300
Mass Waban, Instr. Conslts., 81 Wyman St. 617-969-9881
Mich Detroit, WKM Assocs., 1474 E. Outer Dr. 313-892-2500
Mo Hazelwood, Poly-Onics, 47 Village Sq. 314-837-0597
NJ Westfield, Gray & Reed, 626 Hillcrest 201-233-6116
NM Albuquerque, Williams Assocs., 420 Washington St., S.E. 505-255-1638
NY Huntington Sta., Gray & Reed, 9 Dunford 516-271-6677
NY Depew, Labtronics, 5800 Transit Rd. 716-685-4111
NY Endicott, Labtronics, 306 Mersereau Ave. 607-748-0509
NY Jonesville, Labtronics, 3 Eastwood La. 518-372-6649
NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314
NC Burlington, Gentry Assocs., 116E O'Neal 919-227-2581
Ohio Cleveland, WKM Assocs., 16141 Puritas Ave. 216-267-0445
Ohio Dayton, WKM Assocs., 6073 Far Hills Ave. 513-434-7500
Pa King of Prussia, Elctrn. Mktg., 210 Goddard 215-265-1600
Pa Pittsburgh, WKM Assocs., 90 Clairton Blvd. 412-892-2953
Tex Dallas, Texas Avionics, 4515 Prentice 214-368-3566
Wash Seattle, Paratech, Box 5427 206-784-6447
EXP: N.Y., N.Y., A. Auriema, 120 Liberty St. 212-349-8220

EL-RAD MFG. CO., 4300 N. California, Chicago, Ill., 60618, Tel: 312-478-7300; Sls. Mgr: J.T. Clark

ELASCO-EASTERN, INC., 5 Northwood Rd., Bloomfield, Conn., 06002, Tel: 203-242-0708; Sls. Mgr: H. Corson

ELASTIC STOP NUT DIV., Amerace Esna Corp., 2330 Vauxhall Rd., Union, N.J., 07083, Tel: 201-686-6000, TWX: 710-985-4677; Sls. Mgr: W.H. Riley

ELCO, Maryland Rd. & Computer Ave., Willow Grove, Pa., 19090, Tel: 215-659-7000, TWX: 510-665-5573; Sls. Mgr: C. Shrader ....Pgs. 2624,2625

Ariz Phoenix, J. Berman, 2101 W. Shangri La 602-944-3361
Cal El Segundo, Elco Pacific, 2200 Park Pl. 213-675-3311
Cal Inglewood, J. Berman, 8295 S. LaCienega 213-678-1281
Cal Oakland, F. Moulthrop, 1530 E. 12th 415-AN-1-7676
Cal San Diego, J. Berman, Box 10197 714-583-6457
Colo Denver, Camel Elctrns., 5303 E. Evans Ave. 303-757-6191
Fla Eau Gallie, J. J. Smith, Box 1506 305-254-4206
Fla Miami, J.J. Smith & Assocs., Box 573 305-374-6784
Ga Atlanta, Beacon Elctrns., 2285 Peachtree 404-351-3654
Ill Chicago, D. Dolin, 3525 W. Peterson 312-588-3738
Md Silver Spg., Mechtronics, 11700 Old Columbis Pike 301-622-2420
Mass Waltham, Elco, 181 West St. 617-899-6510
Mich Lathrup Vlg., Sheridan Assocs., Box 128 313-358-3333
Minn St. Paul, Cahil, 3000 Hudson 612-739-8445
Mo Kansas City, R. Farris, 1715 Baltimore 816-HA-1-1751
NY Fayetteville, M. Andrews, 319 Mott 315-637-3144
NY Jericho, Electro Rep., 366 N. Broadway 516-938-0540
Ohio Cincinnati, Baehr-Greenleaf, 9505 Montgomery 513-891-3826
Ohio Cleveland, Baehr-Greenleaf, 14700 Detroit 216-AC-1-9030
Ohio Upper Arlington, Baehr-Greenleaf, Box 5722 614-486-4046
Ohio Xenia, Baehr-Greenleaf, 3350 Maplewood 513-426-5485
Okla Tulsa, H. Daly, 5836 S. 70th, E. 918-627-4159
Ore Portland, Almac/Stroum, Box 25444 503-292-3534
Pa Abington, Hilliard Assocs., Box 186 215-884-6100
Pa Huntingdon, Elco Huntingdon Corp., Huntingdon Ind'l. Pk. 814-643-0700
Pa Pittsburgh, Lowry-Dietrich, 90 Clairton 412-892-2992
Tex Dallas, Aid Elctrns., 8383 Stemmons Frwy. 214-638-8015
Wash Seattle, Almac/Stroum, 5811 Sixth, S. 206-763-2300

ELCO HUNTINGDON CORP., Huntingdon Ind'l. Pk., Huntingdon, Pa., 16652, Tel: 814-643-0700, TWX: 510-691-3117 ....Pgs. 2624,2625

ELCO PACIFIC, 2200 Park Pl., El Segundo, Cal., 90245, Tel: 213-675-3311, TWX: 910-325-6602 Pgs. 2624,2625

ELCO INDS., 1140 Samuelson Rd., Rockford, Ill., 61101, Tel: 815-397-5151, TWX: 910-631-3420; V.P. Sls: J. Rathke

ELCOM SYS., 151-24 W. Industry Ct., Deer Pk., N.Y., 11729, Tel: 516-667-5800; Sls. Mgr: K. Leuenroth, Jr.

ELCOR PRODS. WELEX ELCTRNS., Halliburton Co., 2431 Linden La., Silver Spring, Md., 20910, Tel: 301-589-6614; Sls. Mgr: M.R. Evans ....Pg. 701

Cal Buena Park, Box 5187 714-821-6600
Mass Manchester, Applied Technology, 7 Vine 617-CA-7-2700
NJ Hillsdale, B. Cameron Assoc., 3 Elaine Ct. 201-664-2525
NM Albuquerque, Elctrn. Entrprs., 1900 Wash., NE 505-256-1585
NM Las Cruces, Elctrn. Enterprises, Box 116 505-524-0126
Ohio Cleveland, Electro Sls., 335 E. 200th 216-486-1140
Ohio Dayton, Electro Sls., Box 3122 513-426-5551
Pa King of Prussia, Letronix, 251 W. DeKalb 215-265-1020
Pa Pittsburgh, Electro Sls., 201 Penn Ctr. 412-371-9449
Va Falls Church, Jay Co., 2914 Annandale 703-534-7800
EXP: N.Y., N.Y., Henley & Co., 202 E. 44th St. 212-YU-6-5544
For: Can., Ont., Ont., York Instrs., 1262 Don Mills 445-1255

ELDEMA DIV., See Genisco Technology Corp.

ELDEN MFG. CORP., 2712 N. Elston Ave., Chicago, Ill., 60647, Tel: 312-276-2192

ELDORADO ELECTRODATA, 601 Chalomar Rd., Concord, Cal., 94520, Tel: 415-686-4200, TWX: 910-481-9476; Sls. Mgr: R.P. Swift ....Pg. 449

Ala Huntsville, E. Holmes, 4862 Governors 205-837-6900
Ariz Phoenix, Aztec Entprs., 15 N. 40th 602-267-8103
Cal Cupertino, T. Louis Snitzer Co., 10320 Saratoga Sunnyvale Rd. 408-257-8333
Cal Del Mar, Snitzer, 1150 Camino Del Mar 714-454-2191
Cal Los Angeles, Snitzer, 9005 Exposition 213-836-6170
Colo Littleton, Aztec Entprs., 1449 W. Littleton 303-798-4573
Conn W. Hartford, Instr. Dynamics, 345 N. Main 203-233-5503
Fla Orlando, E. Holmes, 316-1/2 S. Bumby 305-241-2128
Ga Chamblee, E. Holmes, 4185 Clairmont 404-451-6161
Ill Chicago, Carter Elctrns., 4919 W. 63rd 312-585-5485
Ind Indpls., Carter Elctrns., 6333 Hollister 317-293-0696
Kans Leawood, Leemark Engrs., Box 6175 913-NI-8-0124
Md Silver Spring, R. Davies, 10 Old Post Off. 301-587-3910
Mass Wakefield, Instr. Dynamics, Lakeside Off. Pk. 617-245-5100
Mich Farmington, Anderson Elctrns., 30785 Grand River 313-476-9161
Minn Mpls., Carter Elctrns., 1025B Evergreen 612-544-9393
Mo Hazelwood, Carter Elctrns., 400 Brookes 314-731-2237
NJ Fairfield, KLS Assocs., 387 Passaic 201-227-2900
NJ Union, SBM Assocs., 1519 Stuyvesant 201-687-8737
NM Albuquerque, Aztec Entprs., 829 Penn. Ave., N.E. 505-255-2440
NY NY, KLS Assocs. 212-233-4849
NY N. Syracuse, NACO Elctrns., Box 248 315-699-2651
Ohio Cleveland, Instrumentation Sys. Inc., 21877 Euclid Ave. 216-486-0782
Ohio Dayton, Instrumentation Sys., 3481 Office Pk. 513-293-8095
Pa Phila., Megargel Himmelstein 215-925-7948
Tex Austin, Crockett Engrg., 1900 Pecos 512-476-6801
Tex Dallas, Crockett Engrg., 1115 Brookhollow 214-ME-7-6120
Va Virginia Bch., E.G. Holmes, 928 Gen'l. Beauregard 703-340-6556
Wash Bellevue, Brennan, 208 Carlson Bldg. 206-GL-4-9332
Wisc Milwaukee, Carter Elctrns., 6400 W. Capitol Dr. 414-464-5555

ELDRE COMPS., INC., 1239 University Ave., Rochester, N.Y., 14607, Tel: 716-244-2570, TWX: 716-235-4253; Sls. Mgr: J.A. Erdle

ELEC-TROL, INC., 26477 N. Golden Valley Rd., Saugus, Cal., 91350, Tel: 805-252-8330, TWX: 910-336-1556; Sls. Mgr: K.E. Doriot

ELECPAC INC., 15 E. Main St., Cary, Ill., 60013, Tel: 312-639-2307; Sls. Mgr: E. Skwarlo

ELECTRA/MIDLAND CORP., Box 760, Mineral Wells, Tex., 76067, Tel: 817-325-7871, TWX: 910-890-5855; Sls. Mgr: W.R. Ayers

(Refer to Electra/Midland Corp., Midland Div., for sales office information.)

ELECTRA/MIDLAND CORP., Cermetrik Div., 3347 Ind'l. Ct., San Diego, Cal., 92121, Tel: 714-453-0353; Sls. Mgr: J.M. Bratt

(Refer to Electra/Midland Corp., Sls. Div., 3347 Ind'l. Ct., San Diego, Cal., 92121, 714-453-0338, for sales offices information.)

ELECTRAC, INC., 1614 Orangethrope Way, Anaheim, Calif., 92801, Tel: 714-879-6021; Sls. Mgr: L. Katz

ELECTRAID, INC., Box 53, Cambridge, Mass., 02141, Tel: 617-BR-2-4288; Gen'l. Mgr: R.R. Lewis

ELECTREY, S.A., Apartado 1393, Monterrey, Mexico, Tel: 9183-75-1222; Sls. Mgr: J. Diaz

Advertisement

We manufacture a complete line of small, precision fuses and circuit breakers for electronic and automotive applications: over 300 different types including all regular sizes and fusion characteristics. Our special, patented SERIES 02 FUSE gives a TWO-SECOND-MINIMUM TIME DELAY at the same price and size of a 3AG fuse, available in all standard current ratings. Ideal for protection of consumer or professional power supplies.

ELECTRI-CORD MFG. CO., INC., 312 E. Main St., Westfield, Pa., 16950, Tel: 814-367-2265; Sls. Mgr: C. Wexler

ELECTRIC INDICATOR CO., INC., 195 Danbury Rd., Wilton, Conn., 06897, Tel: 203-762-8655; Sls. Mgr: W.L. Sly

ELECTRIC MACHINERY MFG. CO., 800 Central Ave., Minneapolis, Minn., 55413, Tel: 612-378-0500, TWX: 612-321-1390; V.P-Sls: C.M. Burns

ELECTRIC MOTORS & SPECIALTIES, King & Hamsher Sts., Garrett, Ind., 46738, Tel: 219-357-4141; Sls. Mgr: J.A. Fuhrman

ELECTRIC PARTS CORP., Box 234, Georgetown, Ky., 40324, Tel: 502-863-3321; Sls. Mgr: D.E. Summers

ELECTRIC TACHOMETER CORP., 68th & Upland Sts., Philadelphia, Pa., 19142, Tel: 215-SA-6-7723; Sls. Mgr: F.M. Porter

ELECTRIC TERMINAL CORP., 25 Bellows St., Warwick, R.I., 02888, Tel: 401-781-2189; Sls. Mgr: W. Massie, Jr.

ELECTRICAL INDS., Div. Philips Elctrns. Inc., 691 Central Ave., Murray Hill, N.J., 07974, Tel: 201-464-3200, TWX: 701-984-7979; Sls. Mgr: D.V. Wilson

ELECTRICAL INSTR. SVC., INC., 25 Dock St., Mt. Vernon, N.Y., 10550, Tel: 914-699-9717; Sls. Mgr: F.P. Johnston

ELECTRICAL INSULATION CO., INC., 1245 Marconi Blvd., Copiague, N.Y., 11726, Tel: 516-264-6190; Pres: N.S. Goldstein

ELECTRICAL PLASTICS CORP., 280 Warren St., Box 298, Lyndhurst, N.J., 07071, Tel: 201-438-2400; Sls. Mgr: S. Horbach

ELECTRICAL REFRACTORIES CO., 50 Clark St., E. Palestine, Ohio, 44413, Tel: 216-426-9433; Sls. Mgr: J.F. Turner

ELECTRICAL TESTING LABS., INC., 2 East End Ave., New York, N.Y., 10021, Tel: 212-288-2600, TWX: 710-581-2440; Pres: R.J. Amorosi

ELECTRICAL WINDINGS, INC., 2015 N. Kolmar Ave., Chicago, Ill., 60639, Tel: 312-235-3360; Sls. Mgr: L.C. Kammerer

ELECTRO-ALARM SAFETY DEVICES, 745 N. Pleasant, Fresno, Calif., 93728, Tel: 209-AM-4-6894; Sls. Mgr: V. Chambler

ELECTRO ASSEMBLIES, INC., 4338 W. Montrose Ave., Chicago, Ill., 60641, Tel: 312-282-1266; Sls. Mgr: D.P. Stewart

ELECTRO CHEMICAL ENGRAVING CO., 1100 Brook Ave, Bronx, N.Y., 10456, Tel: 212-588-9000; Sls. Mgr: S. Small

ELECTRO-CRAFT CORP, 1600 2nd St South, Hopkins, Minn, 55343, Tel: 612-935-8226, TWX: 910-576-3469; Sls. Mgr: J.R. Little

ELECTRO CUBE, 1710 S. Del Mar Ave., San Gabriel, Cal, 91776, Tel: 213-283-0511, TWX: 910-589-1609; Sls. Mgr: B. Bishop ....Pgs. 2378,2379,2950

Ariz Scottsdale, AR/TEC, Inc., Box 727 602-950-1294
Cal San Marino, Van Gott, Box 8401 213-282-1125
Cal Mtn. View, Daniels-Padgett, 2620 Bayshore Frontage 415-969-1700
Colo Denver, Daniels-Padgett, 2785 N. Speer 303-433-7181
Fla Palm Bch. Gardens, J. Griffin, 3902 Burns 305-848-4617
Ga Chamblee, K. Ekmark, 3676 Teal 404-457-5703
Ill Chicago, Lincoln, Hodges, 5875 N. Lincoln 312-561-8440
Kans Overland Pk., Penzner Assocs., Box 6264 913-381-0004
Mass Reading, C. Godfrey Co., Box 68 617-944-2230
Mich Detroit, S. Greiner, 15318 Mack Ave. 313-882-7570
Minn Mpls., Electro-Serv., 1455 W. Lake 612-827-2907
Mo Hazelwood, Penzner, 400 Brookes La. 314-731-4334
NJ Riverton, Given Assocs., Box 183 609-829-7249
NY Floral Pk., MOS Assocs., 80-54 266th 516-694-5923
NY Rochester, Gislason, 617 Case Bldg. 716-454-4741
Ohio Dayton, K.W. Elctrn. Sls., 8459 N. Main 513-890-2150
Pa Monroeville, NEBco, 1974 Gregory Ave. 412-824-2111
Pa Paoli, T. Griffin, 46 Darby Rd. 215-647-1550
Tex Richardson, Whiteside Sls. Co., Box 814 214-231-9771
Wash Seattle, H. Levinson, 1211 E. Denny Wy. 206-323-5100
Wisc Waukesha, Lincoln, Hodges, 217 Wisconsin 414-542-3087

ELECTRO/DATA, INC., 1621 Jupiter, Garland, Tex., 75040, Tel: 214-341-2100; Sls. Mgr: J.D. Short Pgs. 1558,1559

Md Bethesda, Byrne Assocs., 4853 Cordell 301-654-8814
Mich Franklin, Berberich Assocs., 31425 Nottingham 313-851-5753
NY Plainview, Eastern Metro, Three Eva La. 516-938-4901
Ohio Dayton, Berberich & Assos., 4130 Linden 513-252-9981
Tex Richardson, C. Hoffman, 777 S. Central Expwy. 214-235-3600

ELECTRO DEVICES, INC., 11805 Westline Ind'l. Dr., St. Louis, Mo., 63141, Tel: 314-LI-2-4500; Sls. Mgr: R.E. Overholt

ELECTRO-DEVICES, INC., 4-6 Godwin Ave., Paterson, N.J., 07509, Tel: 201-274-8989; Sls. Mgr: O.E. Carlson

Advertisement

ELECTRIC MOTOR SPEED
CONTROL SYSTEMS
SOLID STATE - MODULAR
CONTROLS
For use in Blue Print Machines .
Machine Tools .
Laboratory Equipment . White
Printers . etc.
1/100th to 3 Horsepower Controls
Our Engineers Will Assist You in
Your
Electronic Control Problems
Controls for Shunt, Permanent
Magnet and
Universal Motors.

ELECTRO-ETCH CIRCUITS, INC., 7112 S. Victoria Ave., Los Angeles, Cal., 90043, Tel: 213-752-6111; Sls. Mgr: R. Grawoig

ELECTRO FIBEROPTICS CORP., 99 Hartwell St., W. Boylston, Mass., 01583, Tel: 617-835-6082; Sls. Mgr: R. Poulin

ELECTRO-FLEX HEAT, INC., Northwood Ind'l. Pk., Bloomfield, Conn., 06002, Tel: 203-242-6287, TWX: 710-425-2978; Sls. Mgr: H.G. Johanson

ELECTRO IMPULSE, INC., 116 Chestnut St., Red Bank, N.J., 07701, Tel: 201-741-0404, TWX: 710-722-5767; Sls. Mgr: M. Rubin ....Pgs. 450,603,2784

Cal Los Angeles, Barnard & Walls, 5716 W. Manchester 213-645-4801
Cal Sunnyvale, Waldman, 1094 W. Evelyn 408-245-2500
Colo Loveland, Kelley Enter., 336 E. 4th St. 303-667-1376
Fla Orlando, Gra-Mar, Inc., 3113 Lawton Rd. 305-841-2330
Ind New Haven, RF Spec., 610 Professional Pk. Dr. 219-749-0379
Ill Park Ridge, RF Spec., 118 W. Higgins Rd. 312-698-2044
Md Beltsville, Scientific Mktg., 6701 Ammendale 301-345-6767
Mass Ashland, Atlantic, 224 Cordaville 617-881-4060
Minn Mpls., RF Spec., 4542 4th St., N.E. 612-560-1222
NJ Merchantville, Megargel & Himmelstein, 6705 Park Ave. 609-662-3081
NY Syracuse, Lightstone, E. Molloy Rd. 315-454-3209
NY Tuckahoe, Rotondi, 16 Fisher 914-961-4338
Tex El Paso, Kelley Enter., 5432 Vancouver 915-751-3842
Tex Richardson, C. Hoffman, 777 S. Central Expwy. 214-235-3600
EXP: N.Y., Sylvan Ginsbury, 425 Park Ave. 212-689-5212

ELECTRO MAGNETIC PRODS., Div. Wabash Magnetics, Inc., Box 708, Wabash, Ind., 46992, Tel: 219-563-3111, TWX: 810-290-2724; Pres: W.F. Boyd

ELECTRO MAT'LS., Div. Illinois Tool Works, Inc., 11620 Sorrento Valley Rd., San Diego, Cal., 92121, Tel: 714-459-4355, TWX: 910-322-1130; Sls. Mgr: L. Smith

ELECTRO MATS. CORP. AMER., 605 Center Ave., Mamaroneck, N.Y., 10543, Tel: 914-OW-8-8434 D. Davis

cont'd

cont'd Advertisement

Full range of products for thick film microelectronics resistors from 1 ohm to 1 meg. Gold, silver, platinum-gold, palladum-gold conductors as well as glass dielectrics for crossovers & Multilayers. Silver, gold and nickel filled epoxies, adhesives and lacquers are also available. Mo-Mn, Mo-W metallizing for green tape.

ELECTRO-MECH. COMPS., 1826 N. Floradale Ave., S. El Monte, Cal., 91733, Tel: 213-442-7180; Sls. Mgr: W.H. Trumbull, Jr. .... Pg. 1907

Ariz Scottsdale, Ar/Tec, Box 460 602-947-6304
Cal Inyokern, D. Staton Elec., Box 48 714-377-4176
Cal Palo Alto, Engrg. Assocs., 999 Commercial St. 415-326-7842
Cal Santa Monica, Rep. Assocs., 1710 Santa Monica Blvd. 213-451-8901
Colo Denver, Franklin Sls., 1924 S. Navajo 303-922-3623
Conn Milford, Todino Engrg. Sls., Box 402 203-TR-4-6643
Fla Orlando, D. Pflueger, 131 Zelma 305-425-4002
Ill Chicago, D.J.M. Elctrns. Sls., 5356 N. Milwaukee 312-774-1212
La New Orleans, Glidden Engrg., Box 10442 312-774-1212
Md Rockville, Quality Comps., Box 711 301-933-1623
Mass Needham Hgts., Todino Engrg., Box 201 617-444-7925
Mich Warren, Ardon Elctrns. Sls., 13969 13 Mile Rd. 313-294-2292
Minn Minneapolis, R. W. Marshall Co., 6106 Excelsior Blvd. 612-929-0457
Mo St. Louis, Ozark Elctrn. Mktg., 2573 Woodson Rd. 314-423-7200
NJ Cherry Hill, Quality Comps. of N.J., Box 583 609-428-6266
NY Scarsdale, Bassin Tech. Sls., 52 Fayette 914-SC-3-3334
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-861-2626
Pa Pittsburgh, Scott Elctrns., 1050 Freeport Rd. 415-471-5233
Tex Dallas, Glidden Engrg., 8609 N.W. Plaza 713-363-6539
Tex Houston, Glidden Engrg., 7728 Long Point 713-681-1415
For: Can., Port Credit, Ont., Leonard Elec., Ltd., 1008 Rangeview Rd. 416-274-3454

ELECTRO-MECHANICAL INSTR. DIV., 8th & Chestnut St., Perkasie, Pa., 18944, Tel: 215-257-6561, TWX: 510-661-5170; Sls. Mgr: R. Jones .... Pg. 451

Cal Los Angeles, C.E. Holmes Co., 107 North Ave., 64 213-256-2255
Cal San Carlos, D.H. Ross Co., 1095 Industrial Rd. 415-591-4411
Colo Denver, Koether-Cox Co., 1327 S. Inca St. 303-PE-3-5561
Fla Clearwater, David Elec. Sls. Co., Box 4102 813-531-2956
Ill Chicago, Ropek & Cahill, Inc., 5439 W. Division St. 312-AU-7-7292
Ind Indianapolis, R.O. Whitesell & Assoc., 6691 E. Washington St. 317-359-9283
Kans Shawnee Mission, Robinson & Assocs., Box 466 913-262-1374
Ky Louisville, R.O. Whitesell & Assoc., 3620 Lexington Rd. 502-893-7303
Md Silver Spring, Globe Assocs., 8121 Georgia Ave. 301-587-0060
Mass Boston, Anderson Sls. Co., 177 State St. 617-CA-7-2980
Minn Minneapolis, H.M.R.,Inc., 9 E. 22nd St. 612-335-7734
NY DeWitt, F.W. Taylor Co., Inc., 4455 E. Genesee St. 315-446-0422
NY Mt. Vernon, D. Sonkin Assocs., 10 Fiske Pl. 914-MO-8-9809
NC Charlotte, Electro-Rep. Assocs., Inc., 128 W. 30th St. 704-333-0451
Ohio Cleveland, Loesch Assocs., Inc., One Public Sq. 216-241-4581
Pa Glenside, Precision Elctrns., Inc., 1601 Church Rd. 215-646-8383
Tenn Bristol, R. O. Whitesell Assocs., 340 Edgemont Ave. 615-968-4195
Tex Addison, Campion Sls. Co., Box 396 214-239-9196
Wash Seattle, F.H. Haight Co., 3212 Eastlake Ave. 206-322-1818

ELECTRO-MECHANICS CO., Box 1546, Austin, Tex., 78767, Tel: 512-345-2660; Sls. Mgr: T. Carlisle Pg. 452

Ala Huntsville, Gentry Assocs., 2109 W. Clinton Bldg. 205-534-9771
Cal Buena Pk., D. Black Assocs., Box 5187 714-821-6600
Fla Orlando, Gentry Assocs., 550 Bumby Ave. 305-841-7740
Ga Atlanta, Gentry Assocs., Box 13513, Sta. K 404-233-3816
Md Silver Springs, Gawler-Knoop, 10 Old Post Off. Rd. 301-589-4406
NJ Roseland, Gawler-Knoop, 14 Beaufort Ave. 201-226-4545
Pa Doylestown, Gawler-Knoop, Box 794 215-348-4646
NC Burlington, Gentry Assocs., 116 E. O'Neal Ave. 919-227-2581
Tex El Paso, H. Markowitz, 1014 Southwest Ctr. 915-533-2860
Tex Houston, H. Markowitz, 4215 Graustark 713-524-8371

ELECTRO-MECHANISMS, INC., 975 W. First St., Azusa, Cal., 91702, Tel: 213-334-4927; Pres: Mr. Guy M. Martin Jr.

ELECTRO MOTIVE MFG., S. Park St., Willimantic, Conn., 06226, Tel: 203-423-9231, TWX: 203-423-5284; Sls. Mgr: K. Foley .... Pg. 2380

Cal Los Altos, Collins & Hyde Co., 900 N. San Antonio Rd. 415-941-3361
Cal Los Angeles, Collins & Hyde Co., 5380 Whittier Blvd. 213-685-7975
Ill Arlington Hgts., Electro Motive Mfg. Co., Inc., 2504 E. Grove St. 312-392-1074

ELECTRO-NUMERICS, 2961 Corvin Dr., Santa Clara, Cal., 95051, Tel: 408-738-1840; Mktg. Mgr: D. Willett Pg. 453

Ala Huntsville, Mekco Assoc., 3322 Memorial 205-881-3721
Ariz Phoenix, Barnhill Three, Inc., 537 E. Osborn 602-263-1250
Cal So. Pasadena, Pierce, Davis & Assocs., 1810 Fair Oaks 213-682-1166
Cal Belmont, Pierce, Davis & Assocs., Box 895 408-245-0986
Colo Denver, Barnhill Three, Inc., 1170 S. Sheridan 303-934-5505
Conn Hamden, Applied Meas., Inc., Box 5181 203-288-5288
Fla Orlando, Mekco Assoc., 3165 McCrory 305-841-2215
Ill Chicago, Pivan Engrg., 3535 W. Peterson 312-539-4838
Ind Indpls., Pivan Engrg., 1259 W. 86th 317-253-1681
Kans Shawnee Mission, Pivan Engrg., 5801 Outlook 913-722-1030
Md Silver Spring, Rep-Tron, 8525 Colesville 301-588-1595
Mass Acton, Applied Meas., Inc., Box 316 617-263-2766
Mich Farmington, Carter, McCormic & Peirce, Inc., 23995 Freeway Pk. Dr. 313-477-7700
Minn Mpls., Pivan Engrg., 3307 N. Hwy. 100 612-537-4501
Mo St. Louis, Pivan Engrg., 725 Old Dallas 314-872-8424
NJ River Edge, Tecnimat, Box 233, N. Hackensack Sta. 201-265-9730
NM Albuquerque, Barnhill Three, Inc., 1410-D Wyoming, N.E. 505-299-7658
NY Liverpool, Rayelco Elctrns., Inc., Box 189 315-652-5272
NC Burlington, Mekco Assoc., 1349 S. Church 919-226-7177
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster 513-278-5873
Pa King of Prussia, Letronix, 251 W. DeKalb 215-265-1020
Pa Pittsburg, Carter, McCormic & Peirce, 201 Penn Ctr. 412-824-3760
Tex Houston, Barnhill Two, Inc., 3810 Westheimer 713-621-0040
Tex Richardson, Barnhill Two, Inc., 312 N. Central 214-231-2573
Wash Seattle, Rush Drake, 6133 Maynard 206-763-2755
Wisc Brookfield, Pivan Engrg. Co., 3055 N. Brookfield Rd. 414-786-1940

ELECTRO OCEANICS, INC., 2000 S. Santa Fe Ave., Compton, Calif., 90221, Tel: 213-537-2430; Oper. Mgr: A. Bertoldo

ELECTRO-OPTICAL DIV., Kollmorgen Corp., 347 King St., Northampton, Mass., 01060, Tel: 413-586-2330, TWX: 510-290-2001; V.P. Mktg. & Sls: R. Saner

ELECTRO-OPTICAL SYSTEMS, Special Products & Sys. Div. Xerox Corp., 300 N. Halstead St., Pasadena, Cal., 91107, Tel: 213-351-2351, TWX: 910-588-3796; V.P. Mktg. Ops: G.W. Gerung

ELECTRO OPTICS ASSOCS., 974 Commercial Ave., Palo Alto, Calif., 94303, Tel: 415-327-6200; Mktg. Mgr: G. Carey

ELECTRO-PACIFIC, INC., 5782 Thornwood Dr., Goleta, Calif., 93017, Tel: 805-964-4878; Mgr: J.R. Lindbery

ELECTRO PHOTO SYSTEMS, 173 Freedom Ave., Anaheim, Cal., 92801, Tel: 714-871-7560; Sls. Mgr: J. Wilcox

ELECTRO POWERPACS CORP., 253 Norfolk St., Cambridge, Mass., 02139, Tel: 617-876-9220; Sls. Mgr: H. Dormitzer

ELECTRO PRODS. LABS., Power Supply, 6125-P Howard St., Chicago, Ill., 60648, Tel: 312-647-8744; Sls. Mgr: E.J. Jasik

ELECTRO PRODS. LABS., Transducer Div., 6125-KP Howard St., Chgo., Ill., 60648, Tel: 312-647-8744; Sls. Mgr: E.J. Jasik

ELECTRO-SCIENCE LABS., 1133 Arch St., Philadelphia, Pa., 19107, Tel: 215-LO-3-1360; Sls. Mgr: Dr. S.J. Stein

ELECTRO SCI. INDS., 13902 N.W. Science Pk. Dr., Portland, Ore., 97229, Tel: 503-646-4141; V.P. Mktg: P.D. Lintner .... Pgs. 454,455,2919

Ala Huntsville, D. Dickinson, Box 4127 205-536-4451
Cal Orange, Bill Lyon, Box 3097 714-633-4703
Cal Palo Alto, T. White, 999 Commercial St. 415-327-1571
Ill Rosemont, Electro Sci. Ind., 9270 Evenhouse Ave. 312-696-4322
Mass Waltham, D. Erickson, 190 Lexington St. 617-899-6633
NJ Bergenfield, Electro Sci. Inds., Box 88 201-385-9493
Ohio Dayton, Instr. Sys., 3481 Office Pk. Dr. 513-293-8095
For: Can., Stittsville, Ont., Instronics, Ltd., Box 100 613-836-4411

ELECTRO-SONIC CONTROL, 1625 N. Main, Manteca, Calif., 95336, Tel: 209-823-7694; Sls. Mgr: L. Apperson

ELECTRO-SONICS INC., 70 Main St., Spofford, N.H., 03462, Tel: 603-363-4701; Sls. Mgr: F. French

ELECTRO-STANDARDS LABS., INC., 3560 N.W. 34th St., Miami, Fla., 33142, Tel: 305-527-5575; Sls. Mgr: S. Gold

ELECTRO STYLUS, 31 Cheyenne Blvd., Colorado Springs, Colo., 80906, Tel: 303-633-5969; Sls. Mgr: L.F. Murray

ELECTRO SWITCH CORP., King Ave., Weymouth, Mass., 02188, Tel: 617-335-5200, TWX: 710-388-0377; Sls. Mgr: H.A. Grey .... Pg. 1908

Ariz Scottsdale, OEM Specialties, 6625 E. MacDonald 602-946-4617
Cal Oakland, W. Nott, 4450 Piedmont 415-654-3747
Cal Pico Rivera, Westrep, 9519 Telegraph Rd. 213-949-2551
Colo Denver, D.E. Bond Assocs., 5505 E. Evans Ave. 303-756-1234
Conn New Canaan, G.M. Hathaway Elctrns., 129 Oenoke La. 203-966-2580
Fla Orlando, Buchanan & Abrams Assoc., Inc., 1512 E. Concord Ave. 305-423-8995
Ill Glen Ellyn, Rockford Controls Co., 21W181 Hill Ave. 312-469-6016
Md Lutherville-Timonium, Naudain, Box 1 301-252-5378
Mass Arlington, G.M. Hathaway Elctrns., 7-11 Mystic 617-646-1380
Mich Detroit, Hilltronics, Inc., 13720 Puritan Ave. 810-243-4069
Minn St. Paul, Mesa Co., 1821 University Ave. 518-869-0405
Mo Kansas Cy., H. Weisler & Assoc., 3307 Chippewa 816-454-5096
Mo St. Louis, H.J. Weisler, 2050 Woodson 314-428-3934
NJ Mt. Laurel, Naudain, Rte. 73 609-235-1801
NM Albuquerque, D. Bond Assocs., Box 14237 505-296-9111
NY Albany, T. Ferguson Sls., Box 5146 518-869-0405
NY Great Neck, F. Tylinski, 425 Northern 516-466-9070
NY Rochester, T. Ferguson Sls., 228 Winton 716-482-7757
NC Winston-Salem, L. G. White Southern, Inc., 1014 Brookstown Ave. 919-725-3612
Ohio Dayton, Rockford Controls Ohio, 2077 Embury Pk. 513-278-7362
Ohio Euclid, Rockford Controls Ohio, 26100 Brush 216-731-5250
Pa Pittsburgh, R.F. Clark Co., 10517 Lindberg Ave. 412-242-9500
Tex Bellaire, Brice Co., Box 730 713-666-1788

WashSeattle, C. B. Parsons & Co., 5319 4th 206-762-7373
Wisc Wauwatosa, Larsen Assocs., 10855 W. Potter 414-258-0529
EXP: Conn., Thomaston, Norcon Div., Box B 203-283-5563
For: Can., Don Mills, Ont., G.M. Fraser, Ltd., 180 Duncan Mill Rd. 449-6600

ELECTRO-VOICE, INC., Sub. Gulton Inds., Inc., 600 Cecil St., Buchanan, Mich., 49107, Tel: 616-695-6831, TWX: 810-270-3135; Adv. Mgr: Wm. Sutherland
ELECTRO WINDINGS & COMPS., 725 Federal Ave., Kenilworth, N.J., 07033, Tel: 201-245-3200; Sls. Mgr: D.E. Mac Millan
ELECTROCHEMICAL INDS., INC., 665 Cambridge St., Worcester, Mass., 01610, Tel: 617-756-3846; Sls. Mgr: H. Narcus
ELECTROCOM INDS., 1105 N. Ironwood Dr., So. Bend, Indiana, 46615, Tel: 219-232-2743; Sls. Mgr: B. Jaffe
ELECTROFILM, INC., 7116 Laurel Canyon Blvd., N. Hollywood, Calif., 91605, Tel: 213-875-1000, TWX: 910-499-2663; Sls. Mgr: L.G. LaGorio
ELECTROID CO., 95 Progress St., Union, N.J., 07083, Tel: 201-MU-6-8290; V.P. Mktg: J.J. Wilson
ELECTROL CO., INC., 771 Spring La., York, Pa., 17403, Tel: 717-843-0242; Sls. Mgr: R.T. Dudley
ELECTROMAGNETIC SCI., INC., 3643 N.E. Expwy., Atlanta, Ga., 30340, Tel: 404-458-3221; Sls. Mgr: W. Baker
ELECTROMATIC EQUIP. CO., 562 Albermarle Rd., Cedarhurst, N.Y., 11516, Tel: 516-295-4300; Sls. Mgr: D.L. Bromley
ELECTRON ENTERPRISES, INC., 6645 Stanley Ave., Berwyn, Ill., 60402, Tel: 312-BI-2-2636; Sls. Mgr: J. Halleck
ELECTRON-MACHINE CORP., Box M, Umatilla, Fla., 32784, Tel: 904-669-3101; Sls. Mgr: R.G. Sheppard
ELECTRON TECHNOLOGY, INC., 626 Schuyler Ave., Kearny, N.J., 07032, Tel: 201-998-8100; Sls. Mgr: G.G. Perry
ELECTRONAUTICS, Dept. Dielectric Comm., Newton Rd., Littleton, Mass., 01460, Tel: 617-486-3575, TWX: 710-347-0650; Sls. Mgr: N.J. Diehm

Advertisement

Designing, Engineering & Manufacturing Loads from Waveguide Sizes WR28 thru WR650 *Low Power Terminations, Tongue Loads, Step Loads Cone Loads
*Hi Pow Dummy Loads from 40 watts to 8000 watts avg. power
*Special Configurations, Stripline Load Elements Attenuators Bushings, Damping Rings
*Bar Stock Material: Round, Square & Waveguide Size
Write for new catalog and price lists

ELCTRN. APPLICATIONS, 2213 Edwards Ave., S. El Monte, Cal., 91733, Tel: 213-442-3212; Sls. Mgr: W.M. Podolece ....Pgs. 1694-1696
Cal Altadena, Dorr Wagner Assoc., Box 485 213-681-4060
Cal San Carlos, Stahl Entprs., Box 207 415-592-6829
Fla Altamonte Spgs., WMM Assoc., 515 Tivoli Ct. 305-831-4645
Fla Clearwater, WMM Assoc., 1260A S. Highland 813-446-0075
Fla Pompano Beach, WMM Assoc., 721 S.E. 6th Terr. 305-943-3091
Ill Barrington, Perhats Assoc., 1280 Burr Oak La. 312-381-6360
Kans Shawnee Mission, M.E. Bettis, Box 598 913-362-0772
Kans Whichita, M.E. Bettis Co., 423 N. Fountain 316-685-7441
La New Orleans, J. Kennedy, 715 Camp St. 504-523-7559
Md Baltimore, M/E Assoc., 320 Hillen Rd. 301-825-1130
Mass Lexington, KC Stevens, Box 24 617-862-1812
Mich Birmingham, OEM Sls., Box 68 313-647-1172
Mo St. Louis, M.E. Bettis Co., 9103 Bessemer 314-429-2099
NJ Little Falls, Carbone Assoc., Box 181 201-356-9191
NY Rochester, Ossmann Comp., 39 Saginaw 716-442-3290
NY Syracuse, Ossmann Comp., 132 Pickard Bldg. 315-454-4477
NY Vestal, Ossmann Comp., 1901 Vestal Pwy. 607-785-9949
Pa Jenkintown, Arnold, Box 1012 215-887-7870
Tex Dallas, G. Weinreich, 11554 E. Northwest Hwy. 214-321-2800
Tex Houston, G. Weinreich, Box 928 713-473-4618
Va Richmond, M/E Assoc., Box 9764 703-266-3457
WashSeattle, Vantage, 621 S. Michigan 206-767-5212
EXP: Cal., L.A., Amrus Entprs., 5455 Wilshire 213-936-2202

ELECTRONIC ARRAYS, INC., 501 Ellis St., Mountain View, Cal., 94040, Tel: 415-964-4321, TWX: 910-379-6985; Mktg. Mgr: R.M. Eiler

ELCTRN. ASSOCS., Comps. Div., 197 Monmouth Pkwy., W. Long Branch, N.J., 07764, Tel: 201-229-1100, TWX: 710-722-6597; Sls. Mgr: J.K. McCormick ....Pg. 2381
Cal Burbank, Weightman, 1226 W. Olive 213-849-7711
Cal Menlo Pk., Weightman, 120 Santa Margarita 415-325-2885
Fla Orlando, Buchanan & Abrams, Box 6026 305-423-8995
Ill Chicago, R.M. Puzerewski, 8159 W. Balmoral
Mass Canton, New England Elec., 590 Wash. 617-828-4835
NY Williston Pk., A.B.C. Elctrn., 275 Hillside 516-747-6610
Ohio Cleveland, Weschler Elec., 4250 W. 130th 216-251-4609
Pa Flourtown, Avenir, Inc., Box 234 215-836-4400
EXP: N.Y., NY, A. Johnson, 110 E. 95th 212-758-3200

ELECTRONIC BATTERIES, INC., 28-34 35th St., Brooklyn, N.Y., 11232, Tel: 212-499-5301; Sls. Mgr: D.G. Scheu
ELCTRN. BRAZING CO., 38 Railroad Ave., Hackensack, N.J., 07601, Tel: 201-343-4674; V.P: N.M. Tymosz
ELCTRN. CHEMICAL CORP., 813 Communipaw Ave., Jersey City, N.J., 07304, Tel: 201-332-2877; Pres: Wm. Gottlieb
ELCTRN. COILS, 33 Lyman St., Springfield, Mass., 01101, Tel: 413-736-6339; Pres: R.E. Lawson
ELCTRN. COMM., INC., Sub. NCR, 1501 72nd St., N., St. Petersburg, Fla., 33733, Tel: 813-347-1121, TWX: 810-863-0377; Asst. V.P: K.L. Carlson
ELCTRN. COMPONENTS CORP., Box 157, Addison, Ill., 60101, Tel: 312-543-7720; Sls. Mgr: J.F. Mattuck
ELCTRN. CONCEPTS, INC., Box 627, Eatontown, N.J., 07724, Tel: 201-542-7[illegible]
ELCTRN. CONTROL CO., Box S150, Dresher, Pa., 19025, Tel: 215-TU-4-4450; Sls. Mgr: J. Sullivan
ELECTRONIC CONTROL CORP., 15341 Dale, Detroit, Mich., 48223, Tel: 313-KE-3-6219; Pres: S.C. Lawrence
ELCTRN. CONTROL SYS., Box 1232, Fairmont, W. Va., 26554, Tel: 304-363-8632; Sls. Mgr: M. Glazer

ELCTRN. CONTROLS, INC., See T-Bar Inc.

ELECTRONIC DESIGN LABS., INC., 1618 W. Olney Ave., Phila., Pa., 19141, Tel: 215-224-3565; Dir. Sls: E.C. Rotar

ELECTRONIC DEV. CORP., 11 Hamlin St., Boston, Mass., 02127, Tel: 617-268-9696; Sls. Mgr: R.B. Ross Pgs. 456,457
Cal Palo Alto, Garner Laine, 825 San Antonio 415-328-1717
Cal Pasadena, Wright Engrg., 180 E. Calif. Blvd. 213-681-2651
Colo Boulder, A.L.S. Elctrns., 1932-14th St. 505-447-2436
Conn Hamden, Applied Meas., 2531 Whitney 203-288-5288
Fla Ft. Laud., Nine Assocs., 3440 N.E. 12th 305-566-8409
Ill Des Plaines, Marsland Assocs., 1000 Executive Way 312-298-2620
Ind Indpls., Marsland Assocs., 3734 Carrollton 317-924-3568
Mass Acton, Applied Meas., Inc., Box 316 617-646-7250
Mich Ferndale, Tiby Co., 380 Hilton Rd. 313-547-3550
Minn Mpls., Marsland Assocs., 231 N. Edgewood 612-545-4481
Mo Florrissant, Marsland Assocs., 100 St. Francois 314-831-0015
NM Albuquerque, A.L.S. Elctrns., Box 11626 505-268-9600
NM Alamogordo, A.L.S. Elctrns., Box 1498 505-437-7576
NY Great Neck, Industron Assocs., 300 Northern 516-487-2620
NY Rochester, Ossmann Instrs., 474 Thurston 716-328-2230
NY E. Syracuse, Ossmann Instrs., Inc., 6666 Old Collamer Rd. 315-437-6666
NY Vestal, Ossmann Instrs., Vestal Pkwy. 607-785-9947
NY Wappingers Falls, Ossmann Instrs., Inc., 122 E. Main St. 914-297-7777
Ohio Cleveland, Tiby, 2245 Warrensville Ctr. 216-371-5335
Ohio Dayton, Tiby Co., 1960 N. Main 513-277-3822
Okla Tulsa, I.B.L. Engrg. & Sls., 4822 S. Wheeling 918-743-2978
Pa King of Prussia, Valley Instrs. Co., 251 W. DeKalb Pike 215-265-4450
Tex Austin, I.B.L. Engrg. & Sls., 1903 W. 34th 512-452-2064
Tex Dallas, I.B.L. Engrg. & Sls., Inc., 219 Preston Royal Ctr. 214-363-2921
Tex Houston, I.B.L. Engrg. & Sls., Inc., 3403 Audubon 713-621-3534
Utah Salt Lake Cy., A.S. Elctrns., 3385 S. 2770 E. 801-363-2921
Va Annandale, Nine Assocs., 7753 Patriot Dr. 703-256-9105
EXP: N.J., Fairfield, Pantronics, Inc., 1275 Bloomfield Ave. 212-244-2855
For: Can., Weston, Ont., Conway Elctrn. Enterprises, 88 Arrow Rd.

ELCTRN. DEV. LABS., 19 Newtown Rd., Plainview, N.Y., 11803, Tel: 516-293-8997; Gen'l. Mgr: N.H. Polsky

ELCTRN. DEVICES, 21 Grey Oaks Ave., Yonkers, N.Y., 10710, Tel: 914-965-4400, TWX: 710-560-0021; Sls. Mgr: S. Winuk ....Pgs. 1802-1805
Ala Huntsville, Beacon, Box 4307 205-881-5031
Ariz Scottsdale, Mercury Engrg. Sls., Box 3130 602-945-1927
Cal Los Angeles, M. Stolaroff, 4622 W. Slauson 213-295-7781
Cal Mountain View, Repex, Box 807 415-969-9200
Colo Denver, Walter Engrg., 880 Bonnie Brae Bl. 303-777-5585
Fla Maitland, Beacon, Box 1278 305-647-3498
Fla Ft. Lauderdale, Beacon, 651 N.E. 45th St. 305-564-4298
Ga Atlanta, Beacon, 2285 Peachtree Rd., N.E. 404-351-3654
Ill Chicago, Berndt Assocs., 6200 N. Hiawatha Ave. 312-283-0713
Ill Chicago, Rozner Sls., 4720 N. Central 312-283-0022
Iowa Cedar Rapids, Reid Assocs., 526 MNB Bld. 319-362-6302
Kans Overland Pk., Penzner-Mankus, Box 6264 913-DU-1-0004
Mass Lexington, Contact Sls., Inc., 49 Waltham St. 617-861-1550
Mich Benton Harbor, J. Morrow Sls., Fairplain Plaza 616-927-3134
Minn St. Paul, Cahill Assocs., 3000 Hudson Rd. 612-739-8445
Mo Hazelwood, Penzner-Mankus, 400 Brookes 314-731-4334
NY Valley Cottage, LRC Assocs., Box 114 914-634-7973
NY Syracuse, Carlen Reps., 3650 James St. 315-437-2921
Ohio Aurora, EMA, Inc., Box 275 216-562-6104
Ohio Centerville, EMA, Inc., Box 191 513-433-2800
Pa Oreland, Brown-Frederick & Assocs., 88 Pennsylvania Ave. 215-TU-7-1325
Tex Garland, Carter Assocs., Box 87 214-276-7151
Va Falls Church, Beacon, 207 Park Ave. 703-534-1673
EXP: N.Y., Yonkers, Elctrn. Devices, N.Y., 21 Gray Oaks Ave. 914-965-4400
For: Can., Montreal, Que., A. Deskin Sls. Corp., 1565 Louvain St., W. 514-384-1420
For: Can., Toronto, Ont., A. Deskin Sls. Corp., 78 Six Point Rd. 416-239-4329
For: Can., Vancouver, B.C., A. Deskin Sls. Corp., 1641 Venables St. 604-253-6396

ELECTRONIC DEVICES, 17877 St. Clair Ave., Cleve., Ohio, 44110, Tel: 216-692-1600; Sls. Mgr: E. Warner

ELECTRONIC ENCLOSURES, Div. Wyle Labs., Box 90978, El Segundo, Cal., 90009, Tel: 213-679-0181; Sls. Mgr: J. Gordon ....Pg. 2315
Cal Monte Sereno, R. McGee, 16290 Ridgecrest Ave. 408-354-8466
Conn Trumbull, H. Belanger, 38 Woolsey Ave. 203-268-5352
Md Rockville, Marktron, 651 Lofstrand La. 301-762-6210
Md Towson, Marktron, 202 W. Pennsylvania Ave. 301-825-8222
NJ Pennsauken, Elctrn. Enclosures, Inc., 7825 Airport Hwy. 609-665-6810

ELCTRN. ENGRG. CO. CAL., Elctrn. Prods., 1441 E. Chestnut Ave., Santa Ana, Cal., 92701, Tel: 714-547-5651, TWX: 910-595-1550; Dir. Mktg. B. Fordiani Pg. 1909
Md Silver Spring, EECO, Box 769 301-588-0727
NJ Ho-Ho-Kus, EECO, Box 335 201-444-3220
NY Rochester, EECO, Box 7492 716-621-2410

ELECTRONIC ENGRG. CO. CAL., Computer Equip., 1601 E. Chestnut Ave., Santa Ana, Cal., 92702, Tel: 714-547-5501, TWX: 910-595-1550; Sls. Mgr: R.T. Clark

ELECTRONIC ENGRS., INC., 1639 W. Evergreen Ave., Chicago, Ill., 60622, Tel: 312-227-2600; Sls. Mgr: J.V. Man
ELCTRN. ENTERPRISES, 775 S. Madison Ave., Pasadena, Calif., 91106, Tel: 213-798-0511; Sls. Mgr: J.H. Cone

ELCTRN. ENTERPRISES, 65 7th Ave., Newark, N.J., 07104, Tel: 201-485-8500; V.P: J.J. Remmert Pg. 1996
EXP: N.Y., Westbury, Minthorne Int'l., 2200 Shames Dr. 516-334-3303
For: Can., Montreal, Que., Future Elctrns. Corp., 4310 Girovard Ave. 514-481-7701
ELECTRONIC FUNCTIONS DIV. TRW INC., Davis & Copewood Sts., Candem, N.J., 08103, Tel: 609-365-5500, TWX: 710-891-7087; Sls. Mgr: F. Weigold

ELECTRONIC HARDWARE, 180-10 Liberty Ave., Jamaica, N.Y., 11433, Tel: 212-291-2710; Sls. Mgr: H. Goodman ....Pg. 1456
Cal Hawthorne, Electro-Sonic Comps., 14126 Lemoli Ave. 213-679-9781
Colo Littleton, Action Sls., 6367 S. Gallup 303-794-0447
Conn Hamden, Impact Sls. Co., 60 Connolly Pkwy. 203-248-9368
Fla Orlando, Geartner Assocs., Inc., 1211 Lee Rd. 305-299-1000
Fla Miami Beach, Geartner Assocs., Inc., 350 Lincoln Rd. 305-531-0200
Ill Skokie, Saffro & Assoc., 3736 Dempster Ave. 312-588-0905
Ind Indianapolis, Tech. Reps., 4000 Meadows Dr. 317-546-4967
La New Orleans, G.V. Peck Co., Box 8087 504-282-1553
Mass Waltham, Impact Sls. Co., 223 Crescent St. 617-893-2850
Mich Kentwood, R.W. Hicks & Assoc., 1299 Gentian Dr., S.E. 616-455-1354
Minn Minneapolis, Bitronics Sls. Co., 6245 Thomas Ave., So. 612-925-2944
Minn Minneapolis, P.L. Coppini Sls. Co., 2907 E. Franklin Ave. 816-842-1760
NJ Keasbey, Addem/2, 1258 Teaneck Rd. 201-721-6449
NJ River Edge, Meg Sls., 792 Kinderkamack Rd. 201-265-9887
NY Buffalo, Telesco Assoc., 395 Cleveland Dr. 716-834-1026
NY Manhasset, HRC Assoc., 390 Plandome Rd. 516-627-4644
Okla Tulsa, G.V. Peck Co., 729 W. 5th St. 918-585-5853
Tex Dallas, G.V. Peck Co., 210 Casa Linda Plaza 214-328-3511
Tex Houston, G.V. Peck Co., 5757 Bellaire Blvd. 713-664-1435
Va Fairfax, T. Davis Marketers, 10713 Almond St. 703-591-7390
Wash Mercer Island, J.H. Andersen Assoc., Box 637 206-232-0484
ELCTRN. IDEAS, Reading Sta., Wyncote, Pa., 19095, Tel: 215-TU-6-4770; Sls. Mgr: B. Cole

ELCTRN. INSTR. & SPECIALTY, 71 Cross St., Winchester, Mass., 01890, Tel: 617-729-1202; Sls. Mgr: R.A. Painter ....Pg. 1706
Cal Anaheim, L & M Sls., Box 6255 714-774-0492
Cal San Jose, Grosken, Inc., 330 Phelan Ave. 408-293-3108
Fla Winter Pk., Spartak, 410 Phelps Ave., S. 305-644-3023
Ill Glen Ellyn, Repwood, 260 Sunset Ave. 312-469-2344
NJ Nutley, I. Brill, 326 Hillside Ave. 201-667-0653
NC Charlotte, B. Jackson, 4632 Randolph Rd. 704-366-6678
Pa Lansdowne, W. F. Satterthwaite, 237 N. Lansdowne 215-623-5100
Tex Houston, Texas Special Elctrn. Comps., 7024 Mapleridge 713-666-5871
ELECTRONIC MACH. PARTS, 128-11 18th Ave., College Point, N.Y., 11356, Tel: 212-IN-1-8850; Pres: W.T. McAdam

ELCTRN. MEAS. INC., 405 Essex Rd., Neptune, N.J., 07753, Tel: 201-922-9300; Sls. Mgr: R.H. Schlote Pg. 702
Ala Huntsville, Lee Assocs., Inc., Box 1506 205-883-2530
Conn Meriden, P. Sturgeon, 99 Colony St. 203-237-1112
Fla Orlando, Lee Assocs., 200 E. Marks St. 305-241-4445
Ill La Grange, Bard, La Grange Ind'l. Pk. 312-354-0660
Ind Indianapolis, Bard, 4000 Meadows Dr. 317-547-3113
Kans Lenexa, Bard, 13100 W. 95th St. 913-888-2673
Md Rockville, Farrell Assoc., 230 N. Wash. 301-424-9460
Mass Chestnut Hill, P. Sturgeon 617-734-7710
Mich Orchard Lake, Sidnell, 6051 Pinecroft 313-851-3518
Minn Mpls., Bard, 4640 W. 77th St. 612-922-8233
NY Wappinger Falls, Ossmann Instr., 122 E. Main 914-297-7777
NY E. Syracuse, Ossmann Instr., 6666 Old Collamer 315-437-6666
NY Huntington Sta., Metro Tech. Mktg., 163 E. 2nd 516-549-8388
NY Rochester, Ossmann Instr., 474 Thurston 716-328-2230
NY Vestal, Ossmann Instr., 1901 Vestal Dr. 607-785-9947
NC Winston-Salem, Lee Assocs., Box 15045 919-724-2406
Ohio Dayton, R. Sidnell, 3300 S. Dixie 513-293-1194
Ohio Mentor, Sidnell, 7191 Dogwood Ln. 216-942-3304
Tex Dallas, Lear Assoc., Box 1266 214-231-7696
For: Can., Stittsville, Ont., Instronics Techno-Prods., Ltd., Box 100 613-836-4411
ELECTRONIC MEAS. CORP., 625 Broadway, New York, N.Y., 10012, Tel: 212-GR-5-0610; Sls. Mgr: M. Lieblich
ELCTRN. MEMORIES, 12621 Chadron Blvd., Hawthorne, Cal., 90252, Tel: 213-644-9881, TWX: 910-325-6213; Sls. Mgr: M.E. Lamph
ELECTRONIC MODULES, INC., 2500 E. Foothill Blvd., Pasadena, Cal., 91107, Tel: 213-795-4231; Sls. Mgr: G.E. Albrecht
ELCTRN. MODULES CORP., Box 141, Timonium, Md., 21093, Tel: 301-666-3300, TWX: 710-862-2638; Sls. Mgr: R. Vogel

ELCTRN. MOLDING CORP., 96 Mill St., Woonsocket, R.I., 02895, Tel: 401-769-3800, TWX: 710-387-1350; Sls. Mgr: H. Fortson ....Pg. 2626
Conn Fairfield, Schumacher & Yarrington, Box 304 203-259-0772
Me Denmark, Great Northern Elctn. 207-452-2800
Md Greenbelt, Jadelectronic Assoc., Box 119 301-474-8161
Minn Minneapolis, Countryman Assoc., 1821 University Ave. 612-645-9151
NY Tuckahoe, Spectrum Sales, 65 2nd Ave. 914-793-1660
Pa Philadelphia, Jadelectronics Assoc., 4338 N. Third St. 215-455-3355
RI Warwick, Schumacher & Yarrington, Box 269 401-884-5671
Tex Dallas, Texport Co., 2411 Farrington St. 214-631-6270
For: Can., Montreal, Que., Future Elctrn. Corp., 6655 Cote-des-Neiges Rd. 514-735-5725
ELCTRN. NAVIGATION INDS., INC., 1337 E. Main St., Rochester, N.Y., 14609, Tel: 716-288-2420; Sls. Mgr: L.M. Salmen
ELCTRN. PRECISION COMPS., 2 Brookdale Pl., Mt. Vernon, N.Y., 10550, Tel: 914-664-2333; Pres: D.R. Edwards

ELECTRONIC RESCH. ASSOCS., 67 Sand Park Rd., Cedar Grove, N.J., 07009, Tel: 201-239-3000, TWX: 710-994-5789; Sls. Mgr: J.B. Rogers ....Pgs. 707-709
Ala Huntsville, Reynolds, 904 Bob Wallace 205-536-1941
Cal Burbank, Tech-Ser, Inc., 2435 N. Naomi 213-846-9631
Cal Palo Alto, Tech-Ser, 800 San Antonia 415-326-6400
Cal San Diego, Tech-Ser, Inc., Box 10544 714-222-1121
Fla Ft. Laud, Reynolds & Assoc., 161 S.W. 75th 305-581-6611
Fla Orlando, Reynolds & Assoc., Box 8877 305-843-6440
Fla Melbourne, Reynolds, Box 1043 305-727-3205
Ga Atlanta, Reynolds, 175 W. Wieuca 404-252-5360
Md Baltimore, Stemler, 6707 Whitestone 301-944-8262
Mich Farmington, W. R. Hummon, Box 501 313-474-0661
NJ Cherry Hill, Stemler Assoc., Inc., Box 287 609-966-3477
NY Fayetteville, M. P. Andrews, 319 Mott 315-637-3144
NC Charlotte, Electro-Rep Assoc., 128 W. 30th St. 704-333-0451
Okla Okla Cy, Ammon & Champion, Box 12274 405-948-2222
Okla Tulsa, Ammon & Champion, Box 4682 918-627-7670
Pa Paoli, Stemler Assoc., Inc., Box 711 215-644-3477
Tex Dallas, Ammon & Champion, Box 35263 214-357-8441
Tex Houston, Ammon & Champion, Box 35552 713-729-1233
Va Alexandria, Stemler, 306 N. Wash. 703-548-7818

ELECTRONIC RESEARCH CO., A Textron Co., Box 913, Shawnee Mission, Kans., 66202, Tel: 913-631-6700, TWX: 910-749-6477; Sls. Mgr., Instrs: R.L. Rush Pgs. 458,1384
Ala Huntsville, Lee Assocs., Inc., Box 1506 205-539-0761
Ala Huntsville, 20th Century Mktg., Box 6127 205-772-9237
Cal Costa Mesa, Meas. Assocs., 2955B Harbor Blvd. 714-540-7160
Cal Menlo Pk., J. S. Heaton Co., Box 2087 415-369-4671
Cal Sunnyvale, Meas. Assocs., Box 2162 408-739-7785
Cal Van Nuys, Shepard Comp., 16152 Covello 213-787-4610
Colo Broomfield, Arrowhead Sls., Box 335 303-222-6462
Colo Denver, Engrg. Resch., 231 Detroit 303-377-8306
Conn New Canaan, S. Pierce, 115 Bald Hill Rd. 203-966-4630
Fla Clearwater, Dyne-A-Mark, 1665 Magnolia 813-446-2991
Fla Fern Pk., Dyne-A-Mark Corp., Box 128 305-831-5100
Fla Orlando, Lee Assocs., 200 E. Marks 305-241-4445
Fla Pompano Bch., Dyne-A-Mark, 1010 E. Atlantic 305-942-5870
Ga Chamblee, Lee Assocs., Box 80666 404-457-7117
Ill Wilmette, Crest Assocs., 505 4th St. 312-256-5202
Ill Oakbrook, Whitmore Assocs., 1301 N. 22nd 312-325-4727
Kans Prairie Vlg., Thunderbird Tech., 4014a W. 95th 913-642-7220
Kans Wichita, Thunderbird Tech., 7707 E. Osie 316-684-3941
Ky Ft. Mitchell, G. W. Thelen, 3273 New Orleans Dr. 606-341-8181
Ky Louisville, Ridgway East, 3807 Bishop 502-968-2292
Md Rockville, Farrell Assocs., 230 N. Wash. St. 301-424-9460
Md Towson, H.J. White Co., 320 Hillen Rd. 301-VA-8-6373
Mass Belmont, Vector Sls., 774 Pleasant St. 617-489-1400
Mass Norwood, S. Pierce, Inc., 24 Linden St. 617-762-3164
Mich Detroit, Ridgway East, 25210 Five Mile Rd. 313-538-4940
Minn Mpls., C.R. Gibb, 1311 W. 25th St. 612-377-1200
Minn Mpls., Whitmore Assocs., 7710 Computer 612-926-2855
Mo Hazelwood, Thunderbird Tech., 400 Brookes 314-731-4343
Mo Kansas City, Prod. Automation, Box 11584 816-763-2132
NJ Cherry Hill, H. White, 499 Cooper Landing 609-828-6373
NJ Englewood, Central Assocs., 44 N. Dean 201-568-0808
NJ Riverdale, Comp. Tech. Sls., Box 50 201-835-0332
NM Albuquerque, Arrowhead Sls., Box 243 505-268-9706
NY Latham, L-Tron Corp., Box 114 518-785-5032
NY Lynbrook, Comp. Tech. Sls., Box 384 516-593-2628
NY Plainview, Central Assocs., 11 Commercial 516-433-0808
NY Rochester, H.R. Murray, 113 Gilbert 716-244-1100
NY Skaneateles, L-Tron Corp., Box 147 315-685-6172
NY Syracuse, H. R. Murray, DeWitt, Box 11 315-446-5555
NY Tonawanda, L-Tron Corp., 123 Dalewood Dr. 716-693-0887
NC Winston-Salem, Lee Assocs., Box 15024 919-724-2406
Ohio Fairview Pk., Ridgway East, 20881 Lorain 216-333-1300
Ohio Loveland, Ridgway East, Box 68 513-683-4350
Pa King of Prussia, LEtronix, 211 W. DeKalb 215-265-1020
Pa Bessemer, Ridgway East, Box 626 412-667-8573
Tex Dallas, R. Martin, 6211 Denton 214-358-3704
Tex Ft. Worth, W.P. Fralia, Box 12625 817-738-2002
Tex Houston, R. Martin, Box 1002

Utah Salt Lake City, Arrowhead Sls., Box 15386 801-487-3444
Wash Seattle, Blum & Assoc., 1818 Westlake N 206-284-4082
For: Can., Montreal, Que., Future Elctrns. Corp., 6655 Cote des Neiges Rd. 514-735-5775

ELCTRN. RESOURCES-COUNTER PROD. GROUP, 4561 Colorado Blvd., L.A., Cal., 90039, Tel: 213-246-6761, TWX: 910-497-2264; Sls. Mgr: R. Sayre

ELCTRN. RESOURCES DIV., Tasker Inds., 4561 Colorado Blvd., Los Angeles, Cal., 90039, Tel: 213-246-6761, TWX: 910-497-2264; Dir. Mktg: T.L. Atherton

ELCTRN. SEALS, 13766 Saticoy St., Van Nuys, Cal., 91402, Tel: 213-873-4982; Sls. Mgr: H. Adelman

ELCTRN. SVC., 201 Linden Ave., Verona, N.J., 07044, Tel: 201-239-0303; Sls. Mgr: W. Zilinsky

ELCTRN. SPACE PRODS., 854 S. Robertson Blvd., Los Angeles, Cal., 90035, Tel: 213-657-5540; Sls. Mgr: A. Freeland

ELCTRN. SPECIALTY, Connecticut Div., 401 Watertown Rd., Thomaston, Conn., 06787, Tel: 203-283-5801, TWX: 710-475-0537; Sls. Mgr: R. Jacques

ELECTRONIC SPECIALTY DIV., Datron System, 18900 N.E. Sandy Blvd., Portland, Ore, 97220, Tel: 503-665-0121, TWX: 910-469-8782; Sls. Mgr: R. Lisdero Pgs. 1698-1705

Ariz Scottsdale, F. Schoeffler, 7224 N. Lakeside 602-948-3470
Cal Palo Alto, Mauldin Co., 200 California 415-326-5291
Cal Pico Rivera, Westrep, 9519 Telegraph 213-949-2551
Colo Denver, Daniels-Padgett, 2785 N. Speer 303-433-7181
Fla Winter Pk., Spartak, Box 915 305-644-3023
Ill Hinsdale, J. O. Allyn, 419 S. Bruner 312-325-0495
Iowa Cedar Rapids, Halgin Sls., 4403 First Ave. S.E. 319-363-5119
Kans Mission, Halgin Sls., 5460 Buena Vista 913-722-2441
Md Hyattsville, L.D. Lowery, 6200 Annapolis 301-773-4977
Mass Natick, G. Rosen, 563 Worcester 617-655-2211
Mich Franklin, Berberich Assoc., 31425 Nottingham 313-626-7508
Minn Minneapolis, Hasse & Assoc., Box 22707 612-588-0551
Minn St. Paul, Countryman Assoc., 1821 University 612-645-9151
NJ E. Orange, Masin-Esco, 263 Central 201-674-6505
NJ Neptune, L. K. Haner, 1420 7th Ave.
NY Commack, L. K. Haner, Box 101 516-368-6668
NY Syosset, Masin - Esco, 333 Jackson 516-364-0310
NY Syracuse, C. W. Floring, Box 175 315-478-2149
Ohio Dayton, Berberich Assoc., 4130 Linden 513-252-9981
Pa Broomall, L. D. Lowery, 2800 W. Chester Pike 215-356-5300
Pa Harrisburg, L. D. Lowery, 1501 Allison St. 717-233-0917
Tex Dallas, R. R. Thomas, 8616 N.W. Plaza Dr. 214-363-8591
Wash Seattle, H. Levinson, 1211 E. Denny Way 206-323-5100
EXP: Los Angeles, Cal., Sumitomo Shoji America, 606 S. Olive St. 213-627-4783
For: Toronto, Ont., Can., Wislon Entprs., 386 Bering Ave. 416-231-7536
For: Roxboro, Que., Can., Wilson Entprs., Box 115 514-684-0383

ELCTRN. SYS. ENGRG., 120 1/2 N. Cleveland, Cushing, Okla., 74023, Tel: 918-CA-5-1266; Sls. Mgr: A.A. Kaminshine

ELCTRN. TRANSFORMER CORP., 460 Totowa Ave., Paterson, N.J., 07509, Tel: 201-279-4445; Sls. Mgr: A. Cezar

ELECTRONIC TRANSISTORS, 153-13 Northern Blvd., Flushing, N.Y., 11354, Tel: 212-539-6700; Sls. Mgr: M.F. Byrnes

ELCTRNS., LTD., 3545 Third Ave., Marion, Iowa, 52302, Tel: 319-377-3566; Sls. Mgr: D. Meuler

ELECTRONICS MISSILES & COMMS., Box 116, White Haven, Pa., 18661, Tel: 717-443-9575; Sls. Eng. Mgr: S. Koppelman

ELECTRONS CO., Unit of General Signal Corp., 65 Passaic Ave., Fairfield, N.J., 07110, Tel: 201-621-9666; Sls. Mgr: R.E. Allison .... Pg. 1451

ELECTROPHYSICS CORP., 48 Spruce St., Nutley, N.J., 07110, Tel: 201-667-2262; Sls. Mgr: L.M. Vallese

ELECTROSPACE CORP., 956 Brush Hollow Rd., Westbury, 11590, Tel: 516-997-7000 .... Pg. 323

Cal No. Hollywood, Assoc. Inds., 6855 Tujunga Ave. 213-877-5458
DC Washington, G. Gill, 1101 17th St., N.W. 202-296-7997

ELECTROSPACE SYSTEMS, Box 1359, Richardson, Tex., 75080, Tel: 214-231-9303; Sls. Mgr: R.L. Carrel

ELECTROTEC, INC., 3726 Cavalier Dr., Garland, Tex., 75040, Tel: 214-276-8394; Mkt. Mgr: W.C. Cloyd

ELECTROTOOLS, INC., 1422 Roosevelt Rd., Broadview, Ill., 60153, Tel: 312-681-6110, TWX: 910-226-4944; Sls. Mgr: H.J. Deerwester

ELECTROVERT, INC., 86 Hartford Ave., Mt. Vernon, N.Y., 10553, Tel: 914-664-6090; Sls. Mgr: D. Reynolds

ELEXON INC., 1422 E. St. Gertrude, Santa Ana, Cal., 92705, Tel: 714-540-9510, TWX: 910-595-1126; V.P. Mktg: L. Towle .... Pg. 706

ELFAB CROP., Box 34555, Dallas, Tex, 75234, Tel: 214-239-7181, TWX: 910-860-5137; Sls. Mgr: P.S. Lyon Pg. 2627

Cal Hollywood, Westaironics, 1800 N. Highland Ave. 213-466-6201
Fla Orlando, G. F. Bohman Assoc., 7040 Lake Ellnor 305-855-0274
Ill Chicago, Gassner & Clark, 6644 N. Western Ave. 312-764-6121
Md Towson, Micro-Comp., 660 Kenilworth Dr. 301-823-3603
Mass Lexington, Circuit Sls., One Militia Dr. 617-861-0567
Mich Lathrup Village, R. C. Nordstrom & Co., Box 32 313-444-4417
Minn Mipls., S. Clothier Co., 7400 Lyndale Ave., S. 612-869-3231
NJ Springfield, F.F. Sylvester Assocs., Box 207 201-376-3324
NC Winston-Salem, Elctrn. Mktg., 928 Burke St. 919-722-5151
Okla Okla. City, Ammon & Champion, Box 12274 504-721-6417
Pa Glenside, Elcom, Inc., 130 S. Easton Rd. 215-885-1325
Pa Huntingdon Valley, F. Inacker, 2436 Ayersdon Ave. 215-947-6224
SC Greenville, Elctrn. Mktg., 808 Botany Rd. 803-268-1125
Tex Dallas, Ammon & Champion, Box 34555 214-233-5591
Tex Houston, Ammon & Champion, Box 35552 713-729-1233
For: Can., Montreal, Que., Deskin Sls., 1565 Louvain St., W. 514-384-1420
For: Can., Toronto, Ont., Deskin Sls., 78 Six Point Rd. 416-239-4329

ELGAR CORP., 8159 Engineer Rd., San Diego, Cal., 92111, Tel: 714-279-0800, TWX: 910-335-1246; V.P. Mktg: R.H. Wheelock .... Pgs. 703-705

Ala Huntsville, BCS, 3322 S. Memorial Pkwy. 205-881-6220
Ariz Phoenix, Barnhill, 537 E. Osborn 602-263-1250
Cal Cupertino, T. Snitzer, 10320 Saratoga-Sunnyvale 408-257-8333
Cal Del Mar, T. Snitzer, 1150 Camino del Mar 714-454-2191
Cal L.A., T. Snitzer, 9005 Exposition 213-836-6170
Colo Denver, Barnhill, 1170 S. Sheridan 303-934-5505
Conn Hamden, Scien. Devices-NE, 2315 Whitney 203-248-9361
DC Wash., Eastern Instr., 5410 Indian Head Hwy. 202-333-8880
Fla Orlando, BCS, 940 N. Fern Creek 305-843-1510
Ill Chicago, Carter Elctrns., 4919 W. 63rd St. 312-585-5485
Ind Indianapolis, Carter Elctrns., 6333 Hollister 317-293-0696
Iowa Cedar Rapids, Palatine Engrg., 720 Third S.E. 319-365-8071
Kans Andover, Palatine Engrg., 1722 Terry La. N. 316-683-7512
Kans Overland Pk., Palatine Engrg., 7520 W. 63rd. St. 913-262-5643
Mass Wakefield, Scien. Devices-NE, 591 North 617-246-0920
Mich Detroit, B. Hocker, 26847 Grand River 313-531-1403
Minn Mpls., Carter Elctrns., 1025B Evergreen La. 612-544-9393
Mo St. Louis, Palatine Engrg., 1573 N. Warson 314-426-7055
NM Albuquerque, Barnhill, 1410-D Wyoming N.E. 505-299-7658
NY Albany, J. Reagan, 6 Highland Ave. 518-489-4777
NY Binghamton, J. Reagan, 52B Crestmont 607-723-9661
NY Great Neck, Meas. Technology, 295 Northern 516-482-3500
NY New Hartford, J. Reagan, 41 Woodberry 315-732-3775 for Utica
NY Rochester, J. Reagan, 891 Monroe 716-473-2115
NC Greensboro, BCS, 1039 E. Wendover 919-273-1918
Ohio Dayton, B. Hocker, 1400 Devereux 513-298-8638
Pa Phila., Eastern Instr., 613 Cheltenham 215-927-7777
Tex Houston, Barnhill, 3810 Westheimer 713-621-0040
Tex Richardson, Barnhill, 312 N. Central Expwy. 214-231-2573
Utah Salt Lake City, Barnhill 801-487-1327
Wash Bellevue, Brennan, 208 Carlson 206-454-9332
Wisc Milwaukee, Carter Elctrns., 6400 W. Capitol 414-464-5555
EXP: San Diego, Elgar, 8159 Engineer 714-279-0800

ELGENCO, INC., 1550 Euclid St., Santa Monica, Cal., 90404, Tel: 213-451-1635, TWX: 910-343-6475; Sls Mgr: D. Cusworth .... Pgs. 460-465

Ala Huntsville, Lee Assocs., Box 1506 205-539-0761
Cal Sherman Oaks, Windsor Dynamics, Box 5500 213-989-3631
Cal Woodside, Windsor Dynamics, 195 Greer 415-854-4870
Conn Glastonbury, Instrs. Reps., Inc., 124 Hebron Ave. 203-633-0777
DC Washington, R. Davies Assoc. 301-587-3910
Fla Orlando, Lee Assocs., 200 E. Marks 305-241-4445
Ga Chamblee, Lee Assocs., Box 80666 404-457-7117
La New Orleans, M. Speairs Operator WX 3161
Md Silver Spg., R. Davies, 10 Old Post Off. Rd. 301-587-3910
Mass Arlington, Instrs. Reps., 1046 Massachusetts 617-646-1034
Mich Detroit, Chandler, 32401 W. 8 Mile Rd. 313-476-5800
NM Albuquerque, C. Schmidt, 9611 Acoma, S.E. 505-298-2415
NY Great Neck, H. Krasner, 33 Great Neck 516-487-0690
NC Winston-Salem, Lee Assocs., Box 15004 919-724-2406
Pa New Britain, Kastle, 434 E. Butler 215-348-4466
Tex Arlington, Packard-Speairs 817-261-4424
Tex Houston, Packard-Speairs Assoc. 713-923-7616
Tex San Antonio, Packard-Speairs Assoc. Dial Opr. 2333

ELGIN ELCTRNS., Sub. Basic, Inc., Walnut St., Waterford, Pa., 16441, Tel: 814-796-2601, TWX: 510-699-6859; Sls. Mgr: L.C. Stuller

ELIN DIV., California Instrs., 5150 Convoy St., San Diego, Cal., 92111, Tel: 714-279-8620; V.P.Mktg: H.W. Clark .... Pg. 671

Ala Huntsville, Currie Aerospace, Box 1424 205-536-5650
Ariz Tempe, Recording Science, Box 27806 602-275-1372
Cal Downey, RDP, 11565-B Paramount Blvd. 213-923-6784
Cal San Jose, RDP Instrs., Inc., 100 N. Winchester Blvd. 408-248-0120
Colo Littleton, RADCO Elctrns., 2552 Ridge 303-794-4279
Conn Hamden, Applied Meas., Box 5181 203-288-5288
Fla Orlando, Currie Aerospace, Box 13229 305-855-0843
Ill Rosemont, Cozzens & Cudahy, 9501 W. Devon 312-825-1144
Ind Indianapolis, Cozzens & Cudahy, 647 Mulford Ct. 317-244-2456
Mass Acton, Applied Meas., Box 316 617-263-2766
Minn Minneapolis, Cozzens & Cudahy, 7450 France Ave. S. 612-920-1022
Mo St. Louis, Cozzens & Cudahy, 10534 Natural Bridge 314-423-1234
NJ Fairfield, KLS Assocs., 387 Passaic 201-227-2900
NJ Hazlet, Mer Mon (2M) Elctrn. Instru., Box 302 201-264-1851
NM Albuquerque, Bennewitz, 9720 Candelaria, N.E. 505-298-6775
NM Albuquerque, Recording Science, 1811 Carlisle N.E. 505-265-7631
NY New York, Labtronics, 130 Pickard Bldg. 315-454-9314
NC Winston-Salem, Currie Aerospace Assocs., Box 10329 919-725-1927
Ohio Medina, Cozzens & Cudahy, 735 South Ct. 216-725-5660
Pa Abington, Bach-Stewart, 947 Old York 215-927-1200
Tex Austin, SESCO, 512 E. Riverside 512-444-6694
Tex El Paso, Recording Science, Box 4033 915-565-5530
Tex Houston, SESCO, 5757 Bellaire Blvd. 713-668-7840
Tex Richardson, SESCO, 300 N. Central Expwy. 214-231-9364

Va Annandale, Nine Assocs., Box 328 703-256-9105
WashSeattle, Datacom, 2207 Fairview 206-329-2989
For: Can., Downsview, Ont., Electronetic Sys., 62 Alness 416-636-3673
For: Can., Ottawa, Ont., Electronetic Sys., 1342 Bank 613-733-3781
For: Can., Montreal, Que., Electronetic Sys., 6420 Victoria 514-342-4112

ELJAY CORP., 9062 Old Annapolis Rd., Columbia, Md., 21043, Tel: 301-730-8450; Pres: S.A. Sladek

ELLISON DRAFT GAGE CO., INC., Box 96, New Buffalo, Mich., 49117, Tel: 616-469-0110; Sls. Mgr: K.O. Plache

ELMAG CORP., 54 Clark St., Newark, N.J., 07104, Tel: 201-481-1600; Pres: I. Black

Advertisement

Elmag Corporation manufactures to customer specifications Electromagnetic Interference Filters, High Voltage and Special Capacitors. The RFI Filters achieve the optimum in the suppression of noise from all spurious energies and can be housed in virtually any package. The High Voltage and Special Capacitors are custom fabricated to meet unique specifications for High Voltage, Multiple Sections, Close Tolerances, High Capacity and High Insulation Resistance. We welcome an opportunity to serve you.

ELMECO ENGRG., 539 Beall Ave., Rockville, Md., 20850, Tel: 301-762-6823; Sls. Mgr: T. Sarkady

ELMWOOD SENSORS, INC., 1653 Elmwood Ave., Cranston, R.I., 02907, Tel: 401-781-6500, TWX: 710-381-6413; Exec. V.P: A. Nathan ....Pg. 1970
Cal Palo Alto, O'Donnell, 1955B El Camino Real 415-327-9061
Cal Torrance, O'Donnell, 18053 Crenshaw Blvd. 213-323-9243
Colo Denver, O'Brien Sls., 2785 N. Speer 303-477-4713
Fla Maitland, D & E Assocs., 2031 Chippewa Trail 305-644-3039
Ga Kennesaw, K & E Asso., Blue Springs Pk. 404-974-4264
Ill Hoffman Estates, Tech. Reps., Box 565 312-894-5189
Ind Columbus, Indl. Comps., Grandview Lake RR6 812-342-4064
Ind Marion, O. Bromberg, 1723 Overlook Dr. 317-664-5384
Iowa Cedar Rapids, Reid Assocs., 526 MNB Bldg. 319-362-6302
Ky Louisville, O. Bromberg, 10306 Hartley Dr. 502-245-8916
Md Baltimore, J. Maguire, 5716 York Rd. 301-433-2613
Mich Farmington, Davis & Martensen, 22725 Orchard Lake 313-474-8300
Minn Mpls., C. Listug Sls., 6309 Wyoming N. 612-537-6740
Mo St. Louis, E.J. Hill Co., 915 Buder Bldg. 314-621-1818
NH Durham, G. Forman, Denbow Rd. 603-868-4064
NJ Pennsauken, J. Maguire, 4608-10 Westfield 609-665-5136
NJ Ridgefield, G.M. Moch Co., 595 Broad 201-945-0080
NY Latham, L-Tron Corp., Box 114 518-785-5032
NY Binghamton, Canavan-Scanlon, 116 State St. 607-724-7220
NY Buffalo, Canavan-Scanlon, 4511 Harlem 716-839-3373
NY New York, G.M. Moch Co. 212-279-6758
NY Rochester, Canavan-Scanlon, 50 Telco Rd. 716-442-0720
NY Syracuse, Canavan-Scanlon, Box 142 315-463-9161
Ohio Cincinnati, O. Bromberg, 561 Reading 513-381-5728
Ohio Cleveland, Allied Entprs., 7281 Pearl 216-234-3838
Pa Pittsburg, Tech. Equip. Mkt., Box 11613 412-341-3011
RI Edgewood, G.H.G. Forman, 21 Stratford 401-781-1230
Tex Richardson, R. Kimball, 777 S. Central Expy. 214-231-3447
WashBellevue, M. Poggi Co., Box 786 206-454-2026
Wisc Milwaukee, R. Zingler, 155 E. Silver Spring 414-964-8120
For: Can., Montreal, Braydon Electro, 360 Montee de Liesse 514-341-3330
For: Can., Nobleton, Ont., Braydon Electro, Box 57 416-859-0712

ELNETIC ELCTRNS., INC., 2100 Zeno Pl., Venice, Cal., 90291, Tel: 213-821-3447; Sls. Mgr: E.H. Carlson Jr.

ELPA MKTG. INDS., Record Prods. Div., Thorens & Atlantic Aves., New Hyde Park, N.Y., 11040, Tel: 516-746-3002; Sls. Mgr: P.A. Stone

ELTEE, INC., 21 Fairfield Pl., W. Caldwell, N.J., 07006, Tel: 201-226-5600; Sls. Mgr: I.A. Trygg

ELZEE METAL PRODS. CO., INC., 775 39th St., Brooklyn, N.Y., 11232, Tel: 212-435-5000; Sls. Mgr: C. Baker

EMC TECHNOLOGY INC, 1300 Arch St., Philadelphia, Pa., 19107, Tel: 215-LO-3-1340, TWX: 710-670-1298; Sls. Mgr: S. Rollin

EMCEE ELCTRNS., INC., 177 Old Churchman Rd., New Castle, Del., 19720, Tel: 302-328-1354

EMELOID CO., INC., Sub. Addressograph-Multigraph Corp., 1239 Central Ave., Hillside, N.J., 07205, Tel: 201-352-1944; Sls. Mgr: G.W. Emerson

EMERSON & CUMING, INC., Dielectric Mat'ls. Div., 869 Washington St., Canton, Mass., 02021, Tel: 617-828-3300, TWX: 710-348-1324; V.P. Sls: W.R. Cuming

EMF SYSTEMS, INC., P.O. Box 1009, State College, Pa., 16801, Tel: 814-237-6022; Sls. Mgr: J. Chernega

EMP ELCTRNS., INC., Box 2346, Phoenix, Ariz., 85002, Tel: 602-978-8604, TWX: 910-950-1944; Sls. Mgr: C.E. Carter

EMPIRE SCIENTIFIC CORP., 1055 Stewart Ave., Garden City, N.Y., 11530, Tel: 516-742-7200; V.P. Sls: M. Squire

EMPIRE SCI., IND'L. ELCTRN. GAGE, 1055 Stewart Ave., Garden City, N.Y., 11530, Tel: 516-742-7200; Sls. Mgr: E.M. Toombs

EMPIRE SCI., IND'L. INSTR., 1055 Stewart Ave., Garden City, N.Y., 11530, Tel: 516-742-7200; Sls. Mgr: E.M. Toombs

EMPRO MFG. CO., INC., Box 26064, Indianapolis, Ind., 46226, Tel: 317-823-4478; Sls. Mgr: D. Hughes Pg. 459
Ala Huntsville, Electro-Tech., 106 Jordan NW 205-539-3718
ConnMiddletown, Mancib Co., Randolph & Co. Ave. 203-347-5629
Fla Orlando, Electro-Tech., Inc., 307 27th St. 305-423-5589
Ga Atlanta, Electro-Tech., 3020 Commerce Way 404-767-8761
Ill Chicago, Pacific Inicators, 5924 W. Madison 312-CO-1-1330
Md Elkridge, Sunshine Sci. Instrs., 5600 Main 301-796-5600
MassBurlington, The Mancib Co., "A" St. at Middlesex Tpke. 617-272-9450
NY LIC, Tobias & Co., 48-15 31st Ave. 212-726-4551
NC Charlotte, Electro-Tech., 5141 Belhaven 704-392-7451
Ohio Cleveland, Weschler Elec., 4250 W. 130th 216-251-4609
Pa Phila., Sunshine Sci. Instrs., 1810 Grant 215-OR-3-5600
For: Can., Ajax, Ont., Stark Elctrn. Instrs., 540 Finley 416-942-2120

EMR COMPUTER, 8001 Bloomington Frwy., Minneapolis, Minn., 55420, Tel: 612-888-9581, TWX: 910-576-2797; Dir. Mktg.: Arthur Mintz

EMR DIV., Weston Instrs., Box 44, Princeton, N.J., 08540, Tel: 609-799-1000; Sls. Mgr: H.K. Yingling

ENCLOSURE CORP., 1701 Industrial Blvd., Pennsauken, N.J., 08110, Tel: 609-665-4321; Sls. Mgr: R.D. Edelman

ENCOM PRODS. CO., INC., Box 300, Oxford, Pa., 19363, Tel: 215-932-9265; Sls. Mgr: R.P. Mallalieu

ENCODER DIVISION, Litton Sys. Inc., 20745 Nordhoff St., Chatsworth, Cal., 91311, Tel: 213-341-6161, TWX: 910-494-1229; V.P. Mktg: J. Ferrero

ENDEVCO, 801 S. Arroyo Pkwy., Pasadena, Calif., 91109, Tel: 213-681-2401, TWX: 910-588-3272; Sls. Mgr: V.L. McKelvy

ENDICOTT COIL CO., 24 Charlotte St., Binghamton, N.Y., 13905, Tel: 607-797-1263; Sls. Mgr: R.L. Beebe

ENERGY SCIENCES INC., 111 Terrace Hall Ave., Burlington, Mass., 01803, Tel: 617-272-8770; Sls. Mgr: J. Weisman

ENERGY SYSTEMS, 3180 Hanover St., Palo Alto, Cal., 94303, Tel: 415-493-3900, TWX: 910-373-1238; V.P-Mktg: R.T. Ashcroft

ENGDAHL ENTERPRISES, 2850 Monterey Ave., Costa Mesa, Cal., 92626, Tel: 714-540-0398; Sls. Mgr: P.D. Engdahl

Advertisement

Engdahl Enterprises manufactures Peak Shock Recorders which are passive instruments measuring accelerations from 0 to 10,000 g. Accuracy is within 3% of full scale with a resolution within 1%. Frequency spectra available are 2 to 25, 310 to 870 and 950 to 2,000 Hz in 12, 8, and 8 discrete frequencies, respecively.

ENGELHARD MINERALS & CHEM., Engelhard Inds. Div., 430 Mountain Ave., Murray Hill, N.J., 07974, Tel: 201-464-7000 ....Pg. 2817
Cal Burlingame, Engelhard Inds., 863 Malcolm Blvd. 415-697-6001
Cal Los Angeles, Engelhard Inds., 6001 Bandini Blvd. 213-724-1800
Ill Skokie, Engelhard Inds., 8131 Monticello Ave. 312-673-1900
Tex Dallas, Engelhard Inds., 2878 Walnut Hill La. 214-350-4106
Tex Houston, Engelhard Inds., 7900 Westglen 713-782-2222
WashSeattle, Engelhard Inds., 3203 Fremont Ave., N. 206-632-7122

ENGELHARD MINERALS & CHEMICALS CORP., Engelhard Inds. Div., H.A. Wilson Dept., Tech. Svc. Dept., 2655 U.S. Rte. 22, Union, N.J., 07083, Tel: 201-686-6600; Sls.Mgr. T.W. Paterson ....Pg. 2817
Cal Los Angeles, 6001 Bandini Blvd. 213-724-1800
Cal Burlingame, 863 Malcolm Rd. 415-421-1447
Ill Skokie, 8131 Monticello Ave. 312-673-1900
Mich Lathrup Vill., 28250 Southfield Rd. 313-358-5750
Tex Dallas, 2810 Lemmon Pk., E. 214-521-0490
Tex Houston, 7900 Westglen 713-782-2222
WashSeattle, 2303 Fremont Ave., N. 206-632-7122

ENGELMANN MICROWAVE, Skyline Dr., Montville, N.J., 07045, Tel: 201-334-5700, TWX: 710 987-8344; Sls. Mgr: C. Schraufnagl

ENGINEERED COMPS. CO., 2134 W. Rosecrans Ave., Gardena, Cal., 90249, Tel: 213-321-6565; Sls. Mgr: J.F. Robison

ENGINEERED PLASTICS, INC., 213 Chase St., Gibsonville, N.C., 27249, Tel: 919-449-4121; Sls. Mgr: S.W. Moore

ENGINEERING ASSOCS., 434 Patterson Rd., Dayton, Ohio, 45419, Tel: 513-293-1662; Pres: C.C. Littell, Jr.

ENGINEERING CONSLTS., LTD., 1509 E. Del Amo, Carson, Cal., 90746, Tel: 213-382-0304; Sls. Mgr. J. Schwabe

Advertisement

ECL's chip carriers are approved by the E.I.A. & Mil. They are inert in material and are completely free from electrostatic charge. ECL's chip TRAYPAK is widely used for optical insp., automatic loading, test and shipping. Achieve accountability of chips after slicing. REduce your rejects from contaminates and excessive handling. TRAYPAK's are coated with either Teflon, Silicon or Electroplate. Are capable of withstanding high bonding temperatures for Molytab processes.

ENGRG. DESIGN & DEV., 12670 Pierce St., Pacoima, Cal., 91331, Tel: 213-899-2521; Sls. Mgr: D.P. Cronin

ENGRG. SVCS., 133 Kings Rd., Madison, N.J., 07940, Tel: 201-377-4003; Sls. Mgr: R. Love

ENGIS CORP., 8035 Austin Ave., Morton Grove, Ill., 60053, Tel: 312-966-5600, TWX: 724-469; Sls. Mgr: A. Leaver

ENGLER INSTR. CORP., 250 Culver Ave., Jersey City, N.J., 07305, Tel: 201-332-5353; Sls. Mgr: W. Heydt

ENM CO., 5350 Northwest Hwy., Chicago, Ill., 60630, Tel: 312-775-8400; Adv. Mgr: M.W. Koziol

ENTERPRISE DEVELOPMENT CORP., 5127 E. 65th St., Indianapolis, Ind., 46220, Tel: 317-251-1231; Sls. Mgr: L. Kopernak

ENTHONE, INC., Box 1900, New Haven, Conn., 06508, Tel: 203-934-8611; Sls. Mgr: J.R. Eisele

ENTRON, INC., 2141 Industrial Pkwy., Silver Spring, Md., 20904, Tel: 301-622-2000; Sls. Mgr: E.P. Whitney

ENTRON INC., L.A.B. Instr. Div., Matawan-Freehold Rd., Morganville, N.J., 07751, Tel: 201-591-1000, TWX: 710-998-0383; Pres: J. Ross

ENVIRONMENTAL CONTAINER SYS., Div. Crate-Rite, Inc., P.O. Box 337, Union City, Calif., 94587, Tel: 415-471-6663; Sls. Mgr: D.M. Becklin

EVIROTECH CORP., See Dohrmann

E.O. ELECTRONICS, INC., Mountain Lakes, N.J., 07046, Tel: 201-334-8727; Pres: E. Osterland

EON INSTR., INC., 15547 Cabrito Rd., Van Nuys, Cal., 91406, Tel: 213-781-2185; Sls. Mgr: R.M. Jones

EPCO PRODS., INC., P.O. Box 298, Wallkill, N.Y., 13589, Tel: 914-TW-5-3300; Sls. Mgr: D. Unger

EPIC, INC., 150 Nassau St., New York, N.Y., 10038, Tel: 212-349-2470; Sls. Mgr: P. Letica

EPOXY CAST ELCTRN. CASE CO., 44 Prospect St, Yonkers, N.Y., 10701, Tel: 914-YO-3-5900; Gen'l Mgr: J.J. Wilentchik

EPOXY PLASTIC MOLDERS, 109 Coit St., Irvington, N J, 07111, Tel: 201-371-3131

Advertisement

Epoxy Molded Products Manufactures a complete line of Encapsulation Cases, Headers and Module Packages. Precision Custom Molding in all plastics. Prototype and Production Tooling built in our own facilities.

EPOXYLITE CORP., Box 3397, S. El Monte, Calif., 91733, Tel: 213-444-9514, TWX: 910-587-3431; Sls. Mgr: P.A. Timmins

EPPLEY LAB., INC., Box 419, Main P.O., Newport, R.I., 02840, Tel: 401-847-1020, TWX: 401-846-3181; Sls. Mgr: G.L. Kirk

EQUIPMENT CO. OF AMERICA, 1075 Hialeah Dr., Hialeah, Fla., 33010, Tel: 305-887-1772; Sls. Mgr: E.S. Christiansen, Jr.

EQUIPMENT & SVC. CO., 7118 Envoy Ct., Dallas, Tex., 78247, Tel: 214-631-7450; Sls. Mgr: J.A. Green

EQUIPTO, 225 S. Highland Ave., Aurora, Ill., 60507, Tel: 312-TW-6-4641; Adv. Mgr: F. Vitek

EQUIPTO ENCLOSURE SYS., Div. Equipto Elctrns., 435 Woodlawn Ave., Aurora, Ill., 60507, Tel: 312-897-4691; Sls. Mgr: Carl W. Peterson ....Pg. 2316

Cal Fullerton, Kendall Co., 725 Roserita Dr. 714-870-4110
Cal Palo Alto, Kendall Co., Box 11073 415-322-6338
Fla Clearwater, W. Wimberly, 532 S. Ft. Harrison 813-446-7072
Fla Orlando, W. Wimberly, 500 S. Osceola 305-425-3083
Ga Smyrna, F. Fausett, 145 Spring 404-436-5169
Ill Palatine, J. Clark Co., 501 W. Hellen Rd. 312-358-5095
Iowa Marion, Thomas-Modrcin, 890 17th 319-377-6261
Kans Shawnee Mission, Thomas-Modrcin, 5450 Buena Vista 913-432-2131
Md Silver Spring, QED Elctrns., 850 Sligo 301-588-8134
Mass Newtonville, Edcom, 815 Washington 617-969-9710
Mich Royal Oak, Satullo, 4514 N. Woodward 313-549-3910
Mo Hazelwood, Thomas-Modcrin, 47 Village Sq. 314-838-6446
NJ Camden, Q.E.D. Elctrns., 2916 Federal St. 609-365-2450
NM Albuquerque, Data Handling, 209 San Pablo, S.E. 505-268-0928
NY Mt. Vernon, Q.E.D. Elctrns., 500 Nuber 914-664-0080
NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314
Ohio Cleveland, Satullo, 16801 E. Euclid 216-486-2800
Ohio Dayton, Satullo, 2801 Far Hills 513-293-7061
SC Greenwood, F. Fausett, Stoney Pt. 803-451-7847
Tex Dallas, Aymond, 4340 N. Central Expwy. 214-827-8043
Utah Salt Lake City, Peirce Bowthorpe Agency, 143 S. 4th, E. 801-328-8173
Wash Seattle, R. Johnston, 1011 N.E. 69th 206-524-5170

EQUITABLE ENGRG. CO., 2724 Normandy Rd., Royal Oak, Mich., 48073, Tel: 313-549-5300, TWX: 810-232-4855; Oper. Mgr: S. Nement

ERA ACOUSTICS, 311 E. Park St., Moonachie, N.J., 07074, Tel: 201-641-3650 J. Grieg

ERA ACOUSTICS CORP., Sub. Elctrn. Resch. Assocs., Inc., 311 E. Park St., Moonachie, N.J., 07074, Tel: 201-641-3650; Sls. Mgr: J. Grieg

ERA TRANSPAC CORP., See Elctrn. Research Assocs.

ERASER CO., Box 1342, Syracuse, N.Y., 13201, Tel: 315-454-3237; Sls. Mgr: J. Kemeny

ERCONA CORP., Elctrns. Div., 2121 Bellmore Ave., Bellmore, N.Y., 11710, Tel: 516-781-2770; Sls. Mgr: M. Kandell

ERDCO ENGRG. CORP., 136 Official Rd., Addison, Ill., 60101, Tel: 312-543-6733; Exec. V.P: E.M.Nesvig

ERIE ARTISAN CORP, 11400 Madison Ave, Cleveland, Ohio, 44102, Tel: 216-521-6173; Sls. Mgr: T.D. Burt

ERIE FREQUENCY CONTROL, Div. Erie Technological Prods., 453 Lincoln St., Carlisle, Pa., 17013, Tel: 717-249-2232; Sls. Mgr: K. Dance ....Pgs. 1382,1383

Cal Palo Alto, Erie Tech. Prods., 460 California Ave. 415-327-1520
Cal Pasadena, Erie Tech. Prods., 1000 E. Walnut St. 213-795-8801
Cal Santa Ana, Erie Tech. Prods., 1420 E. Edinger St. 714-835-4822
Fla Winter Pk., Erie Tech. Prods., 205D W. Fairbanks Ave. 305-644-0954
Ill Des Plaines, Erie Tech. Prods., 3150 Des Plaines Ave. 312-297-5560
Ind Ft. Wayne, Erie Tech. Prods., 2010 Inwood Dr. 219-743-4418
Md Ellicott City, Erie Tech. Prods., 9051 Baltimore Nat'l. Pike 301-465-8450
Mass Wakefield, Erie Tech. Prods., 591 North Ave. 617-245-7880
Minn Minneapolis, Erie Tech. Prods., 7415 Wayzata Blvd. 612-545-2526
Mo No. Kansas City, ECI Semiconductors, 1520 Taney St. 816-421-8400
NJ Montvale, Erie Tech. Prods., 70-J Chestnut Ridge Rd. 201-391-3403
NJ Pennsauken, Erie Tech. Prods., 5425 Marlton Pike 609-665-4787
NY Liverpool, Erie Tech. Prods., 300 Tulip St. 315-457-5935
NC Greensboro, Erie Tech. Prods., 612 Pasteur Dr. 919-299-1905
Ohio Dayton, Erie Tech. Prods., 1563 E. Dorothy La. 513-293-6959
Tex Dallas, Erie Tech. Prods., 4300 N. Central Expwy. 214-827-4401

ERIE TECHNOLOGICAL PRODS. (EEM), 644 West 12 St., Erie, Pa., 16512, Tel: 814-453-5611, TWX: 510-696-6607; V.P. Sls: W.R. Crotty ......Pgs. 1382,1383

Cal Palo Alto, Erie Tech. Prod., 460 California Ave. 415-327-1520
Cal Pasadena, Erie Tech. Prod., 1000 E. Walnut St. 213-795-8801
Cal Santa Ana, Erie Tech. Prod., 1420 E. Edinger St. 714-835-4822
Fla Winter Pk., Erie Tech. Prods., 205D W. Fairbanks Ave 305-644-0954
Ill Des Plaines, Erie Tech. Prod., 3150 Des Plaines Ave. 312-297-5560
Ind Ft. Wayne, Erie Tech. Prod., 2010 Inwood Dr. 219-743-4418
Md Ellicott City, Erie Tech. Prod., 9051 Baltimore Nat'l Pike 301-465-8450
Mass Wakefield, Erie Tech. Prod., 591 North Ave. 617-245-7880
Minn Minneapolis, Erie Tech. Prod., 7415 Wayzata Blvd. 612-545-2526
Mo N. Kansas City, ECI Semiconductors, 1520 Taney St. 816-421-8400
NJ Montvale, Erie Tech. Prod., 70-J Chestnut Ridge Rd. 201-391-3403
NJ Pennsauken, Erie Tech. Prod., 5425 Marlton Pike 609-665-4787
NY Liverpool, Erie Tech. Prod., 300 Tulip St. 315-457-5935
NC Greensboro, Erie Tech. Prod., 612 Pasteur Dr. 919-299-1905
Ohio Dayton, Erie Tech. Prod., 1563 E. Dorothy La. 513-293-6959
Pa Erie, Erie Tech. Prods., 644 W. 12th St. 814-453-5611
Pa Philadelphia, D. Mitcham 215-925-9228
Tex Dallas, Erie Tech. Prod., 4300 N. Central Expry. 214-827-4401
EXP: Erie, Pa, T. O. Brown, 500 W. 12th St. 814-453-5611
For: Don Mills, Ont., Erie Tech. Prod., 1262 Don Mills Rd. 416-449-6376

ERIKSON SPECIALIZED TOOL CO., Box 424, Pico-Rivera, Cal., 90660, Tel: 213-699-3719; Sls. Mgr: J.R. Erikson

ESC ELCTRNS. CORP., 534 Bergen Blvd., Palisades Pk., N.J., 07650, Tel: 201-947-0400, TWX: 710-991-9780; Sls. Mgr: R. Carr ....Pgs. 1513,2747

Ariz Phoenix, Toward Engrg., Box 15268 602-955-3193
Cal Encino, M. Fassberg, 17100 Ventura Blvd. 213-783-4010
Cal Mtn. View, P.M. Sls., 1941 Springer 415-964-5600
Colo Broomfield, Arrowhead Sls., 7943 W. 98th 303-222-6462
Fla Ormond Bch., Mktg. Technology, 110 E. Granada 904-672-2314
Ill Chicago, Carlson Elctrn., 7448 N. Harlem 312-774-0277
Md Baltimore, H.J. White Co., 320 Hillen Rd. 301-828-6373
Mass Winchester, Blake Assoc., 7 Lowell Ave. 617-729-7890
Minn Minneapolis, Carlson Elctrns., 2500 39th NE 612-788-4111
Minn Mpls., Exon Elctrn., 5164 Rainier Pass 612-788-4111
Mo St. Louis, Carlson Elctrns., 453 N. Lindbergh 314-991-0262
NJ Cherry Hill, H. White, 499 Cooper Landing 609-667-3202
NY Centerport, Pyros Engrg., 41 Harbor Circle 516-757-8647
NY Liverpool, Varrelman-Gorman, Box 387 315-458-4774
NM Albuquerque, Arrowhead Sls., Box 243 505-855-4562
Ohio Cincinnati, Giesting Assocs., 3274 Donnybrook 513-541-6650
Tex Dallas, Texas-Microwave/Elctrn., 10425 Countess Dr. 214-358-1172
Utah Salt Lake City, Arrowhead, 49 W. Malvern 801-485-3362
Wash Seattle, Paratech, 2208 N.W. Market St. 206-783-3900

ESCA, Div. of Solitron/Microwave, Jupiter, Fla., 33458, Tel: 305-287-5000; Sls. Mgr: J. Friedman

ESCO PRODUCTS, Oak Ridge Rd., Oak Ridge, NJ, 07438, Tel: 201-697-3700; Sls. Mgr: B. Dixon

ESSENTIAL ELCTRNS. CORP., 3001 Chester Ave., Cleveland, Ohio, 44114, Tel: 216-781-7136; Sls. Mgr: J.L. Fine

ESSEX CRYOGENICS INDS., 8213 Gravois, St. Louis, Mo., 63123, Tel: 314-VE-2-4500; Sls. Mgr: W.J. Adams

ESSEX ENGRG. CO., INC., Box 28, Essex, Conn., 06426, Tel: 203-767-8221; Sls. Mgr: S.C. Ciszek, Jr.

ESSEX INT'L., INC., Communications & CATV Div., 800 E. Garfield Ave., Decatur, Ill., 62526, Tel: 217-429-2531; Sls. Mgr: D. Snyder

ESSEX INT'L, INC., Ind'l. Wire Prods. Div., 445 Park Ave., Sycamore, Ill., 60178, Tel: 815-895-4501, TWX: 910-639-0611; V.P. & Gen. Mgr: J. Gerber

ESSEX INT'L., INC., Magnet Wire Div., 1601 Wall St., Fort Wayne, Ind., 46804, Tel: 219-743-0311, TWX: 219-241-4272; Sls. Mgr: J. Fiske

ESSEX INT'L., INC., Power Conductor Div., 2601 S. Adams, Marion, Ind., 46953, Tel: 317-664-6211, TWX: 317-667-6972; V.P. & Gen. Mgr: W. Skinner

ESSEX INTERNATIONAL, Stemco Controls, Box 1007, Mansfield, Ohio, 44903, Tel: 419-884-1311; Sls. Mgr: R. Joslyn, Jr.

ESTERLINE ANGUS DIV., Esterline Corp., Box 24000, Indianapolis, Ind., 46224, Tel: 317-244-7611; V.P. Sls: H.C. Cameron

ESTES ENGRG. CO., 543 West 184th St., Gardena, Calif., 90248, Tel: 213-321-9811; Sls. Mgr: S. Estes

Advertisement

ASSEMBLY SERVICES for cables, electronic circuits, electro/mechanical devices. Prototype and production quantities. High voltage testing to 30 KV. Encapsulation services for all materials. RFI-EMC specialists for shielding systems, kits, components. ELECTRO-SHIELD engine shielding for all Gov't. and commercial specifications. Private label suppliers to OEMs.

ETAMCO, INDUSTRIES, 1 Montgomery St., Belleville, N.J., 07109, Tel: 201-759-7100; V.P: R.N. Cox

ETC, INC., 990 East 67 St., Cleveland, Ohio, 44103, Tel: 216-HE-2-0855, TWX: 216-574-9355; Sls. Mgr: F. Hoyle, Jr. ....Pg. 2628

Ark Hot Springs, M. Young, Box 705 501-262-1365
Conn W. Simsbury, Anchor Engrg., 6 Arrowhead 203-658-6261
Fla Ft. Lauderdale, Young & Lawrence, 415 E. Broward 305-563-6717
Fla St. Petersburg, Young & Lawrence, 300 31st, N. 813-894-0026
Fla Winter Pk., Young & Lawrence, 601 N. New York 305-647-6929
Ill Chicago, A. J. Ellis, 1607 W. Howard 312-262-2708
Iowa Cedar Rapids, J. Vrbik, 3 50th St., N.E. 319-377-8244
Kans Wichita, Thunderbird Tech. Sls., 7707 E. Osie 316-684-3941
Md Baltimore, J. Maguire, 5716 York 301-433-2613
Mass Wellesley Hills, Anchor Engrg., 40 Washington 617-235-6330
Minn Hopkins, Grayden & Flemmer, Hamilton 612-941-1120
NY Rochester, L. Marchese, 999 Ridge, E. 716-342-7664
NC Charlotte, J. Rudisell, 1225 Harding 704-377-6901
Ohio Avon Lake, Doyle Sls., 321 Bellaire Rd. 313-533-0033
Ohio Cleveland, 990 E. 67th St. 216-432-0855
Ohio Kettering, 4844 Arrowhead Dr. 513-434-4844
Tex Dallas, Compar Southwest, 8609 NW Plaza 214-363-1526

Tex Houston, Compar Southwest, 5757 Bellaire 713-667-3420
Wisc Milwaukee, Devoz-Prinz, 1819 E. Kenilworth 414-272-0356

ETCHIT, INC., 643 13th Ave., S. Hopkins, Minn., 55343, Tel: 612-935-5507; Sls. Mgr: R.H. Dunn

ETCHOMATIC, INC., Box 444, Waltham, Mass., 02154, Tel: 617-893-0220; Sls. Mgr: M.D. Levine

E.T.M. CORP., 144 W. Chestnut Ave., Monrovia, Calif., 91016, Tel: 213-359-8102; Mktg. Mgr: R.A. Brandes

EUBANKS ENGRG., 225 W. Duarte Rd., Monrovia, Calif., 91016, Tel: 213-358-4531, TWX: 910-585-3249; Sls. Mgr: N.C. Sallemi

EUCLID ELEC. & MFG. DIV., Harvey Hubbell, Madison Ind'l. Pk., Madison, Ohio, 44057, Tel: 216-428-1161; Sls. Mgr:

EUGENE ENGRG. CO., INC., 50 Church St., Rockland, Mass., 02370, Tel: 617-878-4800; Sls. Mgr: K. Hill

EUREKA X-RAY TUBE CORP., Div. Litton Inds., 3250 N. Kilpatrick Ave., Chicago, Ill., 60641, Tel: 312-545-3126; Sls. Mgr: R.A. Mies

EUTECTIC CORP., 40-40 172nd St., Flushing, N.Y., 11358, Tel: 212-FL-8-4000; V.P. Sls: J.W. Reuter

EVANS ASSOCS., P.O. Box 5055, Berkeley, Calif., 94705, Tel: 415-653-2616

EVANS, GEORGE CORP., 121-37th St., Moline, Ill., 61265, Tel: 309-762-9456; Sls. Mgr: H.C. Easter Pg. 2785

EVAPORATED COATINGS, INC., 798 Welsh Rd., Huntingdon Valley, Pa., 19006, Tel: 215-WI-7-1465; Sls. Mgr: C.H. Barto

EVER READY LABEL CORP., 357 Cortlandt St., Belleville, N.J., 07109, Tel: 201-759-5500; Sls. Mgr: H. Stillman

EVERETT/CHARLES, INC., 2806 Metropolitan Pl., Pomona, Cal., 91767, Tel: 714-593-2541; Mktg. Mgr: W. Long

EWALD INSTRS. CORP., Rte. 7R, Kent, Conn., 06757, Tel: 203-927-3278; Sls. Mgr: M.K. Ewald

Advertisement

Ewald Miniature Welding Equipment. Welding Heads with minimum inertia for pressures of 1/4 ounce to 30 lbs. Hand welding tools and tweezers. Stored Energy and AC Timer power supplies. Dice Bonders for Semiconductor production. Flash Stripper for shielded and co-ax wire. Submit samples for free processing and ask for data sheets.

EXACT ELCTRNS., INC., 455 S.E. 2nd Ave., Box 160, Hillsboro, Ore., 97123, Tel: 503-648-6661, TWX: 910-460-8811; V. P. Mktg: J.F. Foster ....Pg. 466
Ala Huntsville, Lee, 827 Wheeler 205-539-0761
Alas Anchorage, Arva, Inc., Box 759 907-272-5231
Ariz Phoenix, Barnhill Three, 537 E. Osborn 602-263-1250
Cal Costa Mesa, Meas. Assocs., 2955B Harbor 714-540-7160
Cal Sunnyvale, Meas. Assocs., Box 2162 408-739-7785
Colo Denver, Barnhill Three, 1170 S. Sheridan 303-934-5505
Conn Hamden, Instr. Conslt., 2381 Whitney 203-288-5246
Fla Orlando, Lee Assocs., 200 E. Marks 305-241-4445
Ga Chamblee, Lee Assocs., Box 80666 404-457-7117
Ill Wheaton, Engrg. Prods., 25 W. 485 Geneva 312-653-6826
Kans Leavenworth, McGraw Engrg., 512 McDonald 913-651-2929
Md Rockville, Farrell Assocs., 230 N. Wash. 301-424-9460
Mass Waban, Instr. Conslt., 81 Wyman 617-969-9881
Mich Farmington, Carter-McCormic & Pierce, 23995 Freeway Pk. 313-477-7700
Minn St. Paul, Engrg. Prods., 717 Raymond 612-646-8819
Miss Florisant, McGraw Engrg., 3225 Parker 314-831-0342
NM Albuquerque, Barnhill Three, 1410-D Wyoming, N.E. 505-299-7658
NY Fayetteville, M.P. Andrews, 319 Mott Rd. 315-637-6405
NY Great Neck, Meas. Tech., 295 Northern 516-482-3500
NC Winston-Salem, Lee Assocs., Box 15034 919-724-2406
Ohio Cleveland, Carter-McCormic & Pierce, 21380 Lorain 216-333-5650
Ohio Dayton, Carter-McCormic & Pierce, 5424 Webster 513-278-5873
Ore Portland, Arva, 2305 S.W. 58th 503-292-8762
Pa King of Prussia, Letronix, 215 W. DeKalb 215-265-1020
Pa Pittsburgh, Carter-McCormic & Pierce, 201 Penn Ctr. 412-824-3760
Tex Houston, Sci. Sls., 6400 Westpark Dr. 713-781-2711
Tex Richardson, Sci. Sls., 777 S. Central 214-AD-1-6541
Wash Seattle, Arva, 1320 Prospect 206-622-0177

EXACT WEIGHT SCALE CO., 1005 W Third Ave, Columbus, Ohio, 43212, Tel: 614-294-6253; Sls. Mgr: R.W. Grant

EXCEL SPECIALTY CORP., 6335 N. Broadway, Chicago, Ill., 60626, Tel: 312-262-4781; Sls. Mgr: M. Bank

EXCELLON INDS., 23915 Garnier, Torrance, Calif., 90505, Tel: 213-325-8000; Sls. Mgr: R.E. Hogan

EXECUTONE, INC., 29-10 Thomson Ave., Long Island City, N.Y., 11101, Tel: 212-EX-2-4800; Sls. Mgr: E. Brody

EXIDE POWER SYS. DIV., ESB, Inc., P.O. Box 5723, Philadelphia, Pa., 19120, Tel: 215-FI-2-8000, TWX: 215-725-7397; Sls. Mgr: E.A. Holland

EXOTIC MATERIALS, INC., 2968 Randolph Ave., Costa Mesa, Cal., 92626, Tel: 714-545-9425, TWX: 910-595-1119; Sls. Mgr: D. Stockman

EXTRUDONICS CO., 1002 Jersey Ave., New Brunswick, N.J., 08902, Tel: 201-CH-9-6867; Sls. Mgr: C. Rule

EYELET TOOL CO., INC., 76 Rogers St., Cambridge, Mass., 02142, Tel: 617-UN-4-8170; Sls. Mgr: D. Spencer

F-DYNE ELCTRNS., 449 Howard Ave., Bridgeport, Conn., 06605, Tel: 203-367-4442 ....Pgs. 2382,2383
Ark Hot Springs, M. Young, Rte. 2, Box 705 501-262-1365
Cal Santa Ana, Cal. Elctrn. Mktg., 1905 E. 17th 714-835-2702
Cal San Lorenzo, William Parks, Box 36 415-357-4240
Colo Denver, Walter Engrg., 880 Bonnie Brae 303-777-5585
Conn Wethersfield, Con/Pak, Box 37 203-563-4784
Fla Maitland, Ellis & Assocs., Box 1261
Ill Oak Pk., H. Pretat, Inc., 6905 W. North 312-848-0787
Ind Lafontaine, Kirsch Sls., 107 N. Wabash 317-981-2801
Kans Shawnee, J. Guernsey Co., Box 3305 913-631-2414
Md Rockville, Quality Comps., Inc., Box 711 301-933-1623
Mass Needham, Com/Pak, 14 Oak St. 617-444-1259
Mich Southfield, Sterling-Lowell, 24691 Telegraph 313-354-6130
Minn Mpls., Int'l. Sls. Co., 8703 Beard Rd. 612-881-6683
NY Hempstead, Kahgan Sls., 556 Peninsula 516-538-2300
NY Syracuse, Naylor Elec., 1718 Erie 315-472-9183
NC Greensboro, L & D, Inc., Box 7243 919-292-3201
Ohio Dayton, Sterling-Lowell, Centerville Box 57 513-885-2238
Pa Lansdowne, W. Satterthwaite, Box 191 215-623-5100
Tex Dallas, Southern Engrg., 6434 Maple 214-357-0669
Wash Seattle, Allied Agencies, 1818 Westlake N. 206-AT-4-4082
For: Can., Scarborough, Ont., Paisley Prods of Can., 40 Upton Rd. 416-755-2216

FABRI-TEK, INC., 5901 S County Rd. #18, Minneapolis, Minn., 55436, Tel: 612-935-8811, TWX: 910-576-2913

FABRI-TEK, Micro Sys., Inc., 1410 S.W. 3rd St., Pompano Beach, Fla., 33060, Tel: 305-943-9440; Sls. Mgr: E. Lane

FABRI-TEX, INC., Memory Products Div, 5901 S. County Rd. 18, Minneapolis, Minn., 55436, Tel: 612-939-8811, TWX: 910-576-2913; Sls. Mgr: R.M. Murphy

FABRI-TEK, INC., National Connector Div., Science Industry Ctr., Minneapolis, Minn., 55428, Tel: 612-533-5361; Dir. Mktg: S.O. Wicks

FABRI-TEK INSTRS., INC., 5225 Verona Rd., Madison, Wisc., 53711, Tel: 608-271-3333, TWX: 910-286-2713; Sls. Mgr: R.J. Cushing

FABRICAST, INC., 9835 Alpaca St., So. El Monte, Cal., 91733, Tel: 213-443-3247; Pres: H.P. Wood Pgs. 1592,1593
Wash Seattle, J.J. Backer Co., 221 W. Galer St. 206-AD-6470

FACIT-ODHNER, INC., 501 Winson Dr., Secaucus, N.J., 07094, Tel: 201-866-5111, TWX: 710-992-8927; Sls. Mgr: I. Sachar

FAE INSTR. CORP., 16 Norden La., Huntington Sta., N.Y., 11746, Tel: 516-AR-1-0300; Sls. Mgr: A. Mankes Pg. 1587
Cal Los Angeles, Halbar Assocs., 3261 W. Fourth St. 213-DU-7-8283
Md Baltimore, Moler-Eader Assocs., 320 Hillen Rd. 301-VA-5-1130

FAFNIR BEARING CO., Div. Textron, 37 Booth St., New Britain, Conn., 06050, Tel: 203-225-5151; V.P. Sls: H.S. Frisbie

FAIRBANKS MORSE WEIGHING SYS., Div. Colt Inds., 711 E. St. Johnsbury Rd., St. Johnsbury, Vt., 05819, Tel: 802-748-2371; V.P. Mktg: T.G. Soper

FAIRCHILD CONTROLS, Div. Fairchild Camera & Instr. Corp., 423 National Ave., Mountain View, Calif., 94040, Tel: 415-962-2357; Sls. Mgr: G. Urbani

FAIRCHILD ELECTRO-METRICS, Sub. Fairchild Camera & Instr., 100 Church St., Amsterdam, N.Y., 12010, Tel: 518-843-2600; Mktg. Mgr: K.W. Bach

FAIRCHILD SEMICONDUCTOR, 313 Fairchild Dr., Mountain View, Calif., 94040, Tel: 415-962-5011, TWX: 910-379-6435; Dir. Mktg: A. Procassini

FAIRCHILD SPACE & DEFENSE SYS., Div. Fairchild Camera & Instr., 300 Robbins La., Syosset, N.Y., 11791, Tel: 516-931-4500, TWX: 510-221-1858; Mktg. Dir: C.A. Lay

FAIRCHILD SYS. TECHNOLOGY, 974 E. Arques Ave., Sunnyvale, Cal., 94086, Tel: 408-735-5011, TWX: 910-339-9217; Sys. Sls. Mgr: F. Horwitz

FAIRLANE ELECTRONICS, INC., Box 335, Long Valley, N.J., 07853, Tel: 201-852-7373; Sls. Mgr: M. Maclennan

FAIRMOUNT CHEM. CO., INC., 117 Blanchard St., Newark, N.J., 07105, Tel: 201-344-5790; Sls. Mgr: R. Bailes

FALCON DIV., Gen'l. Thermodynamics Corp., 164 Ballardvale St., Wilmington, Mass., 01887, Tel: 617-933-7370; Sls. Mgr: S. Leto

FALSTROM CO., 174 Falstrom Ct., Passaic, N.J., 07055, Tel: 201-777-0013; V.P. Sls: R.E. Hill

FANON ELCTRNS., 100 Hoffman Pl., Hillside, N.J., 07205, Tel: 201-399-3400; Sls. Mgr: M. Trotiner

FANSTEEL INC., One Tantalum Pl., N Chicago, Ill., 60064, Tel: 312-689-4900, TWX: 910-235-1577; Mktg. Mgr: D.V. Caldwell

FARATRON CORP., 290 Lodi St., Hackensack, N.J., 07601, Tel: 201-488-1440, TWX: 710-990-5022; Sls. Mgr: H. Aufiero .... Pgs. 467,711-713
Cal Downey, Wieler & Co., 10842 Paramount Blvd. 213-861-9223
Cal Palo Alto, Mauldin Co., 200 California Ave. 415-326-5291
Ill Des Plaines, Marsland Assocs., 1000 Executive Way 312-298-2620
Ind Indianapolis, Marsland Assocs., 3734 Carrollton Ave. 317-924-3568
Mass Wellseley, Meas. Instrs., 572 Washington St. 617-235-4577
Minn Mpls., Marsland Assocs., 231 N. Edgewood Ave. 612-545-4481
Mo Florissant, Marsland Assocs., Box 567 314-831-0015
NY Albany, J.A. Reagan Co., 6 Highland St. 518-489-4777
NY Roslyn Hgts., H.D.E. Assocs., 300 Edwards St. 516-484-4010
Ohio Columbus, Meas. Instrs., 2074 Arlington Ave. 614-488-9573
Tex Dallas, Thorsen Co., 77 Carpenter Frwy. 214-631-5440
Tex Houston, Thorsen Co., 6655 Hillcroft 713-771-3504
Va Annandale, Nine Assocs., 7753 Patriot Dr. 703-256-9105

FARGO CO., 1162 Bryant St., San Francisco, Calif., 94103, Tel: 415-621-4471; Sls. Mgr: L.H. Jones

FARIA METER CORP., 19 Faria La., Uncasville, Conn., 06382, Tel: 203-848-9271; Mktg. Mgr: J.F. Schrumm Pg. 468

FARIA, THOMAS G. CORP., 19 Faria La., Uncasville, Conn., 06382, Tel: 203-848-9271; Adv. Mgr: O. Baxter

FARINON ELECTRIC, 935 Washington St., San Carlos, Calif., 94070, Tel: 415-593-8491; Sls. Mgr: T.A. Combellick

FARMER ELEC. PRODS. CO., INC., Tech Circle, Natick, Mass., 01760, Tel: 617-653-8850; Sls. Mgr: C.M. Heckler

FARRALL INSTR. CO., Box 1037, Grand Island, Neb., 68801, Tel: 308-384-1530; Sls. Mgr: W. Farrall

FARRAND CONTROLS, INC., 99 Wall St., Valhalla, N.Y., 10595, Tel: 914-RO-1-2600; Sls. Mgr: C.L. Farrand, Jr.

FASCO INDS., INC., Elctrns. Div., Augusta at N. Union Sts., Rochester, N.Y., 14605, Tel: 716-546-7500; Sls. Mgr:

FASTEX DIV., Illinois Tool Works, 195 Algonquin Rd., Des Plaines, Ill., 60016, Tel: 312-299-2222, TWX: 910-233-2786; Sls. Mgr: L.C. Larson

FAWICK AIRFLEX DIV., Eaton Yale & Towne Inc., 9919 Clinton Rd., Cleveland, Ohio, 44111, Tel: 216-281-2211; Sls. Mgr: R.R. Dirksen

FECO, A Bangor Punta Co., 5855 Grant Ave., Cleveland, Ohio, 44105, Tel: 216-441-2400; V.P. & Gen'l Sls Mgr: B.W. Sanford

FEDERAL MACH. CO., INC., 807 Garfield Ave., Jersey City, N.J., 07305, Tel: 201-HE-5-1500; Sls. Mgr: J.J. Strobel

FEDERAL SCREW PRODS., INC., 3917 N. Kedzie Ave., Chicago, Ill., 60618, Tel: 312-478-5744; Sls. Mgr: L.L. Harris

FEDERAL STAMPINGS, Div. Doric Corp., 2000 West 94th St., Minneapolis, Minn., 55431, Tel: 612-888-9411, TWX: 910-576-2855; Sls. Mgr: Wm. Arimond

FEDTRO, INC., Fed. Elctrns. Sls. Div., Fed. Elctrns. Bldg., Rockville Centre, N.Y., 11571, Tel: 516-536-4400, TWX: 510-225-3661; Sls. Mgr: B. Kleinman

FEEDBACK, INC., 438 Springfield Ave., Berkeley Hghts., N.J., 07922, Tel: 201-464-5181; Sls. Mgr: M.J. Lawson

FEINER, P. & SONS, INC., 522 West 45 St., New York, N.Y., 10036, Tel: 212-PL-7-6150; Sls. Mgr: B.D. Huret

FEL-PRO INC., 7450 N. McCormick Blvd., Skokie, Ill., 60076, Tel: 312-RO-1-4500; Pres: E. Lehman

FELTERS CO., 22 West St., Millbury, Mass., 01527, Tel: 617-865-4401

FELTON, S.A. & SON CO., Sub. USM Corp., 315 Wilson St., Manchester, N.H., 03105, Tel: 603-669-1970, TWX: 710-220-1898

FEMCO DIV., Gulton Inds., Inc., Box F, Irwin, Pa., 15642, Tel: 412-863-3200, TWX: 510-468-8867; Sls. Mgr: J. Beaven

FENWAL ELCTRNS., INC., 63 Fountain St., Framingham, Mass., 01701, Tel: 617-872-8841, TWX: 710-346-0678; V.P. Mktg: B.J. Wojeski ....Pg. 1971

Ala Huntsville, Col-Ins-Co., Inc., Box 4246 205-539-1771
Ariz Phoenix, Dorton Entprs., Box 16127 602-263-0414
Cal L.A., Ed Landa Co., 1607 Pontius Ave. 213-879-0770
Cal Menlo Pk., McKnight, 115 Spruce St. 415-325-2844
Colo Denver, Elctrn. Comps. Sls., Box 22011 303-771-6200
Fla Orlando, Col-Ins-Co., Inc., Box 13189 305-423-7615
Ill Chicago, Midwest Elctrn., 5707 W. Div. St. 312-626-0030
Ind Indpls., Midwest Elctrn., 7407 Glenview Dr 317-849-4905
Iowa Marion, Thomas-Modrcin, 890 17th Ave. 319-377-6261
Kans Shawnee Misn, Thomas-Modroin, 5450 Buena Vista Dr. 913-432-2131
Md Baltimore, B. White & Co., 7 Church La. 301-484-5400
Mass Lynnfield, Andrews Airtronics, Exec. Pk. 617-245-5220
Mich Detroit, Hilltronics, 13720 Puritan Ave. 313-342-3242
Minn Mpls, Murphy Assoc., 730 Chicago Ave. 612-333-4511
Mo Hazelwood, Thomas-Modrcin, 47 Vlg. Sq. 314-838-6446
NY Huntington, CDB Entprs, 675 W. Jericho Tpke. 516-692-5200
NY Hyde Pk., R.P. Kennedy, Green Tree 914-229-2269
NY Rochester, R.P. Kennedy, 39 Saginaw Dr. 716-271-6322
NC Winston-Salem, Col-Ins-Co, Box 5597 919-765-3650
Ohio Dayton, A.H. Baier, 3220 N. Main St. 513-276-4128
Ohio Willoughby, A.H. Baier, 4399 Ind'l Pkwy. 216-946-6080
Ore Beaverton, Arneson Assoc., 4175 S.W. Cedar Hills Blvd. 503-646-3416
Pa Ardmore, W.K. Metz, Box 309 215-649-3966
Tex Ft. Worth, W. P. Farlia, 6100 Camp Bowie Blvd. 817-738-2394
Tex Houston, W. P. Fralia, Box 35685 713-721-0230
Utah Salt Lake City, Elctrn. Comps., 445 E. 2nd, S. 801-355-5327
Wash Seattle, Arneson Assoc., 5950 6th Ave. 206-762-7664
Wisc Waukesha, Midwest Elctrn., 1317 Garfield 414-542-5129
EXP: Mass., Framingham, Fenwal Elctrns., Inc., 63 Fountain St. 617-872-8841
For: Can., Scarborough, Ont., D. Randall Canada, Ltd., 1710 Midland Ave. 416-751-7911
For: Can., Toronto, Ont., S.C. Hooker (Can.) Ltd., 761 Jane St. 416-767-7725
For: Can., Montreal, Que., S.C. Hooker (Can.) Ltd., 144 Ronald Dr. 514-487-5151

FENWAL, INC., Div. W. Kidde & Co., Inc., Main St., Ashland, Mass., 01721, Tel: 617-881-2000, TWX: 617-881-1609; Sls. Mgr: J. Rice

FERMONT DIV., Dynamics Corp. of America, 141 North Ave., Bridgeport, Conn., 06606, Tel: 203-366-5211, TWX: 710-453-2294; Sls. Mgr: C.M. Colt

FERRANTI ELEC., INC., E Bethpage Rd., Plainview, N.Y., 11803, Tel: 516-293-8383, TWX: 510-224-6483; Sls. Mgr: J.P. Brush

FERRANTI LTD., Hollinwood, Lancs., England

FERRO CORP., Electro Refractories Div., Louthan Plant, Box 20, E. Liverpool, Ohio, 43920, Tel: 216-385-1538; Wks. Mgr: W.C. Thornberry

FERRODYNE CORP., 4240 Glencoe Ave., Venice, Calif., 90291, Tel: 213-391-5233, TWX: 910-588-3780; Sls. Adm: P. Whalan ....Pg. 2951

Ariz Phoenix, Williams, 2250 N. 16th 602-254-6085
Cal San Diego, Vistronics, Box 20094 714-283-3946
Cal Pasadena, Dressen-Barnes, 250 N. Vinedo 213-795-7731
Colo Denver, Williams, 4971 Jackson 303-388-4391
Ill Wheaton, Engrg. Prods., 25W485 Geneva 312-653-6826
Md Rockville, Eastronics, 14616 Southlawn 301-762-8445
Minn St. Paul, Engrg. Prods., 717 Raymond 612-646-8819
NM Albuquerque, Williams, 420 Washington 505-255-1638
NY Binghamton, A & D Devices, Country Club Rd. 607-797-3236
NY Hartsdale, Comp. Sls., 221 E. Hartsdale 914-725-1050
NY Rochester, A & D Devices, 320 N. Wash. St. 716-586-8033
NY Verona, A & D Devices, RD 1 315-337-7321
Tex Dallas, Stevens Sls., Box 34493 214-350-2476
Wash Seattle, Avionics-Liaison, 6770 Perimeter 206-707-3870

FERRONICS, INC., 66 N. Main St., Fairport, N.Y., 14450, Tel: 716-377-6820; Sls. Mgr: R. Klonfas ....Pg. 2757

Cal Long Beach, Cairns Eng. Sls., 122 W. 5th 213-432-7444
Cal San Jose, Cairns Eng. Sls., 2787 Moorpark 408-243-8880
Fla Dunedin, J.J. Smith, Box 627 813-733-0032
Fla Eau Gallie, J.J. Smith, Box 1506 305-254-4206
Ill Chicago, Gassner & Clark, 6644 N. Western 312-764-612
Ill Springfield, Gassner & Clark, 1501 Michigan
Md Baltimore, Bernard White, 7 Church 301-484-5400
Mass Needham, W.E. Weeton, Box 77 617-444-1012
Mich Birmingham, Comp. Insulation, 610 N. Woodward 313-644-0087
Minn Mpls., Compar Twin Cities, Box 16095 612-922-7011
NJ Hillsdale, B. Cameron, 3 Elaine 201-664-2525
NY Syracuse, N. J. Matchuk, 4312 W. Genesee 315-488-3251
Ohio Cleveland, Comp. Insulation, 14235 Detroit 216-521-3570
Ore Portland, D. G. Weber, 1226 S.E. 7th 503-234-7671
Pa King of Prussia, Monteiro, 600 Lewis 215-265-0634
Tex Dallas, Compar Southwest, 8609 N.W. Plaza 214-363-1526
Tex Houston, Compar Southwest, 5757 Bellaire 713-667-3420
Wash Seattle, D. G. Weber, 403 Maritime Bldg.
Wash Spokane, D. G. Weber, 303 W. 15th

FERROTRAN ELCTRN., 683 Broadway, New York, N.Y., 10012, Tel: 212-AL-4-5810; Sls. Mgr: E. Abbot Pgs. 715-717,2954

FERROXCUBE CORP., Lock Box 359, Saugerties, N.Y., 12477, Tel: 914-246-2811, TWX: 510-247-5410; Sls. Mgr: A.B. Sanders

FERROXCUBE CORP., Sys. Div., 5455 S. Valentia Way, Englewood, Colo., 80110, Tel: 303-771-2000; Sls. Mgr: J. Buckwalter

FERWALT, W.H., INC., Webb Rd., Lapwai, Idaho, 83540, Tel: 208-VI-3-2463; Sls. Mgr: W.H. Ferwalt ....Pg. 1385

Cal Torrance, Didion, 20910 Anza 213-320-3800
Cal Los Altos, H. Stout Assocs., 200 Third St. 415-948-3265
NJ W. Caldwell, Comp. Sls., 810 Passaic Ave. 201-227-3986
NY Huntington Sta., Comp. Sls., 315 Walt Whitman Rd. 516-549-4301
Pa Philadelphia, W.F. Assocs., Box 8821 215-KI-6-4121
For: Can., Villa Lasalle, Que., Electrodesign, 840 LaFleur 514-389-5914

FIBER PHOTICS, INC., 2557 Soquel Dr., Santa Cruz, Cal., 95060, Tel: 408-475-5242; Sls. Mgr: R. Keller

FIBERITE CORP., 501 W. 3rd St., Winona, Minn., 55987, Tel: 507-454-3611, TWX: 901-565-2270

FIDELITONE, INC., 6415 Ravenswood Ave., Chicago,, Ill, 60626, Tel: 312-274-0075; Sls. Mgr: H.A. Prince

FIDELITY CHEM. PRODS. CORP., 472 Frelinqhuysen Ave., Newark, N.J., 07114, Tel: 201-242-4110; Sls. Mgr: S.B. Lonyai

FIFTH DIMENSION, Box 483, Princeton, N.J., 08540, Tel: 609-924-5990, TWX: 510-685-9294; Dir. Mktg: J.F. Pohlke

FILM ASSOCS., INC., 4600 S. Dixie Hwy., Dayton, Ohio, 45439, Tel: 513-293-2164

FILM CAPACITORS, INC., 100 8th St., Passaic, N.J., 07055, Tel: 201-779-2240; Sls. Mgr: S. Lipman

FILM MICROELECTRONICS, INC., 17 A St., Burlington, Mass, 01803, Tel: 617-272-5650; Sls. Mgr: M. Lioz

FILMOHM DIV., Solitron Microwave, 37-11 47th Ave., Long Island City, N.Y., 11101, Tel: 212-937-0400, TWX: 710-582-2497; Sls. Mgr: R. Latin

FILTECH CORP., 10103 W. Pacific, Franklin Park, Ill., 60131, Tel: 312-678-8900, TWX: 910-227-4637; Sls. Mgr: E. Argoudelis

FILTRON CO., 131-15 Fowler Ave., Flushing, N.Y., 11355, Tel: 212-445-7000, TWX: 710-582-3015; Sls. Mgr: W. Kowalchuk

FINCOR DIV., North American Rockwell, 1000 E. Boundary Ave., York, Pa., 17405, Tel: 717-843-7841; V.P. Mktg: D. Heistand

FINNEY CO., 34 W. Interstate St., Bedford, Ohio, 44146, Tel: 216-232-6161, TWX: 810-427-2279; V.P. Sls: T. Pfeiffer

FIRING CIRCUITS DIV., Marathon Elec. Mfg. Corp., Muller Ave, Norwalk, Conn, 06852, Tel: 203-846-1633; Sls. Mgr: D.H. Lynch

Advertisement

Manufacturers of single and three phase firing circuits for SCRs and SCR Power Supplies of all ratings. Special SCR Power Supplies accurately control electric furnaces, induction furnaces and plating supplies.

FISCHER, H.G. & CO., 9451-9491 W. Belmont Ave., Franklin Park, Ill., 60131, Tel: 312-625-2400; Gen. Mgr: T.C. Field

FISCHER & PORTER CO., 115 Warminster Rd., Warminster, Pa., 18974, Tel: 215-675-6000, TWX: 215-675-4582; Sls. Mgr: B. Buonomo

FISCHER SPECIAL MFG. CO., 446 Morgan St., Cincinnati, Ohio, 45206, Tel: 513-961-1280, TWX: 810-461-2593; Sls. Mgr: J. Connor

FISHER-BERKELEY CORP., 5800 Christie, Emeryville, Calif., 94608, Tel: 415-655-9696; Sls. Mgr: R. Fisher

FISHER & CROME, INC., 2427 N. Mascher St., Philadelphia, Pa., 19133, Tel: 215-GA-6-3232; Sls. Mgr: A. Crome

FISHER RADIO, 11-40 45th Rd., Long Island City, N.Y., 11101, Tel: 212-937-2100; V/P Mktg: J. Parks

FISHER SCI. CO., 711 Forbes Ave., Pittsburgh, Pa., 15219, Tel: 412-391-1330, TWX: 412-642-2186; Dir. Prod. Mgr: J. Ledwith

FITCHBURG COATED PRODUCTS, Div. Litton Inds., P. O. Box 1106, Scranton, Pa., 18501, Tel: 717-347-2035; Sls. Mgr: R. Gallagher

FJW INDS., INC., 215 E. Prospect Ave., Mt. Prospect, Ill., 60056, Tel: 312-259-8100

FKS COMMS., INC., Sub. Frequency Elctrns., Inc., 3 Delaware Dr., New Hyde Park, N.Y., 11040, Tel: 516-328-0283, TWX: 510-223-0418; Sls. Mgr: F. Kupersmith

FLAME RESCH., INC., Box 10502, Pittsburgh, Pa., 15235, Tel: 412-242-3415; Sls. Mgr: J. Shaffer

FLEX KEY CORP., 1277 Main St., Waltham, Mass., 02154, Tel: 617-891-1320; Sls. Mgr: G. Strong

FLEXAUST CO., 277 Park Ave., New York, N.Y., 10017, Tel: 212-826-2950; Sls. Mgr: G.A. Pickios

FLEXIBLE CIRCUITS, INC., Paul Valley Ind'l. Pk., Warrington, Pa., 18976, Tel: 215-DI-3-2300; Sls. Mgr: J.D. Hannum

FLEXION CORP., Box 30470, Santa Barbara, Cal., 93105, Tel: 805-687-3510

FLIGHT SYS., INC., Box 25, Mechanicsburg, Pa., 17055, Tel: 717-697-0333; Sls. Mgr: R.D. Shaffner Pgs. 1707,1910

Cal Altadena, Dorr Wagner Assocs., Box 485 213-681-4060
Cal Burlingame, J.E. Striker Co., 1319 Howard Ave. 415-342-1425
Colo Denver, O'Brien Sls. Agency, 2785 Speer Blvd. 303-477-4713
Conn Farmington, Keyco Assocs., Inc., Box 357 203-677-1771
Fla Ft. Lauderdale, Beacon Elctrn. Assocs., Inc., Box 10212 305-564-4298
Fla Maitland, Beacon Elctrn. Assocs., Inc., Box 1278 305-647-3498
Ga Atlanta, Beacon Elctrn. Assocs., Inc., 2285 Peachtree Rd. 404-351-3564

Ill Lake Zurich, Branum Sls. Co., Box 516 312-438-2356
Mass Needham, Keyco Assocs., Inc., 10 Kearney Rd. 617-321-2323
Minn St. Paul, Countryman Assocs. Co., 1821 University Ave. 612-645-9151
NJ Englewood, Andrews & Andrews, Inc., 44 N. Dean St. 201-569-8800
NY Huntington, Andrews & Andrews, Inc., 140 E. Main St. 516-692-8686
NY Syracuse, Andrews & Andrews, Inc., 236 Erie Blvd. 315-471-8855
NC Jamestown, Beacon Elctrn. Assocs., Inc., Box 503 919-454-1010
Ohio Medina, McShane Co., 3633 Trails End Dr. 216-725-4283
Okla Tulsa, J. A. Green Co., Box 3209 918-742-4657
Pa Paoli, T. Griffin Co., 46 Darby Rd. 215-647-1550
Tex Dallas, J. A. Green Co., 7118 Envoy Ct. 214-631-7450
Wash Seattle, Dewar & Assocs., 6361 First Ave., S. 206-763-2233
EXP: Mass., Mattapoisent, Clark Exp. & Imp. Co., Box 197 617-758-6448

FLITE-TRONICS CO., INC., 3312 Burton Ave., Burbank, Cal., 91502, Tel: 213-849-1552; Pres: W.V. Viscarra Pg. 714

FLOCK PROCESS CORP., Box 497, S. Norwalk, Conn., 06856, Tel: 203-853-4587; Sls. Mgr: M.W. Wilder

FLOW TECHNOLOGY, INC., 401 S. Hayden Rd., Tempe, Ariz., 85281, Tel: 602-967-8601; Sls. Mgr: J.F. Guthrie

FLUKE, JOHN MFG. CO., INC., Box 7428, Seattle, Wash., 98133, Tel: 206-774-2211, TWX: 910-449-2850; Mktg. Mgr: J.A. Froland ....Pgs. 470-479

Ala Huntsville, BCS Assocs., Box 1273 205-881-6220
Ariz Phoenix, Barnhill Assoc., 537 E. Osborn Rd. 602-263-1250
Cal Glendale, Instr. Specialists, 1109 S. Central Ave. 213-245-9404
Cal Santa Clara, Instr. Specialists, 2359 De La Cruz Blvd. 408-244-1505
Cal San Diego, Instr. Specialists, 1909 State St. 714-232-2017
Colo Denver, Barnhill Assocs., 1170 S. Sheridan Blvd. 303-934-5505
Conn Glastonbury, Instr. Reps., Box 165 203-633-0777
Fla Orlando, BCS Assocs., Box 6578 305-843-1510
Ga Atlanta, BCS Assocs., 1230 Briar Hill Dr. 404-874-9925
Haw Honolulu, Ind'l. Elctrns., Box 135 808-533-6095
Ill Rosemont, Cozzens & Cudahy, 9501 W. Devon Ave. 312-825-1144
Ind Indianapolis, Cozzens & Cudahy, 21 Beachway Dr. 317-244-2456
Md Kensington, Elctrn. Mktg. Assoc., 11501 Huff Ct. 301-881-5300
Mass Arlington, Instr. Reps., 1046 Massachusetts Ave. 617-646-1034
Mich Detroit, WKM Assoc., 1474 E. Outer Dr. 313-892-2500
Minn Minneapolis, Cozzens & Cudahy, 7450 France Ave., S. 612-920-1022
Mo St. Louis, Cozzens & Cudahy, Box 10013 314-423-1234
NJ Newark, SBM Assoc., 1519 Stuyvesant Ave. 201-687-8737
NM Albuquerque, Barnhill Assocs., 1410-D Wyoming N.E. 505-299-7658
NY Pleasantville, SBM Assocs., 28 Hobby St. 914-769-1811
NY Rochester, SBM Assocs., 4515 Culver Rd. 716-266-1400
NC Greensboro, BCS Assocs., Box 6426 919-273-1918
Ohio Cleveland, WKM Assocs., 16141 Puritas Ave. 216-267-0445
Ohio Dayton, WKM Assocs., 6073 Far Hills Ave. 513-434-7500
Ore Hillsboro, Showalter-Judd, 1445 N.E. Arrington 503-648-6372
Pa King of Prussia, Elctrn. Mktg. Assoc., 210 Goddard Blvd. 215-248-5050
Pa Pittsburgh, WKM Assocs., 90 Clairton Blvd. 412-892-2953
Tex Houston, Barnhill Assocs., 3810 Westheimer 713-621-0040
Tex Richardson, Barnhill Assocs., 312 N. Central Expwy. 214-231-2573
Va Williamsburg, BCS Assocs., 107 Rich Neck Rd. 703-229-5108
Wash Seattle, Showalter-Judd, 1806 S. Bush Pl. 206-324-7911
For: Can., Vancouver, B.C., A. Crawford Assoc., 1820 Pandora St. 604-253-7136
For: Can., Mississauga, Ont., A. Crawford Assoc., 6427 Northam Dr. 416-678-1500
For: Can., Ottawa, Ont., A. Crawford Assoc., 376 Churchill Ave. 613-725-3354
For: Can., Longueuil, Que., A. Crawford Assoc., 157 St. Charles St. W. 514-670-1212

FLUORO PLASTICS, G & Venango Sts., Phila., Pa., 19134, Tel: 215-GA-5-5500; Sls. Mgr: H. Himbert

FLUOROCARBON CO., 1754 S. Clementine, Box 3339, Anaheim, Cal., 92802, Tel: 714-PR-2-7920

FLUSH WALL RADIO CO., 1721 N. Ft. Harrison Ave., Clearwater, Fla., 33515, Tel: 813-444-6061; Pres: L.R. Schenck

FMC CORP., Organic Chems. Div., 633 Third Ave., New York, N.Y., 10017, Tel: 212-MU-7-7400; Sls. Mgr: F.N. Roberts

FORBES & WAGNER, INC., 345 Central Ave., Silver Creek, N.Y., 14136, Tel: 716-934-2691, TWX: 510-246-6940; Sls. Mgr: R.C. Bensman

FORCE CHEMS. DIV., American Solder & Flux Co., Inc., Ind'l. Blvd., Paoli, Pa., 19301, Tel: 215-647-3575; Sls. Mgr: J.J. McBride

FORD INDUSTRIES, INC., P.O. Box 06459, Portland, Ore., 97206, Tel: 503-774-1104; V.P. Mktg: Peter Grant

FORD RADIO & MICA CORP., 536 63rd St., Brooklyn, N.Y., 11220, Tel: 212-GE-9-8300; Sls. Mgr: A.J. Long

FOREDOM ELEC. CO., Bethel, Conn., 06801, Tel: 203-748-3521; Sls. Mgr: R.E. Chonus

FORK STANDARDS, 213 Main St., W. Chicago, Ill., 60185, Tel: 312-231-3511; Sls. Mgr: T.A. McCollum Pgs. 718,1387-1390

Cal Sherman Oaks, Windsor Dynamics, Box 5500 213-989-3631
Cal Woodside, Windsor Dynamics, 195 Greer 415-854-4870
Fla St. Petersburg, Comp. Sls., Box 9545 813-360-7460
Md Baltimore, Stemler, 6707 Whitestone 301-944-8262
Mass Salem, Forbes Engrg., 19 Flint St. 617-744-1693
Mich Detroit, Harvey Teplitz, 26847 Grand River 313-537-9058
NJ Cherry Hill, Stemler Assocs., Box 287 609-966-4070
NY Great Neck, F. Tylinski, 425 Northern 516-466-9070
Ohio Cleveland, H. Teplitz, 3945 Meadowbrook Blvd. 216-371-2044
Ohio Dayton, H. Teplitz, 3718 Salem Ave. 513-277-6531
Pa Paoli, Stemler Assocs., Box 711 215-644-3477
Wash Seattle, Benno Persitz, 2904 24th, W. 206-AT-2-4860

FORM-IT PRODS., INC., 1619 W. Walnut St., Chicago, Ill., 60612, Tel: 312-421-7337; Sls. Mgr: E.S. Jamison

FORMA SCIENTIFIC, Box 649, Marietta, Ohio, 45750, Tel: 614-373-4763; Sls. Mgr: J.R. Bergen

FORMICA METAL PRODS. CO., INC., Corporation Way, Dept. M, Medford, Mass., 02155, Tel: 617-395-5656; Sls. Mgr: C. Formica ....Pg. 2317

FORMSPRAG CO., 23601 Hoover Rd., Warren, Mich., 48090, Tel: 313-536-9000; V.P. Mktg: J.L. Buell III

FORMULABS IND'L. INKS, Wire Coding Ink & Equip. Sys. Div., 529 W. 4th Ave., Escondido, Cal., 92025, Tel: 714-745-6423; Sls. Mgr: J Blankinship

Advertisement

Complete inhouse wire Color Coding Systems of Modular Design to meet specific customer requirements - large or small - automatic or manual - Teflon, Nylon, Kynar, P.V.C., Polyethylene, etc. - - - Solid Coloring, Spiral Striping, Band Marking. The finest in Wire Color Coding Inks and Equipment. Leasing programs available. Worldwide Sales/Service

FORNEY INDS., INC., 1800 La Porte Ave, Fort Collins, Colo., 80521, Tel: 303-482-7271; Sls. Mgr: J.D. Forney

FOSTER & ALLEN, INC., P.O. Box 466, Chatham, N.J., 07928, Tel: 201-635-7766; Pres: E. Foster

FOSTER TRANSFORMER CO., 3820 Colerain Ave., Cincinnati, Ohio, 45223, Tel: 513-681-2420, TWX: 810-461-2584; V.P. Mktg: A. W. Reynolds

FOSTORIA-FANNON, INC., Infrared Systems Div., 1200 N. Main St., Fostoria, Ohio, 44830, Tel: 419-435-7721; V.P-Sls: R.E. Williams

FOUR-PHASE SYS, 10420 N. Tantau Ave., Cupertino, Cal, 95014, Tel: 408-255-0900; V.P. Mktg: J. Clark

FOURJAY INDS., Box 1465, Northridge Br., Dayton, Ohio, 45414, Tel: 513-278-2924; Sls. Mgr: T.R. Moore

FOX VALVE DEV. CO., INC., 2 Great Meadow La., Hanover, N.J., 07936, Tel: 201-TU-7-7474; Sls. Mgr: Z. Fox

FOXBORO CO., Foxboro, Mass., 02035, Tel: 617-KI-3-8750; Sls. Mgr: E. Kelly

FRANCIS INDS., 11855 Broad St., Pataskala, Ohio, 43062, Tel: 614-927-4091; Pres: R.J. Francis

FRANEL CORP., 8 Ferry St., So. River, N.J., 08882, Tel: 201-254-4487; Sls. Mgr: E. Silverman

FRANKEL ENGRG. LABS., 125 S. 5th St., Reading, Pa., 19603, Tel: 215-373-5205, TWX: 510-651-0491; Sls. Mgr: T. Sheetz

FRANKLIN FIBRE-LAMITEX, 905 E. 13th St., Wilmington, Del., 19899, Tel: 302-652-3621

FRANKLIN GNO CORP., Box 3250, W. Palm Beach, Fla., 33402, Tel: 305-683-6710

FREDERICK ELECTRONICS CORP., Hayward Rd., Frederick, Md., 21701, Tel: 301-662-5901; Mgr: J.P. Harter

FREDERICKS CO., Televac Div., Philmont & Anne Sts., Huntingdon Valley, Pa., 19006

FREED TRANSFORMER CO., 1795 Weirfield St., Bklyn., N.Y., 11227, Tel: 212-386-1300; Sls. Mgr: M. Salzberg Pgs. 480-483,2952,2953

Cal San Gabriel, R. Moye, 244 Milton 213-CU-3-1669
Colo Denver, Nelson, 1294 S. Bannock 303-733-5528
Ga Atlanta, F. Fausett, 2264 Melinda 404-633-3561
Ill Chicago, Tech. Devices, 6416 N. Central 312-774-8252
Iowa Cedar Rapids, R. Flanders, 3923 Council St. N.E. 319-365-8043
Md Baltimore, B. White, 7 Church 301-484-5400
NY Geneva, E. Badway, 1126 Lochland Rd.
NY Mt. Vernon, Elect. Instrs., 25 Dock 914-OW-9-9717
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-TO-1-2626
Pa Easton, Fernwood Elctrns., 1209 Blair St. 215-253-3670
Pa Pittsburgh, Scott Elctrns., 313 Empire Bldg. 412-471-5223
Tex Dallas, R.F. Kimball Co., 5531 Dyer St. 214-EM-1-6067
Wash Seattle, M. Widdekind, 815 W. Ewing 206-284-8020
EXP: N.Y. N.Y., Morhan Exporting, 458 Broadway 212-925-1257

FREQUENCY CONTROL, INC., Box 1565, Austin, Tex., 78767, Tel: 512-444-7401; Sls. Mgr: D.W. Kemptner Pg. 1386

Mass Waltham, Tech. Enterprises, 195 West St. 617-891-5300

Advertisement

FREQUENCY CONTROL, INC. MANUFACTURES

- Low Power Tuning Fork Oscillators, 300 Hz to 50 KHz
- "High Q" Tuning Fork Resonators, 300 Hz to 50 KHz
- Subminiature Tuning Fork Filters, 10 KHz to 50 KHz
- Remote Tone Control Encoders & Decoders
- Touch Tone Calibrators
- Precision Frequency Power Oscillators

FREQUENCY DEVICES, INC., 25 Locust St., Haverhill, Mass., 01830, Tel: 617-372-6930; Sls. Mgr: R.S. Leger

FREQUENCY ELCTRNS., 3 Delaware Dr., New Hyde Pk., N.Y., 11040, Tel: 516-328-0100; V.P: A. Lazar Pgs. 469,1391

Ala Huntsville, Int'l. Scien., Box 2091 205-837-1601
Cal Sherman Oaks, Windsor Dynamics, Box 5500 213-989-3631
Cal Woodside, Windsor Dynamics, 195 Greer Rd. 415-854-4870
Fla Orlando, Truex Assoc., 3165 McCrory Pl. 305-841-8931
Ill Des Plaines, S. Sterling Co., 1001 E. Touhy 312-298-4830
Md Rockville, Marktron Inc., 651 Loftstrand La. 301-762-6210
Mass Newton Highlands, Compar New England, 88 Needham St. 617-969-7140
Mich Ferndale, Tiby Co., 380 Hilton Rd. 313-547-3550
Mo St. Louis, S. Sterling Co., 11734 Lakland Ind. Dr. 314-542-3636
NJ Fairlawn, C.R. Mayer Co., Box 484 201-791-8989
NY Huntington, C.R. Mayer, Box 152 516-921-7876
NY Rochester, Ossmann Comps., 280 Metro Park 716-442-3290
NC Winston Salem, Int'l. Scien., 614 1st Union Bank Bldg. 919-722-1783
Ohio Cleveland, Tiby Co., 2245 Warrensville Cnt. Rd. 216-371-5335

Pa Glenside, Elcom Inc., 130 S. Easton Rd. 215-885-1325
Tex Houston, R. Martin Assocs., Box 19291 713-468-3877
WashSeattle, Associated Inds., 3711 S. Hudson St. 206-723-5600

FREQUENCY ENGRG. LABS., Div. Harvard Inds., Inc., Box 527, Farmingdale, N.J., 07727, Tel: 201-938-9221, TWX: 201-938-2456; Sls. Mgr: G.E. Tirone Pgs. 604,605
Ala Huntsville, E. Holmes, 4862 Governors, W. 205-837-6900
Colo Denver, F. Gates, 700 E. Louisiana Ave. 303-722-4674
Conn Hamden, Applied Meas., 2531 Whitney 203-288-5288
Fla Orlando, E. Holmes, 316⅛1/2 Bumby 305-241-2128
Ga Chamblee, E.G. Holmes, 4185 Clairmont Rd. 404-451-6161
Haw Honolulu, Aloha, 225 Liliuokalani 922-3819
Iowa Cedar Rapids, Engrg. Svcs., 1026 Third, SE 319-366-1591
Kans Prairie Vlg., Engrg. Svcs., 7924A State Line 913-649-4000
Mass Acton, Applied Meas., 86 Hayward Rd. 617-263-2766
Mich Ypsilanti, Micro Sls., 650 Greenlawn 313-482-0880
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NJ Merchantville, Megargel/Himmelstein, 6705 Park 609-662-3081
NM Albuquerque, F. Gates, 2631 Texas, N.E. 505-298-1875
Ohio Cleveland, Micro Sls., 2000 Lee Rd. 216-371-0522
Ohio Dayton, Micro Sls., 1250 W. Dorothy La. 513-298-3033
Tex Ft. Worth, C. Wolf Co., Box 12425 817-738-1702
Tex Houston, C. Wolf Co., Box 60338 713-643-2114
Tex Universal City, C. Wolf, 121 Oaklane Dr. 512-658-6672
Utah Salt Lake City, F. Gates, 455 E. Fourth, S. 801-359-1101
Va Springfield, Dyna-Rep., 5265 Port Royal 710-833-0693
WashSeattle, H. Levinson, 1211 E. Denny Wy. 206-323-5100
For: Can., Downsview 461, Ont., Megatronix, 954 Wilson 416-630-7672
For: Can., Montreal, Que., Megartonix, 3300 Cavendish
For: Can., Ottawa, Ont., Megatronix, 7398 Ridgewood 613-731-3860

FREQUENCY SOURCES, 166 Middlesex St., Box 159, No. Chelmsford, Mass., 01863, Tel: 617-251-8747, TWX: 710-343-6506; Sls. Mgr: D.R. Vining ......Pgs. 1560,1561
Ala Huntsville, Currie Aerospace, Box 1424 205-536-5650
Ariz Phoenix, Thorson Co., 2505 E. Thomas 602-264-5878
Colo Boulder, A.L.S. Elctrns., 1932 14th St. 303-447-2436
Fla Orlando, Currie Aerospace, Box 13229 305-855-0843
Ind Ft. Wayne, Tx Sls., 2919 Canterbury 219-485-0805
Mass Waltham, Resco, 181 West St. 617-899-6618
NM Albuquerque, A.L.S. Elctrns., Box 11626 505-298-2575
NY Tuckahoe, Spectrum Sls., 65 Circuit Ave. 914-793-1660
NY Utica, B.D. Hummel, 2224 Maynard 315-732-2370
Tex Dallas, Thorson, 7700 Carpenter Frwy. 214-631-5440
Va Fairfax, Schibley Assocs., 10604 Warwick 703-591-3008
FREUDENBERG, B., INC., 50 Rockefeller Plaza, New York, N.Y., 10020, Tel: 212-757-9130; Sls. Mgr: W. Frohlich
FRIDEN DIV., Singer Co., 2350 Washington Ave., San Leandro, Calif., 94577, Tel: 415-357-6800; V.P: F.C. Buckley
FRIEND'S MFG., Rd. 2, Box 74, Williamstown, N.J., 08094, Tel: 609-629-7919; Sls. Mgr: F. Friend
FRL, INC., Fisher Resch. Lab., 517 Marine View Ave., Belmont, Cal., 94002, Tel: 415-591-8924; Sls. Mgr: D. Housh
FRL, MARIN CONTROLS CO., 517 Marine View Ave., Belmont, Cal., 94002, Tel: 415-591-8924; V.P. Mktg: A. Ogilvie
FROST ELECTRONICS CORP., Pearl St., Bellingham, Mass., 02019, Tel: 617-966-1590; Gen. Mgr: A.J. Thomson
FUEL WATCHMAN SLS. & SVC., INC., 364 Jackson Ave., Bronx, N.Y., 10454, Tel: 212-669-7200; Pres: G. Strysko
FULLER-O'BRIEN CORP., Tech. Coatings Div., 1342 Willow Rd., Menlo Park, Calif., 94025, Tel: 415-328-6200; Sls. Mgr: D.E. Callis
FURANE PLASTICS, 5121 San Fernando Rd. W., Los Angeles, Cal., 90039, Tel: 213-247-6210, TWX: 910-497-2060; Mktg. Dir: R. Tiefel
FURNAS ELEC. CO., 1197 McKee St., Batavia, Ill., 60510, Tel: 312-879-3410; V.P. Mktg: J.M. O'Rourke
FURNITURE CRAFTSMEN, 3596 Alpine Rd., N.W., Grand Rapids, Mich., 49504, Tel: 616-361-0203; Pres: K.B. Neuenfeldt
G-V CONTROLS, Div. Sola Basic Inds., 101 Okner Pkwy., Livingston, N.J., 07039, Tel: 201-992-6200, TWX: 710-994-4852; V.P. Mktg: G.A. Compton
GABRIEL ELCTRNS. CORP., Saco, Me., 04072, Tel: 207-282-1526; Sls. Mgr: D. Crisman
GAERTNER SCIENTIFIC CORP., 1261A Wrightwood Ave., Chicago, Ill., 60614, Tel: 312-281-5335; Sls. Mgr: L.W. Higgins
GAF CORP., 140 W. 51 St., New York, N.Y., 10020, Tel: 212-582-7600, TWX: 212-640-5088; Sls. Mgr. Ind'l. Prods. Div: F.T. Campagna
GAGNE ASSOCS., INC., 50 Wall St., Dept. 3EE-27, Binghamton, N.Y., 13901, Tel: 607-723-9556; Sls. Mgr: S. Morrisey

Advertisement

Gagne Associates manufactures a variety of fluorescent-lit portable light boxes for tracing, inspection and printed circuit layout; also hermetic-seal dust bellows and covers in many sizes, round or rectangular; also line of fluidic switches and devices; also a low-cost vapor degreaser for developing photo resist and removing silk screen inks and solder fluxes.

GAI-TRONICS CORP., P.O. Box 31, Reading, Pa, 19603, Tel: 215-376-2848; Sls. Mgr: H.S. Campbell

GAMBLE, CHARLES T. INDS., New Jersey Ave. & Fairview St., Riverside, N.J., 08075, Tel: 609-461-1900; Sls. Mgr: C.T. Gamble ....Pg. 2852
Fla Orlando, Buchanan-Abrams, Box 6026 305-423-8995
NH Spofford, Bahr Sls., North Rd. 603-352-5444
Tex Dallas, J.B. Guenther, 4533 N. Central Ave. 214-528-6286
Tex Houston, J.B. Guenther, Box 55525 214-528-6286
GAMMA SCI., Dept. 301, 3777 Ruffin Rd., San Diego, Cal., 92123, Tel: 714-279-8034; Sls. Mgr: R.T. Campbell
GAP INSTR. CORP., 110 Marcus Blvd., Hauppauge, N.Y., 11787, Tel: 516-273-0909, TWX: 510-227-6237; Sls. Mgr: C.L. Houpt
GAR ENTERPRISES, 2031 N. Lincoln Ave., Pasadena, Cal., 91103, Tel: 213-798-0785; Sls. Mgr: G. Sugimoto
GARDINER ELCTRNS., 4729 North 7th Ave., Phoenix, Ariz., 85013, Tel: 602-274-9681
GARDINER SOLDER CO., Div. Gardiner Metal Co., 4820 S. Campbell Ave., Chicago, Ill., 60632, Tel: 312-847-0100, TWX: 910-221-2510; Sls. Mgr: J.R. Mains
GARDNER CRYOGENICS CORP., 2136 City Line Rd., Bethlehem, Pa., 18017, Tel: 215-264-4523, TWX: 510-651-5817; Sls. Mgr: R.F. Benedict
GARDNER-DENVER CO., Gardner Expwy., Quincy, Ill., 62301, Tel: 217-222-5400; Sls. Mgr: D.E. Kipley
GARNER GLASS CO., 177 S. Indian Hill Blvd., Claremont, Calif., 91711, Tel: 714-NA-4-5071; Sls. Mgr: J.C. Hyatt
GARRETT, GEORGE K. CO., MSL Inds./Fastener Group, 8801 Torresdale Ave., Philadelphia, Pa., 19136, Tel: 215-332-6000, TWX: 710-670-0984
GARRETT MICRO-CIRCUITS CORP., 16701 W. Bernardo Dr., San Diego, Cal, 92127, Tel: 714-487-3000; Sls. Mgr: D.A. Beadling
GAS ANALYSIS SYS., INC., P.O. Box 146, Basking Ridge, N.J., 07920, Tel: 201-234-1220; Sls. Mgr: W.H. Wilson

GATES ELCTRN. CO., 256 Van Nest Ave., Bronx, N.Y., 10460, Tel: 212-TU-1-5900; Sls. Mgr: J. Regenbogen Pgs. 720,721
GATES, GEO. W. & CO., Hempstead Tpke. & Lucille Ave., Franklin Sq., N.Y., 11010, Tel: 516-FI-7-0787; Sls. Mgr: T.E. Schulz
GAVIN INSTRS., Box 413, Somerville, N.J., 08876, Tel: 201-356-3500, TWX: 710-480-4725; Sls. Mgr: D. Smith
GAVITT WIRE & CABLE DIV., Amerace ESNA Corp., Brookfield, Mass., 01506, Tel: 617-867-6476; Sls. Mgr: A.J. Lorenz
GBC CLOSED CIRCUIT TV CORP., 74 Fifth Ave., New York, N.Y., 10011, Tel: 212-989-4433; Sls. Mgr: V. Formicola

GC ELCTRNS., Div. Hydrometals, 400 S. Wyman St., Rockford, Ill., 61101, Tel: 815-968-9661; Sls. Mgr: E. Crockett ....Pg. 2629
Ariz Scottsdale, Mercury Engrg., Box 3130 602-945-1927
Cal Oakland, F.W. Moulthrop, 1530 E. 12th 415-261-7676
Colo Denver, R. G. Bowen, 1440 S. Santa Fe 303-722-4641
Fla Altamonte Spgs., WMM Assocs., 515 Tivoli
Fla Clearwater, WMM Assocs., 1260A S. Highland 813-949-1817
Fla Pompano Beach, WMM Assocs., 721 SE 6th Terr.
Ga Atlanta, G. Duckett, Box 29067 404-451-3529
Mass Andover, R. Purinton, 28 Park St. 617-475-7055
Mich Detroit, J. Thorpe, 640 Hidden La. 313-779-6363
Minn St. Paul, Wagner Comp. Cons., 542 Snelling 612-698-0331
Mo St. Louis, Palatine Eng., 8622 St. Charles Rock 314-426-7055
NY Syracuse, Rep. Tech., 5858 E. Molloy 315-454-0761
NY Great Neck, R. Breauer, 1 Barstow Rd. 516-466-3030
Ohio Cleveland, Baehr Greenleaf, 14700 Detroit 216-221-9030
Pa Havertown, FM Elect., 206 Bewley Rd. 215-446-1961
Pa Pittsburgh, Covert & Newman, 300 Mt. Lebanon 412-563-0303
Tex Dallas, J.Guenther, 5121 McKinney 214-528-6286
Tex Houston, J. Guenther, Box 55525 713-661-3723
Utah Salt Lake City, R. Bowen, 1380 W. N. Temple 801-364-4632
WashSeattle, R. Johnston, 1011 N.E. 69th 206-524-5170
GCA TECHNOLOGY DIV., GCA Corp., Burlington Rd., Bedford, Mass., 01730, Tel: 617-275-9000; Dir. Mktg: L.M. Seale
GCO, INC., 3091 S. State Rd., Ann Arbor, Mich, 48104, Tel: 313-761-8500
GEARTRONICS CORP., 112 Chelmsford Rd., N. Billerica, Mass., 01862, Tel: 617-933-1400; Sls. Mgr: F.H. Kean
GEMP TERMINALS, INC., 20 Woodworth Ave., Yonkers, N.Y., 10701, Tel: 914-476-7300; Sls. Mgr: L. Weinberg
GEMS DIV., Delaval Turbine, Spring La., Farmington, Conn., 06032, Tel: 203-677-1311; Sls. Mgr: R.J. White
GENCOM DIV., Varian/EMI, 80 Express St., Plainview, N.Y., 11803, Tel: 516-433-5900, TWX: 510-221-1889; Sls. Mgr: F. Belasco
GENERAL ACOUSTICS CORP., 12248 Santa Monica Blvd, Los Angeles, Calif., 90025, Tel: 213-479-5623
GENERAL ATRONICS, Elctrn. Instr., 1200 E. Mermaid La., Philadelphia, Pa., 19118, Tel: 215-248-3700, TWX: 215-242-1295; Sls. Mgr: W.C. Teagnol
GENERAL ATRONICS, Elctrn. Tube, 1200 E. Mermaid La., Phila., Pa., 19118, Tel: 215-248-3700, TWX: 215-242-1295; Sls. Mgr: R. Koebert
ACCU-SORT SYS., INC., 1200 E. Mermaid La., Phila., Pa., 19118, Tel: 215-233-2275, TWX: 215-242-1295; Mktg. Mgr: R.M. Przybylski
GENERAL ATRONICS, Military Elctrns., 1200 E. Mermaid La., Phila., Pa., 19118, Tel: 215-248-3700, TWX: 215-242-1295; Sls. Mgr: Wm. Teagno
GENERAL AUTOMATIC CORP., 235 W. First St., Bayonne, N.J., 07002, Tel: 201-437-7500; Sls. Mgr: M. Barron
GENERAL BATTERY CORP., Box 1262, Reading, Pa., 19603, Tel: 215-929-0771; Exec. V.P: A.J. Trombetta
GENERAL BEARING CO., 32 High St., W. Nyack, N.Y., 10994, Tel: 914-358-6000; Sls. Mgr: J. Kelley
GENERAL CIRCUITS, INC., 95 Mt. Read Blvd., Rochester, N.Y., 14611, Tel: 716-235-2880; Sls. Mgr: A. Pluta
GENERAL COMPS., INC., Box 10248, St. Petersburg, Fla., 33733, Tel: 813-544-8879; Sls. Mgr: R.D. Spiers
GENERAL COMPUTERS, INC., 5990 W. Pico Blvd., Los Angeles, Calif., 90035, Tel: 213-939-7687; Sls. Mgr: C. Estes
GENERAL CONTROL CO., 1196 Soldiers Field Rd, Boston, Mass., 02134, Tel: 617-782-7440; Pres: W.J. Kelleigh
GENERAL DEVICES, INC., P.O. Box 253, Princeton, N.J., 08540, Tel: 609-924-2500; Sls. Mgr: M. Medvin
GENERAL DYNAMICS, Electro Dynamic Div., Box 127, San Diego, Cal., 92112, Tel: 714-279-7301, TWX: 910-335-2029; Dir. Mktg: D.C. Prim
GENERAL ELEC., Mountain View Rd., Lynchburg, Va., 24502, Tel: 703-846-7311; Sls. Mgr: J. Lightner
GENERAL ELEC. CO., Analytical Meas. Bus. Sect., 25 Federal St., Bldg. 4MX, W. Lynn, Mass., 01905, Tel: 617-594-0100

GENERAL ELEC. CO., Elctrn. Comps. Sls. Dept., 1 River Rd., Schenectady, N.Y., 12305, Tel: 518-FR-4-2211 Pgs. 484,485,719,1462,1595,1708,1709,1911,1997,2384,2385, 2630,2758,2939
Ala Huntsville, 3322 Memorial Pkwy., S. 205-883-3144

Ariz Phoenix, 3550 N. Central Ave. 602-264-1751
Cal Los Angeles, 11840 W. Olympic Blvd. 213-272-8566
Cal Portola Valley, 3210 Alpine Rd. 415-854-4010
Colo Denver, 201 University Blvd. 303-388-5771
Conn Bridgeport, 1285 Boston Ave. 203-334-1012
DC Washington, 777 14th St., N.W. 202-393-3600
Fla No. Palm Beach, 321 N. Lake Blvd. 305-844-5202
Fla Winter Pk., 370 Wymore Rd. 305-647-2030
Ill Chicago, 3800 N. Milwaukee Ave. 312-777-1600
Ind Ft. Wayne, 6001 S. Anthony Blvd. 219-447-1511
Ind Indianapolis, 3750 N. Meridian St. 317-923-7221
Iowa Cedar Rapids, 210 Second St., S.E. 319-364-9149
Mass Wellesley, 1 Washington St. 617-237-2050
Mich Detroit, 15160 W. 8 Mile Rd. 313-564-5231
Minn Minneapolis, 4900 Viking Dr. 612-927-5458
Mo Kansas City, 911 Main St. 816-221-4033
Mo St. Louis, 1530 Fairview 314-429-6941
NJ Clifton, 200 Main Ave. 201-472-8100
NY Albany, 11 Computer Dr., W. 518-458-7755
NY Great Neck, 425 Northern Blvd. 516-466-8800
NY No. Syracuse, Northern Concourse Off. Bldg. 315-456-3412
NY Rochester, 35 Deep Rock 716-436-3480
NC Greensboro, 1842 Banking St. 919-273-6982
Ohio Cleveland, 25000 Euclid Ave. 216-266-2900
Ohio Dayton, 3430 S. Dixie Hwy. 513-298-0311
Okla Oklahoma City, 3022 N.W. Expwy. 405-943-9015
Pa Erie, 2318 W. 8th St. 814-455-8377
Pa Philadelphia, 3 Penn Ctr. Plaza 215-568-1800
Pa Pittsburgh, 875 Greentree Rd. 412-921-4134
Tex Dallas, 4447 N. Central Expwy. 214-521-1931
Va Charlottesville, 2006 Earhart St. 703-296-8118
Va Portsmouth, 3205 King St. 703-393-6780
Wash Seattle, 225 Tukwila Pkwy. 206-244-7750
Wisc Milwaukee, 615 E. Michigan St. 414-271-5000

GENERAL ELEC., Insulating Matl's., 1 Campbell Rd., Schenectady, N.Y., 12306, Tel: 518-374-2211, TWX: 518-556-2290; Sls. Mgr: D.M. Berntson

GENERAL ELEC., Insulator Prods., 2525 Insulator Dr., Baltimore, Md., 21230, Tel: 301-752-8020; Sls. Mgr: H.M. Carmichael

GENERAL ELEC., Laminated Prods., Coshocton, Ohio, 43812, Tel: 614-622-5310, TWX: 614-623-7803; Sls. Mgr: B.F. Brehl

GENERAL ELEC., Lamp Glass, 24400 Highland Rd., Richmond Hgts., Ohio, 44143, Tel: 216-266-4011; Sls. Mgr: N.G. Grafton ....Pg. 2811

Cal Los Angeles, 2747 S. Malt Ave. 213-723-2541
Cal San Jose, 1727 N. First St. 408-298-4126
Mass Newton Upper Falls, 50 Industrial Pl. 617-332-6200
NJ Newark, 133 Boyd St. 201-824-5200
Ohio Willoughby, Euclid Ave. & Campbell Rd. 216-266-4011
For: Can., Toronto, Ont., General Elec. Co., 165 Dufferin St. 416-537-4481

GENERAL ELEC. CO., Lamp Metals & Comps. Div., 21800 Tunqsten Rd., Cleveland, Ohio, 44117, Tel: 216-266-3786; Sls. Mgr: J.J. Galvin

GENERAL ELEC., Metallurgical Prods., Box 237, Detroit, Mich., 48232, Tel: 313-536-9100; Sls. Mgr: H.E. Ihrig

GENERAL ELEC., Miniature Lamp Dept. MYI-I, Nela Park, Cleveland, Ohio, 44112, Tel: 216-226-2248; Sls. Mgr: G.F. Davis ....Pg. 1463

Cal Los Angeles, 2747 S. Malt Ave. 723-2541
Cal Oakland, 999-98th Ave. 569-3422
Colo Denver, 6501 Stapleton Dr., N. 388-4611
Fla Jacksonville, 4077 Woodcock Dr. 396-1205
Fla Miami, 3655 N.W. 71st St. 693-3811
Ga Atlanta, 120 Ottley Dr., N.E. 875-0921
Haw Honolulu, 1149 Bethel St. 537-3280
Ill Chicago, 550 W. Jackson Blvd. 332-4712
Ind Indianapolis, 2511-F-1 E. 46th St. 547-5511
La New Orleans, Box 10236, Jefferson Br. 835-6421
Md Baltimore, Box 7427 242-5700
Mass Newton Upper Falls, 50 Industrial Pl. 332-6200
Mich Detroit, 15135 Hamilton Ave. 883-0200
Minn Minneapolis, 500 Stinson Blvd. 331-4050
Mo No. Kansas City, 535 E. 14th Ave. 471-0123
Mo St. Louis, 1530 Fairview Ave. 429-6930
NJ Newark, 133 Boyd St. 824-5200
NY New York, 219 E. 42nd St. 750-2000
NY Rochester, 31 Gibbs St. 454-2990, Ext. 18
NY Utica, 1001 Broad St. 733-0922
NC Charlotte, Box 17362, 1001 Tuckaseegee Rd. 376-6585
Ohio Cincinnati, 49 Central Ave. 421-6810
Ohio Cleveland, Box 2514, 12910 Taft Ave. 266-4337
Ohio Columbus, 800 Northwest Blvd. 294-4115
Okla Oklahoma City, 2809 Northwest Expwy. 842-4028
Ore Portland, 2800 N.W. Nela St. 503-223-2101
Pa King of Prussia, Rte. 202 at Expwy. 688-5900
Pa Pittsburgh, 238 W. Carson St. 471-9050
Tenn Memphis, 2021 S. Latham St. 948-2642
Tex Dallas, 6500 Cedar Spring Rd. 351-3725
Tex Houston, 5615 Lymbar Dr. 923-2549
Va Richmond, 1510 Willow Lawn Dr. 282-7644
Wash Seattle, 2400 - 6th Ave., S. 622-8081
Wisc Milwaukee, 8100 W. Florist Ave. 462-3860

GENERAL ELEC., Photo Lamp, Nela Park, Cleveland, Ohio, 44112, Tel: 216-266-3116; Sls. Mgr: W.J. Speckerman

GENERAL ELEC., Plastics, 1 Plastic Ave., Pittsfield, Mass., 01201, Tel: 413-443-5681; Sls. Mgr: J.L. Cobb

GENERAL ELEC., Polymer Prods., Noryl Ave., Selkirk, N.Y., 12158, Tel: 413-443-5681; Sls. Mgr: J.L. Cobb

GENERAL ELECTC. SEMICONDUCTOR, Adv. & Sls. Prom., Bldg. 7, Elctrnis Pk., Syracuse,, N.Y., 13201, Tel: 315-456-2357; A&SP Mktg: D.G. Secfeld ....Pg. 1799
(Refer to **GENERAL ELEC. CO., Elctrn. Comps. Sls. Dept.,** for sales office information.)

GENERAL ELEC. CO., Silicone Prods. Dept., Waterford, N.Y., 12188, Tel: 518-237-3330; Sls. Mgr: V.M. Taylor

GENERAL ELEC., Wire & Cable, 1285 Boston Ave, Bridgeport, Conn, 06602; Mktg. Mgr: F.G. Perkins

GENERAL ELEC., Wiring Device, 95 Hathaway St., Providence, R.I., 02904, Tel: 401-781-1800

GENERAL-ELECTRO MECHANICAL, 787 Hertel Ave., Buffalo, N.Y., 14207, Tel: 716-876-9685; Sls. Mgr: J.A. Randolph ....Pg. 1594

Cal LA, American Tech., 1460 S. Sherbourne 213-659-3791

GENERAL ELECTRODYNAMICS CORP., 4430 Forest La., Garland, Tex., 75040, Tel: 214-276-1161, TWX: 910-860-5193; Sls. Mgr: F.D. Jackson

GENERAL ELCTRN. LABS., 1085 Commonwealth Ave., Boston, Mass., 02215, Tel: 617-783-0460; Sls Mgr: J. Pettee

GENERAL ELCTRNS., INC., 42 Spring St., Newark, N.J., 07104, Tel: 201-484-6302; Pres: M.T. Gasparik

GENERAL EQUIP. & MFG., 3303 Fern Valley Rd., Louisville, Ky., 40213, Tel: 502-969-2386; Sls. Mgr: W.W. Lamb

GENERAL HARDWARE MFG. CO., 80 White St., New York, N.Y., 10013, Tel: 212-431-6100; Sls. Mgr: H.W. Ehler

GENERAL ILLUMINATION, INC., 2233 University Ave., St. Paul, Minn, 55114, Tel: 612-646-2823; Sls. Mgr: Stan Wojcik ....Pgs. 1457-1461

Ala Birmingham, F.C. Nickerson, Box 9679 205-853-2852
Ark Magnolia, J.Y. Schoonmaker, Box 247 501-234-3778
Cal Los Angeles, P.F. Wiley, 1632 Silverlake 213-663-8028
Cal Menlo Park, Weightman & Assocs., 120 Santa Margarita 415-325-2885
Colo Aurora, Robbins & Assocs., Box 948 303-399-6618
Conn Meriden, Eagle Assocs., Box 921 203-237-5527
Fla Tampa, F.C. Nickerson Co., Box 13126 813-833-4321
Ga Decatur, F.C. Nickerson, 1240 Clairmont 404-377-1575
Ill Chicago, Memac Sls., 4740 N. Austin 312-545-1033
Ind Indpls, R. Milsk, 2511 E. 46th 317-546-5468
Md Baltimore, Stitzer, 212 Wash. Ave. 301-823-2600
Mich Detroit, R. Milsk Co., 19375-95 James Couzens Hwy. 313-342-6660
Minn Mpls, Heimian, 5603 Lyndale 612-861-6051
Mo Kansas Cy, Harris-Hanson, 7916 Paseo 816-444-9494
Mo St. Louis, Harris-Hanson Co., 2814 S. Brentwood Blvd. 314-962-0111
NY Buffalo, Telesco, 385 Cleveland 716-834-1026
NY Great Neck, F. Tylinski, 425 Northern 516-466-9070
NY Vestal, Telesco, 609 Harvard 607-729-6339
NY Woodstock, Telesco, 10 Cardinal 914-679-7152
NC Charlotte, F. Nickerson, 5817 Haddington 704-537-2855
Ohio Cleveland, Whelan, 21877 Euclid 216-692-1266
Ohio Dayton, Whelan, 2600 Far Hills 513-298-9997
Pa Paoli, Stitzer, 24 State 215-644-5500
Tex Dallas, J.Y. Schoonmaker, 2995 Ladybird 214-357-8481
Tex Houston, J.Y. Schoonmaker, 8619 Mayridge 713-926-9510
Wash Seattle, Blum & Assocs., 2300 N.W. 97th 206-782-1600
EXP: Schenectady, N.Y., EMB Elctrns., 433 Liberty 518-372-5841

GENERAL INSTR. OF CAN., Entertainment Prods., 151 Weber St. S., Waterloo, Ont., Can., Tel: 519-744-8101, TWX: 610-365-3415; V.P. Mktg: J.F. Thompson

GENERAL INSTR. CORP., AUTOMATIC MFG. DIV., 65 Gouverneur St., Newark, N.J., 07104, Tel: 201-485-2100, TWX: 201-621-7993; Sls. Mgr: A. Adessa

GENERAL INSTR. CORP., Capacitor Div., Walnut St, Tazewell, Va., 24651, Tel: 703-988-5551, TWX: 710-938-1580; Dir. Mktg: Roy D. Burke ..Pgs. 2386,2387

Ariz Phoenix, Jarko Assoc., 2032 N. 27th Ave. 602-272-2684
Cal San Carlos, Comp. Assoc., Box 516 415-591-9656
Cal Woodland Hills, Starr Sls., 20300 Reaza 213-348-5241
Colo Denver, Elcom, Box 22011 303-771-6200
Conn Madison, A & M Elctrn. Reps., Ailene Dr. 203-245-1031
Conn Meridan, A & M Elctrn. Reps., 595 Bee St. 203-235-3943
Fla No. Palm Bch., General, 321 Northlake 305-842-5259
Ill Chicago, Gianaras Sls., 7051 W. Wilson 312-774-4600
Ind Ft. Wayne, Needler Sls., Box 2407, Sta. C 219-447-2123
Ind Indpls, Needler Sls., Box 88153 Mapleton 317-255-8056
Iowa Cedar Rapids, J.R. Sls. Engrg., 3550 Cottage Grove 319-377-8211
Md Ekridge, J. Bresson, 5600 Main 301-796-5220
Mass Needham, A & M Elctrn. Reps., 1492 Highland 617-444-8170
Mich Detroit, Blumenberg, Box 25, College 313-341-4737
Minn Mpls, Inds. Comp., Inc., 4004 W. 78th 612-927-9991
Miss Meridian, Herron Assoc., Box 3008 601-482-3631
Mo Grandview, Cen Tech. Sls., Box 310 816-763-2900
Mo St. Louis, Cen. Tech., Box 5932 314-522-1700
NJ Leonia, Kohl-Camber, 201 Crescent 201-944-6488
NJ Newark, General Instr., 65 Gouverneur 201-485-2100
NM Albuquerque, Elcom, 209 San Pablo, S.E.
NY Buffalo, R. W. Mitche Co., Ellicott Sq. Bldg. 716-854-2571
NY New York, Kohl-Camber, 1700 York Ave.
Ohio Cincinnati, G & H Sls., 10599 Chester Rd. 513-771-8231
Okla Tulsa, McKinney Sls.
Pa Narberth, Bresson Assoc., 107 Forrest Ave. 215-839-6770
Tex Dallas, McKinney Sls., 1303 Chemical 214-631-9450
Va Lynchburg, J. Bresson Assocs., Box 4115 703-237-0829
Wash Bellevue, Waddell Assoc., 10211 N.E. 31st Pl. 206-822-0211

GENERAL INSTR. CORP., Defense & Engrg. Prods. Grp., Elctrn. Sys. Div., Andrews Rd., Hicksville, N.Y., 11802, Tel: 516-OV-1-4300, TWX: 516-433-9321; Mktg. Mgr: J. Adams

GENERAL INSTR. CORP., Defense & Engrg. Prods. Grp., Harris ASW Div., 33 Southwest Pk., Westwood, Mass., 02091, Tel: 617-326-7815; Gen'l. Mgr: H. Mattes

GENERAL INSTR. CORP., Semiconductor Prods. Group, 600 W. John St., Hicksville, N.Y., 11802, Tel: 516-733-3333, TWX: 510-221-1866; Sls. Mgr: G. Cacavio

GENERAL INSTR. CORP., Entertainment Elctrns. Prods. Grp., F.W. Sickles, 165 Front St., Chicopee, Mass., 01013, Tel: 413-594-4781, TWX: 710-353-1301; Sls. Mgr: M. Wagener

GENERAL INSTR. CORP., Def. & Engrg. Prods. Sys. & Magne-Head, 13040 S. Cerise Ave., Hawthorne, Cal., 90250, Tel: 213-679-3377, TWX: 910-325-6301; Dir. Mktg: R. Martin

GENERAL LAB. ASSOCS., Norwich, N.Y., 13815, Tel: 607-334-3264, TWX: 510-261-7776; V.P. Mktg: A.J. Kutler

GENERAL MAGNETICS, 135 Bloomfield Ave., Bloomfield, N.J., 07003, Tel: 201-743-2700; Pres: M.G. Tekosky ....Pgs. 1318-1320

GENERAL MFG. CO., 724 Ruberta Ave., Glendale, Calif., 91201, Tel: 213-243-2069; Pres: E. Galle

GENERAL METALS, 2200 Fairfax Rd., Greensboro, N. C., 27420, Tel: 919-292-4400; Sls. Mgr: J. K. Thomas

GENERAL MICROWAVE CORP., 155 Marine St., Farmingdale, N.Y., 11735, Tel: 516-MY-4-3600; Sls. Mgr: M. Wind

GENERAL MONITORS, INC., 3019 Enterprise St., Costa Mesa, Calif., 92626, Tel: 714-540-4895; Pres: F.A. Linville

GENERAL OCEANOLOGY, INC., DynaControl Div., 27 Moulton St., Cambridge, Mass., 02138, Tel: 617-492-6300; Sls. Mgr: A.L. Kadis

GENERAL PLASTICS CORP., 55 La France Ave., Bloomfield, N.J., 07003, Tel: 201-748-5500, TWX: 710-994-4781; Sls. Mgr: J. Desmond

GENERAL RADIO CO., 300 Baker Ave., Concord, Mass., 01742, Tel: 617-369-4400, TWX: 710-347-1051; Sr. V.P: W.R. Thurston

GENERAL RADIOTELEPHONE CO., 3501 W. Burbank Blvd., Burbank, Cal., 91505, Tel: 213-849-6891; Sls. Mgr: B. Mowatt

GENERAL REED CO., Div. of Sigma Instr., Inc., 19 Walnut Ave., Box 858, Clark, N.J., 07066, Tel: 201-382-7373; Sls. Mgr: H.J. Sundermeyer

GENERAL RELAY CORP., 20 Mercer St., Dover, N.J., 07801, Tel: 201-361-1400, TWX: 710-987-7929; Sls. Mgr: B. Nierenberg

GENERAL RELIANCE DIV., General Relay Corp., 20 Mercer St., Dover, N.J., 07801, Tel: 201-361-1400, TWX: 710-987-7929; Sls. Mgr: B. Nierenberg

GENERAL RESISTANCE, Div. Chronetics, Inc., 500 Nuber Ave., Mt. Vernon, N.Y., 10550, Tel: 914-699-8010, TWX: 710-560-0014; Sls. Mgr: L. Silverman Pgs. 2850,2851

COMPONENT REPRESENTATIVES
Ala Huntsville, 20th Century Mktg., Box 6127
Cal LA, M. Stolaroff, 4622 W. Saluson 213-295-7781
Fla Maitland, Greenstein Assocs., 1205 Winston Rd.
Ill Chicago, L.F. Green, 5218 W. Diversey 312-286-6824
Md Silver Spring, QED Elctrns., 850 Sligo
Minn Mpls., L. Green, 6225 University N.E. 612-781-1611
Mo Kansas City, Harris-Hanson, 7916 Pase 816-444-9494
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood 314-647-4350
NY Mt. Vernon, QED, 500 Nuber Ave. 914-664-0080
NY Syracuse, Naylor Elec., 1718 Erie E. 315-872-9183
Ohio Dayton, Rixan, 5752 Wadsworth 614-222-0011
Pa Delmont, T.F. Laslo, 411 Manor Rd.
Tex Dallas, Kemp Engr., 2618 Manana Dr. 214-357-6663
Tex Houston, Kemp Instrs., 6001 Gulf Frwy. 713-928-5426
Tex San Antonio, Kemp Engrg. Co., Inc. 512-344-1841
Wash Bellvue, Brennan, 208 Carolson Bldg. 206-454-9332
For: Can., Ottawa, Ont., Whittaker, 42 Howden 613-224-1221

INSTRUMENT REPRESENTATIVES
Ala Huntsville, Kemp Instrs., 4306 Governors W. 205-837-4304
Cal Palo Alto, B. Oppenheim, 2179 Park Blvd. 415-321-7323
Cal Sherman Oaks, Windsor Dynamics, Box 5500
Fla Maitland, Greenstein Assoc., 1205 Winston Rd.
Ill Chicago, L.F. Green, 5218 W. Diversey 312-286-6824
Md Silver Spring, QED, 880 Bonifant St. 301-588-8134
Minn Mpls., L. Green, 6225 University N.E. 612-781-1611
Mo Kansas City, Harris-Hanson, 7916 Pase 816-444-9494
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood 314-647-4350
NY Dewitt, D.B. Assoc., Box 14, 3307 Erie Blvd. E.
Ohio Dayton, Rixan Assoc., 5752 Wadsworth 513-222-0011
Pa Delmont, T.F. Laslo, 411 Manor Rd.
Tex Dallas, Kemp Engrg., 2618 Manana Dr. 214-357-6663
Tex Houston, Kemp Instrs., 6001 Gulf Frwy. 713-928-5426
Tex San Antonio, Kemp Engrg. Co., Inc. 512-344-1841
Wash Bellvue, Brennan, 208 Carlson Bldg. 206-454-9332
For: Can., Ottawa, Ont., Whittaker, 42 Howden 613-224-1221

GENERAL SCANNING, 80 Coolidge Hill Rd., Watertown, Mass., 02172, Tel: 617-924-6620

GENERAL SCI. EQUIP., Limekiln Pike & Williams Ave., Phila., Pa., 19150, Tel: 215-HA-4-1550; Sls. Mgr: H.W. Kline

GENERAL SEMICONDUCTOR CORP., 230 W. 5th St., Tempe, Ariz., 85281, Tel: 602-966-7263, TWX: 910-950-1942; Sls. Mgr: R.D. Winters

GENERAL SENSORS, INC., P.O. Box 231, Athens, Tex., 75751, Tel: 214-675-5229; Sls. Mgr: D.R. Furey

GENERAL TV NETWORK, 520 W. Eight Mile Rd., Ferndale, Mich., 48220, Tel: 313-LI-8-2500; Sls. Mgr: R.R. Hippler

GENERAL THERMODYNAMICS CORP., Falcon Div., 164 Ballardvale St., Wilmington, Mass., 01887, Tel: 617-933-7370; Sls. Mgr: S. Leto

GENERAL TIME CORP., Industrial Controls Div., Rte. 8, Torrington, Conn., 06790, Tel: 203-482-4481; V.P. Mktg: R.F. Edgar ....Pg. 1321
Cal Pasadena, C.A. Williams, 2401 San Pasqual 213-793-1161
Conn Torrington, S. Horvath, 157 Beechwood Ave. 203-233-5083
Ga Atlanta, Baumgartner Assoc., 3224 Peachtree Rd. 404-237-5563
Ill Des Plaines, J. Barton, 1479 Ellinwood St. 312-296-7751
Ill Des Plaines, Wm. J. Dunne, 1479 Ellinwood St. 312-296-7751
Kans Prairie Village, Thro Ind'l. Sls. Co., 2110 W. 75th St. 913-362-2533
Mass Marshfield Hills, R. L. Smith, 215 Pleasant St. 617-762-1466
Mich Detroit, General Time 313-585-3122
Minn Mpls, General Time 612-333-2815
NC Bethania, Candor Co., Inc. 919-924-1480
NY Coram, K.M. Chalson, 3 Pennaquid Rd. 201-289-5959
NY Rochester, D. F. Lynch, Box 9809 716-546-4766
Ohio Cincinnati, Stewart Sea, Carew Tower 513-421-3366
Ohio Cleveland, A.F. Blaine, 8905 Lake Ave. 216-651-1020
Ore Portland, D. Fry Co., Box 3803 503-226-3903
Pa Philadelphia, G.S. Blower 215-696-3443
Tenn Cleveland, Candor Co., Inc., Box 412 615-472-7059
Tex Dallas, Titan Reps., 6434 Maple 214-357-8266
Va Lynchburg, Candor Co., 309 Buckingham 703-846-6579
For: Can., Peterborough, Ont., Gen'l Time Can., Box 239

GENISCO TECH. CORP., Data Div., 18435 Susana Rd., Compton, Cal., 90221, Tel: 213-774-1850, TWX: 910-346-6773; Sls. Mgr: E.A. Dunn

GENISCO TECH. CORP., Genistron Div., 18435 Susana Rd., Compton, Cal., 90221, Tel: 213-774-1850, TWX: 910-346-6773; Gen. Mgr: T. Moore ....Pgs. 1514,1515
Cal Los Altos, Ewing-Foley, 900 N. San Antonio 415-941-4525
Cal San Diego, F. Nagel, 1253 University 714-290-4050
Cal Van Nuys, Dorado Elctrns., 13615 Victory 213-873-4124
Colo Denver, I. Strong, 635 Canosa Ct. 303-292-6900
Conn Meriden, P. Sturgeon, 99 Colony 203-237-1112
Fla Miami Bch, Geartner, 1125-71st 305-531-0200
Fla Orlando, Geartner, 1221 Lee 305-299-1000
Ga Atlanta, Reynolds & Assocs., 175 W. Wieuca Rd. 404-252-5360
Ill Bellwood, Fiat Engrg., 5133 St. Charles 312-547-6200
Ind Muncie, Fiat Engrg., Box 1165 317-282-5676
Iowa Cedar Rapids, Palatine Engrg., 720 Third, SE 319-365-8071
Kans Andover, Palatine Engrg., 1722 N. Terry 316-683-7512
Kans Overland Pk., Palatine Engrg., 7520 W. 63rd 913-262-5643
Md Kensington, Brown Frederick, 3519 Raymoor 301-949-1707
Mass Chestnut Hill, P.R. Sturgeon, 1330 Boylston 617-734-7710
Mich Detroit, Blumenberg, 20250 Briarcliff 313-341-4737
Minn St. Paul, Countryman, 1821 University 612-645-9151
Mo St. Louis, Palatine Engrg., 8622 St. Charles Rock 314-426-7055
NJ Englewood Cliffs, Sprung/Nussbaum, 120 Sylvan 201-947-6767
NY Buffalo, R. Mitscher, 496 Ellicott Sq. 716-854-2517
NC Raleigh, R. Mitscher, 3508 Horton 919-828-0575
Ohio Dayton, Neal Bear, 1463 E. Dorothy 513-299-3566
Ohio Richfield, Neal Bear, 3435 Streetsboro 216-659-3331
Pa Oreland, Brown Frederick, 88 Pennsylvania 215-837-1325
Tenn Nashville, R. Mitscher, 2508 Stones River 615-883-2220
Tex Dallas, R. Nesbitt, Box 20816 214-357-4601
Tex Houston, R. Nesbitt, Box 66831 713-528-3811
Va Virginia Bch, R. Mitscher, 3100 Basin Ct. 703-464-0500
Wash Seattle, J. Backer, 221 W. Galer St. 206-285-1300
For: Can., Downsview, Ont., Weber-Semad, 1111 Finch W. 416-889-8229
For: Can., Montreal, Que., Specialty Elctrns., 2690 Pitfield 514-336-4500

GENISCO TECHNOLOGY CORP., Eldema Div., 18435 Susana Rd., Compton, Cal., 90221, Tel: 213-774-1850, TWX: 910-346-6773; Gen. Mgr: T. Moore Pgs. 1452-1455
Ariz Phoenix, W. Knight, Box 11394 602-264-3578
Ark El Dorado, D. Bellew Sls., Inc., Box 1835 501-863-8325
Cal Burlingame, W. Purdy, 770 Airport Blvd. 415-347-7701
Cal Inglewood, W. Knight, 112 Glasgow 213-678-4711
Colo Denver, I. Strong, 635 Canosa 303-292-6900
Conn Meriden, P. Sturgeon, 99 Colony St. 203-237-1112
Fla Miami Beach, Geartner, 350 Lincoln 305-531-0200
Fla Orlando, Geartner, 1221 Lee Rd. 305-299-1000
Ga Atlanta, Reynolds, 175 W. Wieuce 404-252-5360
Ill Bellwood, Fiat Engrg., 5133 St. Charles Rd. 312-547-6200
Ind Muncie, Fiat Engrg., Box 1165 317-282-5676
Iowa Cedar Rapids, Palatine Engrg., 720 3rd Ave., S.E. 319-365-8071
Kans Andover, Palatine Engrg., 1722 N. Terry 316-683-7512
Kan Overland Pk., Palatine Engrg., 7520 W. 63rd 913-262-5643
La Metairie, D. Bellew, 3017 "D" 18th St. 504-833-6496
Md Kensington, Brown Frederick, 3519 Raymoor 301-949-1707
Mass Chestnut Hill, P. Sturgeon, 1330 Boylston 617-734-7710
Mich Detroit, Hilltronics, 13720 Puritan 313-342-3242
Minn Mpls., F. B. Hill Co., 7317 Cahill Rd. 612-941-5270
Miss Michigan City, D. Bellew Sls., Inc., Box 43 601-768-2478
Mo St. Louis, Palatine Engrg., 8622 St. Charles Rock 314-426-7055
NM Albuquerque, C. Carlberg, Box 3177 505-265-1579
NJ Englewood Cliffs, Sprung/Nussbaum, 120 Sylvan 201-947-6767
NY Buffalo, R. Mitscher, 496 Ellicott Sq. Bldg. 716-854-2517
NC Raleigh, R. Mitscher, 3508 Horton 919-828-0575
Ohio Dayton, N. Bear, 1563 E. Dorothy 513-299-3566
Ohio Richfield, N. Bear, 3435 Streetsboro 216-659-3331
Pa Oreland, Brown Frederick, 88 Pennsylvania 215-837-1325
Tenn Nashville, R. Mitscher, 2508 Stones River 615-883-2220
Tex Dallas, R.E. Nesbitt Co., Box 20816 214-357-4601
Tex Houston, R.E. Nesbitt Co., Box 66831 713-528-3811
Va Virginia Bch., R. Mitscher, 3100 Basin Ct. 703-464-0500
Wash Seattle, J.J. Backer, 221 W. Galer St. 206-283-6470
For: Can., Downsview, Ont., Weber-Smead Elctrns., 1111 Finch Ave., W. 416-635-9880
For: Can., Montreal 383, Que., Specialty Elctrns., 2690 Pitfield Blvd. 514-336-4500

GENISCO TECH. CORP., INSTR. DIV., 18435 Susana Rd., Compton, Cal., 90221

GENTAPE CORP., 51 LaFrance Ave., Bloomfield, N.J., 07003, Tel: 201-748-5506, TWX: 710-994-4781; Pres: R. Goldsmith

GENTRAN INC., 928 Thompson Pl., Sunnyvale, Cal, 94086, Tel: 408-245-5501

GENTRONICS, INC., 26 Knollwood Dr., Clinton, Conn., 06413, Tel: 203-669-5741; Sls. Mgr: G. Piantoni

Advertisement

Gentronics tantalum capacitors are made to your exact spec's or can be purchased to standard catalog descriptions. We are specialists in custom designs.

GEO SPACE, Ind'l. Prods. Div., 5803 Glenmont, Houston, Tex., 77036, Tel: 713-666-1611; Sls. Mgr: J. Nichols

GEO SPACE SYS., 4715 George Rd., Box 23117, Tampa, Fla., 33622, Tel: 813-884-0492; Dir. Mktg: C.F. Swenson Pgs. 350,486,608

GEOMETRICS, 914 Industrial Ave., Palo Alto, Cal., 94303, Tel: 415-321-7610

GEORATOR CORP., Box 70, Manassas, Va., 22110, Tel: 703-368-2102; Sls. Mgr: E.L. Barrow ....Pgs. 722,723
Cal Encino, King-Way, 17100 Ventura Blvd. 213-788-4124
Cal Fullerton, King-Way, 2931 Sequoia 714-529-8762
Cal San Francisco, Artwel Elec., 1485 Bayshore 415-467-1880
Fla St. Petersburg, Lynch-Gentry, Box 13248 813-347-5131
Mass Braintree, Bordewieck Engrg., 221 Grove 617-843-0845
Minn Hopkins, Dossett Engrg., 128 Jackson, N. 612-938-3332
NY Syosset, H-R Assocs., 17 Hillvale Rd. 516-433-6804

Ohio Cleveland, Orr, 6510 Farnsworth Dr. 216-885-1324
Tex Dallas, Carey, 725 Preston Forest Shop Ctr. 214-363-7813
Tex Houston, Carey, 3315 W. 12th St. 713-869-3623
GERBER SCI. INSTR. CO., Box 305, Hartford, Conn., 06101, Tel: 203-644-1551, TWX: 710-427-2218; V.P. Mktg: L.C. Arnett
GERRARD, A.J. & CO., 400 E. Touhy Ave., Des Plaines, Ill., 60018, Tel: 312-827-5121; Sls. Mgr: E.M. Gerhardstein
GETTYS MFG. CO., 2700 Golf Ave., Racine, Wisc., 53404, Tel: 414-637-6591; Sls. Mgr: R.G. Hill
GHZ DEVICES, INC., Kennedy Dr., No. Chelmsford, Mass., 01863, Tel: 617-251-4981, TWX: 710-343-6506; Sls. Mgr: J. Callahan

GIBBS MFG. & RESCH., Sub. Hammond, 450 N. Main St., Janesville, Wisc., 53545, Tel: 608-756-1261, TWX: 910-288-2927; Dir. Sls.: N. Schlegel ......Pgs. 1395-1402
Ala Huntsville, J. Highsmith, 3322 So. Memorial 205-881-3294
Ariz Tempe, Saguaro Tech. Scv., 1000 E. Apache Blvd. 602-275-0431
Cal Los Altos, H. Stout Assocs., 200 3rd 415-948-3265
Cal Pasadena, TechniSls., 3820 E. Colorado 213-792-5111
Colo Denver, Checkmate Sls., Box 22411 303-771-4020
Conn Hamden, Equip. Sls., 3013 Dixwell 203-248-5581
Fla Orlando, J. Highsmith, 2543 Ind'l. Blvd. 305-293-5202
Ill Geneva, Accutronics/Gibbs, 628 North St. 312-232-2600
Mass Bedford, Equip. Sls., 30 Shawsheen 617-275-7730
Mich Livonia, Chandler Assocs., 32401 W. 8 Mile Rd. 313-476-5800
Minn Mpls, L.F. Green Assoc., 6225 Univ. 612-781-1611
Mo Kansas City, H.J. Weisler, 3307 Chippawa 816-454-5096
Mo St. Louis, H.J. Weisler, 2050 Woodson 314-428-3934
NJ Dover, V.P.I. Assocs., 162 Highview Terr. 516-482-8387
NM Albuquerque, Elctrn. Mktg., 135 Vermont 505-265-7837
NY Fayetteville, Components Ind., 416 Franklin 315-637-9601
NY Great Neck, V.P.I. Assocs., 300 Northern 516-482-8387
NC Charlotte, J. Highsmith & Co., 3733 Monroe Rd. 704-333-7743
Ohio N. Olmsted, Chandler Assocs., 23203 Loraine Rd. 216-734-4747
Pa Paoli, T. Griffin Co., 46 Darby Rd. 215-647-1550
Tex Dallas, Roberts Sls., 9704 Lanward 214-348-4283
Tex Houston, R & K Engrg. & Sls., 9119 Katy Frwy. 713-464-3662
Va Richmond, J. Highsmith, 5003 Brook 703-266-2080
Wisc Janesville, GMRC Sls. Dept., Box 471 608-756-1261
EXP: Ill., Chicago, Hammond Int'l., 4200 W. Diversey 312-283-2000
GIBSON/EGAN CO., 34 La Porte St., Arcadia, Calif., 91006, Tel: 213-446-5259; Sls. Mgr: G.W. Egan
GIBSON ELEC., Talon Div. of Textron, Delmont, Pa., 15626, Tel: 412-468-4121, TWX: 510-468-3567; Sls. Mgr: C.B. McCool
GILLEN, JOHN CO., 2540 South 50th Ave., Cicero, Ill., 60650, Tel: 312-656-4240; Sls. Mgr: G.W. Andrews
GILLETTE ELCTRN. PRODS. CO., 201 Laurel St., Beverly, N.J., 08010, Tel: 609-387-1166; Pres: M. Green
GILLIES, DUNCAN M. CO., INC., 66 Central St., W. Boylston, Mass., 01583, Tel: 617-835-4444; Sls. Mgr: D.M. Gillies
G/L TAB BOOKS, Monterey & Pinola Aves., Blue Ridge Summit, Pa., 17214, Tel: 717-794-2191; Sls. Mgr: S. B. Schiffman
GLAR-BAN CORP., 496 Kennedy Rd., Buffalo, N.Y., 14225, Tel: 716-897-1333 C.R. Arrison
GLASS BEADS CO., Ceramic Prods. Div., Latrobe, Pa., 15650, Tel: 412-537-7791; Sls. Mgr: T.J. Frederick

GLASS TECH., Gulton Inds., 822 Production Pl., Newport Bch., Cal., 92660, Tel: 714-642-0163, TWX: 910-596-1352; Sls. Mgr: G. Porter ....Pg. 2632
Ala Huntsville, R. Steckmesser, Box 4006 205-881-1750
Ariz Scottsdale, Carter Assocs., Box 99 602-945-4755
Cal Los Angeles, E. Landa, 1607 Pontius 213-272-9525
Conn Meriden, H. Lavin Assoc., Inc., Box 921 203-237-5527
NJ Mountain Lakes, J. P. Dearie Co. 201-334-4848
Tex Irving, Kentron Engrg. Sls. Co., Box 1595 214-254-5455

GLASSCO INSTR. CO., See Kratos Instr. Div.
GLASSEAL PRODS. CO., 725 Commerce Rd., Linden, N.J., 07036, Tel: 201-486-2067, TWX: 710-996-5918; Sls. Mgr: C.M. Kalish
GLASTIC CORP., 4321 Glenridge Rd., Cleveland, Ohio, 44121, Tel: 216-486-0100, TWX: 810-421-8827; Sls. Mgr: A.H. Schempp
GLEASON-AVERY CO., Auburn, N.Y., 13021, Tel: 315-253-7396; Sls. Mgr: J.L. Zabriskie
GLENAIR, INC., 1211 Air Way, Glendale, Calif., 91201, Tel: 213-247-6000, TWX: 910-497-2066; Sls. Mgr: J.E. Merrell
GLENTEK, INC., 1557 7th St., Santa Monica, Calif., 90401, Tel: 213-451-4511; Sls. Mgr: R.C. Vasak
GLENTRONICS, 748 E. Alosta Ave., Glendora, Cal., 91740, Tel: 213-963-1676; Sls. Mgr: D.C. Parks
GLIDDEN-DURKEE DIV., SCM Corp., Metals Group, 900 Union Commerce Bldg., Cleveland, Ohio, 44115, Tel: 216-771-5121; Sls. Mgr: J.A. Walker
GLIDELITE INDS., INC., 180 Central Ave., Hackensack, N.J., 07601, Tel: 201-487-0838
GLO-QUARTZ ELEC. HEATER CO., Box 170, Mentor, Ohio, 44060, Tel: 216-255-9700, TWX: 980-284; Sls. Mgr: C.A. Wagner

GLOBE DIV. OF TRW INC., 2275 Stanley Ave., Dayton, Ohio, 45404, Tel: 513-228-3171 ....Pgs. 1598-1607,2787
Ala Huntsville, TRW, Huntsville Jet Port 205-772-9656
Ariz Scottsdale, TRW, 77 W. 3rd Ave. 602-947-5791
Cal Danville, Straube, 401 S. Hartz Ave. 415-837-8151
Cal Hayward, Straube, 98 W. Jackson St. 415-783-6750
Cal Los Angeles, TRW, 5410 W. Imperial Hwy. 213-649-1232
Cal Menlo Pk., Straube, 483 Willow Rd. 415-323-2476
Cal San Diego, Trans Dynamics, 3108 N. 5th Ave. 714-298-8215
Colo Denver, Williams, 4971 Jackson 303-388-4391
Conn Rowaton, TRW, 137 Rowaton Ave. 203-853-4466
Fla Orlando, TRW, 3203 Lawton Rd. 305-841-2982
Ill Elk Grove Vill., J.G. Twist, 1301 Higgins Rd. 312-293-6007
Ill Elk Grove Village, J.G. Twist, 5222 W. Diversey 312-777-2250
Ind Ft. Wayne, R.O. Whitesell, 3426 Taylor St. 219-432-5591
Ind Indpls., R.O. Whitesell, 6620 E. Washington St. 317-359-9283
Ind Kokomo, R.O. Whitesell, 3827 S. Lafountain Sq. 317-453-6868
Iowa Cedar Rapids, V. Fester, 4403 First S.E. 319-362-6997
Ky Louisville, R. O. Whitesell, 3620 Lex. Rd. 502-893-7303
Mass Waltham, TRW, 1345 Main St. 617-899-6100
Mich Southfield, R. Whitesell, 25100 Evergreen 313-358-2020
Mich St. Joseph, R.O. Whitesell, Shepard & Benning Bldg. 616-983-7337
Minn St. Paul, Northport, 2027 Grand Ave. 612-698-3841
Mo Kansas City, Harris-Hanson, 7916 Paseo 816-444-9494
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood 314-647-4350
NM Albuquerque, Williams, 420 Wash., S.E. 505-255-1638
NY Garden City, Comtronic, 370 Old Country 516-741-8966
Ohio Cincinnati, R. Whitesell, 1172 W. Galbraith 513-521-2290
Ohio Cleveland, R. Whitesell, 21139 Loraine 216-333-2585
Ohio Dayton, R. Whitesell, 4133 S. Dixie 513-298-9546
Ore Beaverton, N.R. Schultz Co., Box 156 503-646-1345
Pa Narberth, TRW, 1 Station Circle 215-667-3400
Pa Pittsburgh, R. Whitesell, 201 Penn Center 412-242-0100
Tex Houston, Vista, 1614 S. Post Oak 713-622-5680
Tex Richardson, Vista, 777 S. Central Expwy. 214-235-4547
Va Roanoke, TRW, 4719 Easthill Dr. SW 703-774-5411
Wash Bellevue, N.R. Schultz Co., Box 157 206-454-0300
GLOBE PLASTICS, 1342 S. Signal Dr., Pomona, Cal., 91766, Tel: 714-NA-3-2747; Sls. Mgr: M. Kramer

Advertisement
Injection & Transfer Molding - Custom Molding
Complete Mold-Making Facilities
Quality Control/Mil Q9858
Mfg. Code No. 21071
Specialize in transistor pads, washers, header boards, frames, funnels, clips. Send for complete brochure. Let us quote on your plastic part requirements.

GLOBE-UNION INC., Globe Battery Div., 5757 N. Green Bay Ave., Milwaukee, Wisc., 53201, Tel: 414-228-2535, TWX: 910-262-3084; Sls. Mgr: H. Reed
GM NAMEPLATE, INC., 2040 15th Ave., W., Seattle, Wash., 98119, Tel: 206-284-2200; Sls. Mgr: D. Root
GOE ENGRG. CO., 250 South 9th St., City of Industry, Calif., 91746, Tel: 213-330-7401; Sls. Mgr: G.H. Reynolds
GOERZ OPTICAL CO., INC., 301 Alpha Dr., Pittsburgh, Pa., 15238, Tel: 412-781-6011, TWX: 710-664-2082; Sls. Mgr: J. Parmentier
GOLD LINE CONNECTOR, INC., Muller Ave., Box 893, Norwalk, Conn., 06851, Tel: 203-847-3826; Sls. Mgr: M. Miller
GOLDAK CO., INC., 1101-A Air Way, Glendale, Calif., 91201, Tel: 213-246-8464; Sls. Mgr: B.S. Kincaid
GOLDING MFG. CO., 90 Porete Ave., N. Arlington, N.J., 07032, Tel: 201-998-1805; Pres: J. Golding
GOLDSMAN, INC., 1328-34 North 4th St., Philadelphia, Pa., 19122, Tel: 215-PO-5-4468; Sls. Mgr: R.H. Sager
GOODRICH B. F. CHEM. CO., 3135 Euclid Ave., Cleveland, Ohio, 44115, Tel: 216-881-8200; Sls. Mgr: J.F. Malone
GOODRICH, B.F. IND'L. PRODS. CO., 500 S. Main St., Akron, Ohio, 44318, Tel: 216-379-2000, TWX: 216-972-9100
GOODYEAR AEROSPACE CORP., 1210 Massillon Rd., Akron, Ohio, 44315, Tel: 216-794-2121, TWX: 810-431-2080; V.P. Sls: W. S. Zeigler
GORDON ALAN ENTPRS., 5362 Cahuenga Blvd., N. Hollywood, Cal., 91601, Tel: 213-985-5500; Sls. Mgr: D. Sahlein

GORDOS CORP., 250 Glenwood Ave., Bloomfield, N.J., 07003, Tel: 201-743-6800; Pres: G.B. Marchev Pgs. 1912-1914
Ariz Scottsdale, Engineering Sls. Assocs., Box 544 602-945-5781
Cal Palo Alto, Engrg. Assocs., 999 Commercial St. 415-326-7842
Cal Pasedena, P. Nurches Co., 2396 E. Foothill Blvd. 213-681-8957
Colo Wheatridge, Waugaman Assoc., 4643 Wadsworth 303-423-1020
Fla No. Miami, Barrett Assoc., 300 N.W. 123rd St. 305-681-4957
Fla Orlando, Barrett Assoc., Box 14205 305-277-2857
Ill Glen Ellyn, Rockford Controls Co., 21 W. 181 Hill Ave. 312-469-6016
Iowa Clarion, Ellinger Sls. Corp., 309 Fourth Ave., S.E. 515-532-3218
Md Timonium, Heller Sls. Co., Box 293 301-252-4780
Mass Braintree, R.F. Duffy Assoc., Box 328 617-335-7724
Mich Detroit, L.H. Dickelman Co., 18315 W. Seven Mile Rd. 313-255-3300
Minn Minneapolis, Wenco Sls., Inc., 7728 Morgan Ave., S. 612-866-3639
Mo St. Louis, Ellinger Sls. Corp., 4969 Bancroft 314-352-2027
NJ Short Hills, Murray Co., Box 305 201-376-3834
NY Rochester, M.C. Matthews Co., Box 612 716-271-2143
Ohio Euclid, Rockford Controls Ohio, 26100 Brush Ave. 216-731-5250
Ohio Dayton, Rockford Controls Ohio, Inc., 2077 Embury Pk. Rd. 513-278-7362
Pa Newtown, E. Murphy, Box 253 215-968-2497
SC Greenville, Barker Controls Co., Box 3884 803-244-6495
Tex Dallas, R.F. Kimball Co., 5531 Dyer St. 214-363-5431
Wash Seattle, H. Levinson Co., 1211 E. Denny Way 206-323-5100
GORE, W.L. & ASSOCS., INC., 555 Paper Mill Rd., Newark, Del., 19711, Tel: 302-738-4880, TWX: 510-666-0825; V.P. Mktg: R.C. Krueger
GORMAN MACHINE CORP., 1645 Superior Ave., Costa Mesa, Cal., 92627, Tel: 714-646-4463, TWX: 910-595-1520
GOSH INSTRS., INC., 1252 Berlin Tpke., Wethersfield, Conn., 06109, Tel: 203-527-4794
GOSLIN ELEC. & MFG. CO., 2921 W. Olive St., Burbank, Calif., 91505, Tel: 213-848-0776; Sls. Mgr: A.J. Goslin, Jr.

GOTHAM AUDIO CORP., 2 West 46th St., New York, N.Y., 10036, Tel: 212-CO-5-4111; Sls. Mgr: E. Passin

GOULD, INC., Brush Instrs. Div., 3631 Perkins, Cleveland, Ohio, 44114, Tel: 216-361-3315, TWX: 810-421-8580; Sls. Mgr: R.J. Kuederle ....Pgs. 588,589

Ala Huntsville, W. Brown Instr., 1314 Buford 205-539-4411
Cal Los Angeles, Brush, 5843 Sheila St. 213-685-7476
Cal Palo Alto, Brush, 780 Welch Rd. 415-328-7973
Colo Englewood, Brush, 295 W. Hampden 303-781-4407
Fla Ft. Lauderdale, W. Brown Instrs., 961 N.W. 53rd St. 305-564-8000
Fla Ft. Walton Beach, W. Brown Instrs., 98 Miracle Strip 904-243-6424
Fla Orlando, W. Brown Instrs., 222 Weber 305-425-5505
Ga Tucker, W. Brown Instrs., 1590 Cooledge 404-939-1674
Haw Honolulu, Harkom Hawaii, 630 Piikoi St. 587-178
Ill Oak Brook, Brush, 2000 Spring Rd. 312-654-1430
Md Riverdale, Brush, 6715 Kenilworth Ave. 301-864-0057
Mass Burlington, Brush, Northwest Ind'l. Pk. 617-272-0750
Mich Southfield, Brush, 600 Northland Towers, E. 313-356-6600
Minn Minneapolis, Brush, Box 23178 612-866-4388
Mo St. Louis, Brush, 11722 Studt La. 314-432-8055
NJ Fairfield, KLS Assoc., 387 Passaic Ave. 201-227-2900
NJ Hackensack, Brush, 25 E. Salem St. 201-342-6161
NY Syracuse, Labtronics, Pickard Bldg. 315-454-9314
NC Winston-Salem, W. Brown Instrs., 1108 Burke St. 919-725-5384
Ohio Cleveland, Brush, 3631 Perkins 216-361-3315
Ohio Dayton, Brush, 1700 Needmore Rd. 513-278-9900
Pa Bala-Cynwyd, Brush, Barclay Bldg. 215-839-7066
Pa Pittsburgh, Brush, 3450 Babcock Blvd. 412-931-3660
Tex Dallas, Brush, 6600 Skillman St. 214-348-8610
Tex Houston, Brush, 7007 Gulf Frwy. 713-644-3671
Wash Seattle, Brush, 5950 6th Ave., S. 206-762-2140
For: Can., New Westminster, B.C., A. Crawford Assoc., 721 Aldford Ave. 604-524-1161
For: Can., Longueuil, Que., A. Crawford Assoc., 157 (rue) St. Charles St., W. 514-670-1212
For: Can., Malton, Ont., A. Crawford Assoc., 6427 Northam Dr. 416-673-1500
For: Can., Ottawa, Ont., A. Crawford Assoc., 376 Churchill Ave. 613-725-3354

GOULD, INC., Clevite Bearing Div., 17000 St. Clair Ave., Cleveland, Ohio, 44110, Tel: 216-481-7221, TWX: 216-486-5610; Sls. Mgr: J. McKinnie

GOULD, INC., Gaging & Control Div., 4601 Arden Dr., El Monte, Calif., 91731, Tel: 213-442-7755; Sls. Mgr: R.R. Randolph

GOULD INC., Ind'l. Battery Div., 467 Calhoun St., Trenton, NJ, 08607, Tel: 609-392-3111, TWX: 510-681-8466; Sls. Mgr: R. Relf

GOULD, INC., NICAD Div., 931 Vandalia St., St. Paul, Minn., 55114, Tel: 612-452-1500; Dir. Mktg: H.P. Barry

GOULD LABS., Elctrn. Tech., 540 E. 105th St., Cleveland, Ohio, 44108, Tel: 216-851-5500, TWX: 810-421-8622; Sls. Mgr: N.C. Beerli

GOULD MFG. CANADA, LTD., Mechanical Prods. Div., St. Thomas, Ont., Canada, Tel: 519-631-4880, TWX: 610-356-6708; Sls. Mgr: J.H. Cooke

GOW-MAC INSTR. CO., 100 Kings Rd., Madison, N.J., 07940, Tel: 201-377-3450; Sls. Mgr: R.J. Mathieu

GPS INSTR. CO., 14 Burr St, Framingham, Mass., 01701, Tel: 617-875-0607; Sls. Mgr: A. Kezer

GRACE, W.R. & CO., Davison Chemical Div., 4000 N. Hawthorne St., Chattanooga, Tenn., 37406, Tel: 615-698-3461; Sls. Coord: J. Bowman

GRADO LABS., INC., 4614 Seventh Ave., Brooklyn, N.Y., 11220, Tel: 212-435-5340; Sls. Mgr: R. Krieger

GRAFIX, INC., Box 3296, Albuquerque, N.M., 87110, Tel: 505-265-6903; Sls. Mgr: G.R. Bussey

GRAFO COLLOIDS CORP., P.O. Box 195, Sharon, Pa., 16146, Tel: 412-835-7195; Sls. Mgr: H.J. Lang

GRALEX INDS., INC., 155 Marine St., Farmingdale, N.Y., 11735, Tel: 516-694-3600 M. Wind

GRAND TRANSFORMERS, Box 188, Grand Haven, Mich., 49417, Tel: 616-842-5430; Sls. Mgr: G. V. Retzlaff

GRANITE STATE MACHINE CO., INC., 124 Joliette St., Manchester, N.H., 03102, Tel: 603-668-1900; Sls. Mgr: C.L. Ferguson

GRANT PULLEY & HARDWARE CO., Div. Instr. Sys. Corp., 525 High St., W. Nyack, N.Y., 10994, Tel: 914-EL-8-4400, TWX: 914-358-3541; Sls. Mgr: J. Del Vecchio

GRANVILLE-PHILLIPS CO., 5675 E. Araphahoe Ave., Boulder, Colo., 80303, Tel: 303-443-7660; V.P. Mktg: W.A. Ringer

GRAPHIC CONTROLS CORP., Recording Chart Div., 189 Van Rensselaer St., Buffalo, N.Y., 14210, Tel: 716-853-7500; Sls. Mgr: C.J. Evans

GRAPHITE METALLIZING CORP., 1036 Nepperhan Ave., Yonkers, N.Y., 10702, Tel: 914-968-8400, TWX: 914-476-2411; Sls. Mgr: W.W. Walker ....Pg. 1596

GRAPHTEX INC., 1 Dell Glen Ave., Lodi, NJ, 07644, Tel: 201-478-1166; Sls. Mgr: R.D. Jones

GRAY RESCH. & DEV. CO., 150 Park Ave., E. Hartford, Conn., 06108, Tel: 203-289-1507; Sls. Mgr: H. Lehrman

GRAYHILL, INC., 569 Hillgrove Ave., LaGrange, Ill., 60525, Tel: 312-354-1040; Sls. Mgr: B. Vinkemulder Pg. 1915

Ala Huntsville, J. Highsmith, Holiday Off. Ctr. 205-881-3294
Cal Los Altos, Nickerson-Gray, 4600 El Camino Real 415-941-5777
Cal Orange, F. Huddleston, 44 Plaza Sq. 714-639-1941
Colo Denver, Lindberg Co., 5498 E. Evans 303-758-9033
Fla Miami Beach, Geartner, 1125 71st St. 305-861-3661
Fla Orlando, Geratner Assoc., 1221 Lee 305-299-1000
Ill Hinsdale, Hill & Gray, 2 Salt Creek 312-325-4810
Ind Ft. Wayne, Menze, 6010 Lower Huntington 219-747-5616
Iowa Cedar Rapids, Reid, 526 MNB Bldg. 319-362-6302
Kans Overland Pk., Penzner-Marcus, 5600 W. 95th 913-381-0004
Mass Wellesley Hills, M. Scott, 20 Walnut St. 617-235-0102
Mich Royal Oak, C. Jensen, 26711 Woodward 313-399-0900
Minn St. Paul, Northport Engrg., 2027 Grand 612-698-3841
Mo Hazelwood, Penzner-Mankus, 400 Brookes 314-731-4334
NJ Mt. Laver, Naudain Assocs., Rt. 73 & Ramblewood 215-LO-4-3194
NM Albuquerque, Lindberg, 209 San Pablo, SE 505-345-2489
NY Great Neck, F. Tylinski, 425 Northern 516-466-9070
NY Ithaca, B. Dean, Inc., 714 W. Clinton St. 607-272-2187
NC Charlotte, J. Highsmith, 3733 Monroe 704-333-7743
Ohio Dayton, A. Baier, 3220 N. Main 513-276-4128
Ohio Willoughby, A. Baier, 4399 Industrial 216-946-6080
Pa Pittsburgh, Covert & Newman, 300 Mt. Lebanon 412-563-0303
Tex Ft. Worth, W. Fralia, 6100 Camp Bowie 817-PE-8-2394
Utah Salt Lake City, Lindberg Co., 431 S. 3rd E. 801-364-6409
Va Richmond, J. Highsmith, 2604-D Buford 703-272-5888
Wash Seattle, Seatronics, 5616 4th Ave., S. 206-767-4330
For: Can., Willowdale, Ont., F. Taylor, 12 Howard 416-222-6924

GRAYHILL MOLDTRONICS, INC., 707 Rogers St., Downers Grove, Ill., 60515, Tel: 312-968-7000; Sls. Mgr: D.W. Foskett

GREAT EASTERN METAL PROD. CO., Div. GEMP Mfg. Corp., 22 Woodworth Ave., Yonkers, N.Y., 10701, Tel: 914-476-7300; Sls. Mgr: L. Weinberg

GREEN ELEC. CORP., 29-13 Broadway, Fair Lawn, N.J., 07410, Tel: 201-796-4700; Sls. Mgr: F. McKenzie

GREEN RECTIFIER CORP., 1-10 30th St., Fair Lawn, N.J., 07410, Tel: 201-797-8100; Sls. Mgr: S. Carlson

GREENLEE TOOL CO., 2136-12th St., Rockford, Ill., 61101, Tel: 910-631-0747, TWX: 815-398-0698

GREENRAY INDS., INC., 840 W. Church Rd., Mechanicsburg, Pa., 17055, Tel: 717-766-0223; Sls. Mgr: R.H. Green .... Pgs. 606,607,1392,1393

Ala Huntsville, Beacon Elctrns. Assocs., Inc. 205-881-5031
Ariz Phoenix, Aztec Entprs., 15 N. 40th 602-267-8103
Cal Altadena, D. Wagner Assocs., Box 485 213-681-4060
Cal Burlingame, J.E. Striker, 1319 Howard 415-342-1425
Colo Denver, O'Brien Sls., 2785 Speer 303-477-4713
Fla Ft. Laud, Beacon Elctrns., 651 N.E. 45th 305-564-4298
Fla Maitland, Beacon Elctrns., 540 S. Maitland 305-647-3498
Ga Atlanta, Beacon Elctrns., 2285 Peachtree 404-351-3654
Ill Des Plaines, Marsland, 1000 Executive Way 312-298-2620
Ind Ft. Wayne, McDonald Sls., 7409 Lower Huntington 219-745-9214
Md Annapolis, Hayden, 16 Decatur 202-206-6059
Mass Reading, Geder, Box 232 617-944-3105
Mich Ypsilanti, Micro Sls., 650 Greenlawn 313-483-1229
Minn Mpls, Marsland, 231 N. Edgewood 612-545-4481
Mo Florissant, Marsland, Box 567 314-831-0015
NJ Englewood, Andrews & Andrews, Inc., 44 N. Dean St. 201-569-8800
NM Albuquerque, Aztec Entprs., 829 Pennsylvania 505-255-2440
NY Huntington, Andrews & Andrews, Inc., 140 E. Main St. 516-692-8686
NY Syracuse, Midstate Resch., 327 Wellesley 315-478-8314
Ohio Cleveland, Micro Sls., 2000 Lee 216-271-0522
Ohio Dayton, Micro Sls., 1250 W. Dorothy 513-298-3033
Okla Tulsa, J.A. Green Co., Box 3209 918-742-4657
Pa Ambler, Wm. Assocs., 910 Denston Dr. 215-643-4119
Tex Dallas, J.A. Green Co., Box 47206 214-631-7450
Tex Houston, J.A. Green Co., Box 66506 713-526-2959
Wash Seattle, Seatronics, Inc., 5616 Fourth Ave., S. S. 206-767-4330
For: Can., St. Laurent, Que., Rutherford Agencies, Box 1013 514-747-4339

Advertisement

Greenray Industries, Inc. manufactures a complete line of oscillators including VLF, VHF, UHF, and Microwave types. We offer crystal controlled, L-C and cavity tuned styles, with temperature-compensation, frequency standard and voltage controlled options.
We also offer a complete line of microwave multipliers, solid state amplifiers, microwave filters and couplers.

GRFF, Solitron/Microwave, Cove Rd., Box 278, Port Salerno, Fla., 33492, Tel: 305-287-5000, TWX: 510-953-7500; Sls. Mgr: E. Jacobs

GRIDCRAFT, 14520 Lima Rd., Ft. Wayne, Ind., 46808, Tel: 219-637-3141; Sls. Mgr: K. Howell

GRIES REPRODUCER CO., Div. Coats & Clark Inc., 162 Beechwood Ave., New Rochelle, N.Y., 10801, Tel: 914-633-8600, TWX: 914-235-2188

GRIGSBY-BARTON, INC., 3800 Ind'l. Dr., Rolling Meadows, Ill., 60008, Tel: 312-392-5900; Sls. Mgr: R.J. Grigsby ....Pgs. 1710,1711

Cal Los Angeles, W. Harmon, 6118 Venice 213-WE-7-1460
Cal San Mateo, Luscombe Engrg., 220 E. 3rd 415-342-7057
Fla Maitland, H. Sarkis, 671 Dommerich 305-MI-7-3671
Ill Chicago, L-Tec Co., 5808 Higgins Rd. 312-286-1500
Mass Somerville, N.E.A.R., Inc., 99 Highland 617-PR-6-2262
Mich Detroit, L.H. Dickleman Co., 13331 Puritan 313-273-0806
Minn St. Paul, Mesa Co., 1821 University 612-645-8676
Mo Kansas City, M-C Sls. Co., 505 Delaware 816-842-4640
NJ Mountainside, H. Richter, 608 Sherwood 201-233-5820
NY Fayetteville, H.G. Richter, Box 251 315-637-6713
NC Raleigh, A.B. Andrews, Box 2627 919-833-5565
Ohio Cleveland, L. Dicklelman, 28829 Chagrin 216-831-1039
Ore Beaverton, N.R. Schultz, Box 156 503-646-1345
Pa Wyncote, Cooper-Clement, 835 Glenside 215-LI-8-5450
Tex Garland, Whiteside Sls., Box 22 214-276-8382
Wash Bellevue, N. Schultz, 305 112th Ave., NE 206-454-0300
For: Can., Markham, Ont., Wilson Entprs., 19 Abercorn 416-297-1289

GROENDYK MFG. CO., INC., Box 278, Buchanan, Va., 24066, Tel: 703-254-1010; Sls. Mgr: H.J. McMillan

GROOV-PIN CORP., 1125 Hendricks Causeway, Ridgefield, N.J., 07657, Tel: 201-945-6780, TWX: 710-992-8963; Sls. Mgr: V.J. Mano

GROUND DATA CORP., 4014 N.E. 5th Terr., Ft. Lauderdale, Fla., 33308, 305-563-2527; Sls. Mgr: F. Leitner
GROVER PHOTO PRODS., 341 Arden Ave., Glendale, Cal., 91203, Tel: 213-245-4400; Sls. Mgr: L.V. Grover
GRUENBERG ELEC. CO., INC., 2121 Reach Rd., Williamsport, Pa., 17701, Tel: 717-326-1755; Pres: A.T. Gruenberg, Jr.
GTE AUTOMATIC ELEC., 400 N. Wolf Rd., Northlake, Ill., 60164, Tel: 312-562-7100, TWX: 910-226-1975; V.P. Mktg: W.S. Gage
GTE LENKURT INC., 1105 County Rd., San Carlos, Calif., 94070, Tel: 415-591-8461, TWX: 910-376-4396; V.P. Mktg: H.K. Krengel
GTE SYLVANIA, INC., W.M. Chace Co., Div., 1600 Beard Ave., Detroit, Mich., 48209, Tel: 313-842-7400; Sls. Mgr: W.J. Tait
GTE SYLVANIA, INC., Chem. & Metallurgical Div., Towanda, Pa., 18848, Tel: 717-265-2121; Sls. Mgr: J.W. Parks
GTE SYLVANIA INC., Consumer Prods. - Lighting Prods., 100 Endicott St., Danvers, Mass., 01923, Tel: 617-777-1900; V.P. Mktg: R.B. Martenson
GTE SYLVANIA INC., Elctrn. Comps. Grp., 100 First Ave., Waltham, Mass., 02154, Tel: 617-449-2000; V. P: W.T. Buschmann
GTE SYLVANIA INC., Elctrn. Sys. Gp., 100 First Ave., Waltham, Mass., 02154, Tel: 617-893-9200
GTE SYLVANIA INC., Elctrn. Tube Div., Seneca Falls, N.Y., 13148, Tel: 315-568-5881; Sls. Mgr: R. Starek
GTE SYLVANIA INC., Entertainment Prods., 700 Ellicott St, Batavia, N Y, 14020, Tel: 716-343-3470; Sls. Mgr: W.E. Boss
GTE SYLVANIA INC., Lighting Prods., Sylvania Lighting Ctr., Danvers, Mass., 01923, Tel: 617-777-1900

GTE SYLVANIA INC., Miniature Lighting Prods. Div., W. Main St., Hillsboro, N.H., 03244, Tel: 603-464-5533; Prod. Mktg. Mgr: D.S. Dewsnap ....Pgs. 1464,1465
Cal Los Angeles, 6505 E. Gayhart St.
Ga Atlanta, 2115 Sylvan Rd., S.W.
Ill Melrose Pk., 2001 N. Cornell Ave.
Mass Danvers, Sylvania Lighting Ctr.
Mass Salem, 60 Boston St.
Minn Minneapolis, 2211 E. Hennepin Ave.
Mo St. Louis, 5010 Kemper Ave.
NH Hillsboro, W. Main St.
NJ Teterboro, 1000 Huyler St.
NY Rochester, 3100 Munroe Ave.
Ohio Cincinnati, 5480 Creek Rd.
Ohio Cleveland, 4848 W. 130th St.
Pa Philadelphia, 4700 Parkside Ave.
Tex Dallas, 13555 Inwood Rd.
GTE SYLVANIA INC., Parts Div., 12 Second Ave., Warren, Pa., 16365, Tel: 814-723-2000; Sls. Mgr: F.A. Martin
GTE SYLVANIA, INC., Insulated Wire Parts Div., 333 New Albany Rd., Moorestown, N.J., 08057, Tel: 609-235-6700; Sls. Mgr: W. Wind
GUARDIAN CALIFORNIA, 5755 Camille Ave., Culver City, Cal., 90230, Tel: 213-870-4642, TWX: 910-343-6464; Sls. Mgr: G. Ewmett

GUARDIAN ELEC. MFG. CO., 1562 W. Carroll Ave., Chicago, Ill., 60607, Tel: 312-243-1100, TWX: 910-221-5073; Sls. Mgr: R.F. Heyne Pgs. 1712-1714,1916
Cal Culver City, Guardian Elec., 5755 Camille Ave. 213-870-4642
Cal Palo Alto, O'Donnell, 1955 B El Camino Real 415-327-9260
Cal Torrance, O'Donnell, 18053 Crenshaw Blvd. 213-323-9243
Colo Broomfield, Arrowhead, Box 335 303-222-6462
Fla Orlando, Gra-Mar, Box 20493 305-841-2330
Haw Honolulu, G. Piety Factors, 160 Mokauea St. 808-841-0185
Ill Chicago, Guardian Elec., 1550 W. Carroll 312-243-1100
Ind Ft. Wayne, B. Homsher, 418 E. Berry 219-432-1164
Ind Ft. Wayne, Needler Sls., Box 2407 219-447-2123
Ind Indianapolis, Needler Sls., Box 88153 317-255-8056
Kans Prairie Vlg., Thunderbird Tech., 4014 A W. 95th 913-642-7220
Kans Wichita, Thunderbird Tech., 7707 E. Osie 316-684-3941
Md Ellicott City, McCourt, Chevrolet Ave. at St. John's La. 301-465-4515
Mass W. Concord, Sls. Engrg. Co., Baker Ave. 617-369-3943
Mich Westland, Miltimore Sls., 34142 Fountain 313-261-8117
Minn Minneapolis, F.A. Nitti, 324 S. 4th St. 612-339-5878
Mo St. Louis, Thunderbird Tech., Box 12849 314-542-6488
NJ Riverdale, Tech. Oriented Electrn., Box 72 201-568-5747
NY Binghamton, Elcom Sls., Box 134 607-723-9270
NY Massapequa, J.F. Coughlin, Box 281 516-799-7743
NY Rochester, Elcom Sls., Box 9112 716-385-1400
NY Whitesboro, Elcom Sls., Box 38 315-732-6445
Ohio Miamisburg, W.C. Schmidt, Box 105 513-298-4451
Ohio Richmond Hgts., W. Rowell, Box 43062 216-247-6011
Pa Delmont, T.F. Laslo, 411 Manor Rd. 412-468-5045
Pa Doylestown, Tech. Oriented Elec., Box 530 215-348-5333
Tex Dallas, W. Reese, 3131 Stemmons Frwy. 214-638-6575
Tex Houston, W. Reese, 2400 W. Loop, S. 713-NA-1-3134
Utah Salt Lake City, Arrowhead, Box 15386 801-487-3444
Wash Seattle, R. Squibb, 655 N.E. Northlake Pl. 206-632-2450
Wisc Milwaukee, F.A. Nitti, 2340 W. Wells St. 414-933-1975
For: Can., Willowdale, Ont., A. Simmond, 285 Yorkland 416-491-1010
GUBELMAN CHART DIV., Nashua Corp., 100 E. Kinney St., Newark, N.J., 07105, Tel: 201-589-5970; Sls. Mgr: C. James Smolinske
GUDEBROD BROS. SILK CO., INC., Elctrns. & Exp. Div., 225 W 34th St., New York, N.Y., 10001, Tel: 212-LA-4-5858; Gen'l. Mgr: J. Bacsak

GUDEMAN DIV., Gulton Inds., Inc., 340 W. Huron St., Chicago, Ill., 60610, Tel: 312-337-7400, TWX: 910-221-3863; Sls. Mgr: P.J. LoVecchio Pgs. 2388-2409
Ariz Phoenix, Hecht-Henschen, 2435 E. University 602-275-4411
Cal Los Angeles, Fillmore, Heller, 5455 Wilshire 213-936-8714
Cal San Carlos, Melchior, 820-B Cherry 415-591-7383
Colo Denver, Todd Assocs., 1260 S. Inca St. 303-744-2313
Fla Clearwater, WMM Assocs., 1260A S. Highland 813-446-0075
Ga Atlanta, B.Brown, 3354 Lansbury Vlg. N.E. 404-939-7075
Ill Oak Pk., Wasson-Gallagher, 1024 North 312-CO-1-7517
Ind. Indianapolis, Tech. Rep., 4000 Meadows 317-546-4967
Iowa Cedar Rapids, J.R. Sls., 3550 Cottage Gr., S.E. 319-365-5259
Md Arnold, Lecco Sls., 724 Arnold Dr. 301-757-4785
Mass Wakefield, Underwood Sls., 591 North Ave. 617-245-3850
Mich Grand Rapids, Elko Sls., 3119 Midland S.E. 616-949-1451
Mich Grosse Pt. Woods, Elko Sls., 970 N. Oxford 313-884-7893
Minn St. Paul, Cullen & Assocs., 1595 Selby 612-646-7371
Mo Kansas City, R. Burton, 1016 Baltimore 816-471-2850
NJ Fanwood, King & Assocs., Box 267 201-561-5464
NM Albuquerque, Electronic Mktg., 135 Vermont N.E. 505-265-7837
NY Liverpool, George Corp., 215 Fairmont 315-457-1188
NY New York, E. Glass Assocs., 250 W. 57th St. 212-JU-6-8440
NY Rochester, J.L. Semple, 21 Edgewater 716-342-1413
NC Winston-Salem, C. Dula, Box 5316 919-723-4205
Ohio Dayton, R.G. Siff, 22 Oxford St. 513-CR-8-4779
Ohio Medina, J.C. Hofstetter, 5168 Valley View 216-241-4880
Tex Dallas, Techno Assocs., Box 20544 214-357-9213
Wash Bellevue, Vantage Corp., 300 12th Ave., N.E. 206-455-3460
GUIDE INDS., INC., 11855 Wicks St., Sun Valley, Calif., 91352, Tel: 213-767-2610, TWX: 910-498-2707; Pres: C.A. Strider
GUILDLINE INSTRS., INC., 1997 Palmer Ave., Larchmont, N.Y., 10538, Tel: 914-834-8100; Sls. Mgr: E. Nemeroff
GULTON INDS., Data Systems Div., 15000 Central, E., Albuquerque, N.M., 87112, Tel: 505-299-7601, TWX: 910-989-1669; Sls. Mgr: B.L. Critides
GULTON INDS., Engr. Magnetics Div., 13041 Cerise Ave., Hawthorne, Calif., 90250, Tel: 213-679-0111, TWX: 910-325-6208; Sls. Mgr: M. Eisen

GULTON INDS., INC., Microceramics Div., Metuchen, N.J., 08840, Tel: 201-548-2800, TWX: 710-998-0592; Sls. Mgr: G. Wolter ....Pgs. 1972,2410-2413
Cal Los Altos, Parsons Co., 1 First St. 415-941-4745
Ariz Phoenix, Hecht-Henschen & Assoc., Inc., 2435 E. University Dr. 602-275-4411
Cal Alhambra, M.W. Riedel Co., 2215 W. Valley Blvd.
Cal Los Angeles, Elcom Sls., 3600 Motor Ave. 213-870-4707
Cal Los Angeles, M. Stolaroff, 4622 N. Salusen 213-295-7781
Cal Mtn. View, Riedel Weselch, 2015 Latham St. 415-961-0565
Cal San Carlos, Melchoir Assoc., 820 Cherry 415-591-7383
Cal San Mateo, J. Pyle Co., 1611 Borel Pl. 415-349-1266
Colo Denver, Todd Assocs., 1260 S. Inca St. 303-777-4381
Colo Engelwood, Thorson, 300 E. Hampden 303-789-1841
Fla Altamonte Spr., WMM Assoc., 515 Tivoli Ct. 305-831-4645
Fla Tampa, F. Nickerson, 4513 S. Camerson 813-833-4321
Ga Decatur, F.C. Nickerson, Box 33185 404-377-1575
Ga Tucker, B. Brown Co., Box 407 404-939-7075
Ill Oak Pk., Wasson-Gallagher, 1024 North Bl. 312-CO-1-7517
Ind Indianapolis, Tech. Rep., 4000 Meadows 317-546-4967
Ind Mishawaka, Given, Davis, Rich, 3906 W. Taylor Rd. 219-432-5585
Iowa Cedar Rapids, J.R. Sls. Engrg., 3550 Cottage Grove Ave. 319-377-8211
Md Bethesda, W. Mount, 4924 St. Elmo 301-657-9312
Md Towson, McCourt Co., 610 Washington 301-657-9312
Mass Wakefield, Underwood Sls., 591 North Ave. 617-245-3850
Mass Needham Hgts., Tesco, Inc., Box 201 617-444-7925
Mass Newton, QRC Co., 134 Upland Rd. 617-332-9600
Mich Grand Rapids, Elko Sls., 3119 Midland 616-949-1451
Mich Pleasant Ridge, Martenson, 46 Ridge 313-543-3633
Minn St. Paul, E. Melius, 3758 N. Dunlap 612-488-7293
Minn St. Paul, H.A. Cullen, 1595 Selby 612-646-7371
Minn St. Paul, Wagner Comp. Conslts., 452 S. Snelling Ave. 612-698-0331
Mo Kansas City, R.R. Burton Sls. Co., 1016 Baltimore Ave. 816-471-2850
Mo Overland Pk., Tech. Mktg. Assoc., 2050 Woodson Rd. 314-427-3600
NM Albuquerque, R. Reeder, 15000 Central 505-299-7601
NJ Fanwood, King Assocs., Box 267 201-561-5464
NY New York, E. Glass, 250 W. 57th St. 212-JU-6-8440
NY Rochester, J.L. Semple, 21 Edgewater La. 716-342-1413
NY Rochester, Reed Elctrns., 2815 Monroe 716-473-2767
NC Charlotte, F.C. Nickerson, 4332 University 704-525-2682
NC Charlotte, Dula Assocs., 1402 E. Morehead St. 919-723-4205
Ohio Cincinnati, A.C. Wahl, Box 15220 513-821-3270
Ohio Medina, J. C. Hofstetter Co., 5168 Valley View Dr. 216-241-4880
Ohio Dayton, R.G. Siff & Assocs., 22 Oxford 216-942-0601
Ohio Wickliffe, W.J. Brauer, 29029 Euclid 216-942-0601
Pa Ardmore, W. K. Metz, Box 309 215-649-3966
Tex Dallas, Allied Comps., Box 38009 214-DI-8-6660
Tex Dallas, Techno Assocs., Box 20544 214-FL-7-9213
Wash Belleview, Vantage Corp., 300 120th St., N.E. 206-455-3460
GULTON INDS., Piezo Prods. Div., Box 4300, Fullerton, Cal., 92634, Tel: 714-871-2150, TWX: 910-592-1247; Sls. Rep: R. Hanson
GULTON INDS., Servonic/Instr. Div., 1644 Whittier Ave., Costa Mesa, Cal., 92626, Tel: 714-642-2400, TWX: 714-642-1346; Sls. Mgr: J. Prebicin
GWILLIAM CO., 342 Furman St., Brooklyn, N.Y., 11201, Tel: 212-MA-4-2644; Sls. Mgr: J.V. Cinque
GYROSYSTEMS, INC., 120 Marine St., Farmingdale, N.Y., 11735, Tel: 516-293-5240; Sls. Mgr: E. Sandfort
GYROTRONICS, INC., 3500 Sunset Ave., Asbury Park, N.J., 07712, Tel: 201-922-1000; Gen'l. Mgr: Mr. R. Herter
H-B INSTR. CO., American & Bristol Sts., Phila., Pa., 19140, Tel: 215-DA-9-9125; Sls. Mgr: C.G. Roveran
H-P-M DIV., Koehring Co., Marion Rd., Mt. Gilead, Ohio, 43338, Tel: 419-946-0222; Sls. Mgr: T.G. Bishop
HAAS PRECISION INDUSTRIES, 21308 Mack Ave., Grosse Pointe Woods, Mich., 48236, Tel: 313-886-8455; Sls. Mgr: W.L. Becker

HACKENSACK CABLE CORP., 110 Orchard St., Hackensack, N.J., 07602, Tel: 201-487-1100; V.P-Sls: R.H. Wilson
HACKER INSTRS., INC., Box 646, W. Caldwell, N.J., 07006, Tel: 201-226-8450
HADLOCK & TEMTE, INC., 3332 W. Franklin Blvd., Chicago, Ill., 60624, Tel: 312-SA-2-4200; Sls. Mgr: P.R. Klingsporn
HADRON INC., 800 Shames Dr., Westbury, N.Y., 11590, Tel: 516-334-4402; Mktg. Mgr: W.R. Merrell
HAFSTROM TECH. PRODS., INC., 4616 Santa Fe St., San Diego, Calif., 92109, Tel: 714-274-8822, TWX: 714-277-3194; Sls. Mgr: J.R. Hafstrom
HALE INSTRS., INC., Box 7487, Houston, Tex., 77008
HALEDY ELCTRNS. CO., 99 Wall St., New York, N.Y., 10005, Tel: 212-WH-3-3140; Sls. Mgr: S. Gold
HALEX, INC., Box 2940, Torrance, Cal., 90509, Tel: 213-542-3555; Sls. Mgr: H.S. Hansen
HALLMARK STANDARDS, INC., 257 Washington St., Mt. Vernon, N.Y., 10551, Tel: 914-664-4288, TWX: 710-566-1104; Sls. Mgr: M. Steinberg
HALLOWELL, Div. Standard Pressed Steel Co., Hatfield, Pa., 19440, Tel: 215-723-6011; Sls. Mgr: R.E. McManus
HALM INSTR. CO., INC., Glen Head Rd., Glen Head, N.Y., 11545, Tel: 516-OR-6-6700; V.P. Sls: D. Schanck
HALMAR ELCTRNS., INC., 1544 W. Mound St., Columbus, Ohio, 43223, Tel: 614-276-0131; Sls. Mgr: D.W. Yauch
HAM KITS, Box 175, Cranford, N.J., 07016, Tel: 201-BR-6-8161; Sls. Mgr: J. Higgins
HAMAMATSU TV CO., LTD., 1126 Ichino-Cho, Hamamatsu City, Shizuoka Pref., Japan, Tel: 0534-34-3311; Sls. Mgr: M. Fujita
HAMILTON HALL RESISTOR CORP., 227 N. Water St., Milwaukee, Wisc., 53202, Tel: 414-273-6460; Sls. Mgr: K. Degnan
HAMILTON INDS., Box 504, Winter Haven, Fla., 33880, Tel: 813-293-1058; Sls. Mgr: W.H. Hamilton, Jr.
HAMILTON STANDARD, Div. United Aircraft Corp., Windsor Locks, Conn., 06096, Tel: 203-623-1621, TWX: 710-420-0584; Sls. Mgr: D.P. McLelland
HAMILTON WATCH CO., Precision Metals Div., Lancaster, Pa., 17604, Tel: 717-394-7161, TWX: 510-657-4444; Mktg. Mgr: T.G. Armstrong

HAMLIN ELCTRNS., INC., 3066 W. Clarendon Ave., Phoenix, Ariz., 85017, Tel: 602-277-4834, TWX: 910-951-1535; Sls. Mgr: I.H. Bigelow
Pgs. 1724,1725,1917
Cal Encino, Cardinal, 16161 Ventura #227 213-788-4540
Cal Palo Alto, Testco Sls., 941 Charleston Rd. 415-326-5320
Colo Denver, Elctrn. Comps. Sls., Box 22457 303-771-6200
Conn Berlin, White Sls. Co., Box 122 203-224-0423
Fla Lutz, S. K. Wallace Assoc., Inc., Box 67 813-949-1817
Fla Miami, S. Wallace, 3115 N.W. 81st Terr. 305-691-1654
Ga McDonough, S. Wallace, Box 190 404-957-2156
Ill Chicago, Lincoln, Hodges, 5875 N. Lincoln 312-561-8440
Iowa Marion, Thomas & Modrcin, 890 17th 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin, Box 189 913-432-2131
Mass Needham, White Sls. Co., 20 Chestnut St. 617-444-3676
Mich Dearborn, Villani-Pitcher, 20233 Ann Arbor Tr. 313-271-4600
Minn Mpls., R-J, Inc., 7100 S. France 612-922-1425
Mo Hazelwood, Thomas & Modrcin, Box 545 314-838-6446
NM Albuquerque, Elctrn. Comps., 1811 Carlisle N E 505-256-9831
NY Hyde Pk., R. Kennedy, Greentree N. 914-471-4430
NY Manhasset, Win-Cor Elctrn. Sls., 75 Plandome 516-627-9474
NY Rochester, R. Kennedy, 39 Saginaw Dr. 716-271-6322
NC Kernersville, S. Wallace, Box 526 919-993-3993
NC Matthews, S. Wallace, Box 215 704-847-9262
Ohio Cincinnati, G & H Sls., 10599 Chester Rd. 513-771-8231
Tenn Memphis, S. Wallace, 5960 Brierdale Cove 901-682-2281
Tex Dallas, Allied Comps., Inc., Box 38009 214-348-6660
Tex Houston, Allied Comps., 6400 Westpark 713-782-5406
Utah Salt Lake Cy., Elctrn. Comps., 445 E. 2nd S 801-355-5327
Wash Seattle, Testco Sls., Boeing Field 206-762-8220
Wisc Waukesha, Lincoln, Hodges, 217 Wisconsin 414-542-3087

HAMLIN, INC., 670 Lake St., Lake Mills, Wisc., 53551, Tel: 414-648-2361, TWX: 910-260-3740; V.P. Mktg: R.T. Armantrout
HAMMARLUND MFG. CO., Sub. Elctrn. Asst., 20 Bridge Ave., Red Bank, N.J., 07701, Tel: 201-842-5700, TWX: 710-722-5722; Sls. Mgr: R.W. Fisher
HAMMEL, RIGLANDER & CO., 435 Hudson St., New York, N.Y., 10014, Tel: 212-989-7950; Sls. Mgr: E.J. Renz
HAMMOND MFG. CO., LTD., 394 Edinburgh Rd., N., Guelph, Ont., Can., Tel: 519-822-2960; Sls. Mgr: G.L. Poulter
HANDY & HARMAN, 850 Third Ave., New York, N.Y., 10022, Tel: 212-752-3400, TWX: 212-867-4894; Sls. Mgr: R.E. Burke
HANOVIA LAMP DIV., Canrad Prec. Ind., Inc., 100 Chestnut St., Newark, N.J., 07105, Tel: 201-344-2218; Pres: J.F. Reed
HANSCOM, H.F. CO., INC., 225 Chapman St., Providence, R.I., 02905, Tel: 401-941-1456; Sls. Mgr: H.F. Hanscom
HANSEN MFG. CO., Box 23, Princeton, Ind., 47570, Tel: 812-385-3415; Sls. Mgr: A.F. Bridger
HAPCO, Box 1205, Boulder, Colo., 80302, Tel: 303-447-0441; Sls. Mgr: B. Stark
HARCO LABS., INC., 186 Cedar St., Branford, Conn., 06405, Tel: 203-488-8371; Sls. Mgr: M.A. Porto
HARDER, DONALD C. CO., INC., 2580 "K" St., San Diego, Calif., 92102, Tel: 714-239-8021; Sls. Mgr: W.E. Nagle
HARDMAN INC., Belleville, N.J., 07109, Tel: 201-751-3000; Mktg. Mgr: G.M. Scales
HARMON LICHTENSTEIN & CO., 26 Broadway, New York, N.Y., 10004; Sls. Mgr: R.B. Harmon
HAROWE SERVO CONTROLS, 48 Westtown Rd., W. Chester, Pa., 19380, Tel: 215-692-2700, TWX: 510-663-0335; Mktg. Dir: W.J. Cuff
HARPER, H.M. CO., 8200 Lehigh Ave., Morton Grove, Ill., 60053, Tel: 312-YO-6-6000, TWX: 910-223-3625; Sls. Mgr: J.I. Mengel
HARPER-LEADER, INC., 1046 S. Main St., Waterbury, Conn., 06720, Tel: 203-756-8164; Sls. Mgr: M.M. Di Corpo

HARREL, INC., 16 Fitch St., E. Norwalk, Conn., 06855, Tel: 203-866-2573; Sls. Mgr: J.C. Parry ....Pg. 1973
Ala Birmingham, McConnel Sls., 117 Citation 205-871-3501
Cal Corona, 2167 Burning Tree Dr. 714-776-4450
Cal Walnut Creek, Viking Instr., Box 1039 415-933-1221
Colo Denver, Electro-Rep., 1051 S. Platte River 303-744-2821
Ill Glen Ellyn 312-668-6622
NJ Yardville, Box 202 609-365-2171
NM Albuquerque, Electro-Rep., 3211 Silver SE 505-256-1749
NY Sodus, A.E. DeCew Agency, Box 56 315-483-3261
Ohio Willoughby, 4217 River St. 216-942-0920

HARRIS MFG. CO., INC., 308 River St., Cambridge, Mass., 02139, Tel: 617-864-4000; Sls. Mgr: E. Sweeney
HARRIS SEMICONDUCTOR, Box 883, Melbourne, Fla., 32901, Tel: 305-727-5412, TWX: 510-959-6195; Sls. Mgr: C.C. Merrick
HARSHAW CHEM. CO., 1945 E. 97th St., Cleveland, Ohio, 44106, Tel: 216-721-8300

HART-ADVANCE RELAY DIV., Oak Electro/Netics Corp., Crystal Lake, Ill., 60014, Tel: 815-459-5000, TWX: 910-634-3353; Sls. Mgr: R. Wlochall ....Pg. 1723
Ariz Phoenix, Shefler-Kahn, 2017 N. 7th 602-258-7893
Cal Inglewood, J. Kent, 5005 W. Century Blvd. 213-678-4108
Cal Los Altos, P. Wheaton, 960 N. San Antonio 415-941-1237
Colo Denver, I. Strong, 635 Canosa 303-292-6900
Fla Ft. Lauderdale, D. Green, 1040 Bayview 305-563-2681
Haw Honolulu, B. Kolans, Box 2098 811-628
Ill Oak Pk., Wasson-Gallagher, 1024 North Blvd. 312-261-7517
La Metairie, J. McKinney, 2012 Condon Ave. 504-887-1723
Md Baltimore, J. Sheffer, 4609 Old Frederick 301-233-0606
Mass Andover, R. Purinton, Inc., 28 Park St. 617-475-7055
Mich Berrien Spring, C. Preston, Box 2495 616-471-1072
Mo St. Louis, J.P. Carlson, 2316 Putter La. 314-241-4351
NJ Haddonfield, Gray, 8 E. Mt. Vernon 609-429-5300
NJ Mountainside, H. Richter, 608 Sherwood 201-233-4615
NM Albuquerque, Shefler-Kahn, 408 San Mateo, N.E. 505-265-7077
NY Fayetteville, H. Richter, Box 251 315-637-6713
NY Ontario Center, Gehrs & Kehoe, 344 Rte 104 315-524-2491
NC Charlotte, O. Jones, 9 Brittany 704-364-4700
Ohio Cincinnati, L. Grabinger, 8613 Winton Rd. 513-521-5689
Ore Portland, B. Bartos, 2035 S.W. 58th Ave. 503-292-0878
Tex Bellaire, J.F. McKinney Sls. Co., Box 1026 713-665-3653
Tex Dallas, J. McKinney Sls., 1303 Chemical 214-631-9450
EXP: Crystal Lake, Ill., Oak Electro/Netics Corp. 815-459-5000
For: Can., Ottawa, Ont., Whittaker Elctrns., Ltd., 42 Howden Ave. 613-224-1221
For: Can., Roxboro, Que., Whittaker Elctrns., Box 216 514-684-3000

HARTLEY PRODS. CORP., Barnert Pl., Hohokus, N.J., 07423, Tel: 201-652-7772; Sls. Mgr: R. Schmetterer
HARTMAN ELECTRICAL MFG., Div. A-T-O, Inc., 175 N. Diamond St., Mansfield, Ohio, 44902, Tel: 419-524-1411, TWX: 810-448-2814; V.P. Applications: O.C. Walley
HARTMAN SYS. DIV. A-T-O, INC., 360 Wolf Hill Rd., Huntington Sta., N.Y., 11746, Tel: 516-HA-7-7500, TWX: 510-226-6982; Sls. Mgr: P.G. Schultz
HARWIL CO., 903 Colorado Ave., Santa Monica, Calif., 90404, Tel: 213-394-4710; Sls. Mgr: H. Hutchinson
HARWORTH MFG. CO., 2881 El Camino Real, Redwood City, Calif., 94061, Tel: 415-365-0823; Sls. Mgr: W. Harworth
HASKON, INC., Precision Molding Div., 336 Weir St., Taunton, Mass., 02780, Tel: 617-824-4011, TWX: 710-391-6512; Sls. Mgr: R.J. Sills
HASTINGS-RAYDIST, Teledyne Co., Newcomb Ave., Hampton, Va., 23361, Tel: 703-723-6531, TWX: 710-882-0085; Sls. Mgr: R.T. Doyle
HATFIELD WIRE & CABLE DIV., Continental Copper & Steel Inds., 360 Hurst St., Linden, N.J., 07036, Tel: 201-925-4000; V.P. & Sls. Mgr: E.H. Mac Leod

HATHAWAY COMPS., 5250 E. Evans Ave., Denver, Colo., 80222, Tel: 303-756-8301, TWX: 910-931-0569; Sls. Mgr: C.H. Brunell ....Pgs. 1715-1722,1918
Cal Burbank, Compar L.A., Box 7018 213-843-3884
Cal Redwood City, Woodworth Co., Box 2165 415-369-5430
Colo Littleton, R & G Entprs., 272 S. Lincoln 303-794-6164
Fla Ft. Lauderdale, J.F. Griffin & Co., Box 24058
Fla No. Palm Beach, J. F. Griffin & Co., 812 Lakeside Dr. 305-622-1468
Ill Chicago, Memac Sls. Co., 4740 N. Austin Ave. 312-545-1033
Mass Needham Hghts., Com/Pak, 77 Wexford St. 617-444-1259
Mich Detroit, S. Greiner Assocs., 15318 Mack Ave. 313-882-7570
Minn Minneapolis, M. Franklin Co., 7710 Computer Ave. 612-920-8017
NY New Rochelle, A & M Assocs., 245 Huguenot St. 914-235-4672
NY Syracuse, Naylor Elec., 1718 Erie Blvd. E. 315-472-9183
Tenn Cleveland, Tenn-Tech Sls., Box 412 615-472-7059
Tex Richardson, C. Hoffman Assocs., 777 S. Central Expwy. 214-235-3600
Wash Bellevue, A. Smith Co., 405 - 166 SE 206-746-6770
For: Can., Downsview, Ont., Applied Tech., 312 Dolomite Dr. 416-636-8722

HAWLEY PRODS., HITCO CO., SUB. ARMCO, 333 N. 6th St., St. Charles, Ill., 60174, Tel: 312-584-3130, TWX: 910-238-1443; Sls. Mgr: R.H. Scent
HAYDEN BOOK CO., 116 W. 14th St., New York, N.Y., 10011, Tel: 212-675-5020; Sls. Mgr: A. Bonds

Advertisement

Hayden Book Co., Inc. offers an outstanding selection of technical books dealing with electronics and microelectronics, computers, aeronautical technology, communications, and test equipment. These books are designed to meet the reference needs of engineers and managers. Also included are training materials -- books, records, and overhead transparencies -- designed for students and technicians.

HAYDON, A. W. CO., 232 N. Elm St., Waterbury, Conn., 06720, Tel: 203-756-4481, TWX: 710-477-3141
Pg. 1597
Ala Huntsville, W.A. Brown, 1314 Buford 205-539-4411
Cal Burbank, Transdynamics, Inc., Box 6489 213-849-6261
Cal Palo Alto, Transdynamics, 701 Welch 415-326-6527
Cal San Diego, Transdynamics, Box 3476 714-298-8215

Colo Englewood, Transdynamics, Inc., 3401 S. Bannock St. 303-761-0455
Conn Thomaston, Nelson & Schoonmaker, Inc., 106 Main St. 203-283-5959
Fla Ft. Lauderdale, W.A. Brown Comps., 961 N.W. 53rd 305-564-8000
Fla Orlando, W.A. Brown Comps., 222 Weber 305-425-5505
Ill Rolling Meadows, Sumer, 5105 Tollview 312-392-7370
Ind Ft. Wayne, Sumer, Inc., 2211 S. Calhoun 219-744-4331
Kans Shawnee Mission, Florence & Meyer, 5812 Roeland 913-722-5210
Kans Wichita, Florence & Meyer, 2900 Woodland 316-838-7226
Md Hyattsville, L.D. Lowery, 6200 Annapolis 301-773-4977
Mass Waltham, Selmark Assocs., 181 West 617-899-8110
Minn Mpls, F. Peterson Co., Box 16224 612-927-4453
Mo Bridgeton, F.R. Krabbe, Box 776 314-739-6817
NJ Livingston, A.A. Budde, 13 Winans 201-994-1210
NY Forest Hills, Malin Assocs., Box 426 212-268-9122
NY Rochester, Woodams-Montbach, 4372 Culver 716-544-8721
NC Winston-Salem, W.A. Brown Comps., 1108 Burke 919-725-5384
Ohio Cleveland, C. Robinson Co., 5010 Mayfield 216-381-9049
Ohio Dayton, C. Robinson Co., 11 W. Monument Bldg. 513-222-0832
Pa Broomall, L.D. Lowery, 2801 W. Chester 215-528-5170
Tex Dallas, R. Kimball Co., 5531 Dyer 214-363-5431
Wash Mercer Island, Transdynamics, 7834 S.E. 32nd 206-232-1094
For: Can., Montreal, Que., Philips Elctrns. Inds., Ltd., 5930 Cote-De-Liesse 514-342-9180
For: Can., Toronto, Ont., Philips Elctrns. Inds., Ltd., 116 Vanderhoof Ave. 416-425-5161

HAYDON SWITCH & INSTR., 1500 Meriden Rd., Waterbury, Conn., 06720, Tel: 203-756-7441, TWX: 710-477-2580; Sls. Mgr: W.C. Grunewald
HAYDU PRODS., INC., 1150 Ali Baba Ave., Opa Locka, Fla., 33054, Tel: 305-688-6521; Sls. Mgr: G.K. Haydu, Jr.
HAYES, C.I. INC., 870 Wellington Ave., Cranston, R.I., 02910, Tel: 401-461-3400; Sls. Mgr: W.C. Diman
HAYSITE DIV., Synthane-Taylor, 5599 New Perry Hwy., Erie, Pa., 16512, Tel: 814-868-3691; Prod. Mgr: R.W. Amundsen
HB ENGRG. CORP., 1101 Ripley St., Silver Spring, Md., 20910, Tel: 301-589-0670; Dir. Mktg: C.S. Harris
HEADWAY RESEARCH, INC., 3713 Forest La., Garland, Tex., 75040, Tel: 214-272-5431 W.F. Bain
HEATH CO., Dept. 180, Benton Harbor, Mich., 49022, Tel: 616-YU-3-3961, TWX: 616-983-3897; Sls. Mgr: W.E. Johnson
HEATRON, INC., Box 54, York, Pa., 17405, Tel: 717-846-8819
HECHT RUBBER CORP., 482-484 Riverside Ave., Jacksonville, Fla., 32202, Tel: 904-355-3401; Sls. Mgr: M. Hecht

HECON CORP., 31 Park Rd., New Shrewsbury, N.J., 07724, Tel: 201-542-9200; Adv. Mgr: W. Fuelleman Pg. 1332

Alas Anchorage, Hoffer Entprs., Box 4-1220
Cal Sherman Oaks, Hecon Western, 15130 Ventura Blvd. 213-788-3931
Colo Denver, Franklin Sls, 1924 S. Navajo 303-922-3623
Conn Rocky Hill, Hecon Corp., 336 Old Main St. 203-529-9234
Ill Wheeling, Hecon Corp., 145 N. Milwaukee Ave. 312-541-1882
Minn St. Paul, Mesa Co., 1821 University Ave. 612-645-8676
NJ Long Branch, Hecon Corp., 754 Bowyer Ave. 201-229-5866
Ohio Lyndhurst, Hecon Corp., 969 Hanley Rd. 216-382-7373
SC Greenville, Barker Controls, Box 3884 803-244-6495
Tex Ft. Worth, Hecon Corp., 1662 Shenna Blvd. 816-626-6594
For: Can., Rexdale, Ont., Hecon of Can., 80 Galaxy Blvd. 416-678-2441

HEDQUIST MACH. & TOOL, 13110 Diericx Dr., Mountain View, Cal., 94040, Tel: 415-967-0265; Sls. Mgr: W. Hedquist
HEEGER, INC., 729 Ceres Ave., Los Angeles, Calif., 90021, Tel: 213-627-9319
HEI, INC., Jonathan Ind'l. Ctr., Chaska, Minn., 55318, Tel: 612-448-3510; Sls. Mgr: P.C. Spaulding
HEIDELEX CORP., Stuart Rd., Chelmsford, Mass., 01824, Tel: 617-256-3921

HEINEMANN ELEC. CO., 2636 Brunswick Pike, Trenton, N.J., 08602, Tel: 609-882-4800; Mktg. Mgr: B.A. Plesser Pg. 1919

Ala Birmingham, J. Spader Co., Box 6074 205-879-1366
Ark Little Rock, Ransom Sls., Box 9269 501-562-4090
Ariz Phoenix, Benndorf-Richardson, 1606 E. Catalina 602-264-5814
Cal Burlingame, Campbell & George, 840 Mahler 415-697-2965
Cal Encino, Porter Co., 17000 Ventura Blvd. 213-788-2350
Colo Denver, P.A. Douden, 1645 Wazee St. 303-534-6798
Fla Oviedo, Conley & Assocs., Inc., Box 668 305-365-3283
Fla Satellite Bch., Conley & Assocs., 465 Park Ave. 305-262-2054
Fla Tampa, Conley, 2821 Kimberly 813 933-3183
Ga Atlanta, Hooker Reid Co., Inc., Box 11754 404-237-9385
Ill Chicago, D. Dolin Sls., 6232 N. Pulaski 312-286-6200
Ind Marion, O. Bromberg, 1723 Overlook 317-664-5384
Ky Louisville, O. Bromberg, 10306 Hartley 502-245-8916
La New Orleans, Glidden Engrg. & Equip., Box 10442 504-835-6204
Md Ellicott City, McCourt, Chevrolet Ave. at St. Johns La. 301-465-4515
Mass Boston, Elec. Apparatus, 1200 Soldiers Field 617-782-7440
Mich Dearborn, G. Horne, 1140 N. Telegraph 313-561-1360
Minn Minneapolis, H. Smith, 212 W. Franklin 612-335-8911
Mo St. Louis, Hill & Co., 915 Buder Bldg. 314-621-1818
NJ Ridgewood, Ballou, Inc., 51 N. Broad St. 201-444-6990
NJ Trenton, Kriegner Sls., 1602 Pennington 609-882-6330
NY Buffalo, Canavan-Scanlon, 4511 Harlem 716-839-3373
NY Rochester, Canavan-Scanlon, 50 Telco 716-442-0720
NY Sanitaria Spgs., Canavan Scanlon, Box 1 607-724-7220
NY Syracuse, Canavan-Scanlon, Box 142 315-463-9161
NC Raleigh, Hooker Reid Co., Inc., Box 10941 919-828-8669
Ohio Cincinnati, O. Bromberg, 561 Reading 513-381-5728
Ohio Cleveland, Brown Elect. Prod., 1900 Euclid 216-861-0114
Ohio Toledo, W.J. Ash, 4110 Templar 419-241-1141
Okla Tulsa, Comps. Inc., 1526 E. 4th St. 918-583-9149
Pa Pittsburgh, Brown Elec. Equip., 1612 Potomac 412-563-4444
Tenn Memphis, Ransom Sls., 4230 Hwy. 51 So. 901-332-0036
Tex Dallas, Glidden Engrg. & Equip., 8609 Northwest Plaza Dr. 214-363-6539
Tex Houston, Glidden Engrg. & Equip., 7728 Long Point 713-681-1415
Wash Mercer Island, J. Andersen, Box 637 206-232-0484
Wisc Milwaukee, E. Dickinson, 3612 N. Green Bay 414-CO-4-1080

HEINTZ & KAUFMAN, LTD., 3650 Hayden Ave., Culver City, Calif., 90230, Tel: 213-VE-7-0753; Sls. Mgr: C.A. Tepper
HEITZ, KARL, INC., 979 Third Ave., New York, N.Y., 10022, Tel: 212-421-5220; Sls. Mgr: M. Schlapfer
HELENOR METALS CORP., 60 Marbledale Rd., Tuckahoe, N.Y., 10707, Tel: 212-665-4122; V.P. Sls: N.L. Ament

Advertisement

Specialists in small size, fine dimension thin wall brass, copper, and stainless steel tubing. Also specializing in brass rod, wire, and strip. All material drawn to your exact specifications and unconditionally guaranteed. Contact Helenor Metals Corporation for all of your precision tubing strip and wire needs.

HELI-COIL PRODS., Div. Mite Corp., Shelter Rock La., Danbury, Conn., 06810, Tel: 203-743-7651, TWX: 710-456-0336; Sls. Mgr: B.B. Morgan, Jr.
HELICAL PRODS. CO., INC., P.O. Box 4, Hermosa Beach, Calif., 90254, Tel: 213-374-9941; Pres: C.M. Merrell
HELIOTEK, Div. Textron, Inc., 12500 Gladstone Ave., Sylmar, Calif., 91342, Tel: 213-365-4611, TWX: 910-496-1488; Mktg. Mgr: F. Woodward
HELITRONICS CORP., 155 Tichenor St., Newark, N.J., 07105, Tel: 201-621-7773
HELIX SPRING CORP., 35-10 10th St., Long Island City, N.Y., 11106, Tel: 212-YE-2-0303; Sls. Mgr: S. Treibish
HELLER, G K, CORP., Box 14746E, Las Vegas, Nev., 89114, Tel: 702-735-8081; Sls. Mgr: T. Picarelli
HELWIG CARBON PRODS., INC., 2550 North 30th St., Milwaukee, Wisc., 53210, Tel: 414-372-3113; Sls. Mgr: J.E. Koenitzer
HENES MFG. CO., 4301 E. Madison St., Phoenix, Ariz., 85034, Tel: 602-275-4126; Sls. Mgr: J.E. Hill
HENSCHEL CORP., 14 Cedar St., Amesbury, Mass., 01913, Tel: 617-388-1103; V.P. Mktg: P.V. Johnson
HERCULES, INC., 910 Market St., Wilmington, Dela., 19899, Tel: 302-656-9811; Pres: W.C. Brown
HERLEY INDS., INC., 175 Eileen Way, Syosset, N.Y., 11791, Tel: 516-364-0100; Sls. Mgr: L.N. Blatt
HERMES ELCTRNS., Box 1005, Dartmouth N.S., Can., Tel: 902-466-7491, TWX: 610-271-1973; Sls. Mgr: D. Loader
HERMES PLASTICS, INC., 20 Cooper Square, New York, N.Y., 10003, Tel: 212-533-5100; V. P: Z. Kozak

HERTZ FILTER, 50 Washington Ave., Garden City Pk., N.Y., 11040, Tel: 516-PI-7-7250; Sls. Mgr: G. Starr Pg. 1516

HEWLETT-PACKARD, 1501 Page Mill Rd., Palo Alto, Cal., 94304, Tel: 415-493-1501, TWX: 910-373-1267; Sls. Mgr: J. Petrak .... Pgs. 729-732

Ala Huntsville, Box 4207 205-881-4591
Ariz Phoenix, 2336 E. Magnolia 602-252-5061
Ariz Tucson, 5737 E. Broadway 602-298-2313
Cal Fullerton, 1430 E. Orangethorpe 714-870-1000
Cal No. Hollywood, 3939 Lankershim Blvd. 213-877-1282
Cal Palo Alto, 1101 Embarcadero 415-327-6500
Cal Sacramento, 2220 Watt Ave. 916-482-1463
Cal San Diego, 9606 Aero Dr. 714-279-3200
Colo Englewood, 7965 E. Prentice 303-771-3455
Conn E. Hartford, 508 Tolland St. 203-289-9394
Conn Norwalk, 111 East Ave. 203-853-1251
Fla Ft. Lauderdale, Box 24210 305-731-2020
Fla Orlando, Box 20007 Herndon Sta. 305-841-3970
Ga Atlanta, Box 28234 404-436-6181
Ill Skokie, 5500 Howard St. 312-677-0400
Ind Indianapolis, 3839 Meadows Dr. 317-546-4891
La Kenner, Box 856 504-721-6201
Md Baltimore, 6707 Whitestone 301-944-5400
Md Rockville, Box 164 301-948-6370
Mass Lexington, 32 Hartwell Ave. 617-861-8960
Mich Southfield, 24315 Northwestern Hwy. 313-353-9100
Minn St. Paul, 2459 University Ave. 612-645-9461
Mo Kansas City, 11131 Colorado Ave. 816-763-8000
Mo St. Louis, 2812 S. Brentwood 314-962-5000
NJ Paramus, W. 120 Century Rd. 201-265-5000
NJ Cherry Hill, 1060 N. Kings Hwy. 609-667-4000
NM Albuquerque, Box 8366 Sta. C, 6501 Lomas Blvd. N.E. 505-265-3713
NM Las Cruces, 156 Wyatt Dr. 505-526-2485
NY Albany, 1702 Central Ave. 518-869-8462
NY Endicott, 1219 Campville Rd. 607-754-0050
NY Poughkeepsie, 82 Washington St. 914-454-7330
NY Rochester, 39 Saginaw Dr. 716-473-9500
NY Roslyn, 1025 Northern Blvd. 516-869-8400
NY Syracuse, 5858 E. Malloy Rd. 315-454-2486
NC High Point, Box 5188 919-885-8101
Ohio Cleveland, 25575 Center Ridge Rd. 216-835-0300
Ohio Columbus, 1120 Morse Rd. 614-846-1300
Ohio Dayton, 3460 S. Dixie Dr. 513-298-0351
Okla Oklahoma City, 2919 United Founders Blvd. 405-848-2801
Ore Portland, 4475 S.W. Scholls Ferry 503-292-9171
Pa King of Prussia, 1021 8th Ave. 215-265-7000
Pa Monroeville, 2500 Moss Side Blvd. 412-271-0724
RI E. Providence, 873 Waterman 401-434-5535
Tex Houston, Box 22813 713-781-6000
Tex Richardson, Box 1270 214-231-6101
Tex San Antonio, 231 Billy Mitchell Rd. 512-434-4171
Utah Salt Lake City, 2890 S. Main St. 801-487-0715
Vt So. Burlington, Box 2287 Kennedy Dr. 802-658-4455
Va Richmond, Box 6514 703-285-3431
Wash Bellevue, 433-108th N.E. 206-454-3971
WVa Charleston 304-768-1232
For: Can., Edmonton, Alb., 11745 Jasper Ave. 403-482-5561
For: Can., Halifax, Nova Scotia, 2745 Dutch Village Rd. 902-455-0511
For: Can., No. Burnaby 2, B.C., 4519 Canada Way 604-433-8213

For: Can., Ottawa 3, Ont., 880 Lady Ellen Pl. 613-722-4223
For: Can., Pointe Claire, Que., 275 Hymus Blvd. 514-697-4232
For: Can., Rexdale, Ont., 50 Galaxy Blvd. 416-677-9611
For: Can., St. James, Man., 511 Bradford Ct. 204-786-7581

HEWLETT-PACKARD, N.J. Div., 101 Locust Ave., Berkeley Hgts., N.J., 07922, Tel: 201-464-1234, TWX: 710-984-7972; Sls. Mgr: B.W. Dudley ......Pgs. 729-732
(Refer to Hewlett-Packard, Palo Alto, Cal. for sales office information)

HEXACON ELEC. CO., 621 W. Clay Ave., Roselle Park, N.J., 07204, Tel: 201-CH-5-6200 ....Pg. 2940
Cal Burlingame, Dillon Stevens, 833 Mahler Rd. 415-697-3022
Cal L.A., Dillon Stevens Co., 1610 S. Bonnie Brae St. 213-747-9221
Colo Denver, Bax & Co., 2186 S. Holly St. 303-756-1804
Conn Woodstock, HDQ & HV Neff, RR 2 203-WA-8-4249
Fla Jacksonville, W. Ihlefeld, 1201 San Marco Blvd. 904-396-5282
Ill Chicago, EMF Co., 6135 W. Belmont Ave. 312-889-8323
Ind Carmel, Ribaudo, 39 Circle Dr.
Kans Kansas City, L.E. Bruns, 2210 N. 50th Terr. 913-287-5242
Mich Hillsdale, Zaiser Assoc., 157 S. Budlong St. 517-437-2656
NJ Cherry Hill, Hunt Assoc., Box 398 609-428-6666
NY Clinton, Cartwright & Clair, 46 Dwight Ave. 315-732-5193
NY New York City, Dunn & Bryan, 28 Warren St. 212-964-8091
NY New York City, Lincoln Export Co., 36 Pearl St. 212-344-0210
SC Greenvale, J.B. Jackson, 6 Midvale St. 803-244-2508
Tenn Memphis, H. Carson, 5104 Pilgrim 901-327-8986
Tex Richardson, P.J. Scanlon, Box 70 214-AD-1-4661
Wash Seattle, Wills & Latham, 110 Boylston Ave. E. 206-329-1272
Wisc Milwaukee, Process Technology, 10721 W. Capitol Dr. 464-6620-6621
For: Can., Montreal W. P. Q., Adlam Tool & Supply, 10 Ronald Dr. 514-482-2548

HEYMAN MFG. CO., E. Michigan Ave., Kenilworth, N.J., 07033, Tel: 201-245-2345; V.P. Sls: J.L. Holder
HGA ELCTRNS., 519 S. Fifth Ave., Mt. Vernon, N.Y., 10550
H H CONTROLS CO., 16 Frost St., Arlington, Mass., 02174, Tel: 617-272-3298; Sls. Mgr: G. Armstrong

HI-G, Spring St. & Rte. 75, Windsor Locks, Conn., 06906, Tel: 203-623-2481, TWX: 710-420-0592; Sls. Mgr: R.A. Carroll .... Pgs. 724,725,1322-1331,1726-1738
POWER SUPPLIES
Ariz Phoenix, J. Heaton, 3915 No. 30th 602-264-7887
Cal Menlo Pk., J. Heaton, 3723 Haven 415-369-4671
Conn Hamden, Applied Meas., Box 5181 203-288-5288
Mass Acton, Applied Meas., Box 316 617-263-2766
Mich Grand Rapids, ELFI, 1635 Pembroke Dr., S.E. 616-455-2920
NC Raleigh, Candor, 4810 Stanford 919-787-2652
Va Lynchburg, Candor, 309 Buckingham 703-846-6579
EXP: Cooksville, Ont., Can., ANBAK Sls., 3208 Lenworth 416-625-1061
EXP: Que., Can., Anbak Sls., Box 101, Ile Perrot Sud 514-453-6375
RELAYS, TIMERS & SENSORS
Ariz Phoenix, Barnhill Five, 537 E. Osborn 602-263-1250
Ariz Scottsdale, Compar Rocky Mt., 84 W. First 602-947-4336
Cal Menlo Pk., J.S. Heaton, Box 2087 415-369-4671
Cal Mountain View, Winco Sls., Box 1238 415-961-8510
Cal Solana Beach, Crelco, 342 S. Cedros 714-755-9776
Colo Denver, Barnhill Five, 1170 S. Sheridan 303-934-5505
Colo Englewood, Compar Rocky, 300 E. Hampden 303-781-9012
Fla Oviedo, Conley & Assocs., Box 668 305-365-3233
Fla Tampa, Conley & Assocs., Box 18662 813-822-0161
Ill Chicago, Engineered Sls., 4738 N. Harlem 312-867-8434
Ind Ft. Wayne, Given, Davis & Rich, 3906 W. Taylor 219-432-5585
Md Timonium, Heller-Freedman, Box 293 301-252-4780
Mass Lexington, J.E. Boeing Co., Box 5 617-862-2500
Mich Grand Rapids, ELFI Sls., 4131 W. Saxony SE 616-455-2920
Mich Royal Oak, ELFI Sls., 26711 Woodward 313-399-0902
Minn St. Paul, R. G. Ragon, 1136 W. Larpenteur 612-488-0201
Mo St. Charles, Buse Sls., 214 N. Second 314-739-1613
NJ Teaneck, Electra-Mec, 1258 Teaneck 201-837-4262
NM Albuquerque, Barnhill Five, 827 Penn. NE 505-265-7766
NM Albuquerque, Compar Rocky, 2125 San Mateo NE 505-265-1020
NY Manhasset, HRC Assocs., 390 Plandome 516-627-4644
NY Rochester, Canavan-Scanlon, 50 Telco 716-442-0720
NY Syracuse, Canavan-Scanlon, Box 142 315-463-9161
NC Bethania, Candor Co. 919-924-1480
Ohio Cincinnati, Comps., Inc., 11820 Knoll Sprgs. 513-721-2997
Ohio Cleveland, Comps., Inc., 7461 N. Linden 216-842-2737
Ohio Dayton, P.E. Montplaisir, 5637 Mark-Dale 513-434-4316
Pa Ardmore, Heller-Freedman, Box 391 215-649-3679
Tex Dallas, Blackburn Assocs., Box 20073 214-351-9991
Wash Bellevue, Ruggles Tech., 10717 N.E. 4th 206-455-2778
For: Can., Cooksville, Ont., Anbak Sls., 3208 Lenworth Dr. 416-625-1061
For: Can., Ile Perrot Sud, Que., Anbak Sls., Box 101 514-453-6375

HI-LO MFG. CORP., 1122 W. Newport, Chicago, Ill., 60657, Tel: 312-477-1890; Sls. Mgr: A. Klancnik
HI-TEK CORP., Elctrns. Div., 2220 S. Anne St., Santa Ana, Calif., 92704, Tel: 714-540-3520, TWX: 910-595-1758; Sls. Mgr: R. Williams

HICKOK ELECT. INSTR., 10514 Dupont Ave., Cleveland, Ohio, 44108, Tel: 216-541-8060, TWX: 810-421-8286; Ch. Bd: R.D. Hickok, Jr. .... Pgs. 351,487-489
Ala Huntsville, Col-Ins-Co., Inc., Box 4246 205-539-1711
Ariz Tempe, Hyer Assocs., Box 27208 602-275-7524
Cal Long Beach, Product Data, 3760 Orange 213-595-1777
Cal Los Angeles, Hughes Intl., Box 90927 213-670-1515
Cal San Diego, Product Data, 10457 Roselle S. 714-453-5700
Cal Saratoga, Coherent Mktg., 21346 Sarahills 408-867-2234
Colo Denver, Hyer, 2335 S. Inca St. 303-935-4681
Conn Hamden, J & J Assocs., 965 Dixwell Ave. 203-624-7800
DC Wash., Powell-Pendergraph, 7979 Old Georgetown 301-656-4535
Fla Orlando, Col-Ins-Co., Inc., Box 13189 305-423-7615
Ga Marietta, Col-Ins-Co., Inc., 200 Carrington Way 404-422-8327
Ill La Grange, Bard, LaGrange Ind'l. Pk. 312-354-0660
Ind Indianapolis, Bard, 4000 Meadows 317-547-3113
Kans Lenexa, Bard Assocs., 13100 W. 95th St. 913-888-2673
Mass Burlington, J & J Assocs., 12 Cambridge 617-272-2606
Mich Detroit, B. Hocker, 26847 Grand River 313-531-1403
Minn Mpls., Bard Assocs., 4640 W. 77th St. 612-922-8233
Mo Crestwood, Bard, 50 Crestwood Exec. Ctr. 314-849-0080
NJ E. Orange, Friedman, 110 Halsted 201-673-2500
NM Albuquerque, Hyer, 6401 Acoma 505-265-5961
NY Depew, Labtronics, 5800 Transit Rd. 716-685-4111
NY Endicott, Labtronics, 205 W. Union 607-748-0509
NY Garden City, Friedman Assocs., 174 Wetherill 516-746-5199
NY Jonesville, Labtronics, 3 Eastwood La. 518-372-6649
NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314
NC Winston-Salem, Col-Ins-Co., Box 5597 919-765-3650
Ohio Cleveland, B. Hocker, 2262 Westminster 216-734-4433
Ohio Dayton, B. Hocker, 1400 Devereux 513-298-8638
Pa Hatboro, Powell-Pendergraph, 206 Mill 215-887-1135
Tex Austin, A. Barnes, Box 9748 512-454-4371
Tex Houston, A. Barnes, 3801 Kirby Bldg. 713-523-7333
Tex Richardson, A. Barnes, 740 S. Sherman 214-235-4541
Utah Salt Lake City, Hyer, 2896 S. Main St. 801-487-7747
Wash Seattle, Datacom Assocs., 2207 Fairview E. 206-329-2989
For: Can., Ajax, Ont., Stark Elctrns., 180 Station 416-942-2120

HICKOK INDICATING SYS. INC., 1520 W. Rosecrans Ave., Gardena, Cal., 90249, Tel: 213-324-1194, TWX: 910-346-7021; Sls. Mgr: J.J. Mackey

HICO (HORIZONS INT'L.), E. Fuller at Middlefield, Redwood City, Cal, 94063, Tel: 415-469-7900, TWX: 910-378-5429; Sls. Mgr: C. Lang ....Pg. 1616
Ala Huntsville, G. Duckett Sls., Box 503 205-837-6026
Cal Santa Monica, Davidson Assoc., 2920 Nebraska 213-829-1731
Colo Denver, R. Bowen Co., 1440 S. Santa Fe 303-722-4641
Conn Milford, Todino Engrg., 132 New Haven 203-874-6643
Fla Orlando, G. Duckett Sls., Box 15626 305-295-7802
Ga Atlanta, G. Duckett Sls., Box 29067 404-451-3529
Ill Chicago, Engineered Sls., 4738 N. Harlem 312-867-8434
Kan Overland Pk., Penzner-Mankus, Box 6264 913-381-0004
Kan Wichita, Penzner-Mankus, Box 11252 316-782-3684
Md Silver Spg., Globe Assoc., 8121 Georgia 301-587-0060
Mass Needham Hgts., Todino Engrg., 50 Kearney 617-444-7925
Mich Jackson, Norwood Scroggs, 2221 Arbor Hills 517-782-5211
Minn St. Paul, Countryman Assoc., 1821 University 612-645-9151
NY Rochester, R. Kennedy, 39 Saginaw 716-271-6322
NY HydePark, R. Kennedy, Green Tree Dr., N. 914-229-2269
NY Great Neck, F. Tylinski Co., 425 Northern Blvd. 516-466-9070
NC Greensboro, G. Duckett Sls., Box 22002 919-273-4617
Ohio Fairborn, Tech. Assoc., Box 388 513-878-2484
Ohio Rocky River, Tech. Assoc., 19500 Center Ridge 216-333-0035
Pa Glenside, R.L. Wilkinson, Box 215 215-424-8400
Tex Dallas, Aymond Co., 4340 N. Central Expwy. 214-827-8043
Utah Salt Lake City, R.G. Bowen, 1380 W.N. Temple 801-364-4632
Wash Seattle, Seatronics, 5616 4th Ave., S. 206-767-4330
For: Can., Montreal, Que., A. Deskin, 1565 Louvain W. 514-384-1420
For: Can., Toronto, Ont., A. Deskin, 78 Six Point 416-239-4329
For: Can., Vancouver, B.C., A. Deskin, 1641 Venables, W. 604-253-6396

HIETT ELCTRNS. CORP., 309 Crescent Dr., Wheeling, Ill., 60090
HIGBIE MFG. CO., Wagner Rd., Rochester, Mich., 48063, Tel: 313-651-5300, TWX: 810-232-1592; V.P. Mktg: W.T. Homan, Jr.
HIGH ACCURACY PRODS. CORP., 141 Spring St., Claremont, Cal., 91711, Tel: 714-621-3965; Mktg. Mgr: C. Lambert
HIGH SPEED HAMMER CO., INC., 313 Norton St., Rochester, N.Y., 14621, Tel: 716-CO-6-6740; Sls. Mgr: D.W. Marcellus
HIGH TEMPERATURE INSTR., 5 Union Hill Rd., W. Conshohocken, Pa., 19428, Tel: 215-825-1300, TWX: 510-660-8416; Sls. Mgr: I.E. Robinson
HIGH VACUUM EQUIP. CORP., 2 Churchill Rd., Hingham, Mass., 02043, Tel: 617-749-9000, TWX: 710-348-6981; Sls. Mgr: A.S. Cobb
HIGH VOLTAGE ENGRG. CORP., S. Bedford St., Burlington, Mass., 01803, Tel: 617-272-1313, TWX: 710-332-0245
HIGHTEMP RESINS, INC., 225 Greenwich Ave., Stamford, Conn., 06902, Tel: 203-325-4124; Sls. Mgr: H. Isbenjian
HILL, E. VERNON, INC., Box 14248, San Francisco, Calif., 94114, Tel: 415-626-6644; Sls. Mgr: A. Bocek
HILLBURN RELAY CORP., 125 Schmitt Blvd., Farmingdale, N.Y., 11735, Tel: 516-249-2020; Sls. Mgr: R. Michalski
HILTRONICS, 111 S. Liberty Dr., Stony Pt., N.Y., 10980, Tel: 914-942-1222; Sls. Mgr: S. Heller
HIMMELSTEIN, S. & CO., 2500 Estes Ave., Elk Grove Village, Ill., 60007, Tel: 312-439-8181; Sls. Mgr: H.R. Stellberg

HIPOTRONICS, INC., Brewster, N.Y., 10509, Tel: 914-279-8091, TWX: 710-574-2420; Sls. Mgr: K. Reed Pgs. 490-493,726-728,2415,2955

Ariz	Phoenix, Aztec Enterprises, 15 N. 40th Pl.	602-267-8103
Cal	Calabasas, Repex, Inc., Box 431	213-888-7170
Cal	Mtn. View, Repex, Inc., Box 807	415-969-9200
Colo	Littleton, Aztec Entprs., 1449 W. Littleton Blvd.	303-798-4573
Fla	Orlando, F. Fausett, 2213 Merritt Park Dr.	305-424-0701
Ga	Smyrna, F. Fausett, Box 278	404-436-5169
Ill	Wilmette, Crest Assocs., 505 Fourth St.	312-256-5202
Mass	Canton, New England Elctrn., 590 Wash.	617-828-4835
Mich	Livonia, Chandler, 32401 W. Eight Mile	313-476-5800
NM	Albuquerque, Aztec Entprs., 829 Penn. N. E.	505-255-2440
NY	Sodus, A. De Cew Agency, Inc., Box F	315-HT-3-3261
Ohio	N. Olmsted, Chandler Assoc., 23203 Lorain	216-734-4747
Pa	King of Prussia, Letronix, 251 W. DeKalb	215-265-1020
Tex	Houston, Scientific Sls., 6400 Westpark Dr.	713-781-2711
Tex	Richardson, Scientific Sls., 777 S. Central Expy.	214-231-6541
Va	Roanoke, F. Fausett, 1533 Bluemont	404-436-5169
For:	Can., Montreal, Que., Componentics, 6420 Victoria	514-342-4117

HIRD BROWN AMERICA, Box 544, Livingston, N.J., 07039, Tel: 201-992-3311; Sls. Mgr: A. Marchev

HISONIC, INC., 249 N. Troost, Olathe, Kans., 66061, Tel: 913-782-0012; Sls. Mgr: W. Bonebright Pgs. 1517,2491

Cal	Fullerton, K'Son Co., 3261 N. Harbor Blvd.	714-879-2900
Minn	Mpls, K. Tannehill, 4620 W. 77th St.	612-920-6077
NY	Syracuse, Savco, Inc., 124 Kinne Rd.	315-GI-6-4927
NY	Valley Cottage, LRC Assocs., Inc., Box 114	914-634-7973
Pa	Paoli, C.R. Hile, Box 397	215-644-1314
Tex	Dallas, Scott Tech. Sls., Box 30324	214-FL-2-7698

Advertisement

Hisonic has an established reputation of unexcelled competence in the design and quality manufacture of complex filter network as well as specialized inductors and transformers. Our staff is experienced and equipped to apply unique modern synthesis techniques to your requirements. Do not accept an answer of "impossible" unless you have consulted Hisonic.

HJS ENGRG. CO., P.O. Box 96, Park Ridge, Ill., 60068, Tel: 312-775-6741; Sls. Mgr: F. Moraine

H.K. METALCRAFT MFG. CO., 35 Industrial Rd., Lodi, N.J., 07644, Tel: 201-471-7770; Sls. Mgr: S.P. Hull

HLC MFG. CO., INC., 700 Davisville Rd., Willow Grove, Pa., 19090, Tel: 215-657-1700; Sls. Mgr: R.W. DeMott

HLS, INC., 2576 Lafayette St., Santa Clara, Cal., 95050, Tel: 408-296-7436; Sls. Mgr: P.R. Szasz

HMW ENTERPRISES, INC., 15 Walnut St., Steelton, Pa., 17113, Tel: 717-939-9313; Sls. Mgr: R.A. Reisman

HOAGLAND INSTR., 65 Chestnut St., Red Bank, N.J., 07701, Tel: 201-741-7319; Sls. Mgr: W.J. Fraser

HOBART BROS. CO., 600 W. Main St., Troy, Ohio, 45373, Tel: 513-335-7141; Sls. Mgr: W.B. Howell

HOBBS MFG. CO., 666 Lincoln St., Worcester, Mass., 01605, Tel: 617-791-6301; Pres: P.W. Hall

HOBBY & BROWN ELCTRN., 15 St. Marks Ave,, Rockville Centre, N.Y., 11570, Tel: 516-678-2272; Sls. Mgr: A.K. Palmer

HOBSON BROS., INC., 4940 W. Lawrence Ave., Chicago, Ill., 60630, Tel: 312-AV-3-3600

HOFFMAN ENGRG. CO., Div. Federal Cartridge, 9th & Tyler St., Anoka, Minn., 55303, Tel: 612-421-2240, TWX: 910-578-2211; Sls. Mgr: J.H. Grace

HOFFMAN, P.R. CO. DIV., Howard Aiken Inds., 321 Cherry St., Carlisle, Pa., 17013, Tel: 717-243-2011; V.P. Sls: J.W. Mountz

HOLBROOK-MERRILL CO., 1150 Kifer Rd., Sunnyvale, Cal., 94086, Tel: 408-736-2300; Pres: L.P. Merrill

HOLEX, INC., 2751 San Juan Rd., Box 148, Hollister, Cal., 95023, Tel: 408-637-5851, TWX: 910-590-0457; Sls. Mgr: G.R. Young

HOLLINGSWORTH SOLDERLESS TERMINAL, Box 430, Phoenixville, Pa., 19460, Tel: 215-933-8947; Sls. Mgr: J.C. Ludwick

HOLLIS ENGRG., INC., Charron Ave., Box 742, Nashua, N.H., 03060, Tel: 603-889-1121, TWX: 710-228-1881; Sls. Mgr: C. Papoutsy

HOLMBERG, INC., 20 Melville Park Rd., Melville, N.Y., 11746, Tel: 516-249-2500; Sls. Mgr: C.B. Harlan

HOLMIN, W.A. CORP., 1325 Seventh St., Rockford, Ill., 61108, Tel: 815-968-0517; Sls. Mgr: W.A. Holmin

HOLT INSTR. LABS., Box 230, Oconto, Wisc., 54153, Tel: 414-834-2222; Sls. Mgr: D.J. Stemper

Advertisement

Holt Instrument Laboratories, originators of the Audio Voltage Standard, and Pioneers in precision AC Voltage Measurements, manufactures a complete line of precise AC sources and NBS-traceable Voltage Measurement Instrumentation. Products include, AC Ammeter Calibrators to 100 amperes, Audio Voltage Standards to 1000 volts and 35,000 HZ, Thermal Transfer Voltmeters, Audio Current Shunts and Precision Thermal Converters.

HOLTZER-CABOT CORP., Tri-Borough Ind'l. Pk., No. Attleboro, Mass., 02703, Tel: 617-695-1414; V.P-Mktg: C.E. Walton

HOLUB INDS., INC., 413 DeKalb Ave., Sycamore, Ill., 60178, Tel: 815-895-2161; Sls. Mgr: G.W. Wetzel

HOLYOKE WIRE & CABLE, Div. TRW INC., 720 Main St., Holyoke, Mass., 01040, Tel: 413-533-3961; Sls. Mgr: T. Miles

HOMELITE, Div. Textron Inc., Riverdale Ave., Port Chester, N.Y., 10573, Tel: 914-WE-9-3400, TWX: 914-937-4030; V.P. Sales & Sls. Mgr: R.S. Kennedy

HONEYWELL, Aerospace & Def., 2701 4th Ave., S., Minneapolis, Minn., 55408, Tel: 612-332-5200, TWX: 612-321-1036; V.P. Mktg: R.J. Condon

HONEYWELL, Apparatus Controls, 2701 4th Ave., So., Mpls., Minn., 55408, Tel: 612-332-5200; Sls. Mgr: S.A. Young

HONEYWELL INFORMATION SYSTEMS, 65 Walnut St., Wellesley Hills, Mass, 02181, Tel: 617-237-4100; V.P. Mktg: C.J. Lynch

HONEYWELL, Indl. Div., 1100 Virginia Dr., Ft. Washington, Pa., 19034, Tel: 215-643-1300, TWX: 510-661-0328; Sls. Mgr: R.M. Bullard

HONEYWELL INFORMATION SYSTEMS, Box 549, Santa Barbara Res Pk., Goleta, Cal., 93017, Tel: 805-968-3541; Sls. Mgr: R.E. Kidd

HONEYWELL, Photographic Prods. Div., Box 1010, Littleton, Colo., 80120, Tel: 303-798-9444; V.P. & Gen'l. Mgr: R.L. Pennock

HONEYWELL, Residential Div., 2701 4th Ave., S., Mpls., Minn., 55408, Tel: 612-332-5222; V.P. & Gen'l. Mgr: S.J. Nelson

HONEYWELL, Test Instrs. Div., Box 5227, Denver, Colo., 80217, Tel: 303-771-4700; Sls. Mgr: W.T. Lisenby Pg. 590

Ala	Mobile, 3262 Int'l. Dr.	205-479-8572
Cal	Los Angeles, 6620 Telegraph Rd.	213-724-3500
Cal	San Diego, 1515 Morena Blvd.	715-276-6830
Cal	Sunnyvale, 910 Thompson Pl.	408-732-0120
Colo	Englewood, 7825 E. Prentice Ave.	303-771-2340
Conn	Hartford, 885 Wethersfield Ave.	203-525-3163
Fla	Orlando, 1000 Woodcock Rd.	305-841-1570
Ga	Atlanta, 500 Plaster Ave., N.E.	404-875-9561
Ill	Chicago, 2015 175th St.	312-474-9300
Ill	Chicago, 7350 N. Lincoln Ave.	312-674-9770
Md	Lutherville, 1306 Bellona Ave.	301-828-0900
Mass	Boston, 1230 Soldiers Field Rd.	617-787-5300
Mich	Southfield, 17515 W. Nine Mile Rd.	313-352-1900
Minn	Minneapolis, 7400 Metro Blvd.	612-941-5430
Mo	St. Louis, 2146 Hampton Ave.	314-647-6100
NJ	Westfield, 574 Springfield Ave.	201-233-9200
NM	Albuquerque, 3301 Carlisle Blvd., N.E.	505-345-1656
NY	Long Island City, 24-30 Skillman Ave.	212-392-4300
NY	Rochester, 100 Metro Pk.	716-461-1600
NC	Greensboro, 1216 Perry St.	919-292-1556
Ohio	Cleveland, 1001 E. 55th St.	216-881-0300
Ohio	Dayton, 2314 Stanley Ave.	513-461-4480
Pa	Bala Cynwyd, One Decker Sq.	215-835-2500
Pa	Pittsburgh, Bee St. at Greentree Rd.	412-922-4422
Tex	Dallas, 6000 N. Central Expwy.	214-363-5441
Tex	El Paso, 7350 Gateway, E.	915-591-9447
Tex	Houston, 9440 Westglen Dr.	713-785-3200
Va	McLean, 1766 Old Meadow Rd.	703-893-4660
Wash	Mercer Island, 9555 S.E. 36th	206-232-5030

HONEYWELL, INC., Wabash Comm. Factory, 200 Bond St., Wabash, Ind., 46992, Tel: 219-563-2161, TWX: 810-290-2725; Sls. Mgr: W.G. McLaughlin ......Pg. 2318

Ala	Huntsville, Beacon Elct., 3322 S. Memorial	205-881-5031
Cal	Mountain View, REPEX, Inc., Box 807	415-969-9200
Cal	San Diego, Controls For Ind'l., 8799 Balboa	714-278-6863
Colo	Denver, E. Johnson, 10130 W. Asbury	303-985-4810
Fla	Ft. Lauderdale, Beacon Elct., 651 NE 45th	305-564-4298
Fla	Maitland, Beacon Elctrns., Box 1278	305-647-3498
Ga	Atlanta, Beacon Elctrns., 2285 Peachtree	404-351-3654
Ill	Elmhurst, Scott Assocs., 663 Fairview	312-279-5681
Ind	Ft. Wayne, R. Whitesell, 3426 Taylor	219-432-5591
Ind	Indianapolis, R. Whitesell, 6691 E. Wash.	317-359-9283
Ky	Louisville, R. Whitesell, 3620 Lexington	502-893-7303
Mass	Burlington, Schaal Assocs., Four A St.	617-862-3578
Md	Landover Hills, Eastern Comps., 6200 Annapolis	301-322-1412
Mich	Southfield, R. Whitesell, 25100 Evergreen	313-358-2020
Mich	St. Joseph, R. Whitesell, Shepard-Benning Bldg.	616-983-7337
Minn	Mpls., Pilot Sls., 7007 Walker	612-925-2464
NY	Fayetteville, M.P. Andrews, 319 Mott	315-637-3144
Ohio	Cincinnati, R. Whitesell, 1172 Galbraith	513-521-2290
Ohio	Cleveland, R. Whitesell, 21139 Lorain	216-333-2585
Ohio	Dayton, R. Whitesell, 4133 S. Dixie	513-298-9546
Pa	Phila., Eastern Comps., 1349 W. Cheltenham	215-927-6262
Pa	Pittsburgh, R. Whitesell, 201 Penn Ctr.	412-242-0100
Tex	Dallas, Blair Engrg., 10034 Monroe St.	214-352-8411
Tex	Houston, Blair Engrg., 6420 Hillcroft	713-772-0677

HOPE ELCTRNS., Box 773, Clifton, N.J., 07013, Tel: 201-777-3522; Sls Mgr: R. Mossige

HOPKINS ENGRG., 12900 Foothill Blvd., San Fernando, Cal., 91342, Tel: 213-361-8691, TWX: 910-496-1531; Mktg. Mgr: D.A. Knox ....Pg. 1519

Ariz	Scottsdale, Runyon Co., 6825 E. Thomas	602-947-5711
Cal	Menlo Pk., Frauman Assocs., 1010 Doyle	415-322-8461
Colo	Denver, Camel Elctrns, 5303 E. Evans Ave.	303-757-6191
Conn	Glastonbury, C.K. Barton Assoc., Inc., 343 New London Tpke.	203-633-9417
Iowa	Cedar Rapids, Engrg. Svcs. Co., 1026 3rd Ave., S.E.	319-366-1591
Kans	Prairie Village, Engrg. Svcs. Co., 7924A State Line	913-649-4000
Md	Baltimore, Kaufholz Assoc., Box 6232	301-488-6561
Mass	Auburndale, C.K. Barton Assoc., Inc., Box 51	617-332-2021
Mich	Jackson, Norwood Scroggs Co., 22221 Arbor Hills Rd.	517-782-5211
Minn	St. Paul, H. Cullen & Assoc., 1595 Selby Ave.	612-646-7371
Mo	St. Louis, Engrg. Svcs. Co., 6717 Vernon Ave.	314-726-2233
NJ	Englewood, Andrews & Andrews, Inc., 44 N. Dean St.	201-569-8800
NY	Huntington, Andrews Andrews, Inc., 425 New York Ave.	516-692-8686
NY	Syracuse, H. R. Murray, Inc., Dewitt Box 11	315-446-5555
NC	Bethania, Candor Co., Bethania	919-924-1480
NC	Raleigh, Candor Co., 4810 Stanford St.	919-828-5716
Ohio	Dayton, R.P. Calhoun & Assoc., 40 Southmoor Cir.	513-299-4144
Pa	Newton Sq., Kaufholz Assoc., Box 273	215-356-5000
Tenn	Bristol, Candor Co., Box 3204	703-669-7632
Tex	Dallas, Stevens Sls., 9990 Monroe Dr.	214-350-2476
Va	Lynchburg, Candor Co., 309 Buckingham Dr.	703-846-6579
Wash	Seattle, Blum & Assoc., 2300 N.W. 97th St.	206-782-1600

HOREX ELCTRNS., INC., 1729 21st St., Santa Monica, Calif., 90404, Tel: 213-451-0211; Engr. Mgr: G.E. Nicholasen

HORLICK, WILLIAM I. CO., INC., 266 Summer St., Boston, Mass., 02210, Tel: 617-426-2480; Sls. Mgr: R.C. Horlick

HOTPACK CORP., 5148 Cottman Ave., Phila., Pa., 19135, Tel: 215-333-1700, TWX: 710-670-1694 D.M. Bergen

HOUGHTON, E.F. & CO., 303 W. Lehigh Ave., Philadelphia, Pa., 19133, Tel: 215-RE-9-7100; V.P. Sls: C.R. Schmitt

HOUSTON INSTR., Div. Bausch & Lomb, 4950 Terminal Ave., Bellaire, Tex., 77401, Tel: 713-667-7403, TWX: 910-881-5782; Sls. Mgr: L.C. Bower ....Pg. 591

Ala	Huntsville, J. Highsmith, 3322 S. Memorial	205-881-3294
Ala	Huntsville, Reynolds, 904 Bobwallace	205-536-1941
Ariz	Tempe, Tri-City Electrns., Box 26757	602-969-5877
Ariz	Phoenix, Aztec Entprs., 15 N. 40th Pl.	602-267-8103
Cal	Long Bch., Product Data, 3760 Orange	213-595-1777
Cal	San Diego, Product Data, 8799 Balboa	714-279-2342
Cal	San Mateo, Dayton Assocs, Box 1461	415-347-9419
Colo	Lakewood, Davis Assocs., 820 S. Kline	303-986-3377
Colo	Littleton, Aztec Entprs., 1449 W. Littleton	303-798-4573
Fla	Ft. Lauderdale, Reynolds, 161 S.W. 75th Ave.	305-581-6611
Fla	Melbourne, Reynolds, 822 E. Strawbridge Ave.	305-727-3205
Fla	Orlando, J. Highsmith, 2543 Industrial	305-293-5202
Fla	Orlando, Reynolds, Box 8877	305-843-6440
Ga	Atlanta, Reynolds, 175 W. Wieuca Rd., N.E.	404-252-5360
Haw	Honolulu, Aloha Assocs., 1225 Liluokalani	808-922-3819
Ill	LaGrange, Bard, LaGrange Ind'l. Pk.	312-354-0660
Ind	Indianapolis, Bard, 4000 Meadows Dr.	317-547-3113
Kans	Lenexa, Bard Assocs., 13100 W. 95th	913-888-2673
Mass	Framingham, J. Lancaster, 147 Concord	617-873-8893
Mich	Detroit, Ridgway East, 25210 Five Mile Rd.	313-538-3940
Minn	Mpls., Bard Assocs., 4640 W. 77th	612-922-8233
Mo	Crestwood, Bard, 50 Crestwood Exec. Ctr.	314-849-0080
NJ	Mountainside, J.J. Wild, Box 1217	201-654-3272
NJ	Englewood, Sci. Devices-E., 95 Cedar La.	201-871-3916
NM	Albuquerque, Aztec Entprs., 829 Penn., N.E.	505-255-2440
NY	Fayetteville, Doolittle Elctrn., 100 Valerie Dr.	315-637-3222
NY	Hastings on Hudson, J.J. Wild, Box 266	914-963-3803
NY	Jericho, J.J. Wild, 400 Jericho Tpke.	516-921-7100
NY	Rochester, Genesee Computer, 20 University	716-232-7050
NC	Charlotte, J.L. Highsmith, 3733 Monroe	704-333-7743
NC	Greensboro, Reynolds, 412 2. Market St.	919-275-3725
Ohio	Loveland, Ridgway East, Box 68	513-683-4350
Ohio	Fairview Pk., Ridgway East, 20881 Lorain	216-333-1300
Okla	Tulsa, Data Engrg., 4580 E. 50th St.	918-622-3753
Pa	Bessemer, Ridgway East, Box 626	412-667-8573
Pa	King of Prussia, S & S Assocs., Boro Line	215-265-3450
Pa	Southampton, J.J. Wild, 80 Second St.	215-357-6645
Tex	Houston, Data Engrg., 2120 S. Post Oak	713-622-2820
Tex	Richardson, Data Engrg., 777 S. Central	214-231-4846
Tex	San Antonio, Data Engrg., 4438 Centerview	512-732-7176
Va	Annadale, Nine Assocs., Box 328	703-256-9105
Va	Richmond, J. Highsmith, 2604-D, Buford	703-272-5888
Wash	Seattle, R.S. Drake, 6133 Maynard S.	206-763-2755
Wisc	Hales Cor., Arthur Engrg., 10720 W. Scharles	414-425-5919
For:	Can., Ottawa, Ont., Datagraphics, 1505 Laperriere	613-722-3489

HOUSTON MAGNETICS CORP., 6214 Royalton St., Houston, Tex, 77036, Tel: 713-666-3201; Sls. Mgr: J. Alleran

HOUSTON SCIENTIFIC INDS., INC., 4202 Directors Row, Houston, Tex, 77018, Tel: 713-681-6631; V.P: W.J. Onderdonk

HOWARD INDS., Div. MSL Inds., Inc., 2420 18th St., Racine, Wisc., 53403, Tel: 414-632-2731, TWX: 910-271-2387; Sls. Mgr: C.W. Curtis ....Pg. 1617

Cal	Encino, Howard Inds., 18075 Ventura Blvd.	213-881-4842
Cal	San Jose, Howard Inds., 164 N. Bascom Ave.	408-275-9616
Conn	Torrington, Howard Inds., 70 Main St.	203-482-3193
Fla	Ft. Lauderdale, Dewey Sls. Co., 320 S.W. 75th Terr.	305-587-9454
Ill	Chicago, Howard Inds.	312-437-5815
Minn	Minneapolis, Howard Inds., 5805 Excelsior Blvd.	612-920-5890
Mo	Festus, Howard Inds., Box 232	314-937-3606
NJ	Red Bank, Tech. Sls. Co., 157 Broad St.	201-741-3356
Ohio	Dayton, Howard Inds., 6010 Far Hills Ave.	513-434-9822
Ohio	Toledo, Howard Inds., 3030 N. Reynolds Rd.	419-536-0293
Tex	Houston, Howard Inds., 3400 Montrose Ave.	713-523-6345

HOWE RICHARDSON SCALE CO., 680 Van Houten Ave., Clifton, N.J., 07015, Tel: 201-GR-1-3400; Sls. Mgr: J. Giner

HOWELL INSTRS., INC., 3479 W. Vickery Blvd., Ft. Worth, Tex., 76107, Tel: 817-ED-6-7411; V.P. Sls: L.H. Becker

HOYT ELEC. INSTR. WORKS, Burton-Rogers Co., Sls. Div., 556 Trapelo Rd., Belmont, Mass., 02179, Tel: 617-489-1520; Sls. Mgr: W. Burton ....Pgs. 494,495

Cal	Hollywood, Duncan Eng., 1800 N. Highland	213-462-5880
Colo	Denver, J. Dolliver, 1441 Humboldt St.	303-FR-7-4740
Fla	St. Petersburg, W.P. Lanagan, 126 30th Ave., N.	813-862-6133
Ill	Chicago, R. Krueger, 5844 W. Irving Pk.	312-AV-2-8444
Ind	Ft. Wayne, Val-Skol, 2005 Franklin	219-742-9122
Ind	Indianapolis, Val-Skol Sls., 3556 Luewan	317-926-5063
Mass	Belmont, Burton-Rogers, 556 Trapelo	617-489-1520
Mass	Scituate, G.E. Morton, 161 Summer	617-545-0155
Minn	Mpls, R. Siedare, 4724 42nd Ave., N.	612-533-2294
Mo	Kansas City, K-M Sls., 17th & Main St.	816-GR-1-1355
NJ	Pennsauken, Leff Sls., 5900 Westfield	609-663-4025
NJ	W. Caldwell, Peterson-Rudnick, Box 822	201-CA-6-4363
NY	Bronx, Peterson-Rudnick, 120 Debs	212-671-1923
NY	Syracuse, Carlen Reps., 3650 James St.	315-437-2921
Ohio	Cincinnati, Val-Skol Sls., 10515 Margate	513-563-6790
Ohio	Cleveland Hgts., Val-Skol, 12417 Cedar Rd.	216-462-2822
Ohio	Columbus, Val-Skol Sls., Box 13088	614-291-4123
Pa	Delmont, T. Laslo, 411 Manor Rd.	412-468-5045
Tex	Dallas, Stevens Sls., 9990 Monroe	214-350-2476
Wash	Belleville, E. Bowden, 12927 NE 26th Pl.	206-VA-2-5608

HRB-SINGER, INC., Science Park, Box 60, State College, Pa., 16801, Tel: 814-238-4311, TWX: 510-691-2610; Mktg. Adm. Asst. L.B. Raymond

HUDSON LAMP CO., 528 Elm St., Kearney, N.J., 07032, Tel: 201-997-1850 ....Pg. 1472

Ariz	Tuscon, D.V. Hamilton Co., Box 50526	602-624-2391
Cal	Los Altos, W. Posey, 175 S. San Antonio	415-948-8881
Cal	Santa Monica, Rep. Assocs., 1710 Santa Monica Blvd.	213-451-8901
Ill	Palatine, R.L. Hanna Co., Box 202	312-358-3940
Mich	St. Joseph, R.O. Whitesell, Shepard & Bennings-Bldg.	616-983-7837
Ind	Angola, Southern Sls., 105 Lakeshore	219-665-3961
Ky	Louisville, Southern, 212 Republic Bldg.	502-583-6902
Mass	Needham, Coakley, Boyd & Abbott Co., Box 248	617-444-5470
Mich	Detroit, R.O. Whitesell & Assoc., 25100 Evergreen	313-358-2020
Minn	Mpls., J. Lee, 4241 Toledo Ave. S.	612-920-1525
Mo	Clayton, LR. Harry, 7603 Forsyth	314-872-3183
Mo	Grandview, LR. Harry, Box 288	816-763-3634
NY	Liverpool, Aero Sls., 600 Oswego St.	315-457-6378
Ohio	Chargin Falls, E.H. Alexander, Box 68	216-247-4133
Ohio	Cincinnati, Luebbe Sls., 2649 Erie Ave.	513-871-4211
Pa	Glenside, Shelmar Elctrns, Corp., Box 254	215-885-0800
Pa	Pittsburgh, R. Whitesell, 201 Penn Ctr. Bldg.	412-242-0100
Tenn	Madison, Dixie Elctrn. Assoc., Box 200	615-895-5666
Tex	Dallas, J. Yount & Co., Box 17270	214-EX-1-4125
Wash	Seattle, Blum Assocs., 2300 N.W. 97th St.	206-SU-2-1600
Wisc	Milwaukee, F. Du Bois, 2364 N. 117th	414-774-3100

HUDSON WIRE CO, 62 Water St, Ossining, N Y, 10562, Tel: 914-941-8500; Sls. Mgr: R.W. Cashman

HUGHES AIRCRAFT CO, Aerospace Grp., Centinela Ave & Teale St, Culver City, Cal., 90230, Tel: 213-391-0711, TWX: 213-871-5210

HUGHES AIRCRAFT CO., CONNECTING DEVICES, Box H, Newport Beach, Cal., 92663, Tel: 714-548-0671, TWX: 714-642-1353; Mktg. Mgr: E.V. Valehrach ......Pg. 2633

Ariz	Tucson, Hughes Aircraft, Box 11036	602-294-5211
Cal	Newport Bch., W. E. S. T., Inc., 3825 Birch	714-540-9040
Cal	San Jose, Hughes Aircraft, 100 N. Winchester	408-241-2407
Conn	Meriden, Eagle Assocs., Box 921	203-237-5527
Fla	Orlando, Dost Assocs., Box 17057	305-831-1118
Fla	Winter Pk., Grady Duckett Sls., Box 59	305-424-3466
Ga	Atlanta, Grady Duckett Sls., Box 29067	404-451-3529
Ill	Deerfield, W. Krueger Assocs., 1150 North	312-945-3720
Iowa	Cedar Rapids, Palatine Engrg. Sls., 1032 33rd St., NE	319-365-8071
Kans	Andover, Palatine Engrg. Sls., 1722 N. Terry	316-683-7512
Kans	Overland Pk., Palatine Engrg., 7520 W. 63rd	913-262-5643
Md	Towson, Kraft Elctrns. Sls., 510 Woodbine	301-828-5828
Mass	Needham, Eagle Assocs., Box 274	617-444-3446
Mich	Southfield, Luebbe Sls., 20905 Greenfield	313-357-0335
Minn	Mpls., R.J. Siedare Assocs., 4724 42nd Ave., N.	609-429-4938
Mo	St. Louis, Palatine Engrg., 8622 St. Charles Rock	314-426-7055
NJ	Haddonfield, T. Mills Co., 13 B Tanner	609-429-1005
NJ	Riverdale, Adamo Sls., Box 29	201-839-4463
NY	Syracuse, Floring & Murray, Inc., DeWitt Box 11	315-446-5555
NC	Greensboro, Grady Duckett Sls., Box 22002	919-273-4617
Ohio	Cincinnati, Luebbe Sls., 2649 Erie	513-871-4211
Ohio	Cleveland, Luebbe Sls., 21330 Center Ridge	216-734-4242
Ohio	Dayton, Box 224	513 294-0426
Tex	Irving, Space Elctrns., Box 705, Irving Bank Towers	214-631-0905
EXP:	Los Angeles, Cal., Hughes Int'l, Box 92927	213-670-1515

HUGHES AIRCRAFT CO., Electron Dynamics Div., 3100 W. Lomita Blvd., Torrance, Cal., 90509, Tel: 213-534-2121, TWX: 910-347-6238; Mktg. Mgr: J.H. Johnson

HUGHES AIRCRAFT CO., Frequency Control Devices, 500 Superior Ave., Dept. E-1, Newport Bch., Cal., 92663, Tel: 714-548-0671, TWX: 910-596-1374; Sls. Mgr: F.H. Weisel, Jr. ....Pgs. 496,1403

Ala	Birmingham, F.C. Nickerson, 1148 Cheyenne Blvd.	205-853-2852
Ariz	Scottsdale, O'Hara Engrg. Assoc., 8650 Joshua Tree La.	602-947-4666
Cal	Mt. View, Quadrep, Inc., 949 Stierlin Rd.	415-964-3532
Colo	Littleton, Simpson Assocs., 2552 Ridge Rd.	303-798-8439
Conn	No. Haven, Kitchen & Kutchin, 17 Waltham St.	617-862-8230
Fla	Tampa, F. Nickerson, 4513 S. Cameron Ave.	813-833-4321
Ga	Decatur, F.C. Nickerson Co., 1240 Clairmont Ave.	404-377-1575

Ill Rolling Meadows, Sumer, Inc., 5105 Tollview Rd. 312-392-7370
Ind Ft. Wayne, Sumer, Inc., 2211 S. Calhoun St. 219-744-4331
Kans Overland Pk., Tech. Reps., Inc., 9009 W. 95th St. 913-381-5852
Md Baltimore, Laurel Assocs., 6508 Pimlico Rd. 301-484-1567
Mass Lexington, Kitchen & Kutchin, 17 Waltham St. 617-862-8230
Mich Orchard Lake, R.G. Sidnell, 6051 Pinecroft Dr. 313-851-3518
Minn Mpls., Sumer, Inc., 4660 W. 77th St. 612-920-8414
Mo Hazelwood, Tech. Reps., Inc., 8618 Latty Ave. 314-524-6900
NJ Moorestown, Wire-Conn., 732 Hunter La. 609-234-0569
NM Albuquerque, Data Handling Co., 209 San Pablo, S.E. 505-268-4364
NY Great Neck, Cooper-Simon & Co., 38 Middle Neck Rd. 516-487-1142
NY No. Syracuse, Advanced Comps., Box 248 315-699-2671
NC Charlotte, F.C. Nickerson, 5817 Haddington Dr. 704-537-2855
Ohio Dayton, R.G. Sidnell, 3300 S. Dixie Dr. 513-293-1194
Ohio Mentor, R.G. Sidnell, 4 Meadowlawn Dr. #9 216-942-3304
Ore Portland, J.V. Belusko, 2355 N.W. Quimby St. 503-222-4279
Tex Irving, Space Elctrns., Inc., Irving Bank Tower 214-631-0905
Tex Houston, Space Elctrns. 713-667-5903

HUGHES AIRCRAFT CO, Ground Sys. Grp., 1901 Malvern St, Fullerton, Cal., 92634, Tel: 714-871-3232, TWX: 910-592-1246

HUGHES AIRCRAFT CO., Hybrid Microelectronic Circuits, 500 Superior Ave., Newport Bch., Cal., 92663, Tel: 714-548-0671, TWX: 910-596-1374; Sls. Mgr: D. Mortensen ....Pg. 1403

HUGHES AIRCRAFT CO., Ind'l. Prods. Div., 2020 Oceanside Blvd., Oceanside, Cal., 92054, Tel: 714-757-1200, TWX: 910-322-1380; Div. Mktg. Mgr: R.W. Curry

HUGHES AIRCRAFT CO., Ind'l. Prods. Div. Display Sys., 2020 Oceanside Blvd., Oceanside, Calif., 92054, Tel: 714-757-1200, TWX: 910-322-1380; Mgr: G.D. Wrench

HUGHES AIRCRAFT CO., Ind'l. Prods. Div. FACT Sys., Box 92904, Los Angeles, Cal., 90009, Tel: 213-670-9040, TWX: 213-871-5210; Sls. Mgr: J.E. Bear ....Pg. 496

Ala Huntsville, W.K. Rosinski, 1112 Monte Sano Blvd., S.E. 205-534-8827
Conn Southport, Hughes Aircraft Co., 134 Old Post Rd. 203-255-3523
Tex Dallas, Bradenco, 2646 Andjon Rd. 214-358-3278
Wash Seattle, H. Levinson Co., 1211 E. Denny Way 206-323-5100

HUGHES AIRCRAFT CO., Ind'l. Prods. Div./Ind'l. Auto, 2020 Oceanside Blvd., Oceanside, Cal., 92054, Tel: 714-757-1200, TWX: 910-322-1380

HUGHES AIRCRAFT CO., Mos Div., 500 Superior Ave., Newport Beach, Cal., 92663, Tel: 714-548-0671, TWX: 910-596-1374; Mktg. Mgr: F.L. Krch ......Pgs. 1540,1541

Ala Birmingham, F. Nickerson, 1148 Cheyenne 205-853-2852
Cal San Jose, G. Bryant, 1492 Portobelo 408-264-3200
Cal Torrance, Mitronics Ind., 18039 Crenshaw 213-323-7934
Colo Littleton, Simpson, 2552 Ridge Rd. 303-798-8439
Conn No. Haven, Forsberg Sls., 22 Broadway 203-239-5111
Fla Tampa, F. Nickerson, 4513 Cameron 813-833-4321
Ga Decatur, F. Nickerson, 1244 Clairmont 404-377-1575
Ill Rolling Meadows, Sumer, 5105 Tollview 312-392-7370
Ind Ft. Wayne, Sumer, Inc., 2211 S. Calhoun 219-744-4331
Kans Overland Pk., Tech. Reps., 9009 W. 9th 913-381-5852
Md Laurel, V.P.I., 13001 Mistletoe 301-792-7631
Mass Brockton, Forsberg Sls., 646 Summer St. 617-522-6300
Mich Orchard Lake, R. Sidnell, 6051 Pinecroft 313-851-3518
Minn Mpls., Sumer, Inc., 7710 Computer 612-920-8414
Mo Hazelwood, Tech. Reps., 8618 Latty 304-524-6900
NJ Dover, V.P.I., 162 Highview Terr. 201-366-7518
NY Great Neck, V.P.I., 300 Northern Blvd. 516-482-8387
NY Liverpool, Omni Ind., 600 Oswego 315-457-6378
NC Charlotte, F. Nickerson, 5817 Haddington 704-537-2855
Ohio Mentor, R. Sidnell, 7191 Dogwood 216-942-3304
Ohio Dayton, R.G. Sidnell, 3300 S. Dixie 513-293-1194
Ore Portland, J. Belusko, 2355 N.W. Quimby 503-222-4279
Pa Montgomeryville, V.P.I., Box 452 215-474-3200
Tex Bellaire, Space Elctrns., Box 1186 713-667-5903
Tex Irving, Space Elct., Irving Bank Tower 214-631-0905

Advertisement

The MOS Division of Hughes designs and builds standard and custom MOS products.
D to A converters, discrete MOSFET transistors, Multiplexers, Dynamic Shift Registers up to 1024 bits and frequencies to 20 Mhz. Static Shift Registers, Read Only Memories ROM up to 10Mhz rates, RAM Memories, Display drivers, Frequency Dividers, Counters, TV Synch Circuits, Differential Digital Analyzers, Standard logic elements - P channel, CMOS, 5V CMOS and 1.5V CMOS.
For custom and standard MOS MSI and LSI call Hughes.

HUGHES AIRCRAFT CO, Research Labs., 3011 Malibu Canyon Rd., Malibu, Cal., 90265, Tel: 213-456-6411, TWX: 910-343-6910

HUGHES AIRCRAFT CO., Storage Tubes Ind'l. Prods. Div., 2020 Oceanside Blvd., Oceanside, Calif., 92054, Tel: 714-757-1200, TWX: 910-322-1380; Sls. Mgr: R.W. Curry

HUGHES AIRCRAFT CO, Vacuum Tube Prods. Div/Vacuum Equip., 2020 Oceanside Blvd., Oceanside, Calif, 92054, Tel: 714-757-1200, TWX: 910-322-1380; Sls. Mgr: W. VanDerLinden

HUGHES AIRCRAFT CO., Vacuum Tube Prods. Div/Welding Equip., 2020 Oceanside Blvd., Oceanside, Calif., 92054, Tel: 714-757-1200, TWX: 910-322-1380; Sls. Mgr: C.A. Rollins

HUGHES-TREITLER MFG. CORP., 300 Endo Blvd., Garden City, N.Y., 11530, Tel: 516-ED-3-8660; Sls. Mgr: M. Finkelstein

HUGHEY & PHILLIPS, INC., 3050 N. California St., Burbank, Cal., 91505, Tel: 213-849-1104, TWX: 910-498-2252; Sls. Mgr: C.E. Stephens

HUGLE INDS., 625 N. Pastoria, Sunnyvale, Cal., 94086, Tel: 408-738-1700; Sls. Mgr: J. Victor

HULL CORP., Davisville Rd., Hatboro, Pa., 19040, Tel: 215-672-7800, TWX: 510-665-6822; V.P-Sls: J.L. Hull

HUMBLE OIL & REFINING CO., Box 2180, Houston, Tex., 77001, Tel: 713-CA-1-3636, TWX: 715-571-1160; V.P. Sls: L.G. Rawl

HUMPHREY, INC., 2805 Canon St., San Diego, Calif., 92106, Tel: 714-223-1654, TWX: 910-335-1266; Sls. Mgr: H.H. Kries, Jr.

Advertisement

Humphrey, Inc. designs and manufactures electro-mechanical and inertial reference instruments, including gyroscopes (free, rate, directional, vertical); all-elctric attitude and directional gyros and repeaters for general aviation and avionics OEMs; bore hole survey systems for offshore and inland drilling; angular and rectilinear displacement transducers; accelerometers and acceleration switches; planar accelerometers (Accelograph); pendulums; inertial reference systems for automotive, aircraft, and oceanographic performance testing. Proven and qualified as required for military and industrial applications.

HUNT, PHILIP A. CHEMICAL CORP., Palisades Pk., N.J., 07650, Tel: 201-944-4000, TWX: 710-991-9783; Sls. Mgr: K.W. Lutz

HUNTER SPRING, Div. of Ametek, Inc., One Spring Ave., Hatfield, Pa., 19440, Tel: 215-822-2971, TWX: 510-661-4888; Sls. Mgr: J.V. Bishop

HUNTER-STANLEY ELCTRNS., INC., 208 Russell St., Nashville, Tenn., 37213, Tel: 615-254-6532; Sls. Mgr: W.D. Stanley

HUNTER TOOLS, 9674 Telstar Ave., El Monte, Calif, 91731, Tel: 213-686-0411, TWX: 910-587-1565 Wm. Schick

HUNTINGTON ALLOY PRODUCTS DIV., International Nickel Co., Guyan River Rd., Huntington, W. Va., 25720, Tel: 304-696-3402; Adv. Coordinator:

HURST MFG. CORP., Box 326, Princeton, Ind., 47570, Tel: 812-385-2564, TWX: 810-350-2341; V.P. Sls: W.W. Taylor ....Pgs. 1608-1615

Ariz. Phoenix, Dorton Entprs., 364 E. Virginia Ave. 602-263-0414
Cal Inglewood, V & L Assoc., 3412 W. Century Blvd. 213-671-7688
Cal San Carlos, D. H. Ross Co., 1095 Industrial Rd. 415-591-4411
Colo Broomfield, Arrowhead Sls., RR.1, Box 335 303-222-6462
Conn Canaan, Hathaway Elctrns., Box 797 203-824-7215
Fla Miami Bch., Geartner Assocs., 1125 71st St. 305-861-3661
Fla Orlando, Geartner Assocs., 1221 Lee Rd. 305-299-1000
Ga Atlanta, Cartwright & Bean, Inc., 3223 Cain's Hill Pl., N.W. 404-237-2273
Ill LaGrange, Bierhaus Sls., Inc., 1013 E. 31st St. 312-354-5100
La Metairie, Cartwright & Bean, Inc., 7010 Magnolia Ct. 504-887-5225
Md Glen Arm, Billis Sls. Co., Box 94H-40 301-592-7047
Mass Arlington, Hathaway Elctrns., 711 Mystic St. 617-646-1380
Mich Grand Rapids, R. Van Riper Sls., 1842 Newton, S.E. 616-452-0464
Minn Mpls., M. Foster Co., 229 S. Cedar Lake Rd. 305-299-1000
NJ Cherry Hill, Billis Sls. Co., 14 Galway La. 609-428-3650
NY Elmont, F.E. Schmitt Co., Inc., 311 Meacham St. 516-437-8150
NY Rochester, W.H. Zimmerman, 3100 Monroe Ave. 716-586-4450
NY Syracuse, W.H. Zimmerman, 112 DeWitt St. 315-474-4889
NC Charlotte, Cartwright & Bean, Inc., 625 Harwyn Dr. 704-537-7965
NC Raleigh, Cartwright & Bean, 1016 Belfast Dr. 919-832-7128
Ohio Chagrin Falls, J. Kilroy Corp., 539 E. Washington St. 216-247-8997
Pa Pittsburgh, G.S. Root Co., 809 Wainwright Dr. 412-561-4125
Tenn Memphis, Cartwright & Bean, Inc., 560 S. Cooper 901-276-4442
Tex Dallas, J.B. Guenther, Inc., 5121 McKinney Ave. 214-528-6286
Tex Houston, J.B. Guenther, Inc., Box 55525 713-468-0232
Wash Seattle, F.H. Haight Co., 3212 Eastlake Ave. 206-322-1818
Wisc Wauwatosa, Larson Assocs., 10855 W. Potter Rd. 414-258-0529
For: Can., Scarborough, Ont., Lake Engrg., Ltd., 123 Manville Rd. 416-751-5980

HUTSON INDS., Box 34235, Dallas, Tex., 75234, Tel: 214-241-3511, TWX: 910-860-5537; Sls. Mgr: P.E. Wible

HY-CAL ENGRG., 12105 E Los Nietos Rd., Santa Fe Springs, Cal., 90670, Tel: 213-698-7785; Mktg. Mgr: A.E. Bowman

Advertisement

PRODUCTS INCLUDE: Thermal Systems; SENSIMETER Indicators, digital & analog; Thermocouple Reference Temperature Systems & Single Reference Units; Resistance Temperature Sensors & related electronics, i.e. signal conditioners, bridges, readout, etc.; Thermocouples & accessories; Calorimeters; Radiometers; Pyrheliometers; Test Facilities; Calibration Facilities; Applied Research & Engineering.

HYCOMP INC., Box 250, Maynard, Mass., 01754, Tel: 617-897-4578; Sls. Mgr: N.S. Palazzini

HYBRID SYS. CORP., 95 Terrace Hall Ave., Burlington, Mass., 01803, Tel: 617-272-1522, TWX: 710-332-7584; Sls. Mgr: C.M. Kramer .... Pgs. 352,353,1284

Ariz Phoenix, R. Mays, 4014 N. 7th St. 602-279-5243
Cal Encino, Cardinal, 16024 Ventura Blvd. 213-788-4540
Cal San Jose, RDP, 100 N. Wincester Blvd. 408-248-0120
Fla Clearwater, Brennan, 211 S. Ewing 813-446-5006
Mass Attleboro, Engrg. Sls. New England 617-222-4078
Kans Overland Pk., Penzer-Mankus, 5600 W. 95th St. 913-381-0004
Mass Burlington, Hybrid Sys., 95 Terrace Hall Ave. 617-272-1522
Minn Mpls, Dalec, 821 Second Ave. 612-377-8383

Mo Hazelwood, Penzer-Mankus, 400 Brooks La. 314-731-4334

NJ Haddonfield, Thomas, 138 Haddon Ave. 609-854-3011

NM Albuquerque, R.A. Mays, 8016 Zuni 505-265-7989

NY DeWitt, DB Assocs., 3307 Erie Blvd., E. 315-446-0220

NY Tuckahoe, HAF Spectrum, 65 Circuit 914-793-1660

Tex Richardson, Box 1021 214-235-3043

Va Arlington, Gans-Fryling Co., 2030 16th St. 703-527-3262

EXP: N.Y., N.Y., Multiparts Corp., 52 Wall St. 212-944-4370

HYDE PARK ELCTRNS., INC., Box 44, Dayton View Sta., Dayton, Ohio, 45406, Tel: 513-885-2345; Sls. Mgr: W.R. Winger

HYDOR THERME CORP., 7219 Airport Hwy., Pennsauken, N.J., 08109, Tel: 609-663-8600; Sls. Mgr: W.O. Delaney

HYDRO-AIRE DIV., Crane Co., 3000 Winona Ave., Burbank, Calif., 91503, Tel: 213-842-6121, TWX: 213-846-5585; Dir. Sls: N.E. Hauft

HYDRO MOLDING CO., INC., Plattsburgh, N.Y., 12901, Tel: 518-561-5320; Sls. Mgr: S. Levites

HYGRODYNAMICS, INC., Dept. D-24, 949 Selim Rd., Silver Spring, Md., 20910, Tel: 301-588-6156, TWX: 301-439-4909; Mktg. Mgr: J. Whitehill

Advertisement

HYGRODYNAMICS' humidity measurement and control instrumentation includes: HUMISTAT, a humidity controller for air conditioning and other humidity control applications. HYGRO-CHAMP and SABER-CHAMP, moisture-in-paper test equipment; electronic humidity SEASORS, TRANSMITTERS, CONTROLLERS and RECORDERS.

HYKON MFG. CO., 163 E. State St., Box 923, Alliance, Ohio, 44601, Tel: 216-821-2320; Mgr: A.F. Duchon

HYLETRONICS CORP., Newtown Rd., Littleton, Mass., 01460, Tel: 617-486-8911, TWX: 710-347-0656; Sls. Mgr: J.R. Richmond

HYPERION INDS. CORP., Power Equip. Div., 134 Coolidge Ave., Watertown, Mass., 02172, Tel: 617-926-0140, TWX: 710-327-1868; Sls. Mgr: R. Goodwin

HYPERTRONICS CORP., 50 Hunt St., Watertown, Mass., 02172, Tel: 617-924-1822; Sls. Mgr: R. Macomber

HYSOL DIV., Dexter Corp., 211 Franklin St., Olean, N.Y., 14760, Tel: 716-372-6300, TWX: 510-245-2800; V.P. Mktg: R.C. Whitson

IBM CORP., Ind'l. Prods. Mktg., Dept. EEM, 1271 Ave. of the Americas, New York, NY, 10020, Tel: 212-262-5203; Sls. Mgr: R.P. Wands

IC METRICS, 607 Industrial Way W., Eatontown, N.J., 07724, Tel: 201-229-5544, TWX: 710-722-6682

ICO/RALLY, 1015 Corp. Way, Palo Alto, Cal., 94303, Tel: 415-964-3272; Sls. Mgr: J. Nelson

ICON CORP., 156 Sixth St., Cambridge, Mass., 02142, Tel: 617-868-5400; Sls. Mgr: R.E. Oaklund ......Pg. 1333

Cal Newport Bch, Tekmark West, 4301 Birch St. 714-540-4412

Ill Brookfield, Icon Corp., Box 158 312-485-1350

Ill Chicago, Data Elctrns., 5505 N. Menard Ave. 312-774-1452

Ind Indianapolis, Data Elctrns., 4165 Millesville Rd. 317-547-2329

Iowa Cedar Rapids, Engrg. Svcs. Co., 1076 3rd Ave., S.E. 319-366-1561

Kans Prairie Village, Engrg. Svcs. Co., 7924 Capital A State Line 913-649-4000

Minn Mpls., Loonam Assocs., Box 35126 612-927-4055

Mo St. Louis, Engrg. Svcs., 6717 Vemon 314-726-2233

Ohio Elyria, Icon Corp., 940 Bennett Rd. 216-365-2911

Okla Tulsa, N/C Southwest, Box 4990 918-747-0303

Pa Glenside , C.A. Briggs Co., Box 151 216-885-2244

Tex Dallas, N/C Southwest, Box 35453 214-352-2666

Wash Seattle, Seatronics Inc., 5616 Fourth Ave., S. 206-767-4330

For: Can., Toronto, Ont., Sigma Can. Ltd., Box 43 416-239-8161

ICORE ELECTRO-PLASTICS, INC., 3015 Copper Rd., Santa Clara, Cal., 95051, Tel: 408-732-5400, TWX: 910-339-9293; Sls. Mgr: W. Preston

ICORE, INC., 3015 Copper Rd., Santa Clara, Cal., 95051, Tel: 408-732-5400, TWX: 910-339-9293; Sls. Mgr: C. Stanton

IDALEE ELCTRNS. CORP., 891 Fulton St., Valley Stream, N.Y., 11580, Tel: 516-825-8955; Sls. Mgr: R. Guss

IDEAL ELEC. & MFG. CO., E. First & Oak Sts., Mansfield, Ohio, 44903, Tel: 419-522-3611, TWX: 810-448-2808; Sls. Mgr: E. Strickland

IDEAL-HELLERMANN CAN., LTD., 33 Fuller Rd., Ajax, Ont., Can., Tel: 416-942-6312; Sls. Mgr: W. Imeson

IDEAL INDUSTRIES, INC., 4450 Becker Pl., Sycamore, Ill., 60178, Tel: 815-895-5181; Mktg. Mgr: C.S. Stiles, Jr.

IDEAL PRECISION METER CO., INC., 214 Franklin St., Brooklyn, N.Y., 11222, Tel: 212-383-6904; V.P. Sls: S. June

IDEAS, INC., 118 Grand Ave., Laramie, Wyo., 82070, Tel: 307-742-6668; Sls. Mgr: D.A. Nelson

IE MFG. CO., 3039 W. Carroll Ave., Chicago, Ill., 60612, Tel: 312-722-6900; Sls. Mgr: S. Geansel

IFE DIV, Plastic Mold & Engrg. Co., P.O. Box 4265, E Providence, R.I., 02914, Tel: 401-438-3315; Sls. Mgr: D.G. Barrett

IKL, INC., 4360 Campus Dr., Newport Beach, Calif., 92660, Tel: 714-540-1301; Sls. Mgr: D. Lang

Advertisement

IKL manufactures a variety of bidirectional counters and photo-electric incremental encoders - both rotary and linear. Custom low-cost measurement systems for machine tools are regularly designed and built in quantity. Microcode digital micrometers available from 0.0001" to 0.000010" resolutions.

ILC, INC., 164 Commercial St., Sunnyvale, Calif., 94086, Tel: 408-738-2944; Sls. Mgr: R. Turner

ILG INDUSTRIES, INC., 2850 N. Pulaski Rd., Chicago, Ill., 60641, Tel: 312-725-8016; Mktg. Mgr: A.S. Henderson

ILLUMINATION INDS., INC., 610 Vaqueros, Dept. C, Sunnyvale, Cal., 94086, Tel: 408-738-2744 Ext 336; Mktg. Mgr: E.A. Robinson ....Pg. 1644

Ala Huntsville, Almega, Holiday Off. Ctr. 205-881-1861

Ariz Phoenix, Meas. Conslts., Box 11099 602-264-1279

Cal Mountain View, R. Muenzer, 1959 Old Middlefield 415-964-0390

Cal Torrance, Mitronics Industries, 18039 Crenshaw Blvd. 213-323-7934

Colo Arvada, Meas. Conslts., 8660 Ralston Rd. 303-449-4577

Conn Stamford, Northeast, 516 Pepper Ridge 203-329-0012

Fla Pompano Bch., SEMQUIP, 1900 S. Ocean Blvd. 305-942-4188

Ill Chicago, Brooks Engr., 227 E. Walton Pl. 312-944-1227

Kans Shawnee Mission, Mid-America Elctrns., Box 575 913-432-8678

Md Baltimore, Callas Elctrns., 6409 Frederick 301-744-7711

Mass Marblehead, Northeast Assocs., Box 31 617-595-1000

Mich Ypsilanti, Micro Sls. Corp., 650 Greenlawn 313-482-1229

NJ Upper Montclair, D/R Assocs., Olympic Professional Bldg. 201-744-8378

NM Albuquerque, Meas. Conslts., Box 6081 505-344-7385

NY Great Neck, Krasner, 33 Great Neck 516-487-0690

Ohio Dayton, Micro Sls., 1250 W. Dorothy 513-298-3033

Tex Dallas, Airep Elctrns., 6300 N. Central 214-363-5291

IMC MAGNETICS CORP., Ariz. Div., 1900 E. Fifth St., Tempe, Ariz., 85281, Tel: 602-967-7851; Sls. Mgr: P. Chase

IMC MAGNETICS CORP., Eastern Div., 570 Main St., Westbury, N.Y., 11590, Tel: 516-334-7070, TWX: 510-222-4469; Sls. Mgr: E. Egan

IMC MAGNETICS CORP., New Hampshire Div., Rte. 16B, Rochester, N.H., 03867, Tel: 603-332-5300; Sls. Mgr: R. Smith

IMC MAGNETICS CORP., Western Div., 6058 Walker Ave., Maywood, Cal., 90270, Tel: 213-583-4785, TWX: 910-321-3089; Sls. Mgr: E.W. Blair

IMPACT-O-GRAPH DIV., Torq Engineered Prods., Inc., 32 W. Monroe St., Bedford, Ohio, 44146, Tel: 216-232-1880; Sls. Mgr: W.S. Mielziner

IMPROVED LAMINATED METAL CO., 775 Eddy St., Providence, R.I., 02905, Tel: 401-461-0855; Dir. Mktg. R.W. Douglass

IMTRA CORP., 151 Mystic Ave., Medford, Mass., 02155, Tel: 617-391-5660; Pres: W.H. Farnham

INCOR INSTR., 29 Newtown Rd., Plainview, N.Y., 11803, Tel: 516-293-8717; Sls. Mgr: M.T. Swift

INCRE-DATA CORPORATION, 6405 Acoma Rd., S.E., Albuquerque, N.M., 87108; Sls. Mgr: R.G. Fischer

INDAK MFG. CORP., 1915 Techny Rd., Northbrook, Ill., 60062, Tel: 312-272-0343; Sls. Mgr: A.R. Cobb

INDEPENDENT INK, INC., 14705 S. Avalon Blvd., Gardena, 90248, Tel: 213-321-0181; Sls. Mgr: C. Brucker

INDIANA GEN'L. DIV., Electro-Mechanical Prods., 517 W. Walnut St., Oglesby, Ill., 61348, Tel: 815-883-8453, TWX: 910-642-2370; Sls. Mgr: R.D. Wright, Jr.

INDIANA GEN'L.-PROCESS EQUIP., 6001 S. General Ave., Cudahy, Wisc., 53110, Tel: 414-769-8000, TWX: 910-262-3100; Sls. Mgr: D.G. Morgan

INDIKON CO., 76 Coolidge Hill Rd., Watertown, Mass., 02172, Tel: 617-926-2710; Sls. Mgr: A. Finn

INDIT CORP., 79 Albertson Ave., Albertson, N.Y., 11507, Tel: 516-747-2510

INDIUM CORP. AMERICA, 1676 Lincoln Ave., Box 269, Utica, N.Y., 13503, Tel: 315-797-1630, TWX: 510-242-0288

INDOFEX, INC., 7 Cherry Ave., Waterbury, Conn., 06702, Tel: 203-757-9291; Sls. Mgr: E.H. Ulm

INDUSTRIAL COMMERCE, 105-07 Metropolitan Ave., Forest Hills, N.Y., 11375, Tel: 212-268-5277; Sls. Mgr: L.E. Bruckman

INDUSTRIAL CONDENSER CORP., 3243 N. California Ave., Chicago, Ill., 60618, Tel: 312-463-2200; Sls. Mgr: R.W. Felber

IND'L. CONTROL CO., Central Ave., Farmingdale, N.Y., 11735, Tel: 516-694-3000; Sls. Mgr: G. Attura Pgs. 1872,1873

IND'L. DEVICES, 982 River Rd., Edgewater, N.J., 07020, Tel: 201-943-4084; Sls. Mgr: B. Schnoll Pgs. 1474,1475

Ala Huntsville, Comp. Sls., Box 1156 205-539-6973

Ariz Phoenix, J.R. Morgan, 1123 N. 7th 602-252-3089

Cal Hollywood, Westaironics, 1800 N. Highland 213-466-6201

Cal Menlo Pk, Frauman Assocs, Box 969 415-322-8461

Colo Denver, Koether-Cox, 1327 S. Inca St. 303-733-5561

Conn W. Simsbury, Anchor Engrg. Corp., 6 Arrowhead Dr. 203-658-6261

Fla Ft. Lauderdale, Comps. Sls. Corp., 850 E. Oakland Pk. Blvd. 305-563-1860

Fla St. Petersburg, Comps. Sls., Box 9545 813-360-7460

Ill Chicago, K.D. Engle, 3621 W. Devon 312-539-1820

Kans Leawood, Fixman Eng., 8005 Ensley La. 913-649-0679

Kans Wichita, G. Fixman Engrg. Co., 6631 E. Kellogg 316-MU-2-9433

Md Baltimore, M/E Assocs., 320 Hillen Rd. 301-825-1130

Mass Wellesley Hills, Anchor Engrg., 40 Wash. 617-235-6330

Mich Oak Pk., W. Spenser, 21500 Greenfield 13-398-8005

Minn Wayzata, G.A. Kelly, Box 222 612-GR-3-7602

Mo St. Louis, Fixman Engrg., 8160 Stanford 314-PA-5-5219

NJ Cherry Hill, M/E Assocs., 314 Columbia Blvd. 609-667-6110

NY Buffalo, Niagara Elec. Sls., 505 Delaware 716-TT-6-4000

NY Manhasset, Kaelber & Mack, Inc., 75 Plandome Rd. 516-MA-7-6620

NY Rochester, Niagara Elec. Sls. Co., 55 Canterbury Rd. 716-BR-1-1223

Tenn Chattanooga, Ind'l. Hardgoods Co., 809-11 N. Market St. 615-267-0907

Tex Dallas, Blackburn Assocs., Box 20073 214-351-9991

Va Richmond, M/E Assocs., Box 9764 703-262-9633

Wash Seattle, Fleehart & Sullivan, 10109 Aurora Ave., N. 206-522-1533

EXP: N.Y., N.Y., J.A. Gross, 41 Union Sq. 212-929-5063

For: Can., Windsor, Ont., W. Spenser Co., 3238 Curry St. 519-969-1332

IND'L. ELEC. REELS, 1509 Chicago St., Omaha, Neb., 68102, Tel: 402-341-4600; Sls. Mgr: J.C. Costello

IND'L ELCTRN. ENGRS., 7740 Lemona Ave., Van Nuys, Cal., 91405, Tel: 213-787-0311, TWX: 910-495-1707; Sls. Mgr: W.E. Hartman ....Pgs. 1476-1478

Ala Huntsville, Mekco, 3322 Memorial, S. 205-881-3721

Ariz Phoenix, Gramer, 110 W. Camelback Rd. 602-279-1231

Cal Menlo Pk., J. Heaton, 3723 Haven 415-369-4671

Cal San Diego, L. L. Stoakes, 4438 Ingraham 714-274-6281

Colo Denver, Checkmate, 4785 S. Quebec 303-771-4920

Conn N. Haven, Kitchen & Kutchin, 22 Broadway 203-239-0212

Fla Orlando, Mekco, 3165 McCrory 305-841-2215

Ill Mt. Prospect, Magnuson, 2420 Oakton 312-956-0700

Kans Leawood, Poly-Onics, 4434 W. 90th 913-648-4173
Md Rockville, Marktron, 651 Lofstrand La. 301-762-6210
Md Towson, Marktron, 202 W. Pennsylvania 301-825-8222
Mass Lexington, Kitchen & Kutchin, 17 Waltham 617-862-8230
Mich Detroit, L. Dickelman, 18315 W. Seven Mile 313-358-2616
Minn St. Paul, Magnuson, 1246 W. Seventh 612-227-8495
Mo Hazelwood, Poly-Onics, 47 Village Sq. Shop. Ctr. 314-837-0597
NJ Stratford, A. Luba, 3 Summit Rd. 609-784-5000
NM Albuquerque, Data Handling, 209 San Pablo S.E. 505-268-0928
NY Great Neck, E.R.A., 330 Great Neck Rd. 516-482-9320
NY Kingston, Ossmann Comp., 411 Washington 914-338-5505
NY Rochester, Ossmann Comps., 280 Metro Pk. 716-442-3290
NY Syracuse, Ossmann Comps., 132 Pickard Bl. 315-454-4477
NY Vestal, Ossmann Comps., 1901 Vestal Pkwy., E. 607-785-9949
NC Burlington, Mekco, 1349 S. Church St. 919-226-7177
Ohio Aurora, EMA, 337 Garfield Rd. 216-562-6104
Ohio Centerville, EMA, 35 Compark Dr. 513-433-2800
Pa Pittsburgh, R. Clark, 10517 Lindberg 412-242-9500
Tex Dallas, Norvell, 10210 Monroe 214-357-6451
Tex Houston, Norvell, 6440 Hillcroft Ave. 713-774-2568
Wash Mercer Island, J. Anderson, Box 637 206-232-0484

INDUSTRIAL ELCTRN. HARDWARE, 109 Prince St., New York, N.Y., 10012, Tel: 212-OR-7-1881, TWX: 710-581-4338; Sls. Mgr: M. Offerman

IND'L. ELCTRN. RUBBER, 8589 Darrow Rd., Twinsburg, Ohio, 44087, Tel: 216-425-7121

INDUSTRIAL FORMULATIONS, 175 Terminal Dr, Plainview, N.Y., 11803, Tel: 516-433-1182; Sls. Mgr: P. Novogrod

IND'L. GAUGING & CONTROL, 296 Westport Ave., Norwalk, Conn., 06851, Tel: 203-847-4581; Sls. Mgr: I. Russell

INDUSTRIAL INVENTIONS, INC., RD2 463 U.S. 1, Monmouth Jct., N.J., 08852, Tel: 201-329-6000; Sls. Mgr: H. Star

INDUSTRIAL MICROWAVE, 520 Martin Pl., Scotch Plains, N.J., 07076, Tel: 201-322-4411, TWX: 710-997-9512; Sls. Mgr: H.J. Schatz

INDUSTRIAL NUCLEONICS, 650 Ackerman Rd., Columbus, Ohio, 43202, Tel: 614-267-6351; Pres: D.L. Nelson

INDUSTRIAL RETAINING RING, 57 Cordier St., Irvington, N.J., 07111, Tel: 201-926-5000, TWX: 201-621-7816; Sls. Mgr: P.L. Altpeter

IND'L. SOLID STATE CONTROLS, Box 934, York, Pa., 17405, Tel: 717-848-2825; Sls. Mgr: R.G. Schaffer

IND'L TECTONICS, 18301 S. Santa Fe Ave., Compton, Cal., 90224, Tel: 213-537-3750, TWX: 910-346-6302; Sls. Mgr: H.L. Meek

IND'L. TECTONICS, Ball Div., Box 1128, Ann Arbor, Mich., 48103, Tel: 313-426-4681, TWX: 810-223-6058; Sls. Mgr: F. Zajac

IND'L. TEST EQUIP., 20 Beechwood Ave., Port Washington, N.Y., 11050, Tel: 516-767-5253; Sls. Mgr: M. Schreibman .... Pgs. 497,733

Ala Huntsville, Intern'l. Scientific Instru., Box 2091 205-536-9686
Ariz Phoenix, Luscombe Engrg., Co., 222 W. Osborne Rd. 602-274-1542
Cal Pasadena, Luscombe Engrg., Co., 610 S. Arroyo Pkwy. 213-684-2000
Cal San Mateo, Luscombe Engrg., Co., 220 E. Third Ave. 415-342-7057
DC Washington, Powell-Pendergraph, 7979 Old Georgetown Rd. 301-656-4535
Fla Maitland, E.I.R., Inc., Box 943 305-644-9595
Ill Chicago, Midwest Elctrn., 5707 W. Division 312-626-0030
Mass Needham, Addelco, 56 Pickering St. 617-444-4754
Mich Farmington, Carter, McCormic, & Peirce, 23995 Freeway Pk. 313-447-7700
NY Great Neck, Industron Assocs., Inc., 300 Northern Blvd. 516-HU-7-2620
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster 513-278-5873
Pa Hatboro, Powell-Pendergraph, 206 Mill 215-887-1135
Pa Pittsburgh, Carter, McCormic & Peirce, 201 Penn Ctr. 412-824-3760
Wisc Waukesha, Midwest Elctrn., 1317 Garfield 414-542-5129
EXP: N.Y., N.Y., Ad. Auriema, 120 Liberty 212-349-8220
EXP: Can., Ont., Whittaker Elctrn., 42 Howden, Ottawa 5 613-224-1221

INDUSTRIAL TIMER DIV., Singer Co., U.S. Hwy. 287, Parsippany, N.J., 07054, Tel: 201-887-2200; Sls. Mgr: P. Mariniello

IND'L. TOOLS, 201 Bryant St., Ojai, Cal., 93023, Tel: 805-646-5561; Sls. Mgr: W.B. Burr, Jr.

INDUSTRIAL WASHING MACH., 32 Main St., Matawan, N.J., 07747, Tel: 201-566-4660; Sls. Mgr: H.M. Sadwith

IND'L. WINDING MACH., Box 45, River Edge, N.J., 07661, Tel: 201-488-4492; Sls. Mgr: H.W. Roehrig

INERTIAL MOTORS CORP., 280 N. Broad St., Doylestown, Pa., 18901, Tel: 215-345-1010; Sls. Mgr: E.S. Mihalko

Advertisement

Manufactures Low Inertia D.C. Motors for use in applications where motion control is required. The extreme high torque to Inertia ratios enables these motors to accelerate to 3,000 RPM in less than .00001 sec. with stepping rates of 2,000 steps per second per revolution. Available in all sizes from 1 & 7/8" to 6.5" O.D., with integral digital and analog tachometers.

INFINETICS, INC., Electro-Magnetic Div., 1601 Jessup St., Wilmington, Del., 19802, Tel: 302-658-2471; Sls. Mgr: T.A. Coneys

INFO-LITE CORP., 2337 Lemoine Ave., Ft. Lee, N.J., 07024, Tel: 201-947-6646; Sls. Mgr: J. Cartelli

INFODEX, INC., 7 Cherry Ave., Waterbury, Conn., 06702, Tel: 203-757-9291; Sls. Mgr: E.H. Ulm Pg. 498

Cal Mtn. View, IFM-North, 2269 Middlefield Way 415-961-2828
Ill LaGrange, Bard Assocs., LaGrange Pk. 312-354-0660
Ind Indpls., Bard Assocs., 4002 Meadows 312-849-2723
Kans Lenexa, Bard Assocs., 13100 W. 95th 913-888-2673
Mass Burlgtn., Resch. Instrs., 87 Terr. Hall 617-272-1800
Minn Mpls., Bard Assocs., 4649 W. 77th St. 612-866-1700
NJ Rockaway, Data Rep. Assocs., Box 245 201-625-2233
NY Huntington Sta., Data Rep., Box 164 516-423-7677
Ohio Aurora, E.M.A., Inc., Box 275 216-247-4488
Ohio Centerville, E.M.A., Inc., Box 191 513-433-2800
Pa Norristown, Data Rep. Assocs., Box 349 215-279-8210
Tex Houston, Noakes Engrg., Box 36258 713-529-6213
Tex Irving, Noakes Engrg., Box 968 214-255-0441
Va Falls Church, Jay Co., 2914 Annandale Rd. 703-534-7800
Wash Seattle, Assoc. Inds., 3711 S. Hundson St. 206-723-5600

INFORMATION DISPLAYS, INC., 333 N. Bedford Rd., Mt. Kisco, N.Y., 10549, Tel: 914-241-1000, TWX: 710-571-2179; V.P. Sls: C. Machover

INFORMATION HANDLING SVC., Denver Technological Ctr., Box 1154, Englewood, Colo., 80110, Tel: 303-771-2600; N'tl Sls. Mgr: J.S. Ward

INFOTRONICS INSTR. CORP., See Dohrmann

INFRARED INDS., INC., Electro-Optics Div., Box 989, Santa Barbara, Cal., 93102, Tel: 805-684-4181, TWX: 910-336-1140; Sls. Mgr: S.D. Grandfield

INFRARED INDS., Photoconductor Div., Waltham, Mass., 02154, Tel: 617-893-5400, TWX: 710-324-1199; Sls. Mgr: A.G. Hurd

INGERSOLL PRODS., Div. Borg-Warner Corp., 1016 W. 120th St., Chicago, Ill., 60643, Tel: 312-264-7800, TWX: 910-221-5081; Mktg. Mgr: J.G. Jaworski

INJECTION PLASTIC CORP., 8124-30 N. Ridgeway Ave., Skokie, Ill., 60076, Tel: 312-267-3888; Sls. Mgr: W. Hays

INJECTORALL ELCTRNS. CORP., 4 North Rd., Great Neck, N.Y., 11024, Tel: 516-487-6015; Pres: E. Wollman

INLAND MFG. CO., 1108 Jackson St., Omaha, Neb., 68102, Tel: 402-342-1108; Sls. Mgr: T.R. Gomez

INLAND MOTOR CORP. OF VA., 501 First St., Radford, Va., 24141, Tel: 703-639-3973, TWX: 710-875-3740; Sls. Mgr: L. Davis

INLAND TESTING LABS., INC., Sub. Gen'l. Testing Labs., 7845 Nagle Ave., Morton Grove, Ill., 60053, Tel: 312-966-0770; Sls. Mgr: L.M. Sonenthal

INMANCO, INC., 3800 West 42nd St., Chicago, Ill., 60632, Tel: 312-247-6900; Sls. Mgr: S.A. Sargent

INNOVATEK ENTERPRISE, Smithfield Rd., Millerton, N.Y., 12546, Tel: 914-373-9122; Sls. Mgr: P.F. Fitts

INSACO, INC., Box 422, Quakertown, Pa., 18951, Tel: 215-536-3500, TWX: 510-661-5943; Sls. Mgr: P.E. Haines

INSCO CORP., Main St., Groton, Mass., 01450, Tel: 617-448-6369; Pres: D.L. Ammen

INSPECTION SYSTEMS, Div. Delta Sonics, Inc., 12918 Cerise Ave., Hawthorne, Calif, 90250, Tel: 213-772-1409; Sls. Mgr: G.H. Lynn

INSTRON CORP., 2500 Washington St., Canton, Mass., 02021, Tel: 617-828-2500; Sls. Mgr: A.J. Donius

INSTRU-LEC CORP., 520 Homestead Ave., Mt. Vernon, N.Y., 10550, Tel: 914-668-3754; Sls. Mgr: R. Hobert

INSTRULAB, INC., 1205 Lamar St., Dayton, Ohio, 45404, Tel: 513-223-2241, TWX: 810-459-1926; Asst. Sls. Mgr: W. Rollert

INSTRUMENT DATA PRODUCTS, 3 M Co., 300 S. Lewis Rd., Camarillo, Cal., 93010, Tel: 805-482-1911, TWX: 510-866-7099; Mgr: M.J. Ackerman

INSTRUMENT DISPLAYS, 18 Granite St., Haverhill, Mass., 01830, Tel: 617-374-0311; Sls. Mgr: T. Chadurjian

INSTRUMENT ENGINEERING CO., 3100 Longhorn Blvd., Austin, Tex, 78758

INSTRUMENT LABS. CORP., 315 W. Walton Pl., Chicago, Ill., 60610, Tel: 312-642-0123; Sls. Mgr: H. Taylor

INSTR. RESCH. CO., Box 231, Lincoln, Mass., 01773, Tel: 617-897-7647; Sls. Mgr: B. Hobbs

INSTRUMENT RESISTORS, 503 Adamston Rd., Brick Town, N.J., 08723, Tel: 201-477-5454; Sls. Mgr: H.G. Melick

Advertisement

INSTRUMENT RESISTOR Company's new line of InResCo Reed Relays has been expanded and now covers a wide area of Printed Circuit designs. Form A B & C as well as combinations are now available. Low current draw & low price are featured. Special designs to your specifications our specialty.

INSTRUMENT SPECIALTIES, 276 Bergen Blvd., Little Falls, N.J., 07424, Tel: 201-256-3500, TWX: 710-988-5732; Sls. Mgr: W.C. Carson Pgs. 2760,2761

Cal Palo Alto, O'Donnell Assocs., 1955 B El Camino Real 910-373-1154
Cal Torrance, O'Donnell Assocs., 18053 Crenshaw Blvd. 213-323-9243
Mass W. Concord, Sls. Engrg., Baker Ave. 617-369-3943
Minn St. Paul, Northport Engrg., Inc., 2027 Grand Ave. 612-698-3841
Mo St. Louis, Ryder Pratt Assocs., 6710 Clayton Rd. 314-647-2632
NC Charlotte, McLean Sls. Co., Box 17604 704-366-2675
Ohio Cincinnati, J.G. McLaughlin & Assoc., Box 43138 513-561-2285
Tex Irving, Lee Sls. Co., Box 5566 214-255-5043

INSTR. & CONTROL SYS., INC., 129 W. Laura, Addison, Ill., 60101, Tel: 312-543-6200, TWX: 910-651-4955; Sls. Mgr: H. Washington

INSTRUMENTATION TECH. CORP., 18811 Napa St., Northridge, Calif., 91324, Tel: 213-886-2034; Sls. Mgr: G. Himler

INSTRS. FOR IND., INC., 151 Toledo St., Farmingdale, N.Y., 11735, Tel: 516-694-1414; Sls. Mgr: J.D. Fahnestock .... Pg. 1285 cont'd

cont'd

Advertisement

IFI manufactures BROADBAND POWER AMPLIFIERS with instantaneous bandwidths (flat within 1.5 db) to 15 octaves. Power outputs from "milliwatts to kilowatts" can be obtained using conventional signal generators, sweepers and synthesizers as drivers. Typical systems cover 10 kHz to 220 MHz without tuning or bandswitching.

Most requirements can be met with off-the-shelf hardware. Specials are produced quickly and inexpensively with standard modules.

Since we know more about broadband power amplifiers than anybody, why not call us direct, collect if you wish. Ask for Jim Fahnestock or El Swanson (516-694-1414). It's the quickest, surest way to get direct answers to your questions and authoritative information about our products. West of the Rockies call Del Black (714-821-6600).

Or if you prefer, drop us a note describing your requirement. Our response will be prompt and thorough.

INSTRUMENTS, INC., 3434 Midway Dr., San Diego, Calif., 92110, Tel: 714-223-7156; Sls. Mgr: D.C. Kalbfell

INSULATING FABRICATORS, 150 Union Ave., E. Rutherford, N.J., 07073, Tel: 201-939-7392; V.P. Mktg: M.E. McGuire

INSULATING SHAPES, INC., 1381 Seabury Ave., Bronx, N.Y., 10461, Tel: 212-SY-2-4400

INTECH, 1220 Coleman Ave., Santa Clara, Cal., 95050, Tel: 408-244-0500, TWX: 910-338-0254; V.P, Mktg. B. Jumper

INTEGRATED CIRCUIT ELCTRNS., INC., Div. of Datatronics, 237 Riverview Ave., Waltham, Mass., 02154, Tel: 617-891-4011; Sls. Mgr: D. Wdowiak

INTEGRATED CIRCUIT ENGRG., 4900 E. Indian School Rd., Phoenix, Ariz., 85018, Tel: 602-959-4760, TWX: 910-950-1285; Sls. Mgr: G.R. Madland

INTEGRATED CONTROLS, 6532 Wellesley Pl., San Diego, Cal., 92122, Tel: 714-453-5800; Sls. Mgr: G.B. Johnson

Advertisement

ELECTRONIC AND ELECTRO-OPTICAL INSTRUMENTATION FOR INDUSTRY

Battery powered low level amplifiers and signal conditioners for the laboratory.

Isolation and transducer amplifiers for industrial applications.

Scope-Mate , low cost oscilloscope camera sets for general purpose oscillographic data recording.

Representatives located in major U. S. cities and European countries.

INTEGRATED DEV. & MFG. CO., 510 E. Washington, Chagrin Falls, Ohio, 44022, Tel: 216-247-5100; Sls. Mgr: D.B. Cordes

INTEGRATED ELCTRNS., 900 Walt Whitman Rd., Huntington Station, N.Y., 11746, Tel: 516-271-4100

INTEL CORP., 365 Middlefield Rd., Mountain View, Cal., 94040, Tel: 415-969-1670; Sls. Mgr: R.F. O'Hare

INTER-COMPUTER ELCTRNS., 1213 Walnut St., Lansdale, Pa., 19446, Tel: 215-855-0922 Pgs. 354-356

Ariz Scottsdale, Fryco, Box 460 602-945-3281
Cal Los Altos, IFM North, 2235 Grant Rd. 415-961-2828
Cal Los Angeles, IFM South, 3455 Cahuenga Blvd. 213-469-1641
Md Bethesda, Bartlett Assocs., 4405 E. West Hwy. 301-656-3061
Mass Chelmsford, S & S Elctrns., 93 Chelmsford St. 617-256-8731
NY White Plains, Bartlett Assocs., 470 Mamaroneck Ave. 914-949-6476
Ohio Cleveland, Data-Tron, 7016 Euclid Ave. 216-391-8421
Pa Wayne, Bartlett Assocs., 130 W. Lancaster Ave. 215-688-7325
Tex Dallas, Gipe Assocs., 2653 Tarna Dr.
For: Can., Agincourt, Ont., Electromechanical Prods., Markham Rd. 416-293-7011

INTER-MARKET, INC., 1920 Waukegan Rd., Glenview, Ill., 60025, Tel: 312-729-5330; Sls. Mgr: H.M. Scott Pgs. 1473,1926

Ala Huntsville, Winfield Southeast, 512 Lanier 205-536-0857
Ariz Scottsdale, J. Swanson, Box 172 602-947-4379
Cal Burlingame, Leddy Assocs., 1319 Howard Ave. 415-347-5247
Cal Los Angeles, Universal Comp., 2330 Westwood Blvd. 213-474-1537
Conn Berlin, White Sls., Box 122 203-224-0423
Fla Miami Beach, Geartner, 1125 71st St. 305-861-3661
Fla Orlando, Geartner, 1221 Lee Rd. 305-299-1000
Ga Atlanta, Winfield Southeast, 2991-D N. Druid Hills N.E. 404-636-3023
Ill Chicago, Actronic Sls. Engrg., 4750 N. Milwaukee 312-286-1037
Mass Needham, White Sls., 20 Chestnut St. 617-444-3676
Mich Farmington, Carter, McCormic & Peirce, 23995 Freeway Pk. 313-477-7700
NJ Harrington Pk., Metro Tech. Sls., 39 Bluefield Ave. 201-768-8495
NY Jericho, Metro Tech. Sls., 333 N. Broadway 516-935-3330
NC Raleigh, Winfield Southeast, 4909 Carteret Dr. 919-787-2841
Ohio Cleveland, Carter, McCormic, & Peirce, 21380 Lorain Rd. 216-333-5650
Ohio Dayton, Carter, McCormic, & Peirce, 5423 Webster St. 513-278-5873
Pa Pittsburgh, Carter, McCormic, & Peirce, 201 Penn Ctr. Blvd. 412-824-3760
Tex Dallas, RMC Engrg., 2924 Blystone La. 214-357-0161
Wash Seattle, C. Lyle Reeve, 210 N. 171st 206-542-5889
For: Montreal, Que., Can., H.W. Brieger Sls., 5253 Decarie Blvd. 514-482-0722
For: Thornhill, Ont., Can., Elctrn. Comp. Intl., 5 Guardsman Rd. 416-889-0212

INTER-TECH. GRP., INC., Box 23, Irvington-on-Hudson, N.Y., 10533, Tel: 914-LY-1-8822, TWX: 710-564-0802; Sls. Mgr: G. Morrow ....Pgs. 1998,2759

Ariz Scottsdale, Palmer Assoc., 8650 E. Joshua Tree La. 602-947-4666
Cal San Carlos, Melchior, 820 B. Cherry St. 415-591-7383
Cal San Gabriel, R. G. Moye, 244 Milton 213-283-1669
Colo Denver, Palmer Assocs., Box 4383 303-255-9961
Fla Maitland, H. Sarkis, 671 Dommerich 305-647-3671
Ill Chicago, J. Golton Co., 4319 W. Irving Pk. 312-725-7870
Ill Plato Center, I. Mansfield & Assoc., Muirhead Rd. 312-742-3700
Md Timonium, Heller-Freedman, Box 293 301-252-4780
Minn Minneapolis, Int'l. Sls., 8703 Beard 612-881-6683
Mo St. Louis, Coombs, 11734 Lakland Ind. Dr. 314-542-3657
NJ Fair Lawn, C.R. Mayer Assocs., Box 484 201-791-8989
NY Lynbrook, H.B. Heft, Box 623 516-LY-9-3351
NY Syracuse, Naylor Elec., 1718 Erie 315-GR-2-9183
Ohio Cincinnati, I. W. Grothouse, 3662 Edgebrook 513-611-8814
Pa Ardmore, Heller-Freedman, Box 391 215-649-3679
Tex Dallas, Southwest Elctrn. Inds., 621 Meadows Bldg. 214-363-1671
Wash Seattle, H. Levinson, 1211 E. Denny Way 206-323-5100

INTERCONTINENTAL ELCTRNS., 319 Chestnut St., E. Rochester, N.Y., 14445, Tel: 716-586-7850; Sls. Mgr: R. Main

Advertisement

Manufacturers of Process Control Systems, Machine Control Systems, Analog and Digital Instrumentation, Temperature Controls and Motor Speed Controls. Design and Manufacturing services available for both long and short run requirements.

INTERDYNE CO., 2217 Purdue Ave., Los Angeles, Cal., 90064, Tel: 213-477-6051, TWX: 910-342-6490; Sls. Mgr: C.G. Liotta

INTERELECTRONICS CORP., 550 U.S. Rte. 303, Congers, N.Y., 10920, Tel: 914-EL-8-8000; Sls. Mgr: M.H. Pintell ....Pg. 735

INTERFACE, INC., Box 1652, Scottsdale, Ariz., 85252, Tel: 602-946-9100; V.P: F.L. Schulte

INTERLIND ELCTRNS., 3800 Oakcliff Rd., Doraville, Ga., 30340, Tel: 404-448-9644; Sls. Mgr: G.M. Potter, Jr.

INT'L. COMM., 7620 N.W. 36th Ave., Miami, Fla., 33147, Tel: 305-691-1220, TWX: 810-848-6588; V. P. Mktg: J.B. Gerber

INT'L. COMPUTER PRODS., Box 34484, Dallas, Tex., 75234, Tel: 214-239-5381; Sls. Mgr: R.R. Kramer

INTERNATIONAL CRYSTAL MFG., 10 N. Lee St., Oklahoma City, Okla., 73102, Tel: 405-CE-6-3741, TWX: 910-831-3177 ....Pgs. 1404,1405

INTERNATIONAL DIODE CORP., 90 Forrest St., Jersey City, N.J., 07304, Tel: 201-432-7151

INTERNATIONAL ELECTRO EXCHANGE CORP., 6851 Oxford St., Minneapolis, Minn., 55426, Tel: 612-929-7875, TWX: 910-576-2469; Sls. Mgr: D. Kinney Pgs. 1922-1925

Cal Alhambra, M.W. Riedel, 2215 W. Valley 213-283-7694
Cal Mountain View, Weseloh, 1445 Meadow La. 415-961-0565
Mich Lathrup Village, R.C. Nordstrom Co., Box 32 313-444-4417
Minn Mpls., G.E. Arneson, 400 Viking Dr. 612-920-2086
Ohio Dayton, Dynel Co., Box 7-Centerville Br. 513-434-6467

INT'L. ELECTRO-MAGNETICS, Eric Dr. & Cornell Ave., Palatine, Ill., 60067, Tel: 312-358-4622; Sls. Mgr: J. Pretto ....Pgs. 310,311

INTERNATIONAL ELCTRN. INDS., Div., Callins Inds., Box "C", Greenfield, Tenn., 38230, Tel: 901-235-2234, TWX: 810-590-3779; Sls. Mgr: Frank Acuff

INT'L. ELCTRN. RESCH., 135 W. Magnolia Blvd., Burbank, Cal., 91508, Tel: 213-849-2481, TWX: 910-498-2206; Adv. Mgr: Van Der Boom

INT'L. ELCTRNS., 316 S. Service Rd., Melville, N.Y., 11746, Tel: 516-694-7700, TWX: 510-224-6427; Sls. Mgr: E.J. Porto

INT'L. ELCTRNS., I.E.C. Capacitor Div., Melville, N.Y., 11746, Tel: 516-694-7700, TWX: 510-224-6427; Sls. Mgr: I. Friedman ....Pg. 2418

Ill Chicago, R.D. Marco, 8501 W. Higgins Rd. 312-693-2067

INT'L. INSTRS., Div. Sigma Instrs., 88 Marsh Hill Rd., Orange, Conn., 06477, Tel: 203-795-4711; Sls. Mgr: D.R. Lynch

INTERNATIONAL LIGHT, Dexter Ind'l. Green, Newburyport, Mass., 01950, Tel: 617-465-5923; Sls. Mgr: R.H. Winn

INT'L. MICROWAVE, 33 River Rd., Cos Cob, Conn., 06807, Tel: 203-661-5924, TWX: 710-579-2925; Sls. Mgr: M.R. Rosenzweig

INT'L. PRODS., Box 405, Atchison, Kans., 66002, Tel: 913-EM-7-1934; Sls. Mgr: T. Moorhead

INT'L. RADIO & ELCTRNS. CORP., See Crown Int'l.

INTERNATIONAL RECTIFIER, Semiconductor Div., 233 Kansas St., El Segundo, Cal., 90245, Tel: 213-678-6281, TWX: 910-348-6291; Sls. Mgr: W. Wagner ......Pg. 1807

Alas Anchorage, H.J. Lang, 1406 47th Ave. 907-279-5741
Ariz Phoenix, Shefler-Kahn, 2017 N. 7th 602-258-7893
Cal L.A., Int'l. Rectifier, 1325 El Segundo 213-678-2181
Cal Mtn. View, R. Hartman, 1901 Old Middlefield Way 415-969-0660
Cal San Diego, King & Cassidy Elctrns., 8855 Balboa Ave. 714-278-7640
Colo Denver, Shefler-Kahn, 2422 S. Downing 303-733-6330
Fla Miami, Int'l. Rectifier, 4230 S.W. 15th St. 305-445-5201
Ga Atlanta, Grady Duckett, Box 29067 404-451-3529
Ill Des Plaines, Int'l. Rectifier, 2720 Des Plaines 312-299-7181
Iowa Cedar Rapids, Seltec Sls., 4403 1st Ave., SE 319-362-8155
Md Silver Spring, Int'l. Rectifier, 8605 Cameron 301-589-3305
Mass Lexington, Int'l. Rectifier, 2 Milita Dr. 617-861-1820
Mich Livonia, Int'l. Rectifier, 19500 Middlebelt 313-477-3131
Minn Mpls., Int'l. Rectifier, 5009A Excelsior 612-920-1200
Mo Hazelwood, Int'l Rectifier, 47 Village Sq. 314-838-6333
NJ Palisades Pk., Int'l. Rectifier, 71 Grand 201-943-4554
NM Albuquerque, Shefler-Kahn Co., 405 Ortiz, NE 505-265-7077
NY Buffalo, R. Mitscher, 496 Ellicott Sq. Bldg. 716-854-2518
NY New York, Int'l. Rectifier 212-565-0882
NC Charlotte, Int'l. Rectifier, 1135C Commercial 704-372-9190
Ohio Cleveland, Int'l Rectifier, 25000 Euclid 216-261-2135
Ohio Kettering, Int'l. Rectifier, 3490 S. Dixie 513-299-2635

Pa Abington, Int'l. Rectifier, 1355 Old York 215-886-0130
Tenn Nashville, R. Mitscher, 2508 Stones River Ct. 615-883-2220
Tex Dallas, Int'l. Rectifier, 13125 Tahoe Dr. 214-233-7431
Tex Dallas, Tesco Co., 2837 Anode St. 214-358-3521
Wash Bellevue, Vanlage Corp., 300 120th Ave., N.E.
Wisc Milwaukee, Int'l. Rectifier, 2825 N. Mayfair 414-258-2280
For: Can., Scarborough, Ont., Int'l. Rectifier, 330 Nantucket 416-755-7793

INT'L. REGISTER, 4700 W. Montrose Ave., Chicago, Ill., 60641, Tel: 312-282-7300; Vice Pres: R.C. Bedford

INTERNATIONAL SCANATRON SYS., 1623 Straight Path, Wyandanch, N.Y., 11798, Tel: 516-643-7111; Sls. Mgr: J.F. Verruso

INTERNATIONAL TECH. SVC., Box 299, Glen Ellyn, Ill., 60137, Tel: 312-858-0199

INT'L. TRANSDUCER, 640 McCloskey Pl., Goleta, Cal., 93017; Sls. Mgr: J.A. Scopatz

INT'L WAX REFINING CO., 99 E. Hawthorne Ave., Valley Stream, N.Y., 10603, Tel: 516-LO-1-2500

INT'L. WIRE & CABLE, 1300 W. Fletcher St., Chicago, Ill., 60657, Tel: 312-477-3535 A. Lassers

INTERNATIONAL WIRE PRODS., 500 W. Main St., Wyckoff, N.J., 07481, Tel: 201-891-5800, TWX: 710-988-5839; Sls. Mgr: R.S. Kelly

INTEROCEAN SYSTEMS, 3446 Kurtz St., San Diego, Cal., 92110, Tel: 714-297-2997; Mktg. Mgr: J.E. Lasch

INTERSIL, INC., 10900 N. Tantau, Cupertino, Calif., 95014, Tel: 408-257-5450, TWX: 910-338-0228; Sls. Mgr: R. Hammer

INTERSTATE ELCTRNS. CORP., Prods. Div., Box 3117, Dept. 7000, Anaheim, Cal., 92803, Tel: 714-772-2811, TWX: 714-776-0280; Sls. Mgr: J. C. Norburg ....Pg. 499

Ala Huntsville, Mekco Assocs., Holiday Off. Ctr. 205-881-3721
Ariz Phoenix, Meas. Consits., Box 11099 602-264-1279
Cal Burbank, R. Olander, 540 Hollywood Way 213-843-5200
Cal Santa Clara, R. Olander, 1400 Coleman 408-247-1788
Colo Arvada, Meas. Consits., Box 203 303-423-0010
Conn Hartford, Instr. Assocs., 234 Murphy 203-525-9367
Fla Orlando, Mekco Assocs., 3165 McCrory Rd. 305-841-2215
Kans Overland Pk., Tech. Reps., 9009 W. 95th St. 913-381-5852
Ill Chicago, L. Green, 5218 W. Diversey 312-286-6824
Ind Indianapolis, L. Green, 1111 E. 54th St. 317-253-2087
Md Silver Spring, Sel-Tronics, 721 Ellsworth 301-589-3391
Mass Bedford, Instr. Assocs., 175 Middlesex 617-275-0700
Mich Detroit, B. Hocker, 26847 Grand River 313-531-1403
Minn Minneapolis, L. Green, 6225 University, N.E. 612-781-1611
Mo Hazelwood, Tech. Reps., 8618 Latty Ave. 314-524-6900
NJ Fairfield, KLS Assocs., 387 Passaic Ave. 201-227-2900
NM Albuquerque, Meas. Consits., Box 6081 505-344-3575
NY Albany, J. Reagan, 6 Highland Ave. 518-489-4777
NY Binghamton, J. Reagan, 52B Crestmont 607-723-9661
NY Kings Pk., KLS Assocs. 212-233-4849
NY Newburgh, J. Reagan, Box 2547 914-561-4510
NY New Hartford, J. Reagan, 41 Woodberry 315-732-3775
NY Rochester, J. Reagan, 891 Monroe 716-473-2115
NC Burlington, Mekco Assocs., 1349 S. Church St. 919-226-7177
Ohio Cleveland Hts., B. Hocker, 2262 Westminster 216-734-4433
Ohio Dayton, B. Hocker, 1400 Devereux 513-298-8638
Ore Hillsboro, Showalter-Judd, Inc., 1445 N.E. Arrington 503-648-6372
Pa King of Prussia, S & S, Boro Line Rd. 215-265-3450
Tex Austin, A. Barnes Co., Box 9748 512-454-4371
Tex Houston, A. Barnes Co., 3801 Kirby St. 713-523-7333
Tex Richardson, A. Barnes Co., 740 S. Sherman St. 214-235-4541
Wash Seattle, Showalter-Judd, 1806 S. Bush 206-324-7911
For: Can., Montreal, Que., Radionics, 195 Graveline St. 514-735-4565
For: Can., Downsview, Ont., Radionics, 1111 Finch Ave., W. 416-638-0218
For: Can., Ottawa, Ont., Radionics, 376 Churchill Ave. 613-728-4624
For: Can., Quebec, Que., Radionics, 1001 Rte. De L'Eglise 418-651-5854
For: Can., Vancouver, B.C., Radionics, 2182 W. 12th Ave. 604-732-7317

INTERSWITCH, 770 Airport Blvd., Burlingame, Cal., 94010, Tel: 415-347-8217, TWX: 910-374-2353; Sls. Mgr: D. Oderkirk ....Pg. 1927

Ark Magnolia, J. Y. Schoonmaker, Box 247 501-234-3778
Cal Burlingame, W. Purdy, 770 Airport Blvd. 415-347-7701
Cal Los Angeles, P. Wiley, 1632 Silverlake 213-663-8028
Colo Denver, W. Purdy, 1449 W. Littleton Bl. 303-794-4283
Conn Meriden, P. Sturgeon, 99 Colony St. 203-237-1112
Fla N. Miami Bch., Cartwright & Bean, 20100 N.E. 25th Ct. 305-945-2962
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek 305-425-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill Pl., N.W. 404-237-2273
Ill Hinsdale, Hill-Gray, 2 Salt Creek 312-325-4810
Ind Indianapolis, Thomas & Sukup, 2060 E. 54th 317-251-4574
Iowa Cedar Rapids, Engrg. Svcs., 1026 3rd, SE 319-366-1591
Kans Prairie Vlg., Engrg. Svcs., 7830 State Line 913-649-4000
La Metairie, Cartwright & Bean, Box 73336 504-887-5225
Mass Chestnut Hill, P. Sturgeon, 1330 Boylston 617-734-7710
Mich Detroit, Hilltronics, 13720 Puritan Ave. 313-342-3242
Minn Minneapolis, HMR, Inc., 9 E. 22nd St. 612-335-7734
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NJ Bergenfield, H. Gray Assoc., 20 Foster St. 201-384-3643
NJ Cherry Hill, Trinkle Sls., 500 N. Kings 609-667-3500
NM Albuquerque, C.T. Carlberg, 2611 Quincy NE 505-265-1579
NY Fayetteville, M.P. Andrews, 319 Mott Rd. 315-637-3144
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-537-7965
NC Raleigh, Cartwright & Bean, 1016 Belfast 919-832-7128
Ohio Dayton, Neal Bear, 1563 E. Dorthy La. 513-299-3566
Ohio Richfield, Neal Bear, 3435 Streetsboro 216-659-3331
Tenn Memphis, Cartwright & Bean, 560 S Cooper 901-276-4442
Tex Dallas, J. Schoonmaker, 2995 Ladybird 214-357-8481
Tex Houston, J. Y. Schoonmaker, Box 26036 713-926-9510
Tex San Antonio, J. Schoonmaker, Box 5540 512-342-0251
For: Can., Willowdale, Ont., A. Simmonds, 285 Yorkland 416-491-1010

INTRONICS, INC., 57 Chapel St., Newton, Mass., 02158, Tel: 617-332-7350, TWX: 710-335-6835 P.G. Yochum Pgs. 734,1288

INVERTRONICS, Box 342, Pine Brook, N.J., 07058, Tel: 201-334-6471

INVINCIBLE GEAR CO., 14938 Telegraph Rd., Detroit, Mich., 48239, Tel: 313-533-7524; Sls. Mgr: L.J. Smith

IONIC ELECTROSTATIC CORP., 111 Monroe St., Garfield, N.J., 07026, Tel: 201-478-7300; Sls. Mgr: J. Sedlacsik, Jr

IONICS, INC., Electronics Div., 65 Grove St., Watertown, Mass, 02172, Tel: 617-926-2500; Gen. Mgr: H.G. Ryan

IPT CORP., 185 Evelyn Ave., Mountain View, Cal., 94040, Tel: 415-961-9521, TWX: 910-379-6472; Sls. Mgr: J.F. Day, III

Advertisement

IPT Corporation manufactures production, test and assembly equipment for the semiconductor industry, both manufacturers and users. Products include Photomask Duplicators, Electronic Testers, Wafer Probes, Hybrid Probes, Die Bonders, and Automatic Component Test Handlers. Request information on the IPT-600 bench Top unit for IC/MSI devices in sticks, and The IPT-900 for MOS/LSI devices in carriers.

IRC BOONE DIV. OF TRW INC., Box 393, Boone, N.C., 28607, Tel: 704-264-8861, TWX: 510-936-3241 Pgs. 2889-2895

Ariz Scottsdale, TRW, 77 W. 3rd Ave. 602-947-5791
Cal Burlingame, J. Logan & Assoc., 801-D Mahler Rd. 415-697-6100
Cal Los Angeles, TRW, 5410 W. Imperial Hwy. 213-673-5262
Cal San Diego, Transdynamics, Inc., 3108 5th Ave. 714-298-8215
Colo Denver, Elctrn. Comp. Sls. Co., Box 22011 303-771-6200
Conn Rowayton, TRW, 137 Rowayton Ave. 203-853-4466
DC Washington, TRW EN 1-3155
Fla Orlando, TRW, 3203 Lawton Rd. 305-841-2982
Ill Chicago, J.G. Twist Co., 5222 W. Diversey Ave. 312-777-2250
Ind Ft. Wayne, R.O. Whitesell Assoc., 3426 Taylor St. 219-432-5591
Ind Indianapolis, R.O. Whitesell Assoc., 6691 E. Washington St. 317-359-9283
Ind Kokomo, R.O. Whitesell Assoc., 3827 S. Lafountain Sq. 317-453-6868
Iowa Cedar Rapids, Halgin Sls. Co., 4403 First Ave., S.E. 319-363-5119
Kans Mission, Halgin Sls. Co., Box 1245 913-722-2441
Ky Louisville, R.O. Whitesell Assoc., 3620 Lexington Rd., Lex Manor Bldg. 502-893-7303
Md Baltimore, TRW EN 9-3155
Mass Waltham, TRW, 1345 Main St. 617-899-6100
Mich Southfield, R.O. Whitesell Assoc., 25100 Evergreen Rd. 313-358-2020
Mich St. Joseph, R.O. Whitesell Assoc., Shepard & Benning Bldg. 616-983-7337
Minn St. Paul, Northport Engrg., Inc., 2027 Grand Ave. 612-698-3841
Mo Clayton, Halgin Sls. Co., 201 S. Central St. 314-721-4415
NM Albuquerque, Elctrn. Comp. Sls. Co., Box 3087, Sta. D 505-256-3663
Ohio Cincinnati, R.O. Whitesell Assoc., 1172 W. Galbraith 513-521-2290
Ohio Cleveland, R.O. Whitesell Assoc., 21139 Lorain Ave. 216-333-2585
Ohio Dayton, R.O. Whitesell Assoc., 4133 S. Dixie Ave. 513-298-9546
Ore Portland, C.K. Shanks & Assoc., Box 25375 503-292-5656
Pa Pittsburgh, R.O. Whitesell Assoc., Penn Ctr. Bldg., 201 Penn Ctr. Blvd. 412-242-0100
Pa Villanova, TRW, 771 Lancaster Ave. 215-527-3150
Tex Houston, Vista Engrg. Assoc., 1614 S. Post Oak Rd. 713-622-5680
Tex Richardson, Vista Engrg. Assoc., 777 Central Expwy. 214-235-4547
Utah Salt Lake City, Elctrn. Comp. Sls. Co., Box 2066 801-278-6044
Wisc Waukesha, J.G. Twist Co., 540 Catskill Rd. 414-786-6330

IRC BURLINGTON DIV. OF TRW INC., Box 887, Burlington, Iowa, 52601, Tel: 319-754-8491, TWX: 910-525-1135; Sls. Mgr: W. Stallard ......Pgs. 2885-2888

Ala Huntsville, TRW, Box 6045 205-772-9656
Ariz Scottsdale, TRW, 77 W. 3rd Ave. 602-947-5791
Cal Danville, Straube, 401 S. Hartz 415-837-8151
Cal Los Angeles, TRW, 5410 W. Imperial 213-649-1232
Cal San Diego, Transdynamics, 3108 5th Ave. 714-298-8215
Cal Menlo Pk., Straube, 483 Willow 415-323-2476
Colo Denver, Elctrn. Comp., Box 22011 303-771-6200
Conn Rowayton, TRW, 137 Rowayton Ave. 203-853-4466
DC Washington, TRW ENterprise 1-3155
Fla Orlando, TRW, 3203 Lawton Rd. 305-841-2982
Haw No. Hollywood, Bassett & Moore, 12045 Magnolia 213-877-7129
Ill Elk Grove Vlg., J. Twist, 1301 Higgins 312-593-0200

Ind Ft. Wayne, R. Whitesell, 3426 Taylor 219-432-5591
Ind Indianapolis, R. Whitesell, 6691 E. Wash. 317-359-5374
Ind Kokomo, R. Whitesell, 3827 S. Lafountain 317-453-6868
Iowa Cedar Rapids, Halgin Sls., 4403 First S.E. 319-363-5119
Kans Mission, Halgin Sls. Co., Box 1245 913-722-2441
Ky Louisville, R. Whitesell, 3620 Lexington 502-893-7303
Md Baltimore, TRW ENterprise 9-3155
Mass Waltham, TRW, 1345 Main St. 617-899-6100
Mich Southfield, R. Whitesell, 25100 Evergreen 313-358-2020
Mich St. Joseph, R. Whitesell, Shepard & Benning Bldg. 616-983-7337
Mich Benton Harbor, R. Whitesell, 303 Fidelity Bldg. 616-927-2041
Minn St. Paul, Northport Engrg., 2027 Grand 612-698-3841
Mo Clayton, Halgin Sls., 201 S. Central 314-721-4415
NM Albuquerque, Elctrn. Comp., 1811 Carlisle N.E. 505-256-9831
Ohio Cincinnati, R. Whitesell, 1172 W. Galbraith 513-521-2290
Ohio Cleveland, R. Whitesell, 21139 Lorain 216-333-2585
Ohio Dayton, R. Whitesell, 4133 S. Dixie 513-298-9546
Ore Portland, C.K. Shanks & Assoc., Box 25375 503-292-5656
Pa Pittsburgh, R. Whitesell, 201 Penn Ctr. Blvd. 412-242-0100
Pa Villanova, TRW, 771 Lancaster Ave. 215-527-3150
Tenn Bristol, R. Whitesell, 340 Edgemont 615-968-4195
Tex Houston, Vista Engrg., 1614 S. Post Oak 713-622-5680
Tex Richardson, Vista Engrg., 777 Central Expwy. 214-235-4547
Utah Salt Lake City, Elctrn. Comp., 445 E. 2nd S. Str. 801-355-5327
Wisc Waukesha, J. Twist, 540 Catskill Rd. 414-786-6330

IRC PHILADELPHIA DIV. OF TRW INC., 401 N. Broad St., Philadelphia, Pa., 19108, Tel: 215-922-8900, TWX: 710-670-2286; Sls. Mgr: R.A. Glover ....Pg. 2896

Ala Huntsville, TRW Sls. Off., Box 6045 205-772-9656
Ariz Scottsdale, TRW, 77 W. 3rd Ave. 602-947-5791
Cal Danville, Straube Assoc., 401 S. Hartz 415-837-8151
Cal Los Angeles, TRW, 5410 W. Imperial 213-649-1232
Cal San Diego, Transdynamics, 3108 5th 714-298-8215
Cal Menlo Pk., Straube, 483 Willow 415-323-2476
Colo Denver, Elctrn. Comp., Box 22011 303-771-6200
Conn Rowayton, TRW, 137 Rowayton Ave. 203-853-4466
DC Washington, TRW ENterprise 1-3155
Fla Orlando, TRW, 3203 Lawton Rd. 305-841-2982
Haw No. Hollywood, Bassett & Moore, 12045 Magnolia 213-877-7129
Ill Elk Grove Vge., J.G. Twist, 1301 Higgins 312-593-0200
Ill Des Plaines, TRW, 666 Garland Pl. 312-299-6629
Ind Ft. Wayne, R. Whitesell, 3426 Taylor 219-432-5591
Ind Indianapolis, R. Whitesell, 6691 E. Wash. 317-359-5374
Ind Kokomo, R. Whitesell, 3827 S. Lafountain 317-453-6868
Iowa Cedar Rapids, Halgin Sls., 4403 First S.E. 319-363-5119
Kans Mission, Halgin Sls. Co., Box 1245 913-722-2441
Ky Louisville, R. Whitesell, 3620 Lexington 502-893-7303
Md Baltimore, TRW ENterprise 9-3155
Mass Waltham, TRW, 1345 Main St. 617-899-6100
Mich Southfield, R. Whitesell, 25100 Evergreen 313-358-2020
Mich St. Joseph, R. Whitesell, Shepard & Benning Bldg. 616-983-7337
Mich Benton Harbor, R.O. Whitesell Assoc., 303 Fidelity Bldg. 616-927-2041
Minn St. Paul, Northport Engrg., 2027 Grand 612-698-3841
Mo Clayton, Halgin Sls., 201 S. Central St. 314-721-4415
NM Albuquerque, Elctrn. Comp., 1811 Carlisle N.E. 505-256-9831
Ohio Cincinnati, R. Whitesell, 1172 W. Galbraith 513-521-2290
Ohio Cleveland, R.O. Whitesell Assoc., 21139 Lorain Ave. 216-333-2585
Ohio Dayton, R. Whitesell, 4133 S. Dixie 513-298-9546
Ore Portland, C. Shanks, Box 25375 503-292-5656
Pa Pittsburgh, R. Whitesell, 201 Penn Ctr. 412-242-0100
Pa Villanova, TRW, 771 Lancaster Ave. 215-527-3150
Tenn Bristol, R. Whitesell, 340 Edgemont 615-968-4195
Tex Houston, Vista Engrg., 1614 S. Post Oak 713-622-5680
Tex Richardson, Vista Engrg., 777 Central Ex. 214-235-4547
Utah Salt Lake City, Elctrn. Comp., 445 E. 2nd S. 801-355-5327
Wisc Waukesha, J. Twist, 540 Catskill Rd. 414-786-6330

IRC ST. PETERBURG DIV. OF TRW INC., 2801 72nd St., N., St. Petersburg, Fla., 33733, Tel: 813-347-2181, TWX: 810-863-0357 ....Pgs. 2928-2931

Ariz Scottsdale, TRW, 77 W. 3rd Ave. 602-947-5791
Cal Los Altos, E. Recht Assoc., 900 N. San Antonia Rd. 415-941-0336
Cal Los Angeles, TRW, 5410 W. Imperial Hwy. 213-673-5262
Cal San Diego, Transdynamics, Inc., 3108 5th Ave. 714-298-8215
Colo Denver, Elctrn. Corp., Sls. Co., Box 22011 303-771-6206
Conn Rowayton, TRW, 137 Rowayton Ave. 203-853-4466
DC Washington, TRW EN 1-3155
Fla Orlando, TRW, 3203 Lawton Rd. 305-841-2982
Fla Petersburg, IRC St. Petersburg Div. of TRW Inc., 2801 72nd St., N. 813-347-2181
Ill Chicago, J.G. Twist Co., 522 W. Diversey Ave. 312-777-2250
Ind Ft. Wayne, R.O. Whitesell Assoc., 3426 Taylor St. 219-432-5591
Ind Indianapolis, R.O. Whitesell Assoc., 6691 E. Washington St. 317-359-9283
Ind Kokomo, R.O. Whitesell Assoc., 3827 S. Lafountain Sq. 317-453-6868
Iowa Cedar Rapids, Halgin Sls. Co., 4403 First Ave. S.E. 319-363-5119
Kans Mission, Halgin Sls. Co., Box 1245 913-722-2441
Ky Louisville, R.O. Whitesell Assoc., 3620 Lexington Rd., Lex Manor Bldg. 502-893-7303
Md Baltimore, TRW EN 9-3155
Mass Waltham, IRC, 1345 Main St. 617-899-6100
Mass Waltham, TRW, 345 Main St. 617-899-6100
Mich Southfield, R.O. Whitesell Assoc., 25100 Evergreen Rd. 313-358-2020
Mich St. Joseph, R.O. Whitesell Assoc., Shepard & Benning Bldg. 616-983-7337
Mo Clayton, Halgin Sls. Co., 201 S. Central St. 314-721-4415
NM Albuquerque, Electronic Component Sls. Co., Box 3087, Sta. D 505-256-3663
NY New York, Elctrn. Corp. Sls. Co., 1967 Tumbull Ave. 212-597-5500
Ohio Cincinnati, R.O. Whitesell Assoc., 1172 W. Galbraith 513-521-2290
Ohio Cleveland, R.O. Whitesell Assoc., 21139 Lorain Ave. 216-333-2585
Ohio Dayton, R.O. Whitesell Assoc., 4133 S. Dixie Ave. 513-298-9546
Pa Phila., IRC, 401 N. Broad St. 215-922-8900
Pa Pittsburg, R.O. Whitesell Assoc., Penn Ctr. Bldg., 201 Penn Ctr. Blvd. 412-242-0100
Pa Villanova, TRW, 771 Lancaster Ave. 215-527-3150
Tex Richardson, Vista Engrg. Assoc., 777 Central Expwy. 214-235-4547
Utah Salt Lake City, Elctrn. Comp. Sls. Co., Box 2066 801-278-6044
Wisc Waukesha, J. G. Twist Co., 540 Catskill Rd. 414-786-6330

IRCON INC., 207 Lawrencewood Ctr., Niles, Ill., 60648, Tel: 312-967-5151; Sls. Mgr: J. Oliver

IRD MECHANALYSIS, INC., 6150 Huntley Rd., Columbus, Ohio, 43229, Tel: 614-885-5376; Sls. Mgr: R.B. Jones, Jr.

IRISH MAGNETIC RECORDING TAPE, Div. Morhan Nat'l. Sls., 270-78 Newton Rd., Plainview, N.Y., 11803, Tel: 516-293-5582; Sls. Mgr: G. Krug

IRWIN LABS., INC., 1238 S. Gerhart Ave., Los Angeles, Calif., 90022, Tel: 213-685-8090; Sls. Mgr: W. Irwin

ISC MAGNETICS DIV., Instr. Sys. Corp., 770 Park Ave., Huntington, N.Y., 11743, Tel: 516-423-6200, TWX: 510-226-6983; Mgr: M. Schwartz
Pgs. 500,1334,1335,1806,1920,1921

ISC/TELEPHONICS DIV, Instr. Sys. Corp., 770 Park Ave., Huntington, N.Y., 11743, Tel: 516-423-6200, TWX: 510-226-6983; V.P. Mktg: J.W. Partridge

ISO-SWITCH CORP., 2955 Randolph St., Costa Mesa, Cal., 92626, Tel: 714-540-3244; Sls. Mgr: A. Williams

ISOCHEM RESINS CO., 99 Cook St., Lincoln, R.I., 02865, Tel: 401-723-2100; Sls. Mgr: R. Glovin

ISOFILM INT'L., 20131 Bahama St., Chatsworth, Cal., 91311, Tel: 213-882-0565, TWX: 910-494-1224; Sls. Mgr:

ISOLANTITE MFG. CORP., 337 Warren Ave., Stirling, N.J., 07980, Tel: 201-647-3333; Sls. Mgr: J. Simon

ISOMET CORP., 103 Bauer Dr., Oakland, N.J., 07436, Tel: 201-337-3811; Sls. Mgr: J.J. Fitzgerald

Advertisement

Isomet Corporation manufactures a complete line of laser accessories including Electro and Acousto-Optic Modulators, Q-Switches and Mode Lockers. Matching electronic drivers are available. Isomet also offers a complete line of Optical Crystals and Ultrasonic delay devices.

ISOTECH INC., 2 Vose Rd., Westford, Mass., 01886, Tel: 617-692-2644; Sls. Mgr: L. Wood

ISOTEMP RESEARCH, INC., Box 3389, Charlottesville, Va., 22901, Tel: 703-295-3101; Pres: L.C. Tignor

Advertisement

Isotemp Research is dedicated to precise temperature control using all state-of-the-art temperature sensing elements. Our specialty is low cost solid state proportional control. We offer temperatures from 0 to 2,000°C, stabilities to .0005°C, output from milliwatts to kilowatts, DC to 1,000 CPS. Consult us on your temperature control needs for military, industrial or consumer applications.

ISOTRONICS, INC., 12 Coffin Ave., New Bedford, Mass., 02746, Tel: 617-997-4575; Pres: J. Scherer

ITEK CORP., 10 Maguire Rd., Lexington, Mass., 02173, Tel: 617-276-2000, TWX: 617-862-6901

ITHACO, INC., 735 W. Clinton St., Ithaca, N.Y., 14850, Tel: 607-272-7640, TWX: 510-255-9307
Pgs. 1286,1287

Ala Huntsville, Sci. Devices, 703 Watts, S.E. 205-536-1969
Cal Los Altos, Systems Mktg. Conslts., Box 1376 415-941-4777
Cal Newport Bch., Best Elct., 4301 Birch 714-540-4412
Cal San Diego, Best Elctrn., Box 17156 714-277-0993
Conn Easton, Lindgren Assocs., Box 36 203-255-4133
Fla Orlando, Datarep, Box 5929 305-855-8945
Fla Orlando, Sci. Devices, 707 E. Colonial 305-424-7932
Haw Honolulu, Aloha, 225 Liliuokalani Ave. 801-922-3819
Ill Evanston, Mauer Co., Inc., Box 624 312-869-1644
Ind Indianapolis, Meas. Instrs., 1635 N. Gent 317-631-0909
Kans Prairie Vlg., Leemark Engrs., 4518 W. 89th 913-648-0124
Mass Waltham, Broger Instr., 223 Crescent 617-891-8045
Mich Southfield, Meas. Instrs., 25657 Southfield 313-352-2144
Minn Mpls., Heimann, 5603 Lyndale, S. 612-861-6051
NY Northport, Lindgren, 1026 Ft. Salonga 516-261-7937
Ohio Cleveland, Meas. Instrs., 19115 Detroit 216-333-6611
Ohio Columbus, Meas. Instrs., 2074 Arlington 614-488-9753
Pa Pittsburgh, Meas. Instrs., 908 Perry Hwy. 412-366-1906
Tex Dallas, IBL Engrg., 219 Preston Royal Ctr. 214-363-2921
Utah Salt Lake City, Applied Engrg. Prods., 6375 Emigration Canyon 801-364-4942
Va Springfield, E-Tech., 6615 Backlick Rd. 703-451-6500
Wash Seattle, J.B. Jolly Co., 10119 51st S.W. 206-938-4166
For: Can., Montreal, Que., Ahearn & Soper, Ltd., 3300 Cavendish Blvd. 514-482-9750
For: Can., No. Vancouver, B.C., Ahearn & Soper, Ltd., 1234 Marine Dr. 604-988-6822
For: Can., Ottawa, Ont., Ahearn & Soper, Ltd., 280 Albert St. 613-232-4518
For: Can., Toronto, Ont., Ahearn & Soper, Ltd., 844 Caledonia Rd. 416-789-4325

ITI ELECTRONICS, INC., 369 Lexington Ave., Clifton, N.J., 07015, Tel: 201-473-0900; Sls. Mgr: H. Atwood, Jr.

ITT AEROSPACE, 15151-91 Bledsoe St., San Fernando, Cal., 91342, Tel: 213-362-1511, TWX: 910-496-1485; Sls. Mgr: E.E. Bielicki

ITT AVIONICS DIV, 390 Washington Ave., Nutley, N.J., 07110, Tel: 201-284-0123, TWX: 201-667-1146; VP Sls: J. Gansler

ITT CANNON ELECTRIC, 666 E. Dyer Rd., Santa Ana, Cal., 92702, Tel: 714-557-4700, TWX: 910-321-4267-U; V.P. Dir. Mktg: N. Schoenfeld ....Pgs. 2637-2641
Ala Huntsville, Brandel-Stephens, 2003 Byrd Springs 205-883-0445
Ariz Phoenix, ITT Cannon Elec., 2801 Air La. 602-273-0755
Cal Los Altos, Recht, 900 N. San Antonio 415-941-0336
Cal Los Angeles, Black & Strong, 1728 S. La Cienega 213-870-9191
Cal San Diego, Black & Strong, 7961 Engineer 714-279-6363
Colo Englewood, 300 E. Hampden 303-761-1474
Conn Windsor, ITT Cannon, 61 Cook Hill 203-688-6205
Fla Orlando, Brandel-Stephens, 132 E. Colonial 305-425-3202
Ga Atlanta, Brandel-Stephens, 3110 Maple Dr., N.E. 404-261-7579
Haw Honolulu, Dougherty Entprs., 1164 Waimanu 809-839-9455
Ill Chicago, Carlson Elctrn., 7448 N. Harlem 312-774-4812
Kans Prairie Vlg., Thunderbird Tech., 4014 A-W. 95th 913-642-7220
Kans Wichita, Thunderbird Tech., 7707 E. Osie 316-684-3941
Md Hyattsville, L. Lowery, 6200 Annapolis 301-773-4977
Mass Wakefield, ITT Cannon Elec., 591 North 617-245-3850
Mich Birmingham, J. Hofstetter, 2100 E. Maple 313-642-0590
Minn Mpls., ITT Cannon Elec., 4725 Excelsior 612-920-2911
Mo St. Louis, Thunderbird Tech., Box 12849 314-542-6488
NY Garden City, Comtronic, 370 Old Country Rd. 516-741-8966
NY Rochester, Elcom Sales, Box 9112 716-385-1400
NY Syracuse, ITT Cannon Elec., E. Molloy 315-454-9241
NC Charlotte, Dula, 1321 E. Morehead 704-334-7090
NC Winston-Salem, Dula, 3389 Nottingham 919-768-7166
Ohio Dayton, J. Hofstetter , 3300 S. Dixie Dr. 513-298-0662
Ohio Medina, J. Hofstetter, 5168 Valley View Dr. 216-241-4880
Pa Broomall, L. Lowery, 2801 West Chester Pike 215-528-5170
Pa Pittsburgh, J. Hofstetter, 176 Reed Dr. 412-922-3890
Tex Dallas, Braniff Airways Bldg. 214-357-8171
Tex Dallas, Thunderbird Tech., 5526 Dyer St. 214-368-3064
Wash Bellevue, 300 120th Ave., N.E. 206-454-3903

ITT ELECTRON TUBE, Box 100, Easton, Pa., 18042, Tel: 215-252-7331, TWX: 510-651-4908; Sls. Mgr: A.W. McEwan

ITT GREMAR, INC., 10 Micro Dr., Woburn, Mass., 01801, Tel: 617-729-8950, TWX: 710-393-1235; Sls. Mgr: D.F. Keohane

ITT JENNINGS, Div. Int'l. Telephone & Telegraph Corp., 970 McLaughlin Ave., San Jose, Cal., 95108, Tel: 408-292-4025, TWX: 910-338-0159; Gen. Sls. Mgr: R.W. Hansen .... Pgs. 501,1740,1741,1928,2416,2417

Ariz Phoenix, Hytronic Meas., 1017 North Third St. 602-253-6104
Cal Los Angeles, E. Landa Co., 1607 Pontius Ave. 213-879-0770
Cal Los Altos, E. Landa Co., One First St. 415-948-0788
Cal San Diego, E. Landa Co., 3650 Clairemont Ave. 714-274-7242
Colo Denver, Hytronic Meas., 4940 East 39th Ave. 303-388-4081
Conn North Haven, Forsberg Sls., 22 Broadway 203-239-5111
Fla Indian Rocks Bch., Tech Rep Associ., Box 425 815-595-2834
Fla Melbourne, Tech Rep Associ., Box 2095 305-723-9140
Ga Jonesboro, Tech Rep Associ., Box 955 404-753-0111
Ill Chicago, LGS Elctrns., 5642 W. Diversey 312-622-8183
Kans Overland Pk., Lowell-Kangas & Assoc., Box 4116 913-888-3200
Md Rockville, Marktron, Inc., 651 Lofstrand La. 301-762-6210
Md Towson, Marktron, Inc., 202 W. Pennsylvania Ave. 301-825-8222
Mass Brockton, Forsberg Sls., Inc., 646 Summer St. 617-522-6300
Mo St. Louis, Lowell-Kangas & Assoc., 12015 Manchester 314-821-4050
NJ Tenafly, Garrettson Co., 121 Oak St. 201-568-2354
NM Albuquerque, Hytronic Meas., 205 San Pablo S.E. 505-268-3941
NY Glen Cove, Garrettson Co., 28 Jefferson Ave. 516-671-2376
NY N. White Plains, Garrettson Co., 48 Washington Ave. 914-946-3001
NY Syracuse, Nycom Inc., 2002 Teall Ave. 315-437-8343
NY Williston Pk., Garrettson Co., 275 Hillside Ave. 516-747-6610
Ohio Cleveland, Whelan Corp., 21877 Euclid Ave. 216-692-1266
Ohio Dayton, Whelan Corp., 2600 Far Hills Ave. 216-298-9997
Pa Philadelphia, Garrettson Co., 92-14 Masland St. 215-464-2275
Tex Dallas, Titan Reps., 6434 Maple Bldg. 214-357-8266
Utah Salt Lake City, Hytronic Meas., 2022 S. Main St. 801-466-4924

ITT JENNINGS, Div. Int'l. Telephone & Telegraph Corp., Box 281, Dunellen,, N.J., 08812, Tel: 201-968-6556 Pgs. 501,1740,1741,1928,2416,2417
Refer to ITT Jennings, San Jose Cal. for Sales Office Information

ITT JENNINGS, Indl Prods., 970 McLaughlin Ave., San Jose, Cal, 95116, Tel: 408-292-4025, TWX: 910-338-0159; Sls. Mgr: D.R. Morrison ....Pgs. 1618,1739
Ariz Phoenix, Hytronics Meas., 1017 N. Third St. 602-253-6104
Cal Los Altos, W.W.Posey, 175 So. San Antonio 415-948-7771
Cal Englewood, V & L Assocs., 3412 W.Century 203-671-7688
Colo Denver, Hytronics Meas., 4940 E.39th Ave. 303-388-4081
Conn Essex, J. Stawicki, Box 126 203-767-8566
Fla Indian Rocks Bch, Tech Rep., Box 425 813-595-2813
Fla Melbourne, Tech Rep., Box 2095 305-723-9140
Ga Jonesboro, Tech.Rep., Box 955 404-753-0111
Ill Arlington Hghts., R. Diethert, 2420 Oakton St. 312-593-7600
Ind Indianapolis, Schroeder & Loomis, Box 20071 317-251-4571
Kans Overland Pk., Lowell-Kangas, Box 4116 913-888-3200
Md Silver Spring, Ansell Engrg., 816 Thayer Ave. 301-588-4222
Minn Minneapolis, Furber Co., 6500 Nicollet Ave. S. 612-861-1518
Mo St.Louis, Lowell-Kangas, 12015 Manchester 314-821-4050
NJ River Edge, Tecnimat, Box 233 201-265-9730
NM Albuquerque, Hytronics Meas., 205 San Pablo S.E. 505-268-3941
NY East Aurora, Harries & Kershaw, 654 1/2 Main St. 716-652-1221
NY Fayetteville, Harries & Kershaw, 110 Fayette Cir. 315-637-9871
NY Webster, Harries & Kershaw, 216 Shorewood Dr. 716-671-6365
NC Gastonia, R. Diethert, 903 E. 2nd Ave. 704-864-9757
Ohio Dayton, Whelan Corp., 2600 Far Hills Ave. 513-298-9997
Pa Jenkintown, AMTEC, 730 Washington La. 215-549-2080
Tex Dallas, Titan Reps., 6434 Maple Ave. 214-357-8266
Utah Salt Lake City, Hytronics Meas., 2022 S. Main St. 801-466-4924
Wash Seattle, F. Jackson, 315 N.145th St. 206-363-3931
Wisc Waukesha, R. Diethert, 217 Wisconsin 414-542-9783

ITT MACKAY MARINE, 133 Terminal Ave., Clark, N.J., 07066, Tel: 201-381-2828; Sls. Mgr: E.A. Engebretson

Advertisement

ITT Mackay Marine manufactures a complete line of communications and navigational equipment systems, includes Synthesized Receivers (15 kHz to 30 MHz, Synthesized Transmitters (2-30 Mhz)Solid State Transmitters and Receivers, Auto alarms, Keyers, Radio Direction Finders, Lorans, Omega Receivers, Satellite Navigation Systems, Antenna systems and Survival equipment.

ITT SEMICONDUCTORS, 3301 Electronics Way, W. Palm Beach, Fla., 33407, Tel: 305-842-2411, TWX: 510-952-6667; Sls. Mgr: R. Bender

ITT TELECOMMUNICATIONS, Transmission Dept., 2912 Wake Forest Rd., Raleigh, N.C., 27602, Tel: 919-828-4441, TWX: 510-928-0500; Sls. Mgr: H.L. Blackford

ITT THERMOTECH INC., 1202 S. 5th St., Hopkins, Minn., 55343, Tel: 612-938-7671; Sls. Mgr: E. Ostergard Pgs. 2766-2773
Ariz Phoenix, D. Dick, 4710 North 15th Ave. 602-277-9740
Cal Burbank, Secana Co., 1613 W. Burbank Blvd. 213-849-6848
Cal San Leandro, C. Crisler, 14622 Wicks Blvd. 415-357-1150
Conn W. Hartford, D. Kelley, 28 Whiting La. 203-233-0870
Conn West Simsburg, Anchor Engrg., 6 Arrowhead Dr. 203-658-6261
Fla St. Petersburg, Florida Div., 3200 Tyrone Blvd. 813-347-2191
Ill Chicago, J. Robinson, 1721 W. Division St. 312-252-3400
Ill Norridge, B. Reynolds, 5135 N. Monterey Dr. 312-824-4129
Ind Ft. Wayne, R. McCampbell, 3715 Nokomis Rd. 219-747-9697
Iowa Des Moines, F. F. Wilcox, Box 1056 515-255-8416
Kans Mission, Inland Assocs., 6047 Howe Dr. 913-362-2366
Mass Wellesley Hills, Anchor Engrg., 40 Wash. St. 617-235-6330
Mich Detroit, G. Hall, 10432 W. McNichols Rd. 313-864-1368
Mich Farmington, L. George, 32500 Grand River 313-474-1505
Minn Minneapolis, W. J. Houlihan, 6030 Wayzata Blvd. 612-545-2538
Mo St. Louis, E. Monnig, #3 Laymont 314-991-2512
NJ Roselle, Midlantic Plastic Sls., 208 Columbus Ave. 201-241-3875
NY Manhasset, Kaelber & Mack, 75 Plandome Rd 516-627-6620
NY Rochester, P. B. Schumacher, Box 8399 716-235-2123
NC Greensboro, Mfrs. Sls., Box 20005 919-274-2474
Ohio Cleveland, G. Richards, 14237 Detroit Ave. 216-221-9176
Okla Tulsa, T. J. Ray Co., Box 45191 918-627-1515
Ore Portland, C. E. Riggs, 422 N. W. 8th Ave. 503-226-3286
Pa Ardmore, Midlantic Plastic Sls., 125 Coulter Ave. 215-649-2436
Wash Seattle, J. Noll, 314 2nd Ave. S. 206-623-5709
Wisc Butler, D. Jensen, 5170 North 125th St. 414-781-2260

J-B-T INSTRS., INC., Box 1818, New Haven, Conn., 06508, Tel: 203-772-2220; Sls. Mgr: W.A. Oliver Pg. 1929
Cal Inglewood, J. Berman, 9000 Bellanca St. Sta. 213-678-1281
Cal La Mesa, J. Berman, Box 453 714-583-6457
Cal Oakland, Moulthrop Sls., 1530 E. 12th St. 415-261-7676
Colo Denver, Nelson, 1294 S. Bannock 303-733-5528
Conn Wallingford, Adams-McGregor, 77 Bayberry Dr. 203-269-5816
Fla Pompano Beach, Hawkins-Hutto, 2159 S.E. 9th St. 305-943-9593
Fla Winter Pk., Hawkins-Hutto, 501 Park Ave., N. 305-647-7407
Ga Atlanta, Millar Elctrns., 3110 Maple, N.E. 404-261-6160
Haw Honolulu, B. Kolans & Co., 158 Mokauea St. 811-628
Ill Oak Pk., G. Petitt, 6332 W. Roosevelt 312-369-8940
Ind Ft. Wayne, W.W. Bieberich, 801 Leesburg 219-432-2537
Kans Overland Pk., T.L. Dowell, 8151 Marty 913-649-6069
Md Reisterstown, Massey, Dover Rd. 301-833-2039
Mass Scituate, Adams-McGregor, Box A 617-545-2213
Mich St. Clair Shores, J. Thorpe, 28915 Harper Ave. 313-779-6363
Minn Mpls, Heimann, 5603 Lyndale Ave., S. 612-861-6051
NY Woodside, D. Tobias, 49-01 31st Ave. 212-726-4551
NC Raleigh, Millar Elctrns., Box 17173 919-787-9564
Ohio Rocky River, C.H. Dolfuss, 19035 Detroit 216-333-7504
Pa Havertown, Snyder & Massey, 1325 W. Chester Pike 215-789-2320

Pa Pittsburgh, G. Root, 809 Wainright Dr. 412-561-4125
RI Lincoln, Adams-McGregor, 66 Lakeview 401-726-1300
Tex Dallas, Lund, 2616 Manor Way 214-358-4335
Wash Seattle, J.J. Backer Co., 221 W. Galer St. 206-285-1300
For: Can., Winnipeg, Manitoba, Smith-Paterson, 1550 Erin 204-774-1855
For: Can., Vancouver, B.C., Smith-Paterson, 1120 Hamilton 604-681-0743

J-TRON, 10700 "G" W. Katella, Anaheim, Cal., 92804, Tel: 714-638-3131; Sls. Mgr: L. Jones

JACKSON BROS., (LONDON) LTD., 258 Bway., New York, N.Y., 10007, Tel: 212-WO-2-5485; U.S. Agt: M. Swedgal ....Pg. 2419
Cal Millbrae, Melvin Sls. Co., 113 El Camino Real 697-6922
Ill Westchester, W.G. Brouillette, 9855 Roosevelt 312-345-6500
Ore Portland, J. Eckersley, 3150 S.W. Hamilton 503-246-3183
Ohio Columbus, H. Seay, 1350 Crestwood 614-235-0265

JACKSON ELEC. INSTR. CO., 35 Windson Ave., Mineola, N.Y., 11501, Tel: 516-742-5400; Sls. Mgr: H.M. Rich
JACKSON, J.A. CORP., 430 Center Ave., Mamaroneck, N.Y., 10543, Tel: 914-698-4150; Sls. Mgr: J.A. Jackson
JAIDINGER MFG. CO., INC., 1921 W. Hubbard St., Chicago, Ill., 60622, Tel: 312-421-1090; Sls. Mgr: J.H. Jaidinger
JAMES ELCTRN. TOOL CO., P.O. Box 1482, Palo Alto, Calif., 94302, Tel: 415-961-3448; Sls. Mgr: E.T. James

JAMES ELCTRNS., INC., 4050 N. Rockwell St., Chicago, Ill., 60618, Tel: 312-463-6500; Sls. Mgr: J.A. Kennedy Pgs. 1742,1743
Cal Hollywood, L.G. Snyder, Box 1268 213-469-6278
Cal Oakland, Belilove Co., Box 8612 415-658-9011
Colo Englewood, A-G Elctrns., 5417 Oneida Way 303-771-1473
Fla Lutz, S.K. Wallace Assocs., Box 67 813-949-1817
Ill Chicago, Lightner Assocs., 6322 Milwaukee Ave. 312-774-1500
Md Baltimore, D.K. Jones & Assocs., 2104 N. Charles St. 301-752-0577
Mass Norwood, S. Pierce, Inc., 24 Linden St. 617-762-3164
Mich Ferndale, Shalco Inc., 23529 Woodward Ave. 313
Minn Mpls., C.E. Bohlig, Box 16095 612-922-7011
Mo Kansas City, Automatic Gen. Sls., 6550-E Troost Ave. 816-333-8206
NJ Union City, Bressler Assocs., 4808 Bergenline Ave. 201-864-9577
Ohio Novelty, P. Lohse & Co., 13932 Fox Hollow Dr. 216-381-7788
Ore Portland, D.G. Weber Co., 1226 S.E. 7th St. 503-234-7671
Pa Lansdowne, W.F. Satterwaite, Box 191 215-623-5100
Tex Richardson, J.R. Lavender & Co., 725 S. Central Expwy. 214-231-5040

JAN HARDWARE MFG. CO., INC., 47-27 36th St., Long Island City, N.Y., 11101, Tel: 212-EM-1-0800; Sls. Mgr: I.E. Wasserman

JANCO CORP., 3111 Winona Ave., Burbank, Cal., 91504, Tel: 213-845-7473, TWX: 910-498-2701; Sls. Mgr: R. Jenson ....Pgs. 1930,1931
Ala Huntsville, Rep, Inc., Box 4286 205-881-9270
Ariz Scottsdale, Hower Co., Box 1627 602-947-4204
Cal Menlo Pk., McKnight Co., 115 Spruce 415-325-2844
Cal San Diego, D. Allen Co., 7969 Engineer 714-278-9250
Colo Denver, Brown Tech., 130 S. Yarrow 303-233-0863
Conn Glastonbury, C. K. Barton Assoc., Box 91 203-633-9417
Fla Orlando, D. Pflueger, 131 Zelma 305-425-4002
Ga Atlanta, REP, Inc., 1483 Monroe Dr., N.E. 404-876-1591
Ill Chicago, Midwest Microwave, 6200 N. Hiawatha Ave. 312-283-4900
Kans Prairie Vill., Thunderbird Tech. Sls. & Svc., 4014-A W. 95th St. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Svc., 7707 E. Osie 316-684-3941
Md Baltimore, Kaufholz Assoc., Box 6232 301-488-6561
Mass Auburndale, C. K. Barton Assoc., Box 51 617-332-0342
Minn Mpls, Electro Svc. Co., 1455 W. Lake St. 612-827-2907
Mo St. Louis, Thunderbird Tech. Sls. & Svc., Box 12849 314-542-6488
NY Albertson, C. F. Ward, 33 Coventry Ave. 516-742-5561
Ohio Cincinnati, Comp., Inc., 11820 Knollsprings 513-721-2997
Ohio Cleveland, Comp., 7461 N. Linden La. 216-842-2737
Pa Newton Sq., Kaufholz Assoc., Box 273 215-356-5000
Tex Dallas, Aymond Co., Inc., Box 64917 214-827-8043
Wash Seattle, Norwest Co., 1818 Westlake, N. 206-282-3707
For: Can., Toronto, Ont., J. Herring Co., 3468 Dundas 416-762-7545
EXP: N.Y., Rye, 18 Purdy Rd. 914-967-5704

JANEL, INC., 226 Main Ave., Box 2, Stirling, N.J., 07980, Tel: 201-647-5600; Sls. Mgr: L. Alpert
JANITROL AERO DIV., 4200 Surface Rd., Columbus, Ohio, 43228, Tel: 614-276-3561, TWX: 614-759-0241; Sls. Mgr: N. S. Petersen
JANNEY CYLINDER CO, Sub Edgewater Corp., 7401 State Rd., Philadelphia, Pa., 19136, Tel: 215-624-6600; Sls. Mgr. & V.P.: P.P. Jefferis
JAVEX ELCTRNS., 9509 Oak Glen Rd., Cherry Valley, Calif., 92223, Tel: 714-845-3986; Sls. Mgr: C.J. Reimuller
JAY-EL PRODS., 1859 W. 169th St., Gardena, Calif., 90247, Tel: 213-FA-1-3260, TWX: 213-327-1471; Sls. Mgr: L.K. Miller
JB ELCTRN. TRANSFORMERS, INC., 2300 W. Armitage Ave., Chicago, Ill., 60647, Tel: 312-342-0080; Sls. Mgr: N.K. Yost
JEFFERSON ELEC., Div. Litton Inds., 840 S. 25th Ave., Bellwood, Ill., 60104, Tel: 312-626-7700; Sls. Mgr: W. Beam
JENAER GLASWERK SCHOTT & GEN. INC., 200 Park Ave., New York, N.Y., 10017, Tel: 212-TN-7-8327; Sls. Mgr: H. Moeller
JENKINS', M.W. SONS, INC., P.O. Box 70, Dept. 25, Cedar Grove, N.J., 07009, Tel: 201-239-5150; Sls. Mgr: H.E. Worden
JENSEN MFG. DIV., Muter Co., 5655 West 73rd St., Chicago, Ill., 60638, Tel: 312-767-7600, TWX: 910-224-4661; Sls. Mgr: T.A. Firaneck
JAPANESE PRODS. CORP., 51 Cliff St., New Rochelle, N.Y., 10801, Tel: 914-636-8830; Sls. Mgr: M. Steinberg
JEROME ELEC. CORP., 391 Lakeside Ave., Orange, N.J., 07050, Tel: 201-678-9595; Sls. Mgr: J. DiGirolamo
JERROLD ELCTRNS. CORP., 401 Walnut St., Philadelphia, Pa., 19105, Tel: 215-925-9870, TWX: 215-569-8603
JERROLD/WATKINS DIV., General Instr. of Can., 60 Wingold Ave., Toronto, 395, Ont., Can.; Sls. Mgr: T. Blanks
JERSEY SPECIALTY CO., INC., Box 248, Wayne, N.J., 07470, Tel: 201-694-6200
JERSEY TECH. CONSLTS., 22 Colles Ave., Box 215, Morristown, N.J., 07960, Tel: 201-JE-8-8995; Sls. Mgr: A.P. Gregg
JETTRON PRODS., 58 Rte. 10, Box 7, Hanover, N.J., 07936, Tel: 201-887-0571, TWX: 710-986-8243; Sls. Mgr: J.M. Schill
JEWELL ELECTRICAL INSTRS., Grenier Field, Manchester, N.H., 03105, Tel: 603-669-6400; Sls. Mgr: D.A. Nelson

JFD ELCTRNS./SUB. RIKER-MAXSON, Comps. Div., 15th Ave. at 62 St., Bklyn., N.Y., 11219, Tel: 212-331-1000, TWX: 710-584-2462; Sls. Mgr: G. Ollen Pg. 2420
Cal Sunnyvale, JFD Northwestern, Box 823 408-732-0525
Cal Van Nuys, JFD Western, 7811 Lemona Ave. 213-785-0487
Colo Denver, Bennewitz Asso., 2801 E. Colfax 303-399-1132
Fla Eau Gallie, J.J. Smith Assocs., Box 1506 305-254-4206
Ga Atlanta, Grady Duckett Sls., Box 29067 404-237-5531
Ill Chicago, S.A.R.G.E., 1915 N. Harlem Ave. 312-237-9525
Mass Framingham, JFD, 418 Union Ave. 617-872-4843
Mich Grand Rapids, R. Van Riper Sls., 1842 Newton, S.E. 616-452-0464
Minn Mpls., Heimann, 5603 Lyndale Ave., S. 612-861-6051
NJ Pennsauken, JFD, 6021 Mansion Blvd. 302-798-0894
NY E. Rockaway, Wm. Bellenkes Assoc., 63 Talfor Rd. LY9-8260
NY New Hartford, JFD New York, Box 96 315-732-3507
Pa York, R. Schiding, 2780 Carlisle Rd. 717-764-3407
Tex Ft. Worth, W.P. Fralia Co., Box 12625 817-PE-8-2394
Wash Seattle, H. Levinson, 1211 E. Denny Way 206-EA-3-5100
Wisc Milwaukee, Star Engrg., 7328 W. Burdick 414-LI-3-3469

J.K. ELCTRN. CONTROLS, INC., Box 1582, Vancouver, Wash., 98663, Tel: 503-631-2322; Sls. Mgr: B. Brownell
JMR ELCTRNS. CORP., 1424 Blondell Ave., Bronx, N.Y., 10461, Tel: 212-792-9620; Sls. Mgr: R. Arbus
JO-BELL PRODS., INC., 5456 West 111th St., Oak Lawn, Ill., 60453, Tel: 312-425-0240; Sls. Mgr: P.J. Bell
JODEE PLASTICS, INC., 9903 Foster Ave., Brooklyn, N.Y., 11236, Tel: 212-NI-9-0555; Sls. Mgr: N. Meglino

JOHANSON MFG. CORP., 400 Rockaway Valley Rd., Boonton, N.J., 07005, Tel: 201-334-2676, TWX: 710-987-8367; Sls. Mgr: E. Fagerlund ....Pg. 2421
Ala Huntsville, Powertronics, Box 403 205-852-6347
Cal Burbank, Weightman & Assocs., 1226 W. Olive Ave. 213-849-7711
Cal Menlo Pk., Straube Assocs., 483 Willow Rd. 415-323-2476
Colo Denver, Electro-Rep., 1051 S. Platte River Rd. 303-744-2821
Conn Meriden, J. Murphy Assocs., 166 Converse Ave. 203-268-1812
Fla Clearwater, Perrott Assocs., Box 4532 813-531-5513
Fla Orlando, Perrott Assocs., Inc., 1607 Forsyth Rd. 305-275-1132
Fla W. Palm Beach, Perrott Assocs., Box 6277 305-967-1770
Ill Edwardsville, Delbridge Assocs., Box 241 618-462-8689
Ill Rolling Meadows, Sumer, Inc., 5105 Tollview Ave. 312-392-7370
Ind Ft. Wayne, Sumer, Inc., 2211 S. Calhoun 219-744-4332
La New Orleans, G. V. Peck Co., Box 8087 504-282-1553
Mass Seekonk, J. Murphy Assocs., 30 Sunset Dr. 617-761-7153
Minn Minneapolis, Stoss Assocs., 5700 W. 36th St. 612-925-2757
NM Albuquerque, Electro-Rep., 3211 Silver, S.E. 505-256-1749
NY Fayetteville, Graydon-Sherman, Davis Bldg. 315-637-9861
NY Mt. Vernon, Friedman-Smith Elctrn. Sls., 519 S. 5th Ave. 914-664-4866
NC Thomasville, Powertronics, Box 403 919-476-4257
Okla Tulsa, G. V. Peck Co., Box 15671 918-585-5853
Pa Lansdowne, W. F. Satterthwaite, Box 191 215-623-5100
Tex Dallas, G.V. Peck Co., 210 Casa Linda Plaza 214-328-3511
Tex Houston, G. V. Peck Co., 5757 Bellaire Blvd. 713-664-1435
Wash Seattle, R. Johnston Co., 1011 N.E. 69th St. 206-524-5170
EXP: N.Y., New Yor, Multiparts Corp., 52 Wall St. 212-944-4370
For: Can., Mont., Que., Braydon Electro, 360 Montee DeLiesse Rd. 514-341-3330

Advertisement

Johanson Technology offers a complete line of monolithic ceramic chip capacitors. The same high quality chips are also available as glass encapsulated leaded devices. J.T.I. glass encapsulated units are designed for critical space problems found in computer and communication system applications, yet are competitively prices with common molded devices.

JOHNS-MANVILLE SLS. CORP., 22 East 40th St., New York, N.Y., 10016
JOHNSON CORP., 805 Wood St., Three Rivers, Mich., 49093, Tel: 616-278-1715; Sls. Mgr: R.W. Gotschall

JOHNSON E. F. CO., 1923 Tenth Ave., S.W., Waseca, Minn., 56093, Tel: 507-835-2050; Sls. Mgr: C.S. Willson Pgs. 2422,2423,2642-2644
Ariz Phoenix, H.A. Moore Sls. Co., Box 7245 602-274-0060
Cal No. Hollywood, M. Stobin, 7353 Greenbush
Cal Redwood City, Logan Sls., 463 Brewster 415-369-6726
Cal Sausalito, E. Johnson, 3030 Bridgeway Bldg. 415-332-1979
Colo Denver, McLoud & Raymond, 2151 S. Grape, Box 22044 303-756-1589
Conn Meriden, P.R. Sturgeon, 99 Colony St. 203-237-1112
Fla Winter Pk., Hawkins-Hutto, 501 Park N. 305-647-7407
Ga Atlanta, Millar Elctrns., 3110 Maple NE 404-261-6160

Haw Honolulu, Dougherty Entprs., Box 3497, 1001 Dillingham 531-7548
Ill Chicago, Ellinger Sls., 6580 Northwest 312-763-1570
Ind Ft. Wayne, McFadden Sls., 1102 Roosevelt 219-445-4281
Ind Indianapolis, McFadden Sls., 11059 N. Park 317-846-0790
Iowa Cedar Rapids, J. Vrbik, 3-50 St., NE 319-377-8244
Kans Overland Pk., E.F. Johnson, 8001 Conser 913-381-9736
Md Lanham, E. Johnson, 9420 Defense Hwy. 301-577-5505
Mass Chestnut Hill, E. Johnson, 1330 Boylston 617-734-6660
Minn Savage, E. Johnson, Box 405 612-890-7904
Minn Waseca, E. Johnson, 299 10th Ave., SW 507-835-2050
NY Buffalo, R. Mitscher, 496 Ellicott Sq. Bldg. 716-854-2517
NY Camillus, R. Mitscher, 3573 Howlett Hill
NY Elmont, F. Schmitt, 311 Meacham Ave. 516-437-8150
NY Fayetteville, R. Mitscher, 51 Ely Dr. 315-445-4540
NY Pittsford, R. Mitscher, 22 Latchmere 716-381-9115
NY Syracuse, R. Mitscher, 606 Forest N. 315-458-1321
NC Raleigh, Millar Elctrns., Box 17173 919-787-9564
Ohio Columbus, McFadden Sls., 150 E. Broad 614-221-3363
Ohio Novelty, McFaddert Sls., 13938 Brenner 216-241-0849
Tenn Memphis, E.F. Johnson, 5050 Poplar 901-683-2828
Tex Dallas, R.E. Nesbitt Co., 2930 Merrell Rd. 214-357-4601
Tex Houston, R.E. Nesbitt Co., Box 66831 713-528-3811
Wash Mercer Island, E. Johnson, 3049 78th, S.E. 206-232-6242
EXP: Minn., Waesca, E. Johnson, 299 10th Ave., S.W. 507-855-2050
EXP: N.Y., NY, Roburn Agencies, 349 W. 14th St. 212-989-5939
For: Can., Willowdale, Ont., A.C. Simmonds, 285 Yorkland 416-445-9111

JOHNSON ELEC. COIL CO., 9361 Larch Ave., Box 559, Elmhurst, Ill.,,60126, Tel: 312-833-1800; Sls. Mgr: W.L. Johnson

JOHNSON & HOFFMAN MFG. CO., Div. Superior Tube Co., 40 Voice Rd., Carle Place, N.Y., 11514, Tel: 516-PI-2-3333; Sls. Mgr: R.A. Wille

JOHNSON MFG. CO., Box 96, Princeton, Iowa, 52768, Tel: 319-289-5123; Vice Pres: R.H. Thompson

JOHNSON R. W. CO., 7511 (9) Clay Ave., Huntington Beach, Cal, 92648, Tel: 714-847-8070; Sls. Mgr: R.W. Johnson

JOHNSON RESEARCH CORP., 2099 New Hwy., Farmingdale, N.Y., 11735, Tel: 516-694-5330; V.P.: S.F. Johnson

Advertisement

J.R. Corp's GPL Master Directory is widely used by Govt. contractors and agencies, contains over 5000 pages of Listings of Qualified Manufacturers and their addresses.

The AN, AND, MS Military Standard Parts Catalog is a complete Set of Military Standard Parts Drwgs., 18 Books, Loosleaf form.

Our Mil-Fed Spec. Library Service contains Specs & Slash Sheets of all issues you select according to the FSC Classes of your choice, up-dated as issued.

All these services are available on Micro-Fiche as well as hard copy. Priced right, write for particulars & prices.

Manufacturer's Catalog File 10,000 companies Catalog's on Microfiche Indexed by Firm Name; by Product and by Manufacturers Part.

JOHNSTON LABS., INC., 3 Industry La, Cockeysville, Md., 21030, Tel: 301-666-9500; Sls. Mgr: L. Gevins

JOLIET CONTROL CORP., Box 751, Joliet, Ill., 60434, Tel: 815-726-6273; Sls. Mgr: J. Bourg

JONARD INDS. CORP., 3047 Tibbett Ave., Bronx, N.Y., 10463, Tel: 212-549-7600; Sls. Mgr: B. Osten Pg. 2941

Cal Lynwood, Assoc. Engrg. Sls., 12140 Atlantic Ave. 213-774-3655
Haw Honolulu, Aloha Assocs., 225 Likiuokalani Ave.
Ill Grayslake, R. Kipp Assocs., Box 226

Advertisement

JONARD manufactures "PRECISION HAND TOOLS FOR ELECTRONICS & TELECOMMUNICATIONS." This includes a complete line of: DYNAMOMETER DIAL & TENSION GAUGES. CONNECTOR CONTACT EXTRACTION & REMOVAL TOOLS. RELAY SPRING ADJUSTERS. CONTACT BURNISHERS & CLEANERS. PLIERS. WRENCHES. TOOL KITS (standard or made to order). JONARD ALSO SPECIALIZES IN CUSTOM MANUFACTURING TO EXACT SPECIFICATIONS.

JONES, A.D. OPTICAL WORKS, 64 Cambridge St., Burlington, Mass., 01803, Tel: 617-272-5210; V.P. Cust. Rel: R.J. Downing

JONES HIRAM ELCTRNS., 11607 Vanowen St., No. Hollywood, Cal., 91605, Tel: 213-875-0213; Sls. Mgr: E.W. Reed .... Pgs. 2634,2635

Mass Burlington, G & K Elctrns., 87 Terrace Hall 617-272-3521
NY Bayside, W. Jay Assocs., 23-25 Bell Blvd. 212-762-4238
NY NYC, C. Tennant, 100 Park Ave. 212-889-2530
Ohio Cincinnati, Schlemmer, 1172 W. Galbraith 513-522-8340
Tex Dallas, Packard Assocs., Box 20825 214-357-5713

JONES MOTROLA CORP., 432 Fairfield Ave., Stamford, Conn., 06904, Tel: 203-327-6440; Sls. Engr: W. Bissonnette

JONESVILLE PAPER TUBE CORP., 474 Beck Rd., Jonesville, Mich., 49250, Tel: 517-849-2951; Sls. Mgr: W.W. Schray

JORDAN CONTROLS, 5607 W. Douglas Ave., Milwaukee, Wisc., 53218, Tel: 414-461-9200; Sls. Mgr: C.E. Jordan

JORDAN ELECTRIC CO., 14707 Keswick St., Van Nuys, Calif., 91405, Tel: 213-873-5782; Sls. Mgr: B.M. Barton

JOSLYN ELCTRN. SYS., Div. Joslyn Mfg. & Supply Co., 6868 Cortona Dr., Box 817, Goleta, Cal., 93017, Tel: 805-968-3551; Gen'l. Sls. Mgr: Don Worden Pg. 1933

JOY MFG. CO., 338 S. Broadway, New Phila., Ohio, 44663, Tel: 216-343-3351, TWX: 216-389-9708; Mktg. Mgr: A.J. Pancheri

JOY MFG. CO., Fan Mktg. Dept., 338 S. Broadway, New Philadelphia, Ohio, 44663, Tel: 216-343-3351, TWX: 216-098-6451; Mktg. Mgr: W.J. Bienko

JSH ELCTRNS, INC., 8549 Higuera St., Culver City, Calif., 90230, Tel: 213-870-4616, TWX: 910-340-6356

JUALL GEAR CO., INC., 1108 Goffle Rd., Hawthorne, N.J., 07506, Tel: 201-427-4220; Sls. Mgr: C. Juall

JUDSON RESCH. & MFG. CO., Conshohocken, Pa., 19428, Tel: 215-828-3011; Sls. Mgr: M. Smith

JUDD WIRE DIV., Electronized Chems. Corp., S Bedford St., Burlington, Mass., 01803, Tel: 413-863-4357, TWX: 510-290-2147; Sls. Mgr: J.R. Meachen

JULIE RESEARCH LAB., 211 W. 61st St., New York, N.Y., 10023, Tel: 212-CI-5-2727; Sls. Mgr: D. Koep Pgs. 502,503,2853

Ala Huntsville, Int'l. Sci. Instrs., 4017 Dunsmore 205-536-9686
Cal Cosa Mesa, Meas. Assocs., 2955B Harbor 714-540-7160
Cal Pasadena, Luscombe Engrg., 610 S. Arroyo Pkwy. 213-684-2000
Cal San Mateo, Luscombe Engrg., 220 E. 3rd 415-681-1398
Cal Sunnyvale, Meas. Assocs., Box 2162 408-739-7785
Conn Hamden, Instr. Consits., 2381 Whiteny 203-248-4174
Ill Evanston, Mauer Co., Box 624 312-869-1644
Iowa Cedar Rapids, Engrg. Svcs., 1026 3rd 319-366-1591
Kans Prairie Vlg., Engrg. Svcs., 7830 State Line 914-649-4000
Md Bethesda, S & S Assocs., 7720 Wisconsin 301-654-1434
Mass Waban, Instr. Consits., Inc., 81 Wyman St. 617-969-9881
Minn St. Paul, Wagner Comp., 542 S. Snelling Ave. 612-698-0331
Mo St. Louis, Engrg. Svcs., 67 Vernon Ave. 314-726-2233
NY Mt. Vernon, Electrical Instr. Svc., 25 Dock 914-699-9717
NY Syracuse, Ossmann Instr., 101 Pickard
NC Raleigh, Int'l. Sci. Instrs., 5100 N. Glenn Dr. 919-787-7244
Pa King of Prussia, S & S Assocs., Boro Line 215-265-3450

K & L MICROWAVE INC., 203 Newton St., Salisbury, Md., 21801

K & S ENGRG. CO., 6917 W. 58 St., Chicago, Ill., 60638, Tel: 312-586-8503; Sls. Mgr: M. Berkenbilt

K-TECH., INC., 885 Waverly St., Framingham, Mass., 01701, Tel: 617-873-9705, TWX: 710-380-0509; Sls. Mgr: M.R. Levy

K-W ENGRG. WORKS, N50 W16328 Pin Oak Ct., Menomonee Falls, Wisc., 53051, Tel: 414-781-8616; Sls. Mgr: H.C. Kaetel

K WEST, 9371 Kramer Ave., Westminster, Calif., 92683, Tel: 714-893-6593, TWX: 910-596-1806; Sls. Mgr: F.C. Jones

KAHL SCIENTIFIC INSTR. CORP., P.O. Box 1166, El Cajon, Calif., 92022, Tel: 714-444-5944; Mgr: E. Jerzewski

KAHLE ENGRG. CO., 3344 Hudson Ave., Union City, N.J., 07087, Tel: 201-867-6500; Dir. Sls: C.A. Napor Pg. 947

Advertisement

KAHLE Automatic Production Machines and Machine Systems are custom engineered for precision, high speed processing or assembling of lamps, tubes, semi-conductors, diodes, transistors, electrical sub-assemblies, switches, vacuum bottles, etc. Hermetic seal and exhaust machines include those for most vacuum and gas filled devices; two or three piece lead-and-cap, lead-slug butt welding by resistance or capacitor discharge welding machines with 100-200 per minute capacity; cat-whisker or current carrying element welding. Glass machinery of all types.

KAHLENBERG BROS. CO., Box 358, Two Rivers, Wisc., 54241, Tel: 414-793-1307; Sls Mgr: K.W. Kahlenberg

KAHN & CO., INC., 885 Wells Rd., Wethersfield, Conn., 06109, Tel: 203-529-8643, TWX: 710-425-0790; Pres: I.I. Kahn

KAHN RESCH. LABS., INC., 81 S. Bergen Pl., Freeport, N.Y., 11520, Tel: 516-FR-9-8800; Sls. Mgr:

KAISER AEROSPACE & ELCTRNS., Box 11275, Sta. "A", Palo Alto, Calif., 94306, Tel: 415-321-3320, TWX: 910-373-1274; Mktg. Mgr: C.K. Snyder

KAISER CATV, Div Kaiser Aerospace & Elctrns., Box 9728, Phoenix, Ariz, 85020, Tel: 602-944-4411, TWX: 910-957-1601; Sls.Mgr.: G. Woods

KALART VICTOR, Hultenius St., Plainville, Conn., 06062, Tel: 203-747-1663; Sls. Mgr: M. Goldberg

KAMAN NUCLEAR, Div. Kaman Sci. Corp., 1700 Garden Gods Rd., Colorado Springs, Colo., 80907, Tel: 303-473-5880, TWX: 510-431-4929; Mktg. Mgr: D. Wick

KANO LABS., INC., 1000 Thompson La., Nashville, Tenn., 37211, Tel: 615-833-4101; Sls. Mgr: T.J. O'Kane

KAPPA NETWORKS, INC., 165 Roosevelt Ave., Carteret, N.J., 07008, Tel: 201-541-4226 Pgs. 1520,1521,2748,2749

Cal Escondido, Andrew Elctrn., Box 2154 714-747-3015
Cal Menlo Pk., G. McKnight, Box 36 415-325-2844
Colo Denver, Elctrn. Comps. Sls., Box 22457 303-771-6200
Cal Woodland Hills, Interstate Mktg., 22030 Ventura 213-883-7606
Fla Melbourne, Hanson Assocs., Inc., Box 26 305-727-7474
Ill Franklin Pk., Dekotech Sls., Box 306 312-455-5100
Mass Lexington, J. Boeing, 18 Muzzey St. 617-862-2500
Minn Mpls., L. Murphy, 730 Chicago Ave. 612-333-4511
N J Cherry Hill, Benco Sls., Box 245 609-429-5515
NY W. Islip, Hill Assocs., 142 Sequams La., W. 516-587-9487
Ohio Cincinnati, Tri-State Mktg., 1717 Section Rd. 513-631-5060
Tex Dallas, R. Thomas, 8616 Northwest Plaza Dr. 214-363-8591
For: Tex, Ft. Lee, Euramco Intl., Box 1190G

KARTRON INC., P.O. Box 1338, Huntington Beach, Calif., 92647, Tel: 714-534-1161; Sls. Mgr: T.B. Linton cont'd

cunt'd

Advertisement

Coil Tester--Shorted Turn Indicator--used since 1946 by repeat and new customers. New circuit-board construction. Standard probes for unmounted coils (no iron core or brass sleeve) range in six sizes from 5/32x7/32x3-inch (detects one shorted turn of #44 copper wire in 2-inch dia. loop or #20 wire in 3-ft. dia. loop) down to 0.045x0.050x5/8-inch requiring 3 or more turns #44 to indicate a short. Non-shocking, goof-proof. Requires 5-minute warmup, 10-minute housewife training, your sample shorted turns for "calibration", and your "wire-around-probe and through donut" for toroids at reduced sensitivity. Built for squashing by Mack truck, except small (soft-iron) probes are fragile. Price $250. Shipping wt. 9 lbs.

KATO ENGRG. CO., 1415 1st Ave., Mankato, Minn., 56001, Tel: 507-387-4011, TWX: 910-565-2243; Sls. Mgr: M.C. Madsen

KATOLIGHT CORP., 1st Ave. at Chestnut, Mankato, Minn., 56001, Tel: 507-387-7973; Sls. Mgr: C.E. Buhr

KAVLICO ELCTRNS., 20869 Plummer St., Chatsworth, Cal., 91311, Tel: 213-882-2400; Sls. Mgr: S. Kennon

KAWECKI BERYLCO INDS., INC., 220 E. 42nd St., New York, N.Y., 10017, Tel: 212-682-7143, TWX: 710-581-5199; V.P.-Sls: D. Richards

KAY ELEMETRICS, 12 Maple Ave., Pine Brook, N.J., 07058, Tel: 201-227-2000, TWX: 710-734-4347; Mktg. Mgr: I. Silberg ....Pgs. 504-509

Cal	Goleta, Kay Sls. & Svc., Box 206	805-967-9316
Cal	Los Angeles, Kay Sls. Office	213-622-8039
Ind	So. Bend, Kay Sls. & Svc., U.S. Rte. 31, N.	219-272-2848

KAY-RAY, INC., 740 E. Northwest Hwy., Palatine, Ill., 60067, Tel: 312-358-9437; Sls. Mgr: J.J. Karp

KAYE INSTRS., INC., 737 Concord Ave., Cambridge, Mass., 02138, Tel: 617-868-7080

KAYNAR MFG. CO., 800 S. State College Blvd., Fullerton, Calif., 92631, Tel: 714-871-1550, TWX: 910-592-1239; Sls. Mgr: H. Hatfield

K.C.C. SHOKAI, LTD., 31, 4-chome, Ouchi-dori, Naka-ku, Kobe, Japan, Tel: 078-87-0271, TWX: 5622-835 (WMKCC KOB); Sls. Mgr: K. Himeno ....Pg. 1479

NY	New York, Nichimen Co., Inc., 60 Broad St.	DI 4-3456
Tex	Houston, Japan Cotton Co., Meirose Bldg.	CA 5-6863

Advertisement

KCC is the biggest manufacturer of wire accessories in Japan. For example, Adhesive wire marker, Slip-on C-type marker, Slip-on tube marker, Sleeve type tube marker etc. KCC is also the pioneer of the mosaic display board in Japan.

KDI ADTROL, INC., 700 Abbott Dr., Broomall, Pa., 19008, Tel: 215-544-6900

KDI SEALTRON CORP., Box 15073, Cincinnati, Ohio, 45215, Tel: 513-821-7444; Sls. Mgr: J.A. Prior

KEDMAN CO., Box 267, 762 S. Redwood Rd., Salt Lake City, Utah, 84110, Tel: 801-363-4413; V. P: D.D. Moore

KEENE CORP., Kaydon Bearing Div., Muskegon, Mich., 49443, Tel: 616-755-3741; Sls. Mgr: W.J. Klinkner

KEISER'S INDS., INC., Laumau St., Mt. Holly Springs, Pa., 17065, Tel: 717-486-7511; Sls. Mgr: E.C. Gedon

KEITHLEY INSTRS., INC., 28775 Aurora Rd., Cleveland, Ohio, 44139, Tel: 216-248-0400; Sls. Mgr: A.D. Oliverio

KELK, GEORGE LTD., 48 Lesmill Rd., Don Mills, Ont., Canada, Tel: 416-445-5850; Sls. Mgr: C.H. Draper

KELLER, HUGO P., INC., 41 East 42nd St., New York, N.Y., 10017, Tel: 212-682-8450 R. Holland

KELM G.R. MACH. WORKS, INC., 347 E. Railway Ave., Paterson, N.J., 07503, Tel: 201-523-0546; Sls. Mgr: O. Lakatos

KELTRON CORP., 225 Crescent St., Waltham, Mass., 02154, Tel: 617-894-0525; Sls. Mgr: H.M. Fox

KELVIN, 5919 Noble Ave., Van Nuys, Cal., 91401, Tel: 213-782-6662; Sls. Mgr: R.A. Featherston

KEMLITE LABS., INC., 1819 W. Grand Ave., Chicago, Ill., 60622, Tel: 312-TA-9-6050; Sls. Mgr: J.V. Daniels

KEMPER ENGRG. CO., 9337 Shoshone Ave., Northridge, Cal., 91324, Tel: 213-886-0121; Sls. Mgr: J.P. Kemper

KEMTRON ELECTRON PRODS., INC., 14 Prince Pl., Newburyport, Mass., 01950, Tel: 617-462-4464; Sls. Mgr: K.A. Callahan

KENDALL CO., Fiber Products Div., Walpole, Mass., 02081, Tel: 617-668-0175, TWX: 710-346-0844; Dir. Mktg: K.W. Hays

KENDALL CO., Polyken Div., 309 W. Jackson Blvd., Chicago, Ill., 60606, Tel: 312-WE-9-7100; Sls. Mgr: W.J. Hodges

KENICS CORP., One Southside Rd., Danvers, Mass., 01923, Tel: 617-774-8600, TWX: 710-347-0882; Sls. Mgr: A.R. Macdonald

KENNAMETAL INC., Lloyd Ave., Latrobe, Pa., 15650, Tel: 412-537-3311, TWX: 510-468-7277; V.P. Sls: B. Burgoon, Jr.

KENNEDY CO., 540 Woodbury Rd., Altadena, Calif., 91001, Tel: 213-798-0953, TWX: 910-588-3751; Mktg. Mgr: D.S. Krueger

KENNEY ENGRG. CORP., 1301 S. Shamrock, Monrovia, Cal., 91016, Tel: 213-357-2224; Sls. Mgr: B. Cerchione

KENT CORP., 169 N. Lake St., Mundelein, Ill., 60060, Tel: 312-566-1300, TWX: 910-685-4322; V.P. & Gen'l. Mgr: C. Chun

KENTON ENGRG. CORP., 8232 Christiana Ave., Skokie, Ill., 60076, Tel: 312-677-8280; Sls. Mgr: A. Zemanski

KENTROX INDS., INC., 14335 N.W. Science Pk. Dr., Portland, Ore., 97229, Tel: 503-643-1681; Pres: T.J. Holce

KENTUCKY ELCTRNS., Box 511, Owensboro, Ky., 42301, Tel: 502-684-0431; Sls. Mgr.: P. M. Gahr

KEPCO, INC., 131-38 Sanford Ave., Flushing, N.Y., 11352, Tel: 212-461-7000, TWX: 710-582-2631; Sls. Mgr: M. Kupferberg ....Pgs. 737-771

Ala	Huntsville, J. Highsmith, 3322 S. Memorial	205-881-3294
Ariz	Tempe, Tri-City Elctrns., Inc., Box 26757	602-967-3222
Cal	Sherman Oaks, Windsor Dynam., Box 5500	213-989-3631
Cal	Woodside, Windsor Dynam., 195 Greer Rd.	415-854-4870
Colo	Denver, J.F. Hurlbut, 1295 Bannock St.	303-744-1451
Conn	Farmington, R. Perron, 10 Briarwood Rd.	203-673-4825
Conn	Trumbull, R. Perron & Co., 36 Louis St.	203-268-9631
DC	Wash., Eastern Instr., 5410 Indian Head Hwy.	202-333-8880
Fla	Orlando, J. Highsmith, 2543 Industrial	305-293-5202
Ill	Chicago, Midwest Elct., 5707 W. Division	312-626-0030
Ind	Indianapolis, Midwest Elct., 4000 Meadow	317-546-4967
Iowa	Cedar Rapids, Midwest Elct., 2042 Franklin N.E.	319-362-4410
Kans	Shawnee Mission, Kathrinus, Kelly, Boswell, 5460 Buena Vista	913-722-0000
Mass	Norwood, R. Perron, 159 Morse St.	617-762-8114
Mich	Royal Oak, Satullo, 4514 N. Woodward	313-549-3910
Minn	Mpls., E.C. Elctrn., 10108 Abbott S.	612-888-4626
Mo	St. Louis, N. Kathrinus, 2427 Brentwood	314-962-5627
NH	Dover, R. Perron, 1 Elm St.	603-742-2321
NJ	Red Bank, Eastern Instr., Inc.	201-842-4242
NM	Albuquerque, C. Schmidt, 9611 Acoma, S.E.	505-298-2415
NY	Great Neck, Eastern Instr., 300 Northern	516-466-9505
NY	No. Syracuse, NACO Elctrns., Box 248	315-699-2651
NY	Poughkeepsie, NACO Elctrns., 14 Lori St.	914-462-2730
NY	Rochester, NACO Elctrns., 74 Park Ave.	716-244-4720
NY	Utica, NACO Elctrns., 2631 Edgewood	315-732-1801
NC	Charlotte, J.L. Highsmith, 3733 Monroe	704-333-7743
Ohio	Cleveland, Satullo Co., 16801 Euclid Ave.	216-486-2800
Ohio	Dayton, Satullo Co., 2801 Far Hills Ave.	513-293-7061
Pa	Phila., Eastern Instr., 613 Cheltenham	215-927-7777
Pa	Pittsburgh, Satullo Co.	412-931-5200
Tex	Dallas, Airep Elctrns., Inc., 6300 N. Central Expwy.	214-363-5291
Utah	Salt Lake City, J. Hurlbut, 3605 S. Bannock	801-299-4321
Va	Richmond, Eastern Instr., Inc., Ross Bldg.	703-644-6622
Va	Richmond, J. Highsmith, 2604-D Buford	703-272-5888
Wash	Seattle, H. Levinson, 1211 E. Denny Wy.	206-323-5100
Wisc	Waukesha, Midwest Elect., 1317 Garfield	414-542-5129
EXP:	N.Y., NY, Ad. Auriema, 120 Liberty St.	212-349-8220
For:	Can., Montreal, Que., Radionics, 195 Graveline	514-735-4565

KEPRO CIR. SYS., INC., 3630 Scarlet Oak Blvd., St. Louis, Mo., 63122, Tel: 314-AC-5-5166; Mktg. Mgr: G.E. Mobus

KERR-MCGEE CHEM. CORP., Kerr-McGee Bldg., Oklahoma City, Okla., 73102, Tel: 404-236-1313; Sls. Mgr: W.F. O'Brien

KERTRON, INC., 7516 Central Ind'l Dr., Riviera Beach, Fla, 33404, Tel: 305-848-9606, TWX: 510-952-7611; Sls. Mgr: J.J. Flynn

KESSLER-ELLIS PRODS., 120 1st Ave., Atlantic Highlands, N.J., 07716, Tel: 201-291-0500; Sls. Mgr: R. Messer ....Pg. 1336

Ala.	Huntsville, Rep, Inc., 8100 S. Memorial Pkwy.	205-881-9270
Ariz.	Scottsdale, Palmer Assoc., 8650 E. Joshua Tree La.	602-947-4666
Cal	Sunland, Anderson Power Prods., 9310 Hillrose	213-352-3114
Colo	Denver, Palmer Assocs., 1050 Yuma St.	303-255-9961
Fla.	Clearwater, WMM Assoc., 1260 A. S. Highland Av.	813-446-0075
Ga.	Atlanta, Rep, Inc., 1483 Monroe Dr. N.E.	404-876-1591
Ill	Chicago, Lincoln, Hodges, 5875 N. Lincoln	312-561-8440
Ind	Indianapolis, F. Sedlack, 2511 E. 46th	317-545-1141
Iowa	Des Moines, BEAMS, 517 Fifth Av.	515-279-3015
Md	Silver Spring, Globe Assocs., 8121 Georgia Ave.	301-587-0060
Mass	Newburyport, Gilway Sls. Co., Box 584	617-465-7568
Mich	Detroit, D. Poulin, 17222 E. Warren	313-886-4990
Minn	Minneapolis, R.J. Sls., 7100 S. France	612-922-1425
NY	Liverpool, L. Garner & Assocs., Box 56	315-652-7911
NC	Charlotte, Count, Inc., 7616 Frosch Rd.	704-392-7496
Ohio	Cleveland, E. Bock, 18838 Canyon	216-331-5212
Pa	Media, W. Reeves, 2973 N. Providence	215-566-6709
Tex	Dallas, T.M. Curtis Co., 5635 Yale Blvd.	214-361-1666
Wash	Seattle, C. Parsons, 5319 4th Ave., S.	206-762-7373
Wisc	Waukesha, Rockwell, Brown, Lincoln, Hodges, 217 Wisconsin	414-542-3087

KESTER SOLDER CO, Div. Litton Ind. Inc., 4201 Wrightwood Ave., Chicago, Ill., 60639, Tel: 312-235-1601; Mgr. Sls. Adm: G. Vanicek

KESTLER ELCTRNS., 9417 La Rosa, Temple City, Cal, 91780, Tel: 213-286-2739; Sls. Mgr: R.J. Kestler

KEUFFEL & ESSER CO., 20 Whippany Rd., Morristown, N.J., 07960, Tel: 201-285-5360; V.P. Sls: J. Burton

KEVLIN MFG. CO., 26 Conn St, Woburn, Mass., 01801, Tel: 617-935-4800, TWX: 710-393-1239; Sls. Mgr: J.J. Glynn

KEYSTONE CARBON CO., Thermistor Div., St. Marys, Pa., 15857, Tel: 814-834-1591; Sls. Mgr: J.A. Brock Pgs. 1974-1979

Cal	San Carlos, Electro Pacific, 1710 Industrial Rd.	415-593-1334
Cal	San Francisco, Electro-Pacific, 2524 Franklin St.	415-776-8582
Cal	San Marino, VanGott&Assoc., Box 8401	213-282-1125
Fla	No.Miama Bch, Cartwright & Bean, 20100 N.E. 25th Ct.	305-945-2962
Fla	Orlando, Cartwright & Bean, 601 N. Fern Creek Ave.	305-425-8284
Ga	Atlanta, Cartwright & Bean, 3223 Cain's Hill N.W.	404-237-2273
Ill	Elk Grove Vge, Knoblock, Box 67	312-593-5940
Ind	Ft. Wayne, R. Whitesell, 3426 Taylor	219-432-5591
Ind	Indianapolis, R. Whitesell, 6691 E. Washington	317-359-9283
Ind	Kokomo, R.O. Whitesell & Assoc., 3827 S. La Fountain Sq.	317-453-6868
Ky	Louisville, R.O. Whitesell & Assoc., 3620 Lexington Rd.	502-893-7303
La	Metairie, Cartwright & Bean, 7010 Magnolia Ct.	504-887-5225
Md	Silver Spg., Mechtronics Sls., 11700 Old Columbia Pike	301-622-2420
Mass	Reading, C.E. Godfrey Co., Box 68	617-944-2230
Mich	Montgomery, J.L. Montgomery, Inc., 19400 W. Ten Mile	313-358-2616
Minn	Mpls., R. W. Marshall Co., 6106 Excelsior Blvd.	612-929-0457

NY N.Y., Haber-Ramp, 2315 Broadway 212-799-4040
NY Pompey, S.F. Foster Co., 2806 Hennaberry Rd. 315-677-3333
NY Webster, S.F. Foster Co., 1591 Greensboro 716-872-5220
NC Charlotte, Cartwright & Bean, 625 Harwyn Dr. 704-333-6457
NC Raleigh, Cartwright & Bean, 1016 Belfast Dr. 919-832-7128
Ohio Cincinnati, R. Whitesell, 1172 W. Galbraith 513-521-2290
Ohio Cleveland, R.O. Whitesell & Assoc., 21139 Lorain Ave. 216-333-2585
Ohio Dayton, R.O. Whitesell & Assoc., 4133 S. Dixie Ave. 513-298-9546
Pa Ambler, Griffin-Campbell, Inc., 25 Skippack Pike 215-646-7535
Pa Pittsburgh, R.O. Whitesell & Assoc., 201 Penn Ctr. Blvd. 412-242-0100
Tenn Bristol, RO Whitesell, 340 Edgemont Ave. 615-968-4195
Tex Dallas, Spacetronics Co., 4515 Prentice St. 214-368-1215
EXP: Westbury, N.Y., Minthorne Intl., 2200 Shames 516-334-3303
For: Can., Markham, Ont., Tel-Mar Elec. Sls., Ltd., 19th Ave., R.R. 2 416-887-5612

KEYSTONE ELCTRNS. CORP., 49 Bleeker St., New York, N.Y., 10012, Tel: 212-475-4600; Sls. Mgr: R.D. David

Advertisement

Manufacturers of Battery Holders made of aluminum and steel for mercury, ni-cad and alkaline cells. Complete line of terminals, brushings, brackets, eyelets and Pre-Punched bakelite boards. Also Standardized and Custom-Built Terminal Boards. Certificate of Compliance to government specifications issued on request. Free descriptive catalog: Write direct or phone nearest representative.

KEYSTONE COLUMBIA, INC., Box 1005, 23328 Sherwood Rd., Warren, Mich., 48090, Tel: 313-757-4400

KEYSTONE MICRO SCAN., 151 Hallet St., Boston, Mass., 02124, Tel: 617-436-8000; Ex. V.P. T. Role

Advertisement

Keystone Micro Scan, Inc. manufactures complete lines of microfiche reader equipment and accessories - controls for safe operation of hazardous equipment-glass fiber optic products-light pipes-light sources and "Opti-Scopes" (flexible fiber optic borescopes). Keystone also services electronic and computer peripheral equipment makers producing precision metal parts and sub assemblies - complete electro-plating and painting capability.

K.G.S. ELCTRNS., 2029 N. Lincoln Ave., Pasadena, Cal., 91103, Tel: 213-798-0787 ....Pgs. 2956,2957

KIDCO, INC., Box 278, Medford, N.J., 08055, Tel: 609-267-2100; Sls. Mgr: L. Moyerman

KIDDE, WALTER & CO., Belleville Div., 675 Main St., Belleville, N.J., 07109, Tel: 201-759-5000, TWX: 710-995-4925; Gen. Mgr: W.E. Morgan

KIKUSUI ELCTRNS. CORP., 3-1175, Shinmaruko-Higashi, Kawasaki City, Kanagawa-Pref., Japan, Tel: 044-41-0111; Sls. Mgr: M. Nagura

KILOVAC CORP., Box 4422, Santa Barbara, Cal., 93103, Tel: 805-684-4560, TWX: 910-336-1141; Sls. Mgr: J.L. Dysart .... Pgs. 1688-1691,1744,1745,2428

Ariz Tempe, WhiTronics, Inc., 209 N. Perry La. 602-966-4417
Cal Los Angeles, Rep. Assocs., 1710 Santa Monica Blvd. 213-451-8901
Cal San Carlos, Electro Pacific, 1710 Industrial Rd. 415-593-1334
Conn Hamden, Compar, 2531 Whitney 203-288-9276
Fla Orlando, Holcombe, 2827 Cullen Lake Shore 305-855-2455
Ga Atlanta, Holcombe, 3098 Piedmont N.E. 404-233-2837
Ill Chicago, Gassner & Clark, 6644 N. Western 312-764-6121
Iowa Cedar Rapids, Brown-Flanders, 3400 Indian S.E. 319-366-0635
Kans Shawnee Mission, M. Bettis, Box 598 913-362-0772
Kans Wichita, M.E. Bettis Co., 423 N. Fountain 316-685-7441
Md Towson, Burgin-Kreh, Box 9787 301-661-1120
Mass Newton Highlands, Compar, 88 Needham 617-969-7140
Minn St. Paul, De Beck, 2119 Grand 612-690-1557
Mo St. Louis, M. Bettis, 9103 Bessemer 314-429-2099
NJ Riverton, Given Assocs., Box 183 609-829-7249
NM Albuquerque, Data Handling, 209 San Pablo, S.E. 505-268-0928
NY Buffalo, R. Lamb, 1865 Kenmore 716-874-4900
NY Great Neck, Trionic, 320 Northern Blvd. 516-466-2300
NY Kingston, R. Lamb, Box 661, Uptown Sta. 914-338-8833
NY Rochester, R. Lamb, 4515 Culver Rd. 716-544-5580
NY Syracuse, R.F. Lamb Co., E. Molloy St. 315-454-2469
NC Charlotte, DGW, Inc., Box 6096 704-334-7090
NC Winston-Salem, DGW, Inc., Box 5316 919-768-7166
Ohio Dayton, H. Pipe, 5335 Far Hills Ave. 513-434-7900
Tex Dallas, Norvell Assocs., Box 20279 214-357-6451
Tex Houston, Norvell, 6440 Hillcroft Ave. 713-774-2568
Va Lynchburg, Burgin-Kreh, 2600 Memorial 703-845-5600
Wash Bellevue, A. Smith, 405 166th St., S.E. 206-746-6770
For: Can., Downsview, Ont., Whittaker Elct., 43 Troutbrooke 416-247-7454
For: Can., Ottawa, Ont., Whittaker Elct., 42 Howden 613-224-1221
For: Can., Roxboro, Que., Whittaker Elct., Box 216 514-683-3621
For: Can., W. Vancouver, B.C., Whittaker Elctrns., 1144 Millstream 604-926-3411

KILOVOLT CORP., 238 High St., Hackensack, N.J., 07602, Tel: 201-488-7373; Sls. Mgr: S. Rothman Pgs. 772,773

Cal Sherman Oaks, Windsor Dynamics, Inc., Box 5500 213-989-3631
Cal Woodside, Windsor Dynamics, 195 Greer 415-851-0417
Colo Englewood, PLS Assocs., 7895 E. Prentice 303-771-0140
Conn Meriden, Abbott-Allison Co., Inc., Box 467 203-237-9232
Ill Chicago, P. Lind Elctrns. Co., 5483 W. Northwest Hwy. 312-774-1246
Ind Indpls, P. Lind Elctrns., 3969 Meadows 317-547-9178
Mich Farmington, Carter, McCormic & Peirce, 23995 Freeway Pk. Dr. 313-477-7700
Minn Circle Pines, Lind Elctrns., 10104 Sunset 612-786-5770
NM Albuquerque, PLS Assocs., 4200 B Silver 505-255-2330
NY Latham, L-Tron Corp., Box 336 518-785-5032
NY Tonawanda, L-Tron Corp., 123 Dalewood Ave. 716-691-8887
NY Skaneateles, L-Tron Corp., Drawer 67 315-685-6172
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster Ave. 513-278-5873
Okla Tulsa, J.A. Green Co., Box 3209 918-742-4657
Pa Pittsburgh, Carter, McCormic & Peirce, 201 Penn Ctr. Blvd. 412-824-3760
Tex Dallas, J.A. Green Co., 7118 Envoy Ct. 214-ME-1-7450
Tex Houston, J.A. Green Co., 3400 Montrose 713-526-2959
Wash Seattle, Dewar & Assocs., 6261 1st Ave. 206-763-2233
EXP: N.Y., Melville, Rocke Int'l., 80 Marcus 516-694-7800

KINETIC TECH., INC., 3393 De La Cruz Blvd., Santa Clara, Cal., 95050, Tel: 408-296-9305; Sls. Mgr: R. S. Smith

KINETRON CORP., 1416 Roller Rd, Asbury Park, N.J., 07712, Tel: 201-776-9595; Sls. Mgr: V.H. Triwedi

Advertisement

CUSTOM FABRICATED ENCLOSURES
for
Filters - Transformers - Delays Lines
Relays - Capacitors - Related Networks
including
Standard MIL-T-27B transformer cases, sizes AF-OA (Deep Drawn and Fabricated). Chassis-MU-Metal Shields-Brackets-Inserts-Weld Studs

KING LABORATORIES, INC., 127 Solar St., Syracuse, N.Y., 13204, Tel: 315-471-8123; Sls. Mgr: W.R. MacLeod

KING RADIO CORP., 400 N. Rogers Rd., Olathe, Kans., 66061, Tel: 913-782-0400; Sls. Mgr: B.L. Glover

KINGMANN-WHITE, INC., 653 S. Melrose St., Placentia, Calif., 92670, Tel: 714-528-2111; Sls. Mgr: J.M. Quirk

KINGS ELCTRNS., 40 Marbledale Rd., Tuckahoe, N.Y., 10707, Tel: 914-SW-3-5000, TWX: 710-562-0110; Sls. Mgr: E. Corcoran

KINGSLEY MACH. CO., Aero-Space Div., 850 Cahuenga Blvd. - EEM, Hollywood, Calif., 90038, Tel: 213-469-7243; V.P. Sls: J.M. Butler

KINNEY VACUUM CO., 3529 Washington St., Boston, Mass., 02130, Tel: 617-522-7100, TWX: 710-348-0873; V.P-Sls: A.A. Chambers

KIRCHBERGER, M & CO., INC., 250 Humphrey St., Englewood, N.J., 07631, Tel: 201-568-4555; Sls. Mgr: T.H. Church

KIRK & BLUM MFG. CO., 3120 Forrer St., Cincinnati, Ohio, 45209, Tel: 513-351-1400; Sls. Mgr: E.A. Vogel

KIRKHILL RUBBER CO., 300 E. Cypress St., Brea, Calif., 92621, Tel: 714-529-4901, TWX: 910-596-1213; V.P. Sls: D. Reid

KIRKLAND H. R. CO., 8 King St., Morristown, N.J., 07960, Tel: 201-538-2777; Sls. Mgr: B. A. Kirkland

KISTLER INSTR. CO., Overlake Ind'l. Pk., Redmond, Wash., 98052, Tel: 206-885-3737, TWX: 910-449-2860; Sls. Mgr: E.L. Balyeat

KLEIN, MATHIAS & SONS, 7200 McCormick Rd., Chicago, Ill., 60645, Tel: 312-JU-8-6820; Sls. Mgr: C.F. Castino

KLINE IRON & STEEL CO., INC., P.O. Box 1013, Columbia, S.C., 29202, Tel: 803-AL-4-0301; Sls. Mgr: J.R. Trotter

KLING METAL SPINNING & STAMPING, 247 Centre St., New York, N.Y., 10013, Tel: 212-226-5580; Sls. Mgr: S. Gross

KLIPSCH & ASSOCS., INC., Box 280, Hope, Ark., 71801, Tel: 501-777-6751; Sls. Mgr: R.L. Moers

KNOPP, INC., 1307 66th St., Oakland, Calif., 94608, Tel: 415-653-1661; Sls. Mgr: H. Muller

KNOWLES ELCTRNS., INC., 3102 N. Mannheim Rd., Franklin Park, Ill., 60131, Tel: 312-455-3600; Dir. Mktg: C.K. Apel

KOCH, H. & SONS, Corte Madera, Cal., 94925, Tel: 415-924-3510, TWX: 415-927-3221; Sls. Mgr: R.H. Duyore

KOCH INDS., 401 S. Dale St., Anaheim, Cal., 92804, Tel: 714-527-1864; Sls. Mgr: H.E. Koch

KOH-I-NOOR RAPIDOGRAPH, 100 North St., Bloomsbury, N.J., 08804, Tel: 201-479-4124, TWX: 510-235-3340; Sls. Mgr: R. La Barre

KOLE ENTERPRISES, INC., Box 152, Biscayne Annex, Miami, Fla., 33152, Tel: 305-633-9023; Sls. Mgr: B. Cole

KOLLMORGEN-COLOR SYS. DIV., Kollmorgen Corp., 67 Mechanic St., Attleboro, Mass., 02703, Tel: 617-222-3880, TWX: 710-346-0567; Pres: A.J. Blanc

KOLLSMAN INSTR. CORP., 575 Underhill Blvd., Syosset, N.Y., 11791, Tel: 516-921-4300, TWX: 212-672-1224; Group V.P: J.C. Allwarden

KOLTON ELEC. MFG. CO., 123 New Jersey R.R. Ave., Newark, N.J., 07105, Tel: 201-344-4622; Sls. Mgr: H. Kolton

KOMAK, INC., 9th & Ontario Sts., Phila., Pa., 19140, Tel: 215-BA-6-0770; Sls. Mgr: W.M. Auchenbach

KONELL ENTERPRISE, Box 962, So. Pasadena, Cal., 91030, Tel: 213-681-6281; Sls. Mgr: B. Perra

KOOLTRONIC FAN CO., P.O. Box 504, Princeton, N.J., 08540, Tel: 609-799-1466; Sls. Mgr: P.J. Paulucci

KOONTZ-WAGNER ELEC., 516 N. Michigan St., South Bend, Ind., 46601, Tel: 219-234-3157; Sls. Mgr: F.V. Mulligan

KOPP GLASS, INC., Box 8255, Swissvale, Pittsburgh, Pa., 15218, Tel: 412-271-0190; Sls. Mgr: W.A. Provost

KORAD MAT'LS. SYS. DIV., Union Carbide, 2520 Colorado Ave., Santa Monica, Cal., 90406, Tel: 213-829-3377, TWX: 910-343-6870 J.J. Kessey

KORRY MFG. CO., 223-8th Ave. N., Seattle, Wash., 98109, Tel: 206-624-4066, TWX: 910-444-2295; Sls. Mgr: J.A. Hevly

KOSS ELCTRNS., INC., 4129 N. Pt. Washington Ave., Milwaukee, Wisc., 53212, Tel: 414-964-5000; Sls. Mgr: G. Cornehls

KRATOS INSTRUMENT DIV., 403 S. Raymond Ave., Pasadena, Cal, 91105, Tel: 213-449-3090, TWX: 910-588-3288 ....Pgs. 510,511

Ala Huntsville, Space Engrg., Box 5208 205-837-6060
Cal Long Beach, Kirk-Anderson, 4102 E. 7th 213-433-4929
Cal Oakland, Willard Nott, 4450 Piedmont 415-654-3747
Conn Hamden, Northeast Engrg., 3013 Dixwell 203-248-4481
Fla Orlando, Space Engrg., 999 Woodcock, #216 305-841-2271
Iowa Cedar Rapids, Engrg. Svc., 1026 3rd S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svc., 7924-A State Line 913-649-4000
Md Landover Hills, Eastern Comps., 6200 Annapolis, #311 301-322-1412

Mass Danvers, Northeast Engrg., 5 Elm St. 617-774-3010

Minn St. Paul, Wagner Comp. Consits., 542 S. Snelling 612-698-0331

Miss St. Louis, Engrg. Svc., 6717 Vernon 314-726-2233

NY Manhasset, Northeast Engrg., 124 Trumbull Rd. 516-365-9633

Ore Portland, Shaffer & Nelson, 1001 E. Water 503-234-7437

Pa Phila, Eastern Comps., 1349 W. Cheltenham 215-927-6262

Tex Dallas, V. Sykes, 13333 N. Central Expwy. 214-235-5289

Utah Salt Lake City, Shaffer & Nelson, 805 W. 2500 S. 801-484-3382

Wash Bellevue, Doland Co., 545 108th St. N.E. 206-454-4952

Wash Seattle, Shaffer & Nelson, 314 N.E. 72nd 206-523-0664

Wash Spokane, Shaffer & Nelson, W. 1505 4th 509-624-1339

KRATOS PRECISION PRODS., 11161 W. Pico Blvd., Los Angeles, Cal., 90064, Tel: 213-478-0635; Gen. & Sls. Mgr: J.M. Phipps ....Pg. 1783

Ariz Phoenix, Lange Assocs., 221 W. Seminole Ave.

Cal Los Altos, Nickerson-Gray, Box 127 415-941-5777

Cal Pasadena, Nurches Co., 2396 E. Foothill Blvd. 213-681-8957

Colo Englewood, A-G Elctrns., 5417 S. Oneida Way 303-771-8805

Fla N. Miami, Barrett Assocs., 300 NW 123rd St. 305-68-4957

Fla Orlando, Barrett Assocs., Box 14205 305-277-2857

Ill Highland Pk., Feller Assocs., 940 Auburn Ave. 312-433-3651

Md Baltimore, Stitzer Assocs., Box 6873 301-823-2600

Mich Plymouth, Romarc Co., Box 257 313-455-0300

Minn Mpls., Tec Sls., 9906 Chicago Ave. S. 612-884-1180

NH Manchester, Engrg. Assoc. of New Eng., 503 Donald St.

NJ Collingswood, Burdette Co., 201 Lees Ave. 609-858-6768

NJ Livingston, Varrelman-Gorman, Box 206 201-992-2505

NY Centerport, Varrelman-Gorman, Box 216 212-463-5000

NY Liverpool, Varrelman-Gorman, Box 387 215-458-4774

Ohio Cleveland, K.W. Elctrn. Sls., 3439 Brainard Rd.

Ohio Dayton, K.W. Elctrn. Sls., 8459 N. Main St. 513-890-2150

Pa Delmont, K.W. Elctrn. Sls., 411 Manor Rd. 412-468-4020

Pa Erie, K.W. Elctrn. Sls., 155 W. 8th St. 814-455-1615

Pa Paoli, Stitzer Assocs., 24 State Rd. 215-644-5500

Tex Ft. Worth, Dyna-Reps, Inc., Box 8446

Tex Houston, Dyna-Reps, 1815 Dallas St. 817-451-1392

Wash Seattle, Blum & Assocs., 2200 NW 97th St. 206-782-1600

EXP: Can., Ottawa 4, Ont., Communications Sys., 347 Catherine St.

KRAUTKRAMER ULTRASONICS, INC., 1 Research Dr., Stratford, Conn., 06497, Tel: 203-335-2504; Asst. Sls. Mgr: A. Ruiz, Jr.

KRECKMAN, HERB CO., Cresco, Pa., 18326, Tel: 717-595-2212; Sls. Mgr: H. Kreckman

KRISS ELCTRNS., INC., 169 Lake St., Upper Saddle River, N.J., 07454, Tel: 201-327-8185; Sls. Mgr: C.J. Kriss

KROHN-HITE, 580 Massachusetts Ave., Cambridge, Mass., 02139, Tel: 617-491-3211, TWX: 710-320-6583; Sls. Mgr: E.C. Lutfy ....Pgs. 512,1522

Ala Huntsville, Col-Ins-Co., Inc., Box 4246 205-539-1771

Alas Anchorage, H.J. Lang, 1406 47th Ave. 279-5741

Ariz Phoenix, Aztec Entprs., 15 N. 40th Pl. 602-267-8103

Cal Inglewood, L & M Engrg., 9911 Inglewd Ave. 213-674-6850

Cal Santa Clara, L & M Engrg., Inc., 3242 McKinley Dr. 408-243-2891

Colo Littleton, Aztec Enterprises, Inc., 1449 W. Littleton Blvd. 303-798-4573

Conn Glastonbury, Instr. Rep., Box 165 203-633-0777

Fla Orlando, Col-Ins-Co., Inc., Box 13189 305-423-7615

Ga Marietta, Col-Ins-Co, 200 Carrington Way 404-422-8327

Ill Rosemont, Cozzens & Cudahy, Inc., 9501 W. Devon Ave. 312-825-1144

Ind Indpls, Cozzens & Cudahy, 21 Beachway Dr. 317-244-2456

Md Beltsville, Snow Co., 10442 Baltimore Ave. 301-345-2211

Mass Arlington, Instr. Rep., 1046 Mass Ave. 617-646-1034

Mich Detroit, Electro Sls., 11211 Morang Dr. 313-526-8800

Minn Mpls, Cozzens & Cudahy, 7450 Computer Ave. 612-920-1022

Mo Edmundson, Cozzens & Cudahy, Inc., 10534 Natural Bridge Rd. 314-423-1234

NM Albuquerque, Aztec Enterprises, Inc., 829 Pennsylvania, N.E. 505-255-2440

NY Elmont, Crane & Egert, 146 Meacham Ave. 516-488-2100

NY Syracuse, Ossmann Instrs., Inc., 6666 Old Collamer Rd. 315-437-6666

NC Winston-Salem, Col-Ins-Co., Box 5597 919-765-3650

Ohio Cleveland, Electro Sls. Assoc., 335 E. 200th St. 216-486-1140

Ohio Dayton, Electro Sls. Assoc., Box 3122 513-426-5551

Pa Phila, R. Meyers, 529 Shoemaker Rd. 215-224-1663

Pa Pittsburg, Electro Sls., 201 Penn Ctr. Blvd. 412-371-9449

Tex Dallas, R. Martin Assocs., Box 64513 214-FL-8-3704

Tex Houston, R. Martin Assocs., Box 19291 713-468-3877

Wash Seattle, Avionics Liaison, 6770 Perimeter Rd., S. 206-RO-7-3870

For: Can., Toronto, Ont., A. Crawford Assocs., Ltd., 6427 Northham Dr., Malton 416-678-1500

KSC SEMICONDUCTOR CORP., KSC Way, Katrina Rd., Chelmsford, Mass., 01824, Tel: 617-256-3321, TWX: 710-343-0576; Sls. Mgr: J.Q. Adams Jr.

KULITE SEMICONDUCTOR PROD., 1030 Hoyt Ave., Ridgefield, N.J., 07657, Tel: 201-945-3000; Sls. Mgr: A. Brosh

KULKA ELEC. CORP., 520 S. Fulton Ave., Mt. Vernon, N.Y., 10551, Tel: 914-664-4024, TWX: 710-562-0104; Sls. Mgr: J.D. Murphy ....Pg. 2645

Ala Huntsville, Winfield Southeast, 512 Lanier 205-536-0857

Ariz Phoenix, Shefler-Kahn Co., Box 1587 602-AL-8-7893

Cal Los Angeles, E. Strassner, 3121 Los Feliz 213-666-1511

Cal Redwood City, Warren-Hickey, 175 Fifth 415-368-3849

Colo Denver, Koether - Cox, 1327 S. Inca 303-733-5561

Conn Waterbury, Coakley, Boyd & Abbett, 820 Hamilton 203-756-8766

Fla N. Miami, Winfield Elct., 1875 N.E. 149 305-751-5566

Ga Atlanta, Winfield Southeast, 2991-D N. Druid Hills N.E. 404-636-3023

Ill Chicago, R. Hanke, 2660 N. Clybourn 312-528-5800

Ind Ft. Wayne, B. Homsher, 418 E. Berry St. 219-432-1164

Kans Overland Pk., Lowell - Kangas, Box 4116 913-TU-8-3200

La Metairie, J. McKinney, 2012 Condon Ave. 504-887-1723

Md Hyattsville, L. Lowery, 6200 Annapolis 301-773-4977

Mass Needham, Coakley, Boyd & Abbett, Box 248 617-444-5470

Mich Ferndale, Shalco, 23529 Woodward 313-547-4771

Minn St. Paul, R. Ragon, 1136 W. Larpenteur 612-488-0201

Mo St. Louis, Lowell - Kangas, Box 12526 314-MI-7-1111

NJ So. Orange, Simberkoff, 71 Valley 201-763-7900

NY DeWitt, F. Taylor, 4455 E. Genessee 315-GI-6-0422

NC Raleigh, Winfield Southeast, 4909 Carteret 919-787-2841

Ohio Dayton, N. Bear, 1563 E. Dorothy La. 513-299-3566

Chio W. Richfield, N. Bear, 3435 Streetboro Rd. 216-659-3331

Ore Portland, Earl & Brown, Box 25408 503-292-9145

Pa Broomall, L. Lowery, 2801 Westchester 215-EL-6-5300

Pa Pittsburgh, Trymac, 201 Penn Ctr. Blvd. 412-823-8400

Tex Bellaire, J. McKinney, 5458 Edith 713-665-3653

Tex Dallas, J. McKinney, 1303 Chemical St. 214-631-9450

Wash Seattle, Earl & Brown, 2047 14th N.W. 206-284-1121

Wisc Milwaukee, A. Gaertner, 206 W. Highland 414-BR-3-6162

For: Can., Ajax, Ont., Munro Elct. Comps., Box 147 416-942-2191

KURMAN INSTRS. CORP., 15 Burke La., Syosset, N.Y., 11791, Tel: 516-921-7550, TWX: 510-221-2139; Sls. Mgr: J. Bozart

KURZ-KASCH, INC., 1421 S. Broadway, Dayton, Ohio, 45401, Tel: 513-223-8161; Pres: R.L. Davidson

KURZ & ROOT CO., INC., 1000 N. Meade St., Appleton, Wisc., 54911, Tel: 414-739-9441, TWX: 910-272-1169; Sls. Mgr: W.E. Meyer

KWIKSET POWDERED METAL PRODS., Kwikset Div-Emhart Corp., Box 3579, Anaheim, Cal., 92803, Tel: 714-535-8111; Sls. Mgr: J. Mikitka

KYROS CORP., Box 406, Madison, Wisc., 53701, Tel: 608-238-3587; Sls. Mgr: E. Cox

L & L MFG. CO., 166 Conchester Rd., Twin Oaks, Pa., 19016, Tel: 215-HU-5-6334; Sls. Mgr: S. Lewicki

L & R MFG. CO., 577 Elm St., Kearny, N.J., 07032, Tel: 201-991-5330; Nat'l. Sls. Dir: J.L. Morganelli

LAB-LINE INSTRS., INC., 15th & Bloomingdale Aves., Melrose Park, Ill., 60160, Tel: 312-345-7400; Sls. Mgr: R.C. Wagner

L.A.B. CORP., Div. Redford Corp., 981 Onondaga St., Skaneateles, N.Y., 13152, Tel: 315-685-5781; Sls. Mgr: J.T. Hubbard

LAB ELECTRO-ACOUSTIQUE, 5 Rue Jules-Parent, 92-Rueil, Malmaison, France, Tel: 967-2784; Pres: A. Lubszynski

LABELON CORP., 10 Chapin St., Canandaigua, N.Y., 14424, Tel: 315-394-6220; Sls. Mgr: R.O. Dill

LABORATORY DATA CONTROL, Box 10235, Riviera Beach, Fla., 33404, Tel: 305-844-5241; Sls. Mgr: J.L. West

LABORATORY EQUIPMENT CORP., 3000 Lakeview Ave., St. Joseph, Mich., 49085, Tel: 616-983-5533; Sls. Mgr: W.E. Stockwell

LAD ELECTRO-SYS., INC., 7 Commercial St., Hicksville, N.Y., 11801, Tel: 516-822-1420; Exec. V.P: S.F. Delligatti

LAKE CHEMICAL CO., 250 N. Washtenaw Ave., Chicago, Ill., 60612, Tel: 312-826-1700; V.P. Sls: C. Kleiman

LAKESHORE ELECTRIC CORP., 205 Willis, Bedford, Ohio, 44146, Tel: 216-232-0200; Sls. Mgr: S.W. Soos

LAKETOWN MFG. CORP., Box 27A RFD 1, Waconia, Minn., 55387, Tel: 612-442-4045; Sls. Mgr: N.S. Field

LA MARCHE MFG. CO., 102 Bradrock Dr., Des Plaines, Ill., 60018, Tel: 312-299-1193 ....Pgs. 774,775

Ala Birmingham, Hollen Crim, Box 58033 205-871-4084

Alas Anchorage, J.P. Bagoy, Box 1005 277-0911

Ariz Phoenix, B. Hartley, Box 4381 602-258-2552

Ark El Dorado, L. Byrne, 632 Champagnalle 501-UN-3-9435

Cal El Cerrito, B. Saletta, 10567 San Pablo 415-527-0557

Cal Encino, R. J. Meyers, 16024 Ventura 213-981-6552

Colo Denver, J. Raney, 4068 E. Iliff 303-757-7623

Fla Juniper, J.L. Marsh, Box 865 305-746-4911

Ga Atlanta, H.P. Whitehead, Box 28662 404-252-5977

Ga Atlanta, J. Reid, 4271 Garmon Rd., NW 404-CE-7-9385

Ill Wood Dale, T. Waters, 242 E. Irving 312-595-0050

Ind Indianapolis, K. Reinhardt, 1407 N. Illinois 317-631-4136

Md Annapolis, P. Martini, 778 Fairview Ave. 301-267-7462

Mass Dover, E. Hubert, Box 21 617-235-6815

Mass Melrose, W. Doggett, 159 Warwick 617-665-7404

Mich Detroit, Webco, 16542 Wyoming 313-862-4673

Mich Grand Rapids, J. Perry, 2339 Oakwood S.E. 616-949-0271

Mo Kansas City, C. Dunn, 11 E. Gregory 816-HI-4-6212

Mo St. Louis, R. Link, Box 4311 314-AX-1-0330

NM Albuquerque, R. Black, 1025 Hermosa, S.E. 505-265-0144

NY Buffalo, W. Stamp, 127 S. Long St. 716-634-2240

NY Uniondale, A. Crowe, 783 Henry St. 516-485-2622

NC Raleigh, M. Constantino, 2317 McMullan 919-828-8669

Ohio Columbus, A. Ulrich, 1565 Alum Creek 614-253-2706

Ohio Willoughby, B. Ehret, Box 488 216-946-2033

Okla Enid, R. Riddle, 2705 W. Chestnut 405-233-6562

Okla Tulsa, L.W. Hubbell, Box 7573 918-RI-3-9851

Ore Portland, B. Haynes, 401 S.E. 50th Ave. 503-236-2744

Pa Havertown, E. Roberts, 614 Darby Rd. 215-JA-8-6640

Pa Pittsburgh, Box 7904 412-561-8500

Tenn Jackson, D. Hallman, 730 Westwood 901-424-8840

Tex Dallas, D. Cooper, 4914 Greenville Ave. 214-368-5881

Tex Houston, E. Meyer, 6831 Navigation 713-WA-8-3463
Utah Salt Lake, D. Parker, 3385 S. 2770 East 801-466-1159
Wash Seattle, V. Roger, 6361 First Ave. 206-RO-2-3834
For: Can., Scarborough, Ont., B. Preston, Box 102 293-8716 A.C. 416
For: Can., Vancouver, B.C., Simson Maxwell, 1380 W. 6th 736-5431

LAMBDA ELCTRNS., 515 Brd. Hollow Rd., Melville, N.Y., 11746, Tel: 516-694-4200, TWX: 510-224-6484; Sls. Mgr: J. Albers ....Pgs. 777-806
Ariz Mesa 602-962-0327
Cal No. Hollywood, 13425 Wyandotte St. 213-877-0041
Cal Sunnyvale, 575 N. Mathilda Ave. 408-738-2541
Fla Largo, Tanglewood N. 813-595-6500
Ill Schiller Pk., 4849 N. Scott St. 312-671-0182
Ind Indianapolis, 7401 N. Central Ave. 317-631-9557
Md Baltimore 301-243-0035
Mass Lexington, 2 Militia Dr. 617-861-8585
Minn Minneapolis 612-332-6714
NY Melville, 515 Broad Rd. 516-694-4200
NC Greensboro 919-274-5745
Ohio Cleveland 216-771-7447
Pa Warminster, 1093 Little La. 215-272-7101
Tex Houston, 1823 Maux 713-464-6554
For: Can., Pointe Claire, Que., 100C Hymus Blvd. 514-697-6520
EXP: N.Y., Melville, 515 Broad Hollow Rd. 516-694-4200

LAMINAIR, INC., 13226 Figueroa, Los Angeles, Calif., 90061, Tel: 213-321-0545; Sls. Mgr: C.M. Newsom
LAMINATED FABRICATORS, 1145 San Mateo Ave., San Bruno, Calif., 94066, Tel: 415-583-5092; Sls. Mgr: H.L. Jacobs
LAMINATED SHEET PRODS., 127 W. Main St., Millbury, Mass., 01527, Tel: 617-865-5881; Sls. Mgr: R. McQuiggan
LAMINATED SHIM CO., INC., 48 Union St., Glenbrook, Conn., 06906, Tel: 203-325-2631, TWX: 203-327-1184; V.P., Sls. Mgr: M.E. Errico
LAMPKIN LABS., INC., Perico Rd., Bradenton, Fla., 33505, Tel: 813-746-4175; Sls. Mgr: W. L. Pascoe

LAMPS, INC., 19220 S. Normandie Ave., Torrance, Cal., 90502, Tel: 213-323-7578, TWX: 910-346-7038; Sls. Mgr: J.F. Delaney ....Pgs. 1480,1481
Cal Los Altos, Shannon Assocs., One First St. 415-941-2217
Cal Del Mar, McKim Entrprs., 1812 Santa Fe 714-755-2641
Colo Littleton, R-G Entprs., 7272 S. Lincoln Way 303-794-6164
Conn Farmington, R. Perron, 10 Briarwood 203-673-4825
Conn Old Greenwich, Hoffman Engr., Box 300 203-637-1719
Conn Trumbull, R. Perron, 36 Louis St. 203-268-9631
Fla Indian Rock Bch., Tech-Rep., Box 425 813-391-0008
Fla Melbourne, Tech-Rep., Box 2095 305-723-9140
Ga Jonesboro, Tech-Rep., Box 955 404-753-0111
Ill Chicago, Engineered Sls., 4738 N. Harlem 312-867-8434
Md Baltimore, Callas Elctrns., 6409 Frederick 301-744-7711
Mass Norwood, R. Perron, 159 Morse 617-762-8114
Mich Southfield, G. & H. Sls., 24001 Southfield 313-358-1910
Minn Minneapolis, G. Arneson, 4900 Viking 612-920-2086
Mo Bridgeton, F.R. Krabbe, Box 776 314-739-6817
NH Dover, R. Perron, One Elm St. 603-742-2321
NY Fayetteville, Graydon-Sherman, 404 E. Genesee 315-637-9861
Ohio Cincinnati, G. & H. Sls., 10599 Chester 513-771-8231
Ore Beaverton, Arneson, 4175 S.W. Cedar Hill 503-646-3416
Pa Wayne, Emlen-Peterson, 34 West 215-687-3535
Tex Dallas, Scott Tech. Sls., Box 30324 214-352-7698
Wash Seattle, Arneson, 5950 6th Ave., S. 206-762-7664
EXP: Cal., Torrance, Lamps, Inc., 19220 S. Normandie Ave. 213-323-7578

LAMSON & SESSIONS CO., 5000 Tiedeman Rd., Cleveland, Ohio, 44144, Tel: 216-267-5000; Sls. Mgr: E.A. Murray
LANCASTER GLASS CORP., 220-226 W. Main St., Lancaster, Ohio, 43130, Tel: 614-653-0311; Sls. Mgr: B.C. Greenlee
LANCE INDS., P.O. Box 4156, Sylmar, Calif., 91342, Tel: 213-367-1811; Sls. Mgr: J. Updyke
LANCER ELCTRNS. CORP., 1416 W. Main St., Norristown, Pa., 19401, Tel: 215-277-4410; Sls. Mgr: C.E. Anstey
LANDAUER, R.S., JR. & CO., Science Rd., Glenwood, Ill., 60425, Tel: 312-755-7000; Dir. of Sls: A. J. Kawaters

LANDIS & GYR, INC., 4 Westchester Plaza, Elmsford, N.Y., 10523, Tel: 914-592-4400, TWX: 710 567-1219; Sls. Mgr: E. Geide ....Pg. 1337
Ala Huntsville, Craft Assocs. Co., Box 1053 205-837-0221
Cal Los Altos, Recht, 900 N. San Antonio Rd. 415-941-0336
Cal Los Angeles, P. Willey, 1632 Silverlake 213-NO-3-8028
Conn Old Lyme, Aid Engrg., Salt Kettle La. 203-434-5581
Conn Rocky Hill, Aid Engrg., Box 247 203-673-3692
Fla Maitland, Craft Assocs. Co., Box 986 305-645-2242
Ga Atlanta, Craft Assocs. Co., Box 11716 404-237-2282
Haw Honolulu, Berkley Engrg., Box 3856 808-538-1921
Ill Rolling Meadows, Sumer, 5105 Tollview 312-392-7370
Ind Ft. Wayne, Sumer, Inc., 2211 S. Calhoun St. 219-744-4331
Md Glen Arm, Billis Sls., Box 94H-40 301-592-7047
Mass Westboro, Aid Engrg., Box 208 617-839-8181
Mich Detroit, L. Dickelman, 18315 W. Seven Mile 313-255-3300
Minn Mpls., Sumer, 77-10 Computer Ave. 612-920-8414
NJ Cherry Hill, Billis Sls. Co., 14 Galway La. 609-HA-8-3651
NY Mt. Vernon, D. Sonkin, 10 Fiske Pl. 914-668-9809
NY Syracuse, Naylor Elec., 1718 Erie Blvd., E. 315-GR-2-9183
Ohio Cincinnati, L.H. Dickelman, 6914 Silverton Ave. 513-793-2452
Ohio Cleveland, L. Dickelman, 28829 Chagrin Blvd. 216-831-1039
Ore Mercer Island, J. Andersen, Box 637 206-232-0484
SC Greenville, Bond Trans. & Cont., 1214 Laurens 803-288-4590
Tex Dallas, Southland Engr., 1040 W. Mockingbird 214-638-6264
Tex Houston, Southland Engrg., 5810 Schumacher 713-782-4575
Wash Mercer Island, J. Andersen, Box 637 206-232-0484

LANDSVERK ELECTROMETER CO., 641 Sonora Ave., Glendale, Cal., 91201, Tel: 213-245-9281; Sls. Mgr: R.L. Morris
LANE INDS., Elctrns. Div., 7254 Atoll Ave. N., North Hollywood, Calif., 91605, Tel: 213-877-7828; Sls. Mgr: F. Christian
LANSDALE MICROELECTRONICS DIV., Gulton Inds., Inc., 212 Durham Rd., Metuchen, N.J., 08840, Tel: 201-548-2800, TWX: 710-998-0592; Sls. Mgr:

LANSDALE TRANSISTOR & ELCTRNS., INC., 19 Jenkins Ave., Lansdale, Pa., 19446, Tel: 215-855-9002, TWX: 510-661-4932; Sls. Mgr: L. Gana ....Pg. 1808
Cal Los Angeles, L.J.G. Inds., 1720 Pontius Ave. 213-472-8902
Cal Palo Alto, L.J.G. Inds., 201 Town & Country Village 415-327-8272
Ill Chicago, Brock & Cushman, Inc., 6261 W. Grand Ave. 312-CO-1-6313
La Metairie, M. White Engrg., 247 Phosphor Ave. 504-833-3731
Mass Needham, Comp. Rep. Assocs., Inc., 1116 Great Plain Ave. 710-325-6907
Minn St. Paul, Countryman, Wagner & Behnen Co., 1821 University Ave. 612-645-9151
NJ Rivervale, LBS Assocs., 615 John St. 201-391-9400
Ohio Springfield, H. Stobbs, 2279 Seminole Dr. 513-255-4023
Tex Dallas, Mfrs. Mktg. Svc., 10303 Carry Back Cir. 214-357-6893
Tex El Paso, McNicol, Inc., 811 N. Estrella 915-LO-5-8282
Wash Seattle, B. Hirsh Co., 4013 Leary Way 206-783-3423
For: Can., Montreal, Que., Elpro Elctrn. Sls., Ltd., Box 35, Youville Sta. 514-381-8331
For: Can., Oakville, Ont., W. Barron, Box 127 416-845-2224

LANSING, JAMES B. SOUND, 3249 Casitas Ave., Los Angeles, Cal., 90039, Tel: 213-665-4101, TWX: 910-321-4317; Exec. VP Mktg:
LA POINTE INDS., INC., 155 W. Main St., Rockville, Conn., 06066, Tel: 203-875-3351, TWX: 710-435-1663; Pres: J.H. Stillbach
LAPP INSULATOR DIV., INTERPACE CORP., Radio Specialties, 350 Sumner St., LeRoy, N.Y., 14482, Tel: 716-967-6221, TWX: 716-967-2511; Sls. Mgr: Sumner P. Lapp

Advertisement

Lapp Insulator Division of Interpace Corporation manufactures a complete line of high voltage gas-filled capacitors in variable and fixed types for capacitances up to 30,000 mmf, with current ratings up to 400 amps. at 1 mc. Other Lapp products for commercial and military radio broadcast include tower footing and guy insulators, as well as a complete line of antenna strain insulators, standoffs and entrance bushings.

LARK ELCTRNS., INC., 45 Walker St., New York, N.Y., 10013, Tel: 212-925-9060; Sls. Mgr: J. Cole
LA ROSE, W.T. & ASSOCS., Box F, Lansingburg Sta., Troy, N.Y., 12182, Tel: 518-237-6500; Sls. Mgr: J.F. Trembley
LARSEN IMPORTING CO., 140 Nassau St., New York, N.Y., 10038, Tel: 212-233-2490; Sls. Mgr: A. Gordon
LARSON AERO DEV., Box 135, Concord, Calif., 94522, Tel: 415-228-7870; Pres: M.D. Larson
LARSON CHARLES O. CO., P.O. Box "E", Sterling, Ill., 61081, Tel: 815-625-0503; Sls. Pres: C. O. Larson

LARSON INSTR. CO., INC., Greenbush Rd., Orangeburg, N.Y., 10962, Tel: 914-359-3800; Pres: G.E. Larson ....Pg. 513
Ala Huntsville, BJR Research, Box 4422 205-881-3569
Cal Costa Mesa, Meas. Assocs., 2955B Harbor Blvd. 714-540-7160
Cal Sunnyvale, Meas. Assocs., Box 2162 408-739-7785
Fla Orlando, Truex Assocs., 3165 McCrory 305-841-8931
Ill Chicago, Megatek, 1915 N. Harlem 312-889-1277
Ind Richmond, Kennedy Sls., 4423 South B St. 317-966-1933
Kans Leawood, Vasen Sls., 8005 Ensley 816-842-1760
Mich St. Clair Shores, G.C. Davies, 22931 Avalon 313-778-2784
Mo St. Louis, G. Fixman, 8160 Stanford 314-725-5219
NY Syracuse, Tesco Assocs., 2002 Teall Ave. 315-463-4566
Okla Tulsa, Barnard Equip., Box 7002 918-742-2652
Pa Ingomar, R. W. Moulton Assocs., Box 331 412-366-3333
Pa New Britain, Kastle Assocs., 434 E. Butler 215-348-4466
SC Santee, JLH Electro Dynamics, Box 131 803-897-2670
Tex Dallas, IBL Engrg., 219 Preston Royal 214-363-2921
Wash Seattle, Instr. Engrg., 3618 Sea-First Bldg. 206-682-1123
EXP: Can., Montreal, Que., Brian Engrg., 2445 Duncan 514-735-1671

LASER SYS. CORP., 396 W. Washington, Ann Arbor, Mich., 48103, Tel: 313-761-7150; V.P: D.R. Matthews
LASER TECHNOLOGY, INC., 10624 Ventura Blvd., N. Hollywood, Calif., 91604, Tel: 213-763-7091; Sls. Mgr: H B McLaughlin
LASERMETRICS, INC., 19 Legion Pl., Rochelle Park, N.J., 07662, Tel: 201-843-5780; Sls. Mgr: R. Goldstein
LATRONICS CORP., Box 469, Latrobe, Pa., 15650, Tel: 412-539-1626; Sls. Mgr: J.F. Murray
LATTIN RADIO LABS., 1431 Sweeney, Box 44, Owensboro, Ky., 42301, Tel: 502-683-2868; Pres: W.J. Lattin
LAURIER ASSOCS., 2 Vose Rd., Westford, Mass., 01886, Tel: 617-692-2644; Sls. Mgr: L. Wood
LEA MFG. CO., 237 E. Aurora St., Waterbury, Conn, 06720, Tel: 203-753-5116; Sls. Mgr: J.A. Doyle
LEA-RONAL, INC., 272 Buffalo Ave., Freeport, N.Y., 11520, Tel: 516-868-8800; Sls. Mgr: M. Nadel
LEACH CORP., Controls Div., 717 N. Coney Ave., Azusa,, Cal., 91702, Tel: 213-334-8211, TWX: 910-584-1855; Sls. Mgr: G. Long
LEACH CORP., Controls Div., 717 N. Coney Ave., Los Angeles, Cal., 91702, Tel: 213-334-8211; Sls. Mgr: B. Dody
LEACH CORP., Relay Div., 5915 Avalon Blvd., Los Angeles, Cal., 90003, Tel: 213-232-8221; Sls. Mgr: D. Purkey
LEADER INSTR. CORP., 37-27 27th St., Long Island City, N.Y., 11101, Tel: 212-729-7410; V.P: Y. Dobashi
LEAR SIEGLER, INC., 3171 S. Bundy Dr., Santa Monica, Calif., 90406, Tel: 213-391-0666, TWX: 910-343-6463
LEAR SIEGLER, Elctrn. Instr. Div., 714 N. Brookhurst St., Anaheim, Cal., 92803, Tel: 714-774-1010, TWX: 910-591-1157
LEAR SIEGLER, INC., Transportation Support Div., 3333 W. Warner Ave., Santa Ana, Calif., 92704, Tel: 714-546-3060; V.P. Mktg: R.L. Kelly

LEAR SIEGLER, Instr. Div., 4141 Eastern Ave., S.E., Grand Rapids, Mich., 49508, Tel: 616-241-7000, TWX: 810-273-6929; V.P. Contr: G.R. Anderson
LEAR SIEGLER, INC., Romec Div., 241 S. Abbe Rd., Elyria, Ohio, 44035, Tel: 216-323-3211, TWX: 216-322-7265; Sls. Mgr: R.N. MacLeod
LEBOW ASSOCS., INC., 1728 Maplelawn Rd., Troy, Mich., 48084, Tel: 313-642-1220, TWX: 810-232-4818; Sls. Mgr: C.E. Storie
LECROY RESCH. SYS. CORP., 126 N. Rte. 303, West Nyack, N.Y., 10994, Tel: 914-358-7900, TWX: 710-575-2629; Sls. Mgr: A. Michalowski
LECLANCHE S A, 48 Ave De Grandson, CH 1401-Yverdon, Switzerland
LECTRODRYER DIV., McGraw-Edison Co., P.O. Box 4599, Pittsburgh, Pa., 15205, Tel: 412-923-2970; Sls. Mgr:
LECTRODYNE SYS. CORP., 1234 Carpenter St., Philadelphia, Pa., 19147, Tel: 215-463-8585; Sls. Mgr: S. Shankin
LECTROETCH, 14925 Elderwood Ave., E. Cleveland, Ohio, 44112, Tel: 216-451-8080; Sls. Mgr: E. Badt

LECTROHM, INC., Sub. Cook Elec., 5562 Northwest Hwy., Chicago, Ill., 60630, Tel: 312-763-1700; Sls. Mgr: M. Forester ....Pgs. 1760,2854-2856
Ariz Phoenix, Lange Assocs., 221 W. Seminole Dr. 602-942-0724
Cal Inglewood, V & L, 3412 W. Century Blvd. 213-671-7688
Cal Menlo Pk., Frauman Assocs., Box 969 415-322-8461
Colo Aurora, Robbins & Assocs., Box 948 303-399-6618
Fla Cutz, S.K. Wallace, Box 67 813-949-1817
Ga McDonough, S.K. Wallace, Box 190 404-957-2156
Ill Chicago, Rinaldi Sls. Co., 6319 N. Central 312-763-4848
Iowa Cedar Rapids, Engrg. Svcs., 1026 3rd Ave., S.E. 319-366-1591
Kans Praire Vlg., Engrg. Svcs., 7924 A State Line 913-649-4000
Mass Sherborn, Naton, 42 Old Field 617-789-5645
Mo St. Louis, Engrg. Svcs., 6717 Vernon Ave. 314-726-2233
NJ Ft. Lee, S. Justin, Box 1068 201-947-4371
NC Kernersville, S.K. Wallace, Box 526 919-993-3993
Ohio Wickfiffe, D. Steffen, 30212 Lakeland 216-944-8080
Ohio Dayton, D. Steffen & Assoc., 1201 Hempstead 513-293-3145
Tenn Memphis, S.K. Wallace, 5960 Brierdale Cove 901-682-2281
Tex Dallas, T. Curtis, 5635 Yale Blvd. 214-361-1666
Wisc Milwaukee, Star Engrg., 7328 W. Burdick 414-543-3469
LECTROMAGNETICS, 6056 W. Jefferson Blvd., Los Angeles, Cal., 90016, Tel: 213-870-9383; Sls. Mgr: F.J. Nichols

LEDEX, INC., 126 Webster St., Dayton, Ohio, 45402, Tel: 513-224-9891, TWX: 513-944-0286; Dir. Mktg. E. Hoffman .... Pgs. 1542,1619-1621,1936-1940
Ariz Phoenix, Barnhill Five, 537 E. Osborn 602-263-1250
Cal Inglewood, Ledex, Inc., 1621 Centinela 213-670-6112
Cal Los Angeles, Galaxie Sls. Int'l., 1930 Wilshire Blvd. 213-483-0910
Cal Palo Alto, Testco, 941 Charleston Rd. 415-326-5320
Colo Denver, Barnhill Five, 1170 S. Sheridan 303-934-5505
Fla Clearwater, W. Wimberly, 532 S. Ft. Harrison 813-446-7072
Fla Orlando, W. Wimberly, 500 S. Osceola 305-425-3083
Ill Lombard, Strain Sls. Co., 1028 Cherry La. 312-627-7696
Kans Prairie Vlg., Thunderbird Tech., 4014-A W. 95th St. 913-642-7220
Kans Wichita, Thunderbird Tech., 7707 E. Osie 316-684-3941
Mass Lexington, K. Stevens, 442 Marrett 617-862-1812
Mich Lathrup Vlg., R. Nordstrom, Box 32 313-444-4417
Minn Minnetonka, T. Ayre, 5509 Eden Prairie 612-935-2191
Mo St. Louis, Thunderbird Tech., Box 12849 314-542-6488
NY Liverpool, L. Garner, Box 56 315-652-7911
NY Oceanside, Bittan Assocs., 400 Merrifield 516-678-6222
NC Raleigh, A.B. Andrews Co., Box 2627 919-833-5565
Ohio Dayton, Dynel Co., Box 7, Centerville Br. 513-434-6467
Pa Philadelphia, V.S. Malta, Box 4007 215-836-5122
Pa Pittsburgh, R. Clark, 10517 Lindberg 412-242-9500
Dallas, Thunderbird Tech., 5526 Dyer 214-368-3064
Wash Seattle, Testco, 219 Boeing Field 206-762-8220

LEECRAFT MFG. CO., INC., 21-16 44th Rd., Long Island City, N.Y., 11101, Tel: 212-392-8800; Sls. Mgr: T.J. Marine ....Pg. 1482
Ark Hot Springs, M. Young & B.M. Triggs, Rte. 2, Box 705 501-262-1365
Cal Fremont, Kelly & Kenman, Box 328 415-863-2200
Cal Chatsworth, Hansen, 9139 Lurline 213-225-8114
Colo Broomfield, Arrowhead Sls., 7943 W. 98th 303-222-6462
Conn Bloomfield, Zaslow Sls., 6 Newberry 203-242-7781
Fla Miami Bch., Geartner, 1125 71st St. 305-861-3661
Ill Hinsdale, Hill & Gray, 2 Salt Creek La. 312-325-4810
Ind Angola, Southern Sls., 105 Lakeshore 219-665-3961
Iowa Des Moines, K-S-W, 3831 43rd St. 515-279-9235
Ky Louisville, Southern Sls. Co., 212 Republic Bl. 502-583-6902
Md Hyattsville, L. Lowery, 6200 Annapolis 301-773-4977
Mass Lowell, Zaslow Sls., 3999 Middlesex 617-458-8452
Mich Royal Oak, C. Jensen, 26711 Woodward 313-399-0900
Minn St. Paul, R. Ragon, 1136 W. Larpenteur 612-488-6634
Mo Kansas City, K-S-W, 7546 Troost Ave. 816-363-5651
Mo St. Louis, K-S-W, 3219 Hampton Ave. 314-781-6111
NM Albuquerque, Arrowhead Sls., Box 243 505-268-9706
NY Cazenovia, A.L. Perkins, 3994 East Rd. 315-682-5005
NC Charlotte, B.M. Triggs, Box 17844 704-376-4619
Ohio Cleveland, Anderson-Bolds, 10001 Carnegie 216-229-4700
Ore Portland, A. Stroum, 8888 S.W. Canyon 503-292-3534
Pa Broomall, L.D. Lowery, Box 209 215-356-5300
Tenn Chattanooga, Shipley Sls. Co., Box 4051 615-266-6235
Utah Salt Lake City, Arrowhead Sls., 49 W. Malvern 801-487-3444
Wash Seattle, Almac Stroum, 5811 6th Ave., S. 206-763-2300
EXP: N.Y., N.Y., Roburn Agencies, 345-349 W. 14th St. 212-989-5939
For: Can., Scarborough, Ont., Lake Engrg., 123 Manville 416-751-5980
LEEDS & NORTHRUP CORP., Sumneytown Pike, No. Wales, Pa., 19454, Tel: 215-643-2000; Sls. Mgr: J.P. Puckett
LEESONA CORP., Coil Winding Machinery Div, Mirybrook Rd., Danbury, Conn., 06810, Tel: 203-744-5510; Sls. Mgr: H.R. Snider

Advertisement

The Coil Winding Machinery Division sells a complete line of wire winding equipment for the Electronic Industry. Engineering, manufacturing, tooling, sales and service facilities for bobbin coil, stick, heavy duty and toroidal winding machinery are located in Danbury, Conn. Application Engineering services available to solve your production problems.

LEGI ELCTRNS. CORP., 3118A W. Jefferson Blvd., Los Angeles, Cal., 90018, Tel: 213-737-1521 Pgs. 1483-1486
Cal Burlingame, Leddy Assocs., 1319 Howard Ave. 415-347-5247
NY Tuckahoe, Rotondi Assocs., 16 Fisher Ave. 914-961-4338
LEHIGH VALLEY ELCTRN., INC., Box 125, Fogelsville, Pa., 18051, Tel: 215-285-4211; Sls. Mgr: P.D. Donahue
LEHIGHTON ELCTRNS., INC., Box 281, Lehighton, Pa., 18235, Tel: 717-386-4156; Sls. Mgr: J.A. Mandour

Advertisement

Let Lehighton Electronics, Inc. be your one stop high quality fast delivery source for artwork, printed circuit boards and assemblies, special and catalog test, production and automation equipment and switchgear. Please send your specifications and drawings for fast competitive pricing.

LEICO INDS., INC., 250 W. 57th St., New York, N.Y., 10019, Tel: 212-765-5290; Sls. Mgr: E. Sherer
LEKTRA LABS., INC., 129-07 18th Ave., College Point, N.Y., 11356, Tel: 212-939-7171; Sls. Mgr: F.L. Chilton
LEM INSTRUMENT CORP., 20 Sarah Dr., Farmingdale, N.Y., 11735, Tel: 516-293-7240; Sls. Mgr: F. Lowell
LEMOSA, INC., 465 California St., San Francisco, Cal., 94104, Tel: 415-989-5515; Sls. Mgr: F. Yoshida
LENCO, INC., 319 W. Main, Jackson, Mo., 63755, Tel: 314-243-3141; Sls. Mgr: R.W. Poe
LENK MANUFACTURING CO., INC., Franklin, Ky., 42134, Tel: 502-586-3231; Office Mgr: M. Daoust
LENOX-FUGLE ELCTRNS., INC., 100 Sylvania Pl., S. Plainfield, N.J., 07080, Tel: 201-756-1164; Sls. Mgr: H.J. Lenox
LENOX INSTR. CO., 121 E. Luray St., Philadelphia, Pa., 19120, Tel: 215-DA-4-4543; Sls. Mgr: J.W. Lang Jr.
LENZ ELEC. MFG. CO., 1751 N. Western Ave., Chicago, Ill., 60647, Tel: 312-276-4454; Sls. Mgr: R.G. Zender
LEPEL HIGH FREQUENCY LABS., 59-21 Queens-Midtown Expwy., Maspeth, N.Y., 11378, Tel: 212-HA-6-4580; Regional Sls. Mgr: J. Cioffi
LEUPOLD & STEVENS, INC., Box 688, Beaverton, Ore., 97005, Tel: 503-646-9171; Sls. Mgr: C.W. Fetty
LEVELL ELECTRONICS LTD., Park Rd., High Barnet, Herts,, England, Tel: 01-449-5028; Sls. Mgr: M Yemm
LEVIANT INT'L., 641 Lexington Ave., New York, N.Y., 10022
LEVITON MFG. CO., INC., 236 Greenpoint Ave., Brooklyn, N.Y., 11222, Tel: 212-EV-3-4500, TWX: 212-366-3247; Sls. Mgr: J. Amsterdam
LEWIS CORP., Rte. 6, Woodbury, Conn., 06798, Tel: 203-263-2158; Pres: R.L. Hunicke
LEWIS ENGRG. CO., 550 Spring St., Naugatuck, Conn., 06770, Tel: 203-729-5253; Dir. Mktg: J.E. Nicholas
LEWIS G. B. CO, 426 Montgomery St., Watertown, Wisc, 53094, Tel: 414-261-3162; Sls. Mgr: R. Zimmerman
LEYBOLD-HERAEUS, Seco Rd., Monroeville, Pa., 15146, Tel: 412-372-8800; Sls. Mgr: D. Meyers
LGM ELCTRNS., INC., 4304 La Branch St., Houston, Tex., 77004, Tel: 713-524-8383

LIBERTY CONTROLS, Div. Liberty Leasing Co., Inc., R.F.D. 5, Joliet, Ill., 60431, Tel: 815-725-2241; Sls. Mgr: D.J. Fumagalli ....Pgs. 1746-1749
Cal Burlingame, Peters de Laet, 1606 Rollins 415-697-1800
Cal Hawthorne, Peters de Laet, 13845 S. Hawthorne 213-772-4226
Cal Sacramento, Peters de Laet, 910 15th 916-442-0769
Colo Denver, Peters de Laet, Hilton Off. Bldg. 303-255-2171
Fla Ft. Lauderdale, R. Carlson, 3071 N.W. 47th Terr. 305-733-0811
Ind La Fontaine, Kirsch Sls., 107 Wabash 317-981-2801
La New Orleans, Glidden Engrg., Box 10442 504-835-6204
Md Towson, C. Newson, 16 Skidmore 301-825-0001
Minn St. Paul, Countryman Assocs., 1821 University 612-645-9151
Mo St. Louis, R. Carlson, 8721 Manchester 314-961-4485
NJ Middletown, D.A. Rugg, 2 Dove Ct. 201-671-0662
NY Buffalo, Niagara Elec. Sls., 505 Delaware 716-886-4000
NY Rochester, Niagara Elec., 55 Canterbury 716-271-1223
Ohio Cleveland, E. Bock, 18838 Canyon 216-331-5212
Okla Tulsa, H. Furtney Co., Box 7081 918-747-6490
Ore Portland, Peters de Laet, 5937 N. Greeley 503-285-7703
Pa Phila., C. Newson, 711 Bethlehem Pike 215-248-3377
Tex Dallas, Glidden Engrg., 8609 Northwest Plaza 214-363-6539
Tex Houston, Glidden Engrg., 7728 Long Pt. 716-681-1415
Utah Salt Lake City, Peters de Laet, 323 W. 1410, S. 801-484-7649
Wash Spokane, Peters de Laet, 11 S. Jefferson 509-624-0137
Wash Spokane, Peters de Laet, 1703 Nagle Pl. 206-322-2215
LIBERTY MIRROR DIV., Libbey-Owens-Ford Co., 851 Third Ave., Brackenridge, Pa., 15014, Tel: 412-224-1800, TWX: 510-467-4624; Sls. Mgr: J.R. Drake

LICON DIV., Illinois Tool Works, 6615 W. Works Rd., Chicago, Ill., 60634, Tel: 312-282-4040, TWX: 910-221-0275; Mktg. Mgr: J. Aylward Pgs. 357,1934,1935
Cal Los Angeles, Licon, 5431 Sheila St. 213-723-1181
Cal Menlo Pk., McKnight Co., 115 Spruce 415-325-2844

Colo Denver, Elctrn. Comps., 4785 S. Quebec 303-771-6200
Fla Clearwater, W. Wimberly, 532 S. Ft. Harrison 813-446-7072
Fla Orlando, W. Wimberly, 500 S. Osceola 305-425-3083
Ga Atlanta, Grady Duckett Sls., Box 29067 404-451-3529
Ill Chicago, Licon, 6615 W. Irving 312-282-4040
Md Ellicott City, McCourt Co., Chevrolet Ave. at St. Johns 301-465-4515
Kans Overland Pk., Penzner-Mankus, Box 6264 913-381-0004
Kans Wichita, Penzner-Mankus, Box 11252 316-782-3684
Mass Lexington, J. Griffin, Box 640 617-891-7741
Mich Dearborn, Villani-Pitcher, 20203 Ann Arbor Trail 313-271-4600
Minn Minneapolis, Wenco Sls., 7728 Morgan S. 612-866-3639
Mo Hazelwood, J. Mankus, 400 Brookes 314-731-4334
Neb Lincoln, Mktg. Assoc., 1200 N. 79th St. 402-434-5244
NM Albuquerque, Elctrn. Comps., 1811 Carlisle, N.E. 505-256-9831
NY Massapequa, J.F. Coughlin, Box 281 516-799-7743
NY Syracuse, Licon, Div. I.T.W., 3650 James 315-437-8525
NC Greensboro, Grady Duckett, Box 22002 919-273-4617
Ohio Euclid, Rockford Controls, 26100 Brush 216-731-5250
Ohio Columbus, Rockford Controls, Box 6523 614-231-5890
Ohio Dayton, Rockford Controls, 2077 Embury Pk. 513-278-7362
Pa Newtown Sq., Kaufholz Assocs., Box 273 215-356-5000
Tex Dallas, Evans-McDowell, Box 35093 214-351-1839
Utah Salt Lake City, Electrn. Comps., 445 E. 2nd S. 801-355-5327
Va Richmond, McCourt Co., 100 Damascus 703-266-8490
Wash Seattle, Licon, I.T.W., 331 Andover E. 206-CH-2-1288
For: Can., Don Mills, Ont., Illinois Tools, 67 Scarsdale

LIEBEL-FLARSHEIM CO., Div Sybron Corp., 111 East Amity Rd., Cincinnati, Ohio, 45215, Tel: 513-761-2700; V.P. Mktg: J.T. Johnson

LIECO, INC., 80 E Montauk Hwy., Lindenhurst, N.Y., 11757, Tel: 516-884-4300; Sls. Mgr: E. Lark

LIGHT ELEC. CORP., 50 Indel Ave., Rancocas, N.J., 08073, Tel: 609-267-6750; Sls. Mgr: L. Torcicollo Pgs. 808,809

Cal No. Hollywood, Crown Elctrns., 5657 Lankershim Blvd. 213-877-3550
Colo Denver, Space Sys. Sls. & Engrg., 5810 W. 38 Ave. 303-424-5574
Ill Chicago, Communications Engrs., 7106 N. Western Ave. 312-761-0548
Ill K.W. Meyers Co., 7256 W. Touhy Ave., 312-774-6440
Kans Leawood, Leemark Engrs., Box 6175 913-648-0124
Mass Wellesley Hills, Anchor Engrg., 40 Washington St. 617-235-6330
NJ Cherry Hill, Benco Sls., 112 E. Ormond Ave. 609-429-5515
NJ Englewood Cliffs, Power Conversion & Control, Box 1251 201-569-0015
NM Albuquerque, Space Sys. Sls. & Engrg., Box 9063 505-247-0458
NY Brooklyn, Alto Assocs., 1125 E. 4th St. 212-253-6295
Ohio Avon Lake, Doyle Sls., 321 Bellaire Rd. 313-533-0033
Pa Pittsburgh, Weiss Instrs., 6 Barton Dr. 412-371-3020
Tex Dallas, R. Martin Assocs., Box 64513 214-358-3704
Tex Houston, R. Martin Assocs., Box 19291 713-468-3877

LINCOLN ELEC. CO., 22801 St. Clair Ave., Cleveland, Ohio, 44117, Tel: 216-481-8100; Sls. Mgr: A.F. Boucher

LINDBERG HEVI-DUTY, Div. Sola Basic Inds., 2450 W. Hubbard St., Chicago, Ill., 60612, Tel: 312-666-3443

LINDEN LABS., INC., Box 920, State College, Pa., 16801, Tel: 814-383-2308; Sls. Mgr: J.W. Anderson

LINDGREN, ERIK A. & ASSOC., 4515 - 17 N. Ravenswood Ave., Chicago, Ill., 60640, Tel: 312-LO-1-0408; Pres: R. Felice

Advertisement

Lindgren manufactures screen and solid RFI/EMI shielded enclosures to satisfy all requirements for industry, research & development, government and bio-medical. We meet or exceed all applicable Mil Specs and Mil Stds. and provide sizes from single work stations to shielding whole laboratories or production lines. Write or call for catalog.

LINDSAY ANTENNA & SPECIALTY PRODS., 50 Mary St., Lindsay, Ont., Canada, Tel: 705-324-2196; Sls. Mgr: J. Thomas

LINDSAY STRUCTURE, Div. Int'l. Steel Co., 1360 Edgar St., Evansville, Ind., 47710, Tel: 812-425-3311; Sls. Mgr: W.H. Beastall

LINE ELEC. DIV., Singer Co., U.S. Hwy. 287, Parsippany, N.J., 07054, Tel: 201-887-8200; Sls. Mgr: P. Mariniello

LINEAR ALPHA, INC., 823 Emerson, Evanston, Ill., 60201, Tel: 312-475-1730; Sls. Mgr: Dr. E.H. Wakefield

LINEAR CORP., 347 S. Glasgow Ave., Inglewood, Calif., 90301, Tel: 213-678-4242; Sls. Mgr: M.A. Schanbacher

LINEAR NETWORKS CO., Box 1328, San Pedro, Cal., 90733, Tel: 213-547-2258; Sls. Mgr: J.L. Hogin

LINEAR SYS., INC., 220 Airport Blvd., Watsonville, Calif., 95076, Tel: 408-722-4177; V.P. Mktg: D.K. Bradley

LINELL ENGRG. CORP., 2852 N. Cicero Ave., Chicago, Ill., 60641, Tel: 312-283-0451; Sls. Mgr:

LINEMASTER SWITCH CORP., Box 52, Woodstock, Conn., 06281, Tel: 203-928-6538; Sls. Mgr: W.O. Johnson

LING ELCTRNS., Div. LTV Ling Altec, 1515 S. Manchester Ave., Anaheim, Calif., 92803, Tel: 714-774-2000, TWX: 910-591-1142; Sls. Mgr: H.L. Proppe

LINGENFELTER APPLIED TECH., 9101 Gaither Rd., Gaithersburg, Md., 20760, Tel: 301-948-9002; Sls. Mgr: J. Lingenfelter

LINK DIV., Singer Co., Binghamton, N.Y., 13902, Tel: 607-772-3011, TWX: 510-252-0195; V.P. Mktg: W.D. Turner

LION PRECISION DIV., Lion Resch. Corp., 60 Bridge St., Newton, Mass., 02195, Tel: 617-969-4710 L. Michelson

Advertisement

Lion Precision specializes in the manufacture of precision industrial gaging equipment for non-contact measurement using capacitance. Equipment includes low pressure transducers, flowmeters, thickness gages, spring gages, wire gages, sorting chutes, controllers, carbon dioxide sensore, reflectometers and emissometers.

LIONMOUNT & CO., LTD., Bellevue Rd., New Southgate, London, England, Tel: 01-368-7047; Sls. Mgr: M. Lowenberg

LIPPS, INC., 1630 Euclid St., Santa Monica, Calif., 90404, Tel: 213-393-0449; Sls. Mgr: R.J. Cross

LIQUID CRYSTAL INDS., INC., 460 Brown Ave., Turtle Creek, Pa., 15145, Tel: 412-823-4300; Sls. Mgr: A.L. Gursha

LISK, G.W. CO., 5019 South St., Clifton Springs, N.Y., 14432, Tel: 315-462-2611; Sls. Mgr: R.A. Nelson

Advertisement

Design, develop, and manufacture standard and special military and commercial Linear and Rotary Solenoids. Also Rotary stepping actuators, both uni-directional and bi-directional for Rotary switches, waveguide switches, flag indicators, and similar applications.

LISTENING, INC., 6 Garden St., Arlington, Mass., 02174, Tel: 617-643-4100; Sls. Mgr: J. Cook

LITTELFUSE, INC., 800 E. Northwest Hwy., Des Plaines, Ill., 60016, Tel: 312-824-1188, TWX: 910-233-3598; Exec. V.P: W. Clements

LITTLE FALLS ALLOYS, INC., 189 Caldwell Ave., Paterson, N.J., 07501, Tel: 201-525-1014, TWX: 710-988-5923; Sls. Mgr: J.D. Fisk

LITTON ENGRG. LABS., Box 669, Carson City, Nev., 89701, Tel: 702-882-0590; Pres: C.V. Litton

LITTON INDS., Electron Tube Div., 960 Industrial Rd., San Carlos, Calif., 94070, Tel: 415-591-8411, TWX: 910-376-4900; Sls. Mgr: B. Silver

LITTON INDS., Potentiometer Div., 226 E. Third St., Mt. Vernon, N.Y., 10550, Tel: 914-664-7733, TWX: 710-562-0129; Sls. Mgr: G. Erbe

LITTON INDS., Useco Div., 13536 Saticoy St., Van Nuys, Calif., 91409, Tel: 213-786-9381; Sls. Mgr: T. Balzer

LITTON SYS., INC., Guidance & Control Sys. Div., 5500 Canoga Ave., Woodland Hills, Calif., 91364, Tel: 213-887-3702, TWX: 910-494-2091; Sls. Mgr: W.C. McAtee

LIVINGSTON ELCTRN., Div. Jettron Prods., Box 7, 58 Rte. 10, Hanover, N.J., 07936, Tel: 201-887-0571, TWX: 710-986-8243; Sls. Mgr: B. Leroe

LM ERICSSON, Electron Tube Div., 215 Park Ave S., New York, N Y, 10003, Tel: 212-677-8400

LOCHART INDS., INC., 15707 Texaco Ave., Paramount, Cal., 90724, Tel: 213-774-2981; Sls. Mgr: E.H. Lockhart

LOCKHEED AIRCRAFT SVC., Ont. Intl. Airport, Ont., Cal., 91764, Tel: 714-984-1234, TWX: 714-556-9517; Dir. Sls. & Mktg: W.H. Snyder

LOCKHEED AIRCRAFT SVCE., Special Devices Div., Ontario Int'l. Airport, Ontario, Calif., 91764, Tel: 714-984-1234, TWX: 714-556-9517; Div. Mgr: D.C. Shea

LOCKHEED ELCTRNS. CO., Rte. #22, Watchung, N.J., 07060, Tel: 201-757-1600, TWX: 710-997-9541; Sls. Mgr: M.A. Tutino

LOCKHEED ELCTRNS. CO., Data Prods. Div., 6201 E. Randolph, Los Angeles, Calif., 90040, Tel: 213-722-6810, TWX: 910-580-3623; Dir. Mktg: D. Kreiger

LOCTITE CORP., 705 N. Mountain Rd., Newington, Conn., 06111, Tel: 203-278-1280

LOCUS, INC, 906 West College Ave., State College, Pa., 16801, Tel: 814-273-0301; Sls. Mgr: R.L. Riddle

LOGETRONICS, INC., Dryomatic Div., 6628 Electronic Dr., Springfield, Va., 22151, Tel: 703-354-4500; Sls. Mgr: H.E. Puttbach

LOGIMETRICS, Sub. Slant/Fin Corp., 100 Forest Dr., Greenvale, N.Y., 11548, Tel: 516-484-2222; Sls. Mgr: G.D. Arzt .... Pgs. 514,515

Ala Huntsville, J. Highsmith, Holiday Off. Ctr. 205-881-3294
Ariz Scottsdale, Scien. Devices-SW, 8202 E. Sheridan 602-946-0333
Cal Inglewood, L&M Engrg., 9911 Inglewood 213-674-6850
Cal Santa Clara, L&M Engrg., 3242 McKinley 408-243-2891
Colo Denver, Scien. Devices, 2765 S. Colorado 303-758-1888
Fla Orlando, J. Highsmith, 254-3 Industrial 305-293-5202
Haw Honolulu, Aloha Assocs., 225 Lilioukalani 808-922-3810
Ill Chicago, P. Lind Elctrns., 5483 Northwest 312-774-1246
Ind Indianapolis, P. Lind Elctrns., 3969 Meadows 317-547-9178
Md Silver Spg., Brimberg Assocs., 814 Thayer 301-588-7790
Kans Overland Pk., Tech. Reps., 9009 W. 95th 913-381-5852
Mass Burlington, R. Sickles, 12 Cambridge 617-272-7285
Mich Detroit, H. Teplitz, 26847 Grand River 313-537-9058
Minn Circle Pines, P. Lind Elctrns., 10104 Sunset 612-786-5770
Mo Florissant, Tech. Reps., 525 St. Francois 314-838-9100
NJ Englewood, Scien. Devices - East, 95 Cedar 201-871-3916
NJ Hazlet, Mer. Mon. Elctrn. Instr., Box 302 201-264-1851
NM Albuquerque, Scien. Devices, 4300 Silver, S.E. 505-268-6729
NY N. Syracuse, Naco Elctrns., Box 248 314-699-2651
NC Charlotte, J. Highsmith, 3733 Monroe 704-333-7743
Ohio Cleveland, H. Teplitz, 3945 Meadowbrook 216-371-2044
Ohio Dayton, H. Teplitz, 3718 Salem 513-277-6531
Pa Fairview Vge., Acromatix Assocs., Box 271 215-279-0377
Tex Houston, Scien. Devices, 3827 Richmond 713-623-4250
Tex Richardson, Scien. Devices, 312 N. Central 214-231-8106
Wash Bellevue, Brennan, 208 Carlson Bldg. 206-454-9332

LOGITEK, INC., 42 Central Dr., Farmingdale, N.Y., 11735, Tel: 516-694-3080; Sls. Mgr: A. Partner Pgs. 1338,1750-1759

LONDON CHEMICAL CO., 240 Foster Ave., Bensenville, Ill., 60106; Sls. Mgr:

LONDON CO., 811 Sharon Dr., Cleveland, Ohio, 44145, Tel: 216-871-8900 .... Pg. 516

Cal Pasadena, Wright Eng., 155 W. Bellevue 213-681-2651

Cal Los Altos, Wright Eng., 175 S. San Antonio 415-941-4405
Colo Denver, Applied Tech. Prods., 5120 Havana 303-364-7248
Conn Glastonbury, Instr. Rep., Box 165 203-633-0777
Fla Miami, Scott Instrs., 8821 S.W. 129 Terr. 305-235-7888
Ill Chicago, Berndt Assoc., 6200 N. Hiawatha 312-283-0713
Mass Arlington, Instr. Reps., 1046 Massachusetts 617-646-1034
Mich Royal Oaks, Satullo, 4514 N. Woodward 313-549-3910
NJ Rockaway, Data-Rep., Box 245 201-625-2233
NY Huntington Sta., Data-Rep., Box 164 516-423-7677
Ohio Cleveland, Satullo, 16801 Euclid 216-486-2800
Ohio Dayton, Satullo, 2801 Far Hills 573-293-7061
Pa Norristown, Data-Rep., Box 349 215-279-8210
Wash Seattle, Dewar, 6361 First Ave., S. 206-763-2233

LONG, T.J., INC., 215 Stonehinge La., Carle Pl., N.Y., 11514, Tel: 516-334-2300; Sls. Mgr: N.A. Terry

LORAL ELCTRN. SYS., Div. Loral Corp., 825 Bronx River Ave., Bronx, N.Y., 10472, Tel: 212-TI-2-9500; V.P. Mktg: G Blanton

LORANGER MFG. CORP., Box 948, Warren, Pa., 16365, Tel: 814-723-8600; Sls. Mgr: J.A. Loranger Jr.

LORCH-ADRET CORP., 105 Cedar La., Englewood, N.J., 07631, Tel: 201-569-8282, TWX: 710-991-9718; Mktg. Mgr: N.A. Ellen ....Pg. 517

Ariz Phoenix, Williams, 2250 N. 16th St. 602-254-6085
Cal Los Angeles, R.F. Assocs., 1621 Pontius 213-478-1586
Cal Palo Alto, R.F. Assocs., 800 San Antonio 415-327-5531
Colo Denver, Williams Assocs., 4971 Jackson 303-388-4391
Ill Chicago, Marsland Assocs. 312-775-1309
Ill Des Plaines, Marsland, 1000 Executive Way 312-298-2620
Ind Indianapolis, Marsland, 3734 Carrollton Ave. 317-924-3568
Md Randallstown, F. Groman, 3904 Bryony 301-922-1994
Mass Reading, Geder Assocs., 39 Cross 617-944-3105
Minn Mpls., Marsland, 231 N. Edgewood Ave. 612-545-4481
Mo Florissant, Marsland, Box 567 314-831-0015
NJ River Edge, Tecnimat, Box 233 201-265-9730
NM Albuquerque, Williams, 420 Wash., S.E. 505-255-1638
NY Liverpool, R & D Assocs., 109 Woods-Path 315-622-2350
Ohio Dayton, Manrep Assocs., 745 Salem 513-278-6111
Pa Jenkintown, Amtec, 730 Wash. La. 215-549-2080
Tex Arlington, Packard-Speairs, 803 Ave. "H" East 817-261-4424
Tex San Antonio, Ashcraft, 6936 Van Pedro St. 512-824-7267
Utah Salt Lake City, Williams, 2461 S. Main St. 801-466-8709
Wash Seattle, G.M. Gillett, Box 99035 206-284-3344
For: Can., Ottawa, Ont., L. Albert, 281 Palace 613-746-0021

LORCH ELCTRNS. CORP., 105 Cedar La., Englewood, N.J., 07631, Tel: 201-569-8282, TWX: 710-991-9718; Mktg. Mgr: N.A. Ellen ....Pg. 609

Ariz Phoenix, Williams, 2250 N. 16th 602-254-6085
Cal Los Angeles, R.F., 1621 Pontius 213-478-1586
Cal Palo Alto, R.F., 800 San Antonio 415-327-5531
Colo Denver, Williams Assocs., 4971 Jackson 303-388-4391
Ill Des Plaines, Marsland, 1000 Executive Way 312-298-2620
Ind Indianapolis, Marsland, 3734 Carrollton 317-924-3568
Md Randallstown, F. Groman, 3904 Bryony Rd. 301-922-1994
Mass Reading, Geder Assocs., 39 Cross St. 617-944-3105
Minn Mpls, Marsland, 231 N. Edgewood Ave. 612-545-4481
Mo Florissant, Marsland Assoc., Inc., Box 567 314-831-0015
NJ River Edge, Technimat, Box 233 201-265-9730
NM Albuquerque, Williams, 420 Washington, S.E. 505-255-1638
NY Liverpool, R & D Assocs., 109 Woods-Path 315-622-2350
Pa Jenkintown, AMTEC, 730 Washington La. 215-549-2080
Tex Arlington, Packard-Speairs, 803 Ave. "H" 817-261-4424
Tex San Antonio, Ashcraft, 6936 Van Pedro St. 512-824-7267
Wash Seattle, G. Gillett, Box 99035 206-284-3344
EXP: N.Y., New York, Lindor Int'l., 10 E. 40th St. 212-685-6740
For: Can., Ottawa 7, Ont., L. Albert, 281 Palace 613-746-0021

LORD MFG. CO., Div. Lord Corp., 1635 West 12 St., Erie, Pa., 16512, Tel: 814-456-8511, TWX: 510-696-6672; Sls. Mgr: J. Michel

LORLIN INDS., INC., Precision Rd., Danbury, Conn., 06810, Tel: 203-744-0096; Mktg. Mgr: R.C. Lancaster

LOYOLA INDUSTRIES, INC., 155 Arena St., El Segundo, Calif., 90245, Tel: 213-322-6140; Sls. Mgr: Q.P. Thompson

LPS RESEARCH LABS., 2050 Cotner Ave., Los Angeles, Cal., 90025, Tel: 213-478-0095; Sls. Mgr: Nick Barton

LTV ELECTROSYSTEMS, Garland Div., Box 6118, Dallas, Tex., 75222, Tel: 214-BR-6-7111, TWX: 214-276-8576; Mgr. Mkt. Plan: D. Dirks

LTV ELECTROSYSTEMS, Memcor Div., Comps. Oper., 1320 Flaxmill Rd., Huntington, Ind., 46750, Tel: 219-356-4300, TWX: 810-333-1531; Sls. Mgr: J.H. Kinnaw Pgs. 2857,2922

Ala Huntsville, Murphy & Cota, 904 Bob Wallace 205-539-8476
Cal Los Angeles, W. Barron, 1406 S. Grand 213-748-6191
Cal San Carlos, D. Ross, 1095 Ind'l. 415-591-4411
Colo Denver, Gossard, 12159 W. Dakota 303-985-0602
Fla Orlando, Geartner, 1221 Lee Rd. 305-299-1000
Fla Miami Beach, Geartner, 1125 71st. St. 305-861-3661
Ga Atlanta, Murphy & Cota, 500 Plasamour, N.E. 404-875-2525
Ind Lafontaine, Kirsch Sls. Co., 107 Wabash Ave. 317-981-2801
Iowa Marion, Thomas-Modrcin, 819 17th 319-377-6261
Kans Shawnee Mission, Thomas-Modrcin, 5450 Buena Vista 913-432-2131
Md Baltimore, Brothers & Conneen, 6302 Lincoln Ave. 301-764-7189
Md Baltimore, Brothers & Conneen, 1620 Myamby 301-823-5063
Md Baltimore, Brothers & Conneen, 4391 Crestheights 301-486-6127
Mass Randolph, O. H. Marks, 16 Vine St. 617-963-8464
Mich St. Clair Shores, J. Thorpe, 38915 Harper 313-779-6363
Minn St. Paul, H. Cullen, 1595 Selby 612-646-7371
Mo Hazelwood, Thomas-Modrcin, 47 Village Sq. 314-838-6446
NJ Cinnaminson, Brother & Conneen, 3108 Pheasant Run 609-829-9325
NJ Union, H. Strand, 397 Chestnut 201-687-8484
NY Fairport, M.P. Andrews, 38 Harvest Rd. 716-381-2571
NY Fayetteville, M. Andrews, 319 Mott 315-637-3144
NC Burlington, Murphy & Cota, 1557 Granville 919-228-9670
NC Winston-Salem, Murphy & Cota, 1106 Burke 919-723-1001
Ohio Cleveland, Glover, 7008 Big Creek 216-842-4520
Pa Newton Sq., Brothers & Conneen, 12 S. Newton St. 215-353-2241
Tex Addison, Parvin Sls. Co., Box 307 214-239-9148
Tex Houston, Parvin, 5700 Savoy La. 713-782-0218
Wash Seattle, J.J. Backer, 221 W. Galer St. 206-285-1300

LUDLOW CORP., Chart Paper Div., Ware, Mass., 01082, Tel: 413-967-6204; Sls. Mgr: J. N. Lyons, Jr.

LUFT INSTRS., INC., Old Winter St., Lincoln, Mass., 01773, Tel: 617-259-9215; Sls. Mgr: L. Luft

LUKE LINE FASTENERS, 201 Laurel St., Beverly, N.J., 08010, Tel: 609-387-1166; Sls. Mgr: L. Klein

LUMA ELECTRIC EQUIPMENT CO., 1607 Coining Dr., Toledo, Ohio, 43612, Tel: 419-479-8481; Sls. Mgr: J. Hinds

LUMINATOR DIV., Gulton Ind., Box 278, Plano, Tex., 75074, Tel: 214-235-8307; Mktg. Mgr: W. Ieter

LUMINETICS CORP., Box 1943, Pompano Beach, Fla., 33061, Tel: 305-974-5403

LUMITRON CO., 393 Broad St., Summit, N.J., 07901, Tel: 201-273-8998; Sls. Mgr: H.G. Chassie

LUNDEY ASSOCS., INC., 694 Main St., Waltham, Mass., 02154, Tel: 617-893-6064; Sls. Mgr: E.T. Englund

LUNDY ELCTRNS. & SYS., INC., Robert La., Glen Head, N.Y., 11545, Tel: 516-OR-6-1440, TWX: 510-223-0605; Mktg. Dir: J. Snee

LUNKENHEIMER CO., Div. Conval Corp., P.O. Box 14360, Cincinnati, Ohio, 45214, Tel: 513-921-3400; Pres: M.W. Pauly

LUTRON ELCTRNS. CO., INC., Coopersburg, Pa., 18036, Tel: 215-282-3800; Sls. Mgr: J.A. Wisniewski

LVC IND'S., INC., Co-ord Switch Bloc-Lite Divs., 102-48 43rd Ave., Corona, N.Y., 11368, Tel: 212-899-5588; Sls. Mgr: J. Muller ....Pgs. 1441,2617

Ala Huntsville, Young & Lawrence, 2901 Governors Dr. SW 205-539-6575
Cal Los Angeles, Dyna Sls., Box 6757 213-268-1175
Fla Winter Park, Young & Lawrence, 601 N. New York Ave. 305-647-6929
NJ Riverton, V. Malta, 220 Linden 609-829-3924
NJ Parsippany, H. Krasner, 6 Linda 201-334-1959
NY Great Neck, H. Krasner, 33 Great Neck 516-487-0690
Ohio Akron, A. Natalino, 209 Harmony Hills 216-666-1447
Ohio Dayton, A. Natalino, 333 W. 1st St. 513-223-5002
Pa Phila., V.S. Malta, Box 4007 215-836-5122
Pa Pittsburgh, A. Natalino, 530 Sixth 412-281-8283
EXP: Can., Montreal, Que., Ind'l Elctrns. & Automation, Box 306 514-935-7262

LYNCH COMMUNICATION SYSTEMS, 695 Bryant St., San Francisco, Calif., 94107, Tel: 415-397-1471; V.P., Mktg: A.K. Urschel

LYNCH, R.H. MFG. CO., 7831 E. Arroyo Dr., S. San Gabriel, Calif., 91770, Tel: 213-280-3810; Pres: R.H. Lynch

LYNN ELCTRNS. CORP., Box 3003, Philadelphia, Pa., 19150, Tel: 215-677-6700; Sls. Mgr: P.B. Rosen

LYON METAL PROD., INC., 47 Railroad Ave., Aurora, Ill., 60507, Tel: 312-892-8941; V.P. Sls: L.F. Tilly

M & T CHEMICALS INC., Sub. American Can Co., Rahway, N.J., 07065, Tel: 201-499-0200 J.J. Gurney

M-T ELCTRNS. CO., 536 Lewelling Blvd., San Leandro, Calif., 94579, Tel: 415-357-5262; Sls. Mgr: P. Moore

MAC DERMID, INC., 50 Brookside Rd., Waterbury, Conn., 06720, Tel: 203-754-6161; Pres: H. Leever

MAC PANEL CO., Programming Prods. Div., Box 5027, High Pt., N.C., 27262, Tel: 919-882-8138, TWX: 919-883-4923; Sls. Mgr: J.L. Craycroft

MACDONALD & CO., 213 S. Brand Blvd., Glendale, Calif., 91204, Tel: 213-241-1101; Sls. Mgr: D.W. MacDonald

MACHLETT LABS., INC., Sub. Raytheon Co., 1063 Hope St., Stamford, Conn., 06907, Tel: 203-348-7511, TWX: 710-474-1744; Sls. Mgr: C.E. Ramich

MACK ELEC. DEVICES, 32 Glenside Ave., Wyncote, Pa., 19095, Tel: 215-884-8123; Sls. Mgr: N.K. McKinney

MACKAY, A.D., INC., 198 Broadway, New York, N.Y., 10038, Tel: 212-BA-7-8532; Sls. Mgr: P.H. Nisley

MACLEAN-FOGG LOCK NUT CO., 1000 Allanson Rd., Mundelein, Ill., 60060, Tel: 312-566-0010, TWX: 910-685-4323; Sls. Mgr: H.C. Koestring

MACRODATA, 20440 Corisco St., Chatsworth, Cal., 91311, Tel: 213-882-8880; Sls. Mgr: F.E. Chase

MACRONETICS, INC., 1003 Weeks St., E. Palo Alto, Cal., 94303, Tel: 415-322-5351; Prod. Mgr: R.B. Suddick

MAG-CON ENGRG. CO., 85 Richardson St., S.E., St. Paul, Minn., 55112, Tel: 612-633-8820; Sls. Mgr: M. Lorge

MAGITRAN CO., 311 E. Park St., Moonachie, N.J., 07074, Tel: 201-641-3650; Sls. Mgr: J. Grieg

MAGNAFLUX CORP., 7328 W. Lawrence Ave., Chicago, Ill., 60656, Tel: 312-UN-7-8000; Sls. Mgr: R.G. Strother

MAGNAVOLT INC., 44 Prospect St., Yonkers, N.Y., 10701, Tel: 914-YO-3-5900; Sls. Mgr: J.J. Wilentchik

MAGNECESSORIES, Box 6960, Washington, D.C., 20032, Tel: 301-839-1383; Sls. Mgr: R.H. Carson

Advertisement

Manufacturer of The Carson Tape Splicer, a precision machined splicing block available for all widths to tape, and of Visi-Mag, a solution for application to magnetic tapes to make visible the signals recorded on the tape. It is especially useful in trouble shooting digital magnetic tape systems, in video tape editing, in track alignment in head alignment, etc. Several types are available. Write for further information.

MAGNECRAFT ELEC., 5575 N. Lynch Ave., Chicago, Ill., 60630, Tel: 312-282-5500, TWX: 910-221-5221; Sls. Mgr: R.A. Didriksen ....Pgs. 1762-1768

Ala Huntsville, BJR Resch., 9202 Navios Dr. 205-881-3569
Ariz Scottsdale, Engrg. Sls., Box 544 602-945-5781
Cal L.A., Univ. Comps., 2330 Westwood Blvd. 213-474-1537
Cal San Carlos, Kottmeier, Box 1194 415-592-8333
Colo Wheat Ridge, Waugaman, 4643 Wadsworth 303-423-1020
Conn Farmington, R. Perron, 10 Briarwood Rd. 203-673-4825
Conn Trumbull, R. Perron, 36 Louis St. 203-268-9631
Fla No. Miami, Winfield Elctrn. Sls., 1875 N.E. 149th St. 305-945-6544
Ill Chicago, Ellinger, 6580 N.W. Hwy. 312-763-1570
Iowa Clarion, Ellinger Sls., 309 4th Ave. 515-532-3218
Mass Norwood, R. Perron, 159 Morse St. 617-762-8114
Minn Minneapolis, R. Siedare, 4724 - 42nd Ave., N. 612-533-2294

Mo St. Louis, Ellinger Sls., 4969 Bancroft 314-352-2027
NH Dover, R. Perron & Co., Inc., 1 Elm St. 603-742-2321
NJ So. Orange, Simberkoff, 71 Valley St. 201-763-7900
NY Kenmore, Simberkoff, 284 Edgewood Ave. 716-834-8119
NY Kingston, Simberkoff Sls., Box 237 914-331-4920
NY Lockport, Simberkoff Sls., 35 Niagara St. 716-434-4426
NY New York, Simberkoff Sls., Inc. 212-943-7023
NY No. Syracuse, Simberkoff, 58 Homeland 315-458-5469
Ohio Cleveland, Weschler Elec., 4250 W. 130th St. 216-251-4609
Ohio Dayton, Weschler Elec., 1700 Needmore 513-274-6972
Okla Tulsa, H.J. Daly, 5836 S. 70th E. St. 918-627-4159
Ore Portland, D. Fry Co., Box 3803 503-226-3903
Pa Pine Valley, Simberkoff, 411 Welsh Rd. 215-676-8755
Tex Garland, Compatible Comps., Box 2022 214-279-6330
Va Arlington, Simberkoff, 420 Arlington Towers 703-525-5898
For: Can., Scarborough, Ont., Lake Engrg., 123 Manville Rd. 416-751-5980

MAGNEDYNE INC., 5580 El Camino Real, Carlsbad, Calif., 92008, Tel: 714-729-7191; Sls. Mgr: J. Kimble Pg. 1622
Ariz Scottsdale, O'Hara Engrg. Assoc., 8650 Joshua Tree La. 602-947-4666
Cal Encino, Cardinal Assocs., 16161 Ventura Blvd. 213-788-4540
Cal Mt. View, A. Barauck Co., Box 807 415-327-7711
Colo Littleton, Gropley, Inc., 1523 E. Easter Cir. 303-794-4231
Conn Milford, Todino Engrg. Sls., 132 New Haven Blvd. 203-874-6643
Ill Chicago, J. Popp Sls., 5661 W. Chicago Ave. 312-261-1259
Mass Needham Hgts., Todino Engrg. Sls., 50 Kearney Rd. 617-444-7925
Mich Plymouth, ROMARC, Box 257 313-455-0300
Minn St. Paul, Wagner Comp. Conslts., 542 S. Snelling Ave. 612-698-0331
NJ Teaneck, R.T. Reid Assoc., 175 Cedar La. 201-692-0200
NY E. Rochester, Tech. Sls., 319 E. Chestnut St. 716-381-0740
Ohio Dayton, D. Steffen & Assoc., 1202 Hempstead 513-293-3146
Ohio Wickliffe, D. Steffen & Assoc., 30212 Lakeland Blvd. 216-944-8080
Pa Bethayres, Control Instr. Sls., Box 219 215-676-1808
Tex Dallas, K.O. Brown & Co., Box 20845 214-357-3996
Wash Renton, D & D Sls., 43 Logan St. 206-226-4120

MAGNET WIRE, INC., 25 Walker St., New York, N.Y., 10013, Tel: 212-226-0900; Sls. Mgr: J. Wasserman

MAGNETEC CORP., 7751 Densmore Ave., Van Nuys, Calif., 91406, Tel: 213-787-5131; Sls. Mgr: J.W. Hawkins

MAGNETIC ANALYSIS CORP., 535 South 4th Ave., Mt. Vernon, N.Y., 10550, Tel: 914-699-9450; Sls. Mgr: V.L. Spoley

MAGNETIC CIRCUIT ELEMENTS, 2455A Garden Rd., Monterey, Cal., 93940, Tel: 408-373-0456; Sls. Mgr: J.S. Conklin

Advertisement

MCE offers an extensive line of standard inductors and transformers with package options. These include 60 and 400 Hz transformers, lamination type or toroidal chokes, and precision inductors. Miniature high frequency, high temperature and high voltage units for power supplies are our specialty. Complete catalogue including engineering data and prices on request.

MAGNETIC CORE CORP., Box 368, Newburgh, N.Y., 12550, Tel: 914-561-5116; Pres: G.E. Gruenhagen

MAGNETIC SYS. & INSTRS., Div. O.S. Walker Co., Rockdale St., Worcester, Mass., 01606, Tel: 617-853-3232; Sls. Mgr: C. Cowing

MAGNETIC TECHNOLOGY, Vernitron Corp., 21001 Kittridge St., Canoga Pk., Cal., 91303, Tel: 213-887-7700, TWX: 910-494-1217; Sls. Mgr: F.J. Bowser Pgs. 386,387,1503,1634,1635
Cal Los Angeles, Halbar, 3261 W. Fourth 213-387-8283
Cal Sunnyvale, Servo Data, 844 Bremerton 408-739-7895
Colo Denver, Franklin, 1924 S. Navajo 303-922-3623
Conn N. Haven, Kitchen & Kutchin, 22 Broadway 203-239-0212
Fla Orlando, Orbe, Inc., 1221 N. Orange Ave. 305-425-9004
Fla St. Petersburg, Orbe, 4410 Central 813-894-0687
Ill Wheaton, A. Erickson, 170 Longfellow 312-665-3499
Mass Lexington, Kitchen & Kutchin, 17 Waltham 617-862-8230
Mich Lathrup Vlg., R. Nordstrom, Box 32 313-444-4417
Minn Mpls., F. Peterson, 4501 Minnetonka 612-927-4453
NJ Cherry Hill, A. Lanson, 112 Henfield Ave. 609-424-4670
NJ Harrington Pk., Metro Tech., 39 Bluefield 201-768-8495
NY Endicott, Tech. Mark, Professional Bldg. 607-748-7473
Tex Dallas, Jacobson Co., Box 9702 214-363-7584
Wash Seattle, R. Johnston, 1011 N.E. 69th 206-524-5170

MAGNETIC VIDEO CORP., 23434 Industrial Pk. Ct., Farmington, Mich., 48024, Tel: 313-477-6066

MAGNETIC WINDINGS CO., 2711 Freemansburg Ave., Easton, Pa., 18042, Tel: 215-253-2751, TWX: 510-651-2455; Sls. Mgr: G.E. Brown ....Pg. 2964
Ala Huntsville, BJR Research & Mfg., Box 4422 205-881-3569
Cal Los Angeles, Clemick-Neenan, 654 N. Sepulveda 213-476-1272
Cal Palo Alto, Engrg. Assoc., 999 Commercial 415-326-7842
Colo Englewood, Electrodyne, 300 Hampden 303-469-0024
Conn Thomaston, Nelson & Schoonmaker, 106 Main 203-283-5959
Fla Winter Pk., J. Smith, Box 460 305-374-6784
Ill Chicago, C. Greenslade Sls., 5875 N. Lincoln 312-561-0156
Mich Farmington, D. Martensen, 22725 Orchard Lake 313-474-8300
NY Buffalo, R. Mitscher, 496 Ellicott Sq. Bldg. 716-854-2517
NY NY, Simon Diamond, 19 Rector 212-944-2970
Ohio Dayton, Whelan, 2600 Far Hills 513-298-9997
Ore Portland, Earl & Brown, 2041 S.W. 58th, P.O. Box 15408 503-266-4148
Pa Paoli, Stitzer, 24 State 215-644-5500
Wash Seattle, Earl & Brown, Box 9285 206-284-1121
Wisc Milwaukee, F. DuBois, 2364 N. 117th 414-774-3100

MAGNETICO, INC., 6 Richter Ct., E. Northport, N.Y., 11731, Tel: 516-261-4502; Sls. Mgr: S.J. Renard

MAGNETICS, INC., Comps. Div., Box 391, Butler, Pa., 16001, Tel: 412-285-4711, TWX: 710-373-3821; Sls. Mgr: Joseph F. Huth

MAGNETICS, Ind'l. Control Div., Sandy Lake, Pa., 16145, Tel: 412-376-7515, TWX: 510-461-3334; Div. Mgr: L.N. Martin

MAGNETICS SYS. & INSTRS., Div. O.S. Walker Co., Rockdale St., Worcester, Mass., 01606, Tel: 617-853-3232; Mgr: P.J. Ottowitz

Advertisement

Hysteresisgraphs, Gaussmeters, Fluxmeters, Laboratory Magnets, Superconducting Magnets, Power Supplies, Teaching Systems, Magnetic Tape Testers

MAGNO-CERAM CO., 2614 S. Clinton Ave., S. Plainfield, N.J., 07080, Tel: 201-561-2000; Sls. Mgr: H. Gelbard

MAGNUM ELEC. CORP., Drawer 247, 1000 Streetman, Erie, Mich., 48133, Tel: 313-848-2555

MAGNUSON ENGRS., INC., 1010 Timothy Dr., San Jose, Calif., 95133, Tel: 408-287-1260; Sls. Mgr: T. Smith

MAGTROL, INC., 70 Gardenville Pkwy., W., Buffalo, N.Y., 14224, Tel: 716-675-3333, TWX: 710-260-1360; Sls. Mgr: W. Mulroy

MAIDA DEV. CO., 214 Academy St., Hampton, Va., 23369, Tel: 703-PA-3-0785; Sls. Mgr: F.X. Maida

MAIN ELCTRNS., INC., 353 Pattie, Wichita, Kans., 67211, Tel: 316-267-3581; Sls. Mgr: D.A. Main

MAJOR ELCTRNS. CORP., 649 39th St., Brooklyn, N.Y., 11232, Tel: 212-854-2100; Sls. Mgr: J. Mandel

MALAKER CORP., W. Main St., High Bridge, N.J., 08829, Tel: 201-638-6112, TWX: 201-280-4020; Sls. Mgr: J.B. Malaker

MALCO MFG. CO., 5150 W. Roosevelt Rd., Chicago, Ill., 60650, Tel: 312-287-6700; Pres: M. Just

MALLORY, P.R., 3029 E. Washington St., Indianapolis, Ind., 46206, Tel: 317-636-5353, TWX: 317-634-4214

MALLORY BATTERY, P.R. Mallory, S. Broadway, Tarrytown, N.Y., 10591, Tel: 914-591-7000; Mktg. Mgr: M. Manolios
(Refer to Mallory, P.R. & Co. Inc. for sales office information.)

MALLORY CAPACITOR, P.R. Mallory, 3029 E. Washington St., Indpls., Ind., 46201, Tel: 317-636-5353, TWX: 317-634-4214; Sls. Mgr: A.E. Irwin
(Refer to Mallory, P.R. & Co. Inc. for sales office information.)

MALLORY CONTROLS, P.R. Mallory, Box 327, Frankfort, Ind., 46041, Tel: 317-654-5501, TWX: 317-634-4214; Sls. Mgr: R. Horstmann
(Refer to Mallory, P.R. & Co. Inc. for sales office information.)

MALLORY METALLURGICAL, Div. P.R. Mallory, 3029 E. Washington St., Indianapolis, Ind., 46201, Tel: 317-636-5353, TWX: 317-634-4214; Sls. Mgr: D.J. Smith

MALLORY TIMERS, P.R. Mallory, 3029 E. Washington St., Indpls., Ind., 46201, Tel: 317-636-5353, TWX: 317-634-4214; Sls. Mgr: D.J. Bowden
(Refer to Mallory, P.R. & Co. Inc. for sales office information.)

MAMCO CORP., Motor Div., 532 Fourth St., Racine, Wisc., 53404, Tel: 414-634-1923; Sls. Mgr: F.E. Schumacher

MANGER ELEC. CO., INC., W. Henry St., Stamford, Conn., 06902, Tel: 203-348-7761; Sls. Mgr: H.S. Loeber

MANHATTAN ELEC. CABLE CORP., 170 Imlay St., Brooklyn, N.Y., 11231, Tel: 212-855-0500; Sls. Mgr: J. Michelman ....Pg. 3034
Cal Burlingame, 6 Guittard Rd. 415-697-7016
Cal Los Angeles, 3038 Vail St. 213-685-9473
Ga Atlanta, 101 Villanova Dr. S.W. 404-349-3560
Mo St. Louis, Midwestern Elec. Cable, 2823 Papin St. 314-865-5050
NY Rye, Station Plaza 914-WO-7-4080
Ohio Independence, 5555 Granger Rd. 216-749-7500
Tex Houston, Texas Elect. Insulated Cable, 3111 Leeland 713-227-5228

Advertisement

A complete line of electronic and electrical wire and cable sold exclusively through distributors. Our unique in-depth inventory located in major cities throughout the United States, offers the largest and most diversified selection of Communications, Instrumentation and Control Cable - for immediate delivery.

MANN, DAVID W. CO., Div. GCA Corp., 174 Middlesex Tpke., Burlington, Mass., 01803, Tel: 617-272-5600; Sls. Mgr: A.J. O'Malley

MANN-RUSSELL ELCTRNS., INC., 1401 Thorne Rd., Tacoma, Wash., 98421, Tel: 206-383-1591; V.P. Sls: H.K. Haskell

MANSOL CERAMICS CO., INC., 140 Little St., Belleville, N.J., 07109, Tel: 201-759-8600, TWX: 710-995-4921; Sls. Mgr: R.J. Durkin

MARATHON BATTERY CO., Cold Spring, N.Y., 10516, Tel: 914-265-9282, TWX: 710-573-2221; Mktg. Mgr: R. Gray ....Pgs. 810,811
Cal Westminster, A. Dowers, 15152 Golden West Cir. 213-596-4485
Cal San Carlos, LoDan Inc/D. Bucchia, 1077 Industrial 415-592-4600
Colo Denver, Brown Tech., 130 S. Yarrow St. 303-233-0863
Fla Ft. Lauderdale, Young & Lawrence, 415 E. Broward 305-563-6717
Fla St. Petersburg, Young & Lawrence, 300 31st St., N. 813-894-0026
Fla Winter Pk., Young & Lawrence, 601 N. New York Ave. 305-647-6929
Ill Oakbrook, Whitmore, 1301 W. 22nd St. 312-325-4727
Ind Angola, Southern, 105 Lakeshore Dr. 219-665-3961
Ind Indianapolis, Southern, 1111 E. 54th St. 317-253-3359
Kan Kansas City, D & O Engrg., Box 2349 913-FI-2-6151
Kan Wichita, D & O Engrg., Box 1800 316-AM-4-7358
Ky Louisville, Southern, 212 Republic Bldg. 502-583-6902
Md Silver Spring, Aeron, 1110 Fidler La. 301-588-4047
Mass Reading, C.E. Godfrey Co., Box 68 617-944-2230
Mich Grosse Pointe Pk., Associated Factory Agents, 1347 Audubon 313-886-1669
Mich Livonia, D. Baines, 14393 Alexander 313-427-7636
Minn Mpls., Whitmore Assocs., 7710 Computer 612-926-2855

NY Buffalo, R. Mitscher, 496 Ellicott Sq. 716-854-2517
NM Albuquerque, Bowden Assoc., 730 San Mateo S.E. 505-268-7676
Ohio Cincinnati, Comps., 11820 Knollspgs. 513-721-2997
Ohio Cleveland, Comps., 7461 N. Linden La. 216-842-2737
Okla Tulsa, D & O Engrg., Box 5037 918-WE-2-2813
Pa Phila., C. Newson, 711 Bethlehem Pike 215-248-3377
Tex Dallas, D & O Engrg., Box 8433 214-EM-8-3544
Tex Hurst, Edmar Tech. Sls. Co., Box 818 817-282-5561
Va Arlington, Perrott Engrg. Labs, 1020 N. Fillmore St. 703-528-5861
Wash Seattle, R. Squibb, 655 N.E. Northlake 206-632-2450
Wisc Oak Creek, Erdman Sls., 6312 S. 27th 414-761-2120
EXP: N.Y., Richmond Hill, Aviation Sls., 115-06 Myrtle Ave. 212-441-3100

MARATHON INSTRS. DIV., Spec Tool Co., 9626 E. Beverly Rd., Pico Rivera, Calif., 90660, Tel: 213-723-9533, TWX: 213-685-6218; Sls. Mgr: A.G Fink, Jr.

MARCAL ELECTRO-SONICS, P.O. Box 185, Burkank, Calif., 91503, Tel: 213-VI-9-4473; Sls. Mgr: F.C. Farrell

MARCO-OAK, Div. Oak Electro/Netics Corp., Box 4011, Anaheim, Cal., 92803, Tel: 714-535-6037, TWX: 910-591-1185; Sls. Mgr: B.W. Scharf

MARCONI INSTRS., Div. English Elec., 111 Cedar La., Englewood, N.J., 07631, Tel: 201-567-0607, TWX: 710-991-9675; Mgr: K. Elkins ....Pgs. 519-521
Ala Huntsville, Lee, #5R Traylor Island 205-539-0761
Alas Anchorage, Comm. Engrg., 3340 Mtn. View 907-272-3591
Ariz Phoenix, Moxon Elctrns., 15 N. 40th Pl. 602-273-7363
Cal Los Angeles, Moxon Elctrns., 2311 Pontius 213-272-9311
Cal San Diego, Moxon Elctrns., 2054 Garnet 714-274-6525
Cal Sunnyvale, Moxon Elct., 1259 Birchwood 408-734-4352
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
Fla Orlando, Lee Assocs., 200 E. Marks 305-241-4445
Ga Chamblee, Lee Assocs., Inc., 250R Riverglen Cir. 404-457-7117
Ill Chicago, K.W. Meyers, 7256 W. Touhy 312-774-6440
Ind Indpls., K. Meyers, 3512 Rockville 317-243-6681
Md Bethesda, S & S, 7720 Wisconsin 301-654-1434
Mass Belmont, Vector Sls., 774 Pleasant St. 617-489-1400
Minn Mpls., K.W. Meyers, 4725 Excelsior 612-920-7080
NJ Saddle Brook, L & M Assocs., 511 Victor 201-843-8700
NM Albuquerque, Hytronic Meas., 205 San Pablo 505-268-3941
NY Brentwood, L & M Assocs., 7 Mayflower 516-231-8363
NY Fayetteville, M.P. Andrews, 319 Mott 315-637-3144
NC Winston-Salem, Lee Assocs., Inc. 919-724-2406
Ohio Worthington, Ohio Instr., 505 Whitney 614-885-0743
Pa Andalusia, L & M, 965A Bristol Pike 215-639-3100
Tex Dallas, Bradenco, 2646 Andjon Dr. 214-352-4626
Tex Houston, Bradenco, 3130 S.W. Frwy. 713-JA-9-9881
Utah Salt Lake City, Hytronic Meas., 2022 S. Main 801-466-4924

MARDUTH PRODS., 1387 Ledge Rd., R.D. 1, Hinckley, Ohio, 44233, Tel: 216-239-6479; Sls. Mgr: D.R. Christian

Advertisement

Manufacturer of hand held and motor driven Surface Roughness measuring equipment used by the Armed Forces and industry to control the quality of the surface finish of a wide variety of machined and cast products. Special pickups and attachments are available for unusual measuring problems. Small transistorized units for ease in portability. Comply with ASA B-47.1 Standard and Military Standard, Mil-1-45177A.

MARK MICRO-ELCTRNS. MFG., 56 New Hook Rd., Bayonne,, NJ, 07002, Tel: 201-339-2121, TWX: 710-729-4489; Sls. Mgr: M. Feinman

MARK PRODUCTS CO., 5439 W. Fargo Ave., Skokie, Ill., 60076, Tel: 312-675-1500; Sls. Mgr: J.C. Bridgwater

MARK PRODS., INC., 3935 Fairhill Dr., Houston, Tex., 77042, Tel: 713-782-4430; Sls. Mgr: W. Tabor

MARKAL CO., 250 N. Washtenaw Ave., Chicago, Ill., 60612, Tel: 312-826-1700; VP Sls: D. Lytton

MARKEL, L. FRANK & SONS, School La., Norristown, Pa., 19404, Tel: 215-272-8960, TWX: 510-660-0190; V. P. Mktg: W.F. Michener ....Pgs. 2812,3035
Ariz Pheonix, K. Jahn Co., Box 15621 602-956-9060
Cal L.A., Insulation Supply, 779 E. Pico 213-747-5416
Cal L.A., National Wire & Cable, 136 San Fernando 213-225-5611
Cal Redwood City, Insulation Supply, 2553 Middlefield 415-369-7357
Colo Denver, Ward Elec. Supply, 1909 Blake 303-222-3541
Conn Watertown, R.P. Mahan Co., Hopkins Rd. 203-274-2363
Fla Palm Bch. Gdns., J. Griffin, 3902 Burns 305-848-4617
Ga Chamblee, K. Ekmark, 3676 Teal Rd. 404-457-5703
Ill Chicago, J. Glenn, 4300 S. Tripp Ave. 312-847-6400
Mass Wellesley, R. Mahan, 572 Washington 617-237-1040
Mich Northville, L. George Agency, Box 127 313-474-1505
Minn Mpls., F. Peterson, Box 16224 612-927-4453
Mo Webster Groves, Hippler, 1135 Cheshire 314-961-8499
NJ Old Bridge, H.B. Heft Assocs., Box 444 201-679-8000
NY Lynbrook, H.B. Heft, Box 623 516-599-3351
NY Rochester, Gislason, 617 Case Bldg. 716-454-4741
NC Charlotte, H.T. Altman Co., Box 15631 704-399-8626
Ohio Chagrin Falls, Electrolock, 1 N. Franklin 216-247-4245
Okla Oklahoma City, J. Cole, 1811 N.W. First 405-235-2447
Ore Portland, C. Riggs, 422 N.W. 8th Ave. 503-226-3286
Pa Munhall, P.E.I. Sls. Corp., 800 Martha St. 412-462-6300
Pa Phila., C. Newson, 711 Bethlehem Pike 215-248-3377
Tenn Chattanooga, Jackson, Box 2035 615-267-4260
Tex Arlington, Cline & Son, Inc., Box 413 817-261-2255
Utah Salt Lake City, Elec. Parts & Insulation Co., 246 W. 13th, S. 801-486-0773
Wash Seattle, C. Riggs, 314 Second Ave., S. 206-623-5707
Wisc Elm Grove, J.J. Glenn & Co., Box 553 414-353-7262
For: Can., Burlington, Ont., H. Ruggles, 3077 Mainway 416-632-1403

MARKEM CORP., 194 Congress St., Keene, N.H., 03431, Tel: 603-352-1130, TWX: 710-366-1880; Sls. Mgr: P. Faulkner

MARKITE CORP., 155 Waverly Pl., Dept. 301, New York, N.Y., 10014, Tel: 212-OR-5-1384, TWX: 710-581-3673; Sls. Mgr: J. Luch

MARLIN MFG. CORP., 12404 Triskett Rd., Cleveland, Ohio, 44111, Tel: 216-941-6200; Sls. Mgr: P.J. Hruby

MARLIN-ROCKWELL, Div. TRW, Inc., 402 Chandler St., Jamestown, N.Y., 14701, Tel: 716-484-0141; Gen'l. Sls. Mgr: P.H. Martin

MAROTTA SCI. CONTROLS, INC., Boonton Ave., Boonton, N.J., 07005, Tel: 201-334-7800, TWX: 710-987-8358; Sls. Mgr: W.T. Browne

MARSHALL INDS., Capacitor Div., 1960 Walker Ave., Monrovia, Cal., 91016, Tel: 213-359-8281, TWX: 910-585-1830; Sls. Mgr: W.L. Atkinson

MARSHALL INSTRS., INC., 14203 Bessemer St., Van Nuys, Calif., 91401, Tel: 213-TR-3-1016; Sls. Mgr: J.V. Pavelka

MARSTAN RESISTOR, Balco Elctrns., Inc., 307 Washington St., Orange, N.J., 07050, Tel: 201-677-1200, TWX: 710-994-5812; Mktg. Mgr: M. K. Goldstein

MARYLAND LAVA CO., Box 527, Dept. EEM, Bel Air, Md., 21014, Tel: 301-838-4114; Sls. Mgr: J.B. Dinning

MARYLAND MAGNET CO., 8825 Allenswood Rd., Randallstown, Md., 21133, Tel: 301-922-2272; Sls. Mgr: J. Caplan

MASON ELECTRIC CO. INC., 3839 Verdugo Rd., Los Angeles, Cal., 90065, Tel: 213-254-9104, TWX: 910-321-2352; Sls. Mgr: R. Doll

MASPRO CO., INC., Asada, Nissin, Nagoya-Shigai, Japan, Tel: 052-802-2214; Sls. Mgr: C. Oda

MASSA DIV., Dynamics Corp. America, 280 Lincoln St., Hingham, Mass., 02043, Tel: 617-749-4800, TWX: 710-348-0162; Sls. Mgr: D.W. Bacso

MASSEY DICKINSON CO., INC., 9 Elm St., Saxonville, Mass., 01701, Tel: 617-877-2511; Pres: Paul L. Meretsky

MAST DEV. CO., 2212 East 12th St., Davenport, Iowa, 52803, Tel: 319-326-0141; Sls. Mgr: J.A. Carrig

MASTER APPLIANCE CORP., 1745 Flett Ave., Racine, Wisc., 53403, Tel: 414-633-7791; Dir. of Mktg: F.N. Pfeil

MASTER ENGRAVING, 11 Wallace St., East Paterson, N.J., 07407, Tel: 201-791-3323; Sls. Mgr: K. Raindorf

MASTER MOBILE MOUNTS, Div. Crystek, 1000 Crystals Dr., Fort Myers, Fla., 33901, Tel: 813-WE-6-2109, TWX: 510-951-7638; Sls. Mgr: G.T. Gay

MASTER SPECIALTIES, 1640 Monrovia, Costa Mesa, Cal., 92627, Tel: 714-642-2427; Mktg. Mgr: S. Brown

MASTER TAPE PRINTERS, INC., 4517 Elston Ave., Chicago, Ill., 60630, Tel: 312-685-4100; Sls. Mgr: R.G. Dorfmeister

MASTERITE INDS., INC., 2841 Lomita Blvd., Torrance, Calif., 90505, Tel: 213-775-3471; Sls. Mgr: J.H. Vallerand

MATERIALS DEVELOPMENT, 6214 W. Manchester Ave., Los Angeles, Cal., 90045, Tel: 213-641-9892

MATERIALS FOR ELCTRNS., INC., 149-32 132nd St., Jamaica, N.Y., 11430, Tel: 212-322-9400; Sls. Mgr: G. Planchon

MATERIALS RESCH. CORP., Route 303, Orangeburg, N.Y., 10962, Tel: 914-359-4200, TWX: 710-576-2656; V.P. Mktg: C. Malo

MATERIALS TECHNOLOGY, INC., P.O. Box 187, Somerset, N.J., 08873, Tel: 201-249-9200; Sls. Mgr: M. Gothelf

Advertisement

Electroformed foil for printed circuitry and chemical milling applications. Vertical grain gives more uniform etching with less undercut. Clad metals and strip plating service available.

MATRIX CORP., 520 North 11th Ave., Beech Grove, Ind., 46107, Tel: 317-786-4601; Sls. Mgr: K. Bartlett Pg. 361
Cal Concord, Nutronic Sls., 822 C Challerge 415-689-8953
Cal Los Angeles, Burtis Instr. Sls., 8921 S. Sepulveda 213-670-5863
DC Wash, Powell-Pendergraph, 7979 Old Georgetown 301-656-4535
Ill Chicago, SEA Inc., 4210 W. Irving Pk. 312-282-6694
Ind Carmel, Sea Inc., 620 S. Range Line 317-846-0687
Minn Mpls., SEA Inc., 7601 N. Kentucky 612-425-4455
Ohio Cleveland, Instr. Sys., 21877 Euclid 216-486-0782
Ohio Dayton, Instr. Sys., 3481 Off. Park 513-293-8095
Pa Fairview Vlg., Acromatix Assoc., Box 271 215-279-0377
Tex Austin, System Engrg., 1005 E. St. Elmo 512-444-0540
Tex Dallas, Sys. Engrg. Sls., Box 31357 214-231-8981
Wisc Waukesha, SEA Inc., 142 South St. 414-547-6637

Advertisement

Matrix Corporation manufacturers data acquisition equipment including random access Scanners (binary and BCD controlled), Frequency to Voltage, Voltage to Frequency Converters, and multi-channel strain gage data acquisition systems.

MATRIX ENGINEERING CORP., 1502 West 166 St., Gardena, Calif., 90247, Tel: 213-770-0521; Sls. Mgr: R.C. Lace

MATRIX SCIENCE, 435 Maple Ave., Torrance, Cal., 90503, Tel: 213-775-2411, TWX: 910-349-6953; Sls. Mgr: J. Schnepf

MATRIX SYS. CORP., 9201 Gazette Ave., Chatsworth, Cal., 91311, Tel: 213-882-2008; Sls. Mgr: J. Singleton

MATSUSHITA COMM. IND'L. CO., LTD., 880 Tsunashima, Kohoku-ku, Yokohama, Japan, Tel: 045-531-1231; Sls. Mgr: Y. Saruogi

MATTHEWS, JAS & CO., 6619 Penn Ave., Pittsburgh, Pa., 15206, Tel: 412-362-6500; Sls. Mgr: S.T. Kerr

MATTHEWS RESCH., INC., 4306 Wheeler Ave., Alexandria, Va., 22304, Tel: 703-751-1600

MATTHEY BISHOP INC., Malvern, Pa., 19355, Tel: 215-NI-4-3100, TWX: 510-668-9565; Sls. Mgr: C.P. Curtis

MAURATRON, INC., 13333 N. Central Expwy., Dallas, Tex., 75231, Tel: 214-235-2640; Pres: J.E. Sykes Pg. 815
Ariz Scottsdale, C.T. Fink, Box 434 602-992-9884

Tex Dallas, V. Sykes, 13333 N. Central Expy. 214-235-5280

MAURER, J.A., INC., 25-26 50th St., Woodside, N.Y., 11377, Tel: 212-937-8800, TWX: 710-582-2995; Sls. Mgr: E.J. Neff

MAURY MICROWAVE CORP., 8610 Helms Ave., Cucamonga, Calif., 91730, Tel: 714-987-4715; Sls. Mgr: M.A. Maury, Jr.

MAXI-SWITCH CO., 3121 Washington Ave. N., Minneapolis, Minn., 55411, Tel: 612-529-7601; Sls. Mgr: E.A. Mitchell ....Pg. 1941

Ala Huntsville, Young & Lawrence, 2907 Governors S.W. 205-539-6575
Cal Canoga Park, R. Kruse, Box 1225 213-341-3020
Cal Santa Clara, Nova-Tronix, 1659 Scott .408-243-9530
Fla Ft. Lauderdale, Young & Lawrence, 415 E. Broward 305-563-6717
Fla St. Petersburg, Young & Lawrence, 300 31st St. N. 813-894-0026
Fla Winter Park, Young & Lawrence, 601 New York 305-647-6929
Ill Fox Lake, Mesa, Inc., Box 92 312-587-6363
Mass Chelmsford, M. Flynn, 17 Purcell 617-256-6229
Mich Brooklyn, W. Moburg, 13695 S. M-50 517-592-6801
Minn St. Paul, J.R. South, 1001 Tiller La. 612-484-8866
NJ Middletown, D.A. Rugg, 2 Dove Ct. 201-671-0662
NY Penfield, J.E. Blair, 15 Stone Island Rd. 716-586-1419
NC Bethania, Candor 919-924-1480
NC Raleigh, Candor, 4810 Stanford St. 919-828-5716
Tenn Cleveland, Candor, Box 412 615-472-7059
Tex Dallas, P. Kreager, 9230 Cliffmere Dr. 214-348-3521
Tex Houston, P. Kreager, Box 12583 713-649-5756
Va Lynchburg, Candor, 309 Buckingham Dr. 703-846-6579

MAXSON ELCTRNS. DIV., Maxson Elctrns. Corp., Sunrise Hwy., Great River, N.Y., 11739, Tel: 516-362-2229, TWX: 510-227-7614; Mgr. Mktg. Svc: F. Benanti

MAXWELL LABS., INC., 9244 Balboa Ave., San Diego, Calif., 92123, Tel: 714-279-5100, TWX: 910-335-2063; Sls. Mgr: I. Kovalik

MAYTRONICS, INC., Box 460, Colorado Springs, Colo., 80901, Tel: 303-636-1301, TWX: 910-920-4982; Sls. Mgr: C.D. Johnson

MB ELCTRNS/TEXTRON CO., Box 1825, New Haven, Conn., 06508, Tel: 203-389-1511, TWX: 710-465-3283; Mktg. Dir: R.J. Kaye

MCCLINTOCK MATRIXES, INC., 211 Washington Rd., Woodbury, Conn., 06798, Tel: 203-263-4624; Sls. Mgr: A. Hertz

MCCOY ELCTRNS. CO., Sub. Oak Electro/Netics Corp., Chestnut & Watts St., Mt. Holly Springs, Pa., 17065, Tel: 717-486-3411, TWX: 510-650-3548; Sls. Mgr: M.L. Myers, Jr. ....Pgs. 1408-1411

Cal Inglewood, D. E. Foyer, 5005 W. Century Blvd. 213-678-4108
Cal Los Altos, Oak Electro/Netics, 960 N. San Antonio 415-941-1237
Colo Denver, I.W. Strong, 635 Canosa Ct. 292-6900
Fla Ft. Lauderdale, Oak Electro/Netics, 1040 Bayview Dr. 305-563-2681
Ill Chicago, Brock & Cushman, 6156 W. Grand 312-622-4110
Ind Ft. Wayne, Menze, 6010 Lower Huntington 219-747-5616
Iowa Cedar Rapids, Lorenz, 4403 First SE 319-366-0774
Md Baltimore, J. Sheffer, 4609 Old Frederick 233-0606
Mass Norwood, JMG, Inc., Box 310 617-762-5333
Mich Jackson, N. Scroggs Co., 2221 Arbor Hills 517-782-5211
Mo Kansas City, Automatic Gen. Elct., 6550 E. Troost 333-8206
Mo St. Louis, Automatic Gen. Elec., 4523 Westminister 314-652-5366
NJ Haddonfield, Gray Assoc., 8 E. Mt. Vernon 609-429-5300
NJ Westwood, Clarfield-Stollmack, 175 Westwood 201-666-8989
NY Pompey, S. Foster, 2806 Hennaberry 315-677-3333
NY Webster, S. Foster, 1591 Greensboro Dr. 716-872-5220
Ohio Dayton, Midwest Mktg., 137 Lakeview 513-433-2511
Ore Salem, M. Widdekind, 3292 Sunnyview NE 503-363-6445
Tex Richardson, R. Kimball, 777 S. Central Expwy. 214-231-3447
Wash Seattle, M. Widdekind, 815 W. Ewing St. AT 4-8020
EXP: NY N.Y., S. Ginsbury, 425 Park S. 212-689-5212
For: Can., Aurora, Ont., Oak Electro/Netics 727-4231

MCELROY ELCTRNS. CORP., Fredonian St., Shirley, Mass., 01464, Tel: 617-425-4055; Pres: J.C. McElroy

MCFADDEN ELCTRNS. CO., 8953 S. Atlantic Blvd., South Gate, Calif., 90281, Tel: 213-564-5958; Sls. Mgr: W.V. McFadden

MCG ELCTRNS., INC., 279 Skidmore Rd., Deer Park, N.Y., 11729, Tel: 516-586-5125; Sls. Mgr: M. Coyle

MCGILL MFG. CO., Electrical Div., 909 N. Lafayette St., Valparaiso, Ind., 46383, Tel: 219-462-2161; Sls. Mgr: P. Bain

MCKEE-PEDERSEN INSTRS., P.O. Box 322, Danville, Calif., 94526, Tel: 415-937-3630; Sls. Mgr: W.H. Schick

MCLEAN ENGRG. LABS., 70 Washington Rd., Princeton Jctn., N.J., 08550, Tel: 609-799-0100; V.P. Sls: W.B. Eckenhoff ....Pgs. 1623,2788

Ala Huntsville, W. Brown, 1314 Buford N.W. 205-539-4411
Cal Cupertino, T. Snitzer, 10320 Saratoga-Sunnyvale 405-257-8333
Cal Del Mar, T. Snitzer, Box 805 714-454-2191
Cal L.A., T. Snitzer, 9005 Exposition Blvd. 213-836-6170
Colo Englewood, PLS Assoc., 8080 E. Union 303-771-0140
Conn Bridgeport, Technical Instrs., 575 Broad 203-FO-8-4582
Fla Ft. Lauderdale, W. Brown, 961 N.E. 53rd 305-564-8000
Fla Ft. Walton Bch., W. Brown, 98 Miracle Strip Pkwy. 904-243-6424
Fla Orlando, W. Brown, 222 Weber 305-425-5505
Ga Tucker, W. Brown, 1682 Weymouth Ct. 404-939-1674
Ill Elmhurst, Scott Assocs., 663 Fairview 312-279-5681
Kans Kansas City, Harris-Hanson, 7916 Paseo 816-HI-4-9494
Mass Wilmington, Tech. Instrs., 122 West St. 617-658-9171
Mich St. Clair Shores, J. Thorpe, 28915 Harper 313-779-6363
Minn Mpls., Scott Elctrn., 5209 W. 60th St. 612-929-2985
Mo St. Louis, Harris-Hanson, 2814 So. Brentwood 314-962-0111
NJ Ft. Lee, K. Hughes, 2175 Lemoine 201-944-1600
NM Albuquerque, PLS Assocs., 4300H Silver 505-255-2330
NY Albany, J. Reagan, 6 Highland Ave. 518-489-4777
NY Binghamton, J. Reagan, 52B Crestmont 607-723-9661
NY New Hartford, J. Reagan, 41 Woodberry 315-732-3775
NY Rochester, J. Reagan, 891 Monroe 716-473-2115
NC Winston-Salem, W. Brown, 1108 Burke 919-725-5384
Ohio Cleveland, Marlow Assocs., 4468 Mayfield 216-381-4500
Ore Beaverton, N.R. Schultz Co., Box 156 503-646-1345
Tex Dallas, J.A. Green Co., 7118 Envoy Ct. 214-ME-1-7450
Tex Houston, J.A. Green Co., 3400 Montrose 713-JA-6-2959
Va Alexandria, W. Brown, 325 First 703-TE-6-1800
Wash Seattle, N. Schultz, 305 - 112th Ave. 206-454-5224
For: Can., Montreal, Que., Brian Engrg., 2445 Duncan 514-735-1671
For: Can., Rexdale, Ont., Brian Engrg., 45 Shaft 416-248-0226

MCMILLAN RADIATION LABS, INC., Sub. Lundy Elctrns. & Sys., Inc., Brownville Ave., Ipswich, Mass., 01938, Tel: 617-356-5761, TWX: 710-390-1133; Mktg. Mgr: R.W. Neumann

MCNAB, INC., 165 Spring St., New York, N.Y., 10012, Tel: 212-WO-6-2625; Sls. Mgr: R.C. Ryan

MCNALLY BROS. MACH. & GEAR, 1145 E. 79th St., Mipls., Minn., 55420, Tel: 612-888-8419; Sls. Mgr: A.B. Sorensen

MCPHERSON INSTR., Sub. GCA Corp., 530 Main St., Acton, Mass., 01720, Tel: 617-263-7733; Sls. Mgr: S.C. Hammond

MCS CORP., 1307 S. Myrtle Ave., Monrovia, Calif., 91016, Tel: 213-357-3285, TWX: 910-585-3482; Sls. Mgr: A. Coverley

Advertisement

Specialists in microwave wageguide components and subsystems assemblies. Unusual custom waveguide devices fabricated to customer drawings or completely designed to customer specifications. Employing cost-saving production techniques, MCS produces in reasonable time, with no do-overs. In addition to custom capabilities a complete catalog line of microwave test equipment from 1.7 to 90 GC is available. This includes ferrite devices, slotted lines, couplers, standard gain horns, attenuators, flanges and related components.

MEASUREMENT SYS., INC., 523 West Ave., Norwalk, Conn., 06850, Tel: 203-838-5561; Pres: M.H. Mehr

MECA ELCTRNS., INC., 459 E. Main St., Denville, N.J., 07834, Tel: 201-625-0661; Sls. Mgr: R.R. Davo

MECH-TRONIC EQUIP. CO., Box 510, Silver Spring, Md., 20907, Tel: 202-TU-2-4851; Pres: B.L. Davis

MECHANICAL ENGRAVING CO., INC., 10 Van Cortlandt Ave., E., Bronx, N.Y., 10468, Tel: 212-LU-4-8600; Sls. Mgr: J. Mandel

MECHANICAL ENTERPRISES, 5249 Duke St., Alexandria, Va., 22304, Tel: 703-751-3030, TWX: 710-832-9810; Sls. Mgr: R.A. Thomas

MECHANICAL PRODS., Div. Aiken Inds., Inc., 1824 River St., Box 729, Jackson, Mich., 49202, Tel: 517-782-0391, TWX: 810-253-0827; Sls. Mgr: L.R. Matzen

MECHANICAL TECHNOLOGY, INC., 968-9 Albany-Shaker Rd., Latham, N.Y., 12110, Tel: 518-785-2323; Sls. Mgr: K.E. Wilson

MECHANICS FOR ELCTRNS., INC., 340 Fordham Rd., Wilmington, Mass., 01887, Tel: 617-658-5500, TWX: 710-347-6938; V.P. Mktg: M. Kasok

MECHANIZATION ASSOCS., 140 S. Whisman Rd., Mt. View, Calif., 94040, Tel: 415-967-4262; Sls. Mgr: B.F. Kalvelage

MEDISTOR INSTR. CO., 4503 8th Ave., N.W., Seattle, Wash., 98107, Tel: 206-784-8141; Sls. Mgr: L. Larson

MEGADYNE INDS., INC., 1665 Buffalo Rd., Rochester, N.Y., 14624, Tel: 716-328-4242; Sls. Mgr: A. Terpening

Advertisement

THIN-FILM MICROELECTRONICS

- coated substrates
- precircuits
- resistor networks & ladders
- active hybrids
- custom micro assemblies

MILITARY & COMMERCIAL

- Qualified to MIL-Q-9858A, MIL-STD-883 NOD 36352 Class 1

MEKONTROL INC., 56 Hudson St., Northboro, Mass., 01532, Tel: 617-393-2451; Sls. Mgr: D.R. Percival

MEL-RAIN CORP., 3100 Roosevelt Ave., Indianapolis, Ind., 46218, Tel: 317-637-3531; Sls. Mgr: N. Potter

MELCOR-MATERIALS ELCTRN. PRODS., 990 Spruce St., Trenton, N.J., 08638, Tel: 609-393-4178; Sls. Mgr: M. Levine

Advertisement

Creators of the solderable ceramic cooling module. Highest efficiency, and reliability in the industry. Modules and Thermoelectric assemblies, supplied in OEM quantities and prices. Complete line of modules available from stock.

MELCOR ELCTRNS. CORP., 1750 New Hwy., Farmingdale, N.Y., 11735, Tel: 516-694-5570, TWX: 510-224-6429; Dir. Mktg: N. Sakellarios ....Pg. 1290

Ariz Mesa, Tri-City Elctrns. 602-969-5877
Cal Encino, Diacoustic 213-346-4322
Cal Los Angeles, El Com 213-223-1351
Cal Los Altos, IFM-North 415-961-2828
Fla St. Petersburg, Orbe, 4110 Central 813-894-0687
Ill Hinsdale, J.D. Allyn 312-325-0495
Md Baltimore, R. F. Assocs., 6630 Baltimore Nat'l. Pike 301-747-0111
Md Rockville, Suburban Sound 301-933-7788
Mich Ann Arbor, H. C. Heym, 1615 Chalmers 313-971-6552
Mo St. Louis, Fixman Engrg., 8160 Stanford 314-725-5219
NY Floral Park, MOS Assocs., 80-54 266th 516-694-5923
Ohio Dayton, Rixan Assocs. 513-222-0011
Pa New Britain, Kastle Assocs. 215-348-4466
Tex Dallas, Remtek, Inc. 214-369-8146
Wash Seattle, Datacom, 2207 Fairview 206-329-2989
Wash Seattle, Paratech 206-784-6447

EXP: N.Y., Richmond Hill, Aviation Sls., 115-06 Myrtle 212-441-3100
For: Can., Ville La Salle, Que., Electrodesign, Ltd. 514-363-5120

MELETRON CORP., 940 N. Orange Dr., Los Angeles, Calif., 90038, Tel: 213-463-4841; Sls. Mgr: E.R. Davis

MELLAND GEAR & INSTR. CO., INC., 84 Sylvester St., Westbury, N.Y., 11590, Tel: 516-ED-3-2700; Sls. Mgr: F. Raleigh

MELLOTONE, INC., 1220 Broadway, New York, N.Y., 10001, Tel: 212-LA-4-1322; Sls. Mgr: J. Powder

MELOY LABORATORIES, 6631 Iron Pl., Springfield, Va., 22150, Tel: 703-354-4450; Sls. Mgr: J.R. Thompson Pg. 1407
Cal Los Altos, Collins & Hyde, 900 N. San Antonio 415-941-3355
Cal Los Angeles, Collins & Hyde, 5380 Whittier 213-728-7221
Tex Dallas, Scott Tech. Sls., Box 30324 214-352-7698

MELTRONICS INC., 3343 Merrick Rd., Wantagh, N.Y., 11793, Tel: 516-785-1286; Sls. Mgr: M. Miele

Advertisement

Meltronics manufactures a complete line of precision magnetic clutches and brakes friction and hysteresis types; single and multi-speed reducers; component modules (brake-pot); gear assemblies; rotary actuators and custom linear solenoids. Custom designs our specialty on all products.

MEM CONTROLS, INC., 1450 East 289th St., Wickliffe, Ohio, 44092, Tel: 216-944-7070; Mktg. Mgr: F. J. Weihmiller

MEMOREX CORP., 1200 Memorey Dr., Santa Clara, Cal., 95050, Tel: 408-987-1000, TWX: 910-338-0131; Comp. Sup: R.D. Boucher

MENNEN-GREATBATCH ELCTRNS., INC., 10123 Main St., Clarence, N.Y., 14031, Tel: 716-759-8361; Sls. Mgr: T. Bellanca

MEPCO, INC., 71 E. Columbia Rd., Morristown, N.J., 07960, Tel: 201-539-2000, TWX: 710-986-7437; V.P. Sls. Mgr: R.J. Gebhardt ....Pg. 2864
Ala Huntsville, Int'l. Sci. Instr., Box 2091 205-536-9686
Ariz Scottsdale, Carter, 201 W. First St. 602-947-4355
Cal Pico Rivera, Westrep, 9519 Telegraph Rd. 213-949-2551
Cal San Diego, Celtec Co., 3821 Fourth Ave. 714-291-4955
Cal Irvine, MEPCO, Inc., 2182 DuPont Dr. 714-833-1990
Cal Mountain View, Quad Rep., 943 Stierling Rd. 415-964-3532
Colo Wheat Ridge, Waugaman, 4643 Wadsworth 303-423-1020
Conn Trumbull, Circuit Sls. Co., 90 Haviland Dr. 203-261-4832
Fla Clearwater, Perrott, 1158 Belleaire La. 813-531-5513
Fla Orlando, Perrott, 1607 Forsyth Rd. 305-275-1132
Fla W. Palm Bch., Perrott, 7517 W. Lake Dr. 305-967-1770
Ill Rolling Meadows, Sumer, 5105 Tollview 312-392-7370
Ind Ft. Wayne, Sumer, Inc., 1430 Dividend Dr. 219-484-9588
Iowa Cedar Rapids, H. Brown, 3400 Indian Rd. 319-366-0635
Kans Overland Pk., Tech. Reps., 9009 W. 95th 913-381-5852
Kans Wichita, Tech. Reps., 6814 Farmview La. 316-682-4140
Md Towson, Micro Comp., 660 Kenilworth 301-823-3603
Mass Lexington, Circuit Sls., One Militia Ave. 617-861-0567
Mass Waltham, MEPCO, 46 Charlesbank Way 617-899-4949
Mich Southfield, Luebbe Sls., 20905 Greenfield 313-357-0355
Minn Mpls., Stack-Johnson, 2740 Louisiana 612-925-2111
Mo Florissant, Tech. Reps., 525 St. Francois 314-838-9100
NJ Nutley, Falk-Baker Assocs., 382 Franklin 201-661-2430
NY Ithaca, B. Dean, Inc., 714 W. Clinton St. 607-272-2187
NY Northport, Halcon, Inc., Box 328 516-423-1818
Ohio Cincinnati, Luebbe Sls., 2649 Erie 513-871-4211
Ohio Dayton, Luebbe Sls., Box 224 513-294-0426
Ohio Dayton, Luebbe Sls. Co., 3490 S. Dixie Dr.
Ohio Sheffield Lake, Luebbe Sls., 269 Thelma 216-459-1779
Pa Glenside, Precision Elctrns., 1601 Church 215-646-8383
Tex Garland, Carter Assocs., 400 Forest Gate 214-276-7151
Wash Bellevue, N.R. Schultz, 305 - 112th Ave. N. E. 206-454-5224

MERCHANT, ROBERT C. CO., Box 246, Carmel Valley, Calif., 93924, Tel: 408-659-2255

MERCO PRODS. CO., INC., 1298 Bethel Dr., Eugene, Ore., 97402, Tel: 503-688-7331; Pres: J.R. Auld

MERCOID CORP., 4201 Belmont Ave., Chicago, Ill., 60641, Tel: 312-736-2100; Sls. Mgr: P.P. Sloss

MERCURY ELCTRNS. CORP., 315 Roslyn Rd., Mineola, N.Y., 11501, Tel: 516-742-5400; Sls. Mgr: H. Rich

MERCURY ELCTRNS. CORP., 339 E. Cottage Pl., York, Pa., 17403, Tel: 717-854-9557; Sls. Mgr: C.H. Bruns

MERIDIAN LABORATORY, INC., 2611 University Ave., Madison, Wisc., 53705, Tel: 608-238-3333; Pres: C.H. Krause

MERIT PLATING CO., INC., 212 East 141st St., Bronx, N.Y., 10451, Tel: 212-CY-2-6380; Pres: D. Levy

MERIX CHEM. CO., 2234 East 75th St., Chicago, Ill., 60649, Tel: 312-221-8242; Sls. Mgr: J. Parus

MERRIMAC RESCH. & DEV., INC., 41 Fairfield Pl., West Caldwell, N.J., 07006, Tel: 201-228-3890, TWX: 710-734-4314; V.P: F.J. Weber

MERRIMACK MAGNETICS, 361 Aiken St., Lowell, Mass., 01850, Tel: 617-458-1487; Sls. Mgr: R.O. Ross

MESON ELCTRNS. CO., INC., 380 Cottage St., Rochester, N.Y., 14611, Tel: 716-235-7070; Sls. Mgr: Mr. H.B. Dorren

MET-L-WOOD CORP., 6755 West 65th St., Chicago, Ill., 60638, Tel: 312-585-7575; Sls. Mgr: D.O. Williamson

METAL BELLOWS CORP., 1075 Providence Hwy., Sharon, Mass., 02067, Tel: 617-668-3050, TWX: 710-346-0849; Sls. Mgr: R.M. Carey

METAL CERAM, INC., 17 N. West St., Mt. Vernon, N.Y., 10550, Tel: 914-664-2800; Sls. Mgr: N. Hascoe

METAL WORKS, INC., 500 W. Ninth St., Hermann, Mo., 65041, Tel: 314-486-2128; V.P. Mktg: R.T. Mathias

METALCRAFT, INC., 149 4th St., S.W., Mason City, Iowa, 50401, Tel: 515-423-9460; Sls. Mgr: D. Lauber

METALLIZED PRODS., Box 391, Norwalk, Conn., 06852, Tel: 203-838-4703, TWX: 710-468-3053; Sls. Mgr: J. Pressler

METALLO GASKET CO., 16 Bethany St., New Brunswick, N.J., 08903, Tel: 201-545-7223; Pres: S.W. Geipel

METALPHOTO CORP., 18531 S. Miles Rd., Cleveland, Ohio, 44128, Tel: 216-475-0555; Sls. Mgr: R. Lundregen

METAPLAST ELECTROCHEMICALS, 915 Westchester Ave., Bronx, N.Y., 10459, Tel: 212-DA-8-2444; Pres: J.L. Lester

METEOROLOGY RESEARCH, INC., 464 W. Woodbury Rd., Altadena, Calif., 91001, Tel: 213-791-1901; Mktg. Mgr: G.P. Ettenheim, Jr.

METEX CORP., 970 New Durham Rd., Edison, N.J., 08817, Tel: 201-287-0800, TWX: 710-998-0578; Sls. Mgr: B. Rashkow

METHODE ELCTRNS., INC., 7447 W. Wilson Ave., Chicago, Ill., 60656, Tel: 312-867-9600, TWX: 910-221-2468; Sls. Mgr: W.T. Jensen

METRIC SYS., 736 N. Beal St., Ft. Walton Beach, Fla., 32548, Tel: 904-242-2111; Sls. Mgr: C.J. Scribner Pgs. 358-360

METRIX INSTR. CO., Box 36501, Houston, Tex., 77036, Tel: 713-668-2386 P.C. Sundt ....Pg. 518
Ariz Phoenix, W.E. Sanderson, 5045 N. 12th 602-277-0077
Cal Van Nuys, Combustion & Controls, 15759 Strathern 213-787-5660
Ga Atlanta, Control Equip., Box 11795 404-237-1688
Ill Des Plaines, Martec Assocs., 1616 Linden 312-296-3331
Mass Newton Centre, Daner-Buchler, Inc., 684 Commonwealth Ave. 617-969-4650
NJ Cinnaminson, Control Equip., Inc., 464 N. Randolph Ave. 609-829-1447
NJ Englewood, Tridon Sls., Eight Depot Sq. 201-569-8011
NY Rochester, Daner-Buchler, Inc., 2019 Hudson 716-467-5100
Ohio No. Canton, M.S. Jacobs & Assoc., 1600 Portage Rd. 216-494-5480
Okla Tulsa, Delcon, Box 4504 918-836-3351
Okla Tulsa, Quigg Process Equip., Center Bldg. 918-587-0166
Pa Jenkintown, Stein Instr. Co., 413 Johnson 215-885-2370
Pa Pittsburgh, M.S. Jacobs, 810 Noblestown 412-923-2090
Wisc Milwaukee, Process Meas. & Control Co., Box 7292 414-774-3290
WVa Charleston, M. Jacobs & Assocs., Box 523 304-343-8906
For: Can., Weston, Ont., Vibron, 2400 Finch 416-741-5200

METROLOGICAL DATA CORP., 70 Plauderville Ave., Garfield, N.J., 07026, Tel: 201-772-6720; Sls. Mgr: T. Nash

METRON INSTRS., INC., 1051 S. Platte River Dr., Denver, Colo., 80223, Tel: 303-744-1791; Sls. Mgr: J.C. Palmer

METROPOLITAN SUPPLY CORP., 468 Park Ave. S., New York, N.Y., 10010, Tel: 212-686-2120; Sls. Mgr: H. Rosen .... Pgs. 1809,2000,2001

METROPOLITAN WIRE GOODS, Industrial Div., Washington & George, Wilkes-Barre, Pa., 18705, Tel: 717-825-2741; Sls. Mgr: R. Maslow

METTLER ELCTRNS. CORP., 123 N. Fair Oaks Ave., Pasadena, Calif., 91101, Tel: 213-795-7769; Pres: H.C. Mettler

M F ELCTRNS. CORP., 118 E. 25th St., New York, N.Y., 10010, Tel: 212-674-5360; Sls. Mgr: M.J. Finkelstein Pgs. 1412,1413
Cal N. Hollywood, B.J. Wolfe Entprs., 10760 Burbank
Cal Cupertino, B.J. Wolfe Entprs., Box 718 408-252-5010
Cal No. Hollywood, B.J. Wolfe Entprs., 10760 Burbank 213-877-5518
Conn Meriden, Abbott-Allison, Box 467 203-237-9232
Mass Andover, Abbott-Allison Co., Box 96 617-245-0250
Tex Dallas, Southern Engrg., 1823 Levee 214-748-5760

M.I.A.L. U.S.A., INC., 165 Franklin Ave., Nutley, N.J., 07110, Tel: 201-667-1600, TWX: 710-989-1443; Sls. Mgr: J.W. Yuhas

MI-KRO CONNECTOR DIV., Penn-Akron Corp., 40-09 21st St., Long Island City, N.Y., 11101, Tel: 212-EX-2-8814; Gen. Mgr: S. Straus

MICA CORP., 4031 Elenda St., Culver City, Calif., 90230, Tel: 213-870-6861, TWX: 910-340-6365; Sls. Mgr: L. Eggert

MICA FABRICATING CO., 53 Central Ave., Rochelle Park, N.J., 07662, Tel: 201-843-1272 M.H. Cymberg

MICACRAFT PRODS., 49-51 Liberty St., Newark, N.J., 07102, Tel: 201-623-4074; Sls. Mgr: C.E. Garneau

MICHIGAN CHEMICAL CORP., 351 E. Ohio St., Chicago, Ill., 60611, Tel: 312-828-9500, TWX: 910-221-3843; V.P. Mktg: T.A. Girard

MICHIGAN CHEM. CORP., Rare Earth Sls., 351 East Ohio St., Chicago, Ill., 60611, Tel: 312-828-9500, TWX: 910-221-3843; Sls. Mgr: T.A. Girard

MICHIGAN MAGNETICS, 203 W. Third St., Vermontville, Mich, 49096, Tel: 517-726-0590; Mktg. Dir: B.L. Killinger

MICHIGAN SCI. CORP., 730 Bellevue Ave., Milford, Mich., 48042, Tel: 313-684-0035, TWX: 313-342-0894; Sls. Mgr: H. Larsen

MICO INSTR. CO., 80 Trowbridge St., Cambridge, Mass., 02138, Tel: 617-547-8660; Sls. Mgr: R.F. Walker

MICRO BALANCING, INC., 120 Finn Ct., Farmingdale, N.Y., 11735, Tel: 516-694-7965; V.P. (Sls.) D.G. Stadelbauer

MICRO-CIRCUITS CO., Dept. EEM I, New Buffalo, Mich., 49117, Tel: 616-469-2727; Sls. Mgr: R.F. Bradley Pg. 2480

Advertisement

Send for our "Ten Ways to Use Electrically Conductive Paints". FREE. It gives you fresh ideas on production and research problems. One customer is saving $32,000 per year in a test application. Another is saving $72,000 per year on high meg resistors. Another cut shielding and ground cost on a plastic part from 5 to 1.5 .

MICRO CONTACTS INC., 62 Alpha Plaza, Hicksville, N.Y., 11801, Tel: 516-433-4380

MICRO DESIGN ASSOCS., Box 692, Burbank, Cal., 91503, Tel: 213-763-9018; Sls. Mgr: J. Herndon

MICRO DEVICES CORP., P.O. Box 501, Far Hill Sta., Dayton, Ohio, 45419, Tel: 513-294-0581; Sls. Mgr: R.L. Woehrmyer

MICRO ELCTRNS. CORP., 37550 Sierra Hwy., Palmdale, Cal, 93550 ....Pgs. 2646-2648
Cal Palmdale, EDCO, 37550 Sierra Hwy. 805-947-0398
Tex Dallas, Aymond Co., 4340 N. Central Expwy. 214-827-8043

MICRO ELCTRNS., INC., Box 8236, Albuquerque, N.M., 87108, Tel: 505-877-1181; Sls. Mgr: C.W. Lytle

MICRO ELCTRNS., LTD., 84 Hung To Rd., Kwun Tong, Hong Kong, Tel: K-893363; Sls. Mgr: R. Chan

MICRO INSTR., 12901 Crenshaw Blvd., Hawthorne, Cal., 90250, Tel: 213-772-1275, TWX: 910-325-6631; Sls. Mgr: B.A. Beneteau

MICRO-MEAS. DIV., Vishay Intertechnology, 38905 Chase Rd., Romulus, Mich., 48174, Tel: 313-941-3900; Sls. Mgr: R.J. Whitehead

MICRO NETWORKS, 5 Barbara La., Worcester, Mass., 01604, Tel: 617-756-4635

MICRO-NOW INSTR., 6104 N. Pulaski Rd., Chicago, Ill., 60646, Tel: 312-478-1151; Sls. Mgr: C. Arnow

MICRO-OHM CORP., 4900 Santa Anita Dr., El Monte, Cal., 91731, Tel: 213-442-3310; Sls. Mgr: S. MacDonald

MICRO-POWER, INC., 25-14 Broadway, Long Island City, N.Y., 11106, Tel: 212-726-4060, TWX: 710-582-2608; Dir. Mktg: R.J. Sheloff

MICRO SCIENCE ASSOCS., 2274 Mora Dr., Mt. View, Cal., 94040, Tel: 415-968-7215, TWX: 910-379-6938; Mgr. Cust. Svc: B. Ruth

MICRO-STRAIN, INC., Spring City, Pa., 19475, Tel: 215-948-4550; Sls. Mgr: R. Jespersen

MICRO SWITCH, Div. Honeywell, 11 W. Spring St., Freeport, Ill., 61032, Tel: 815-232-1122, TWX: 910-642-0922; Sls. Mgr: E.N. Hughes

MICRO-TECHNICAL INDS., 1999 South Coast Hwy., Laguna Beach, Cal., 92651, TWX: 714-494-1036; Sls. Mgr: C. Schwab

MICRO TECH. MFG., INC., 703 Plantation St., Worcester, Mass., 01605, Tel: 617-755-5215, TWX: 710-340-6739; Sls. Mgr: D.G. Allen

MICRO-TEL CORP., 6310 Blair Hill La., Baltimore, Md., 21209, Tel: 301-823-6227; Sls. Mgr: E.C. King

MICROCOM CORP., Horsham Valley Ind'l. Pk., Horsham, Pa., 19044, Tel: 215-OS-2-6300; Sls. Mgr: F. Shandelman

MICRODATA CORP., 644 Young St., Santa Ana, Cal., 92705, Tel: 714-540-6730, TWX: 910-595-1764; Prod. Mgr: R. Oakey

MICRODOT INC., 220 Pasadena Ave., S. Pasadena, Calif., 91030, Tel: 213-682-3351, TWX: 910-588-3768; Sls. Mgr: J. Redwine

MICRODOT INC., Instrumentation Div., 19535 E. Walnut Dr., City of Industry, Cal., 91744, Tel: 213-965-4911, TWX: 910-588-3768; Sls. Mgr: Ru S. Burkett ....Pg. 522

Ala Huntsville, Gentry Assocs., 2109 W. Clinton Ave. 205-534-9771

Cal Cupertino, T. L. Snitzer, 10320 Saratoga-Sunnyvale Rd. 408-257-8333

Cal Del Mar, T. L. Snitzer, 1150 Camino Del Mar 714-454-2191

Cal Los Angeles, T. L. Snitzer, 9005 Exposition Blvd. 213-836-6170

Colo Englewood, PLS Assocs., 8080 E. Union Ave. 303-771-0140

Conn Brookfield Ctr., Webb Assocs., Junction Rd. 203-775-0055

Fla Orlando, Gentry Assocs., 550 No. Bumby Ave. 305-841-7740

Ill Des Plaines, S. Sterling, 1001 E. Touhy Ave. 312-298-4830

Mass Bedford, Webb Assocs., 5 Shawsheen Ave. 617-275-8310

Mich Detroit, S. Sterling, 17500 W. McNichols Rd. 313-255-1970

Mo St. Louis, S. Sterling, 11734 Lackland Ind'l. 314-542-3636

NJ Haddonfield, Mak Elctrns., Box 1000 609-428-1663

NJ Hazlet, Mer Mon Elctrn. Instrs., Box 302 201-264-1851

NM Albuquerque, PLS Assocs., 4300 H Silver Ave., S.E. 505-255-2330

NY Depew, Labtronics, 5800 Transit Rd. 716-685-4111

NY Endicott, Labtronics 607-748-0509

NY Hicksville, Salsbury Assocs., 331 W. John St. 516-938-1080

NY Schenectady, Labtronics 518-372-6649

NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314

NC Burlington, Gentry Assocs., 116 E. O'Neal Ave. 919-227-2581

Ohio Cleveland, S. Sterling, 5827 Mayfield Rd. 216-442-8080

Ohio Dayton, S. Sterling, 2673 Culver Ave. 513-298-7573

Pa Pittsburgh, S. Sterling, #2 Parkway Ctr. 412-922-5720

Tex Richardson, Lear Assocs., Box 1266 214-231-7696

Tex Houston, Lear Assocs., Box 26653 713-649-7727

Utah Salt Lake City, PLS Assocs., 5219 Major St. 801-262-2866

Va Alexandria, W. A. Brown Instrs., 325 First St. 703-836-1800

Wash Seattle, Datacom Assocs., 2207 Fairview Ave., E. 206-329-2989

MICROFLAME, INC., 3724 Oregon Ave. S., Minneapolis, Minn., 55426, Tel: 612-935-3777 C.D. Ludwig

MICROFLECT CO., 3575 25th S.E., Salem, Ore., 97302, Tel: 503-363-9267, TWX: 510-599-0107; Sls. Mgr: G.F. Kreitzberg

MICROLAB/FXR, 10 Microlab Rd., Livingston, N.J., 07039, Tel: 201-992-7700, TWX: 710-994-4850; Sls. Mgr: R. Vincent

MICRO-LINE, Div. Bausch & Lomb, Box 938, Jamestown, N.Y., 14701, Tel: 716-488-1958; Sls. Mgr: J.C. Liuzzo

MICROMEGA, Div. Bunker-Ramo Corp., 12575 Beatrice St., Los Angeles, Cal., 90066, Tel: 213-391-7137, TWX: 910-342-6990; Pres: E. Strumwasser

MICROMETALS, 228 N. Sunset, City of Industry, Calif., 91747, Tel: 213-968-4718; Sls. Mgr: R.H. Barden

MICROPAC INDS., INC., 905 E. Walnut St., Garland, Tex., 75040, Tel: 214-272-3571, TWX: 910-860-5186; Sls. Mgr: R.C. Cire

MICROPHASE CORP., 35 River Rd., Cos Cob, Conn., 06807, Tel: 203-661-6200, TWX: 710-579-2926; Sls. Mgr: F.S. Parin

MICROSEMICONDUCTOR DIV. STANDARD RESOURCES CORP., 11250 Playa Ct., Culver City, Cal., 90230, Tel: 213-391-8271; Sls. Mgr: S. Rastogi Pgs. 1810-1813

Ariz Scottsdale, F. Board Assocs., Box 1906 602-949-9561

Cal Downey, Bertram-Zoolalian, 7340 Florence Ave. 213-927-4406

Cal Mountain View, Nor-Cal Assocs., 2680 Bayshore 415-961-8121

Colo Denver, Brown Tech., 130 S. Yarrow St. 303-233-0863

Fla Orlando, G.F. Bohman Assoc., 7040 Lake Ellenor Dr. 305-855-0274

Fla Palm Beach Gardens, G.F. Bohman Assocs., 10303 Ave. P.G.A. 305-842-7188

Ill Bellwood, Fiat Engrg. Assocs., 5133 St. Charles Rd. 312-547-6201

Md Towson, J.A. Dougherty Sls., 320 Hillen Rd. 301-823-0431

Mass Waltham, Impact Sls., 223 Crescent St. 617-352-8881

Mich Southfield, Sterling-Lowell, 21251 Civic Ctr. Dr. 313-352-8881

Minn Mpls., Bitronics Sls., 6245 Thomas Ave., S. 612-888-7044

Mo Grandview, Centech. Sls., Box 310 816-763-2900

NJ Livingston, Varrelman-Gorman, Box 206 201-992-2505

NY Liverpool, Varrelman-Gorman, 21 Lorraine Crescent 315-458-4774

Ohio Dayton, Gibson Elctrns., 122 Westpark Rd. 513-433-3521

Pa Ambler, Griffin-Campbell, 25 Skippack Pk. 215-646-7535

Tex Richardson, Thornton-Leeper Elctrn. Sls., Box 111 214-231-6891

Wash Seattle, Blair Hirsh Assocs., 4013 Leary Way N.W. 206-SU-3-3423

MICROSONICS, INC., Div. Sangamo Elec. Co., 60 Winter St., Weymouth, Mass., 02188, Tel: 617-337-4200; Sls. Mgr: J. Klayman

MICROTRAN CO., 145 E. Mineola Ave., Valley Stream, N.Y., 11582, Tel: 516-LO-1-6050, TWX: 510-225-8412; Gen. Sls. Mgr: W. Benscher ....Pgs. 2958-2963

Ala Birmingham, F. Nickerson Co., Box 9679 205-853-3181

Ariz Scottsdale, F. Schoeffler, 7224 N. Lakeside 602-948-3470

Cal Los Altos, Westec Elctrns., 110 1st St. 415-948-8880

Cal San Marino, Van Gott Assocs., Box 8401 213-282-1125

Colo Denver, Gossard, 12159 W. Dakota 303-985-0602

Fla Miami Beach, Geartner, 350 Lincoln 305-531-0200

Fla Orlando, Geartner Assocs., 1221 Lee 305-299-1000

Ga Decatur, F. Nickerson, 1240 Clairmont 404-377-1575

Ill Chicago, T.B. Hunter, 5653 W. Irving Pk. 312-777-2500

Ind La Fontaine, Kirsch Sls., 107 N. Wabash 317-981-2801

Iowa Cedar Rapids, V. Fester Sls., 1311 Oakland 319-362-6997

Kans Shawnee, J. Guernsey Co., Box 3305 913-631-2414

Md Baltimore, J.R. Daniel, 1404 Bare Hills 710-232-1813

Mass Newtonville, C. Segel Co., Box 106 617-969-6900

Minn Hopkins, Beta Engrg., 128 Jackson 612-938-2551

NY Hollis, A. Friedman, 86-51 Palo Alto 212-776-4800

NY N.Y., E. Glass Assocs., 250 W. 57th 212-JU-6-8440

NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343

NC Charlotte, F. Nickerson, 5817 Haddington 704-537-2855

Ohio Cincinnati, J. Olsen, 12119 Marwood 513-671-8134

Ohio Cleveland, J.O. Olsen, 16201 Shaker 216-752-5444

Ohio Dayton, R.G. Siff, Box 7035, Sta. B 513-278-4779

Pa Jenkintown, Arnold Assocs., Box 1012 215-887-7870

Pa Pittsburgh, J.O. Olsen Co., 104 Elatan Dr. 412-279-2550

Pa Pittsburgh, J.O. Olsen Co., 1843 Maydell 412-341-8391

Tex Grand Prairie, Howell Sls., Inc., Box 747 214-AN-2-5153

Tex Bellaire, Howell Sls., Inc., 4701 Linden 713-MO-4-4379

Wash Seattle, Westec Elctrn., Inc., Box 66521 206-CH-3-7070

EXP: N.Y., Valley Stream, Microtran, 145 E. Mineola Ave. 516-561-6050

MICROWAVE ASSOCS., INC., Northwest Ind. Pk., Burlington, Mass., 01803, Tel: 617-272-3000, TWX: 710-332-6789

MICROWAVE CAVITY LABS., Div. KMS Inds., 10 N. Beach Ave., La Grange, Ill., 60525, Tel: 312-354-4350, TWX: 910-683-1899; Sls. Mgr: T.N. Hewlett Pgs. 610,611

Cal Orange, Smith & Assoc., 363 S. Main 714-633-7991

Fla Orlando, Gra-Mar, Inc., 3113 Lawton Rd. 305-841-2330

Ill Mt. Prospect, Cain, 1203 Ironwood Dr. 312-253-3578

Md Baltimore, Stemler, 6707 Whitestone 301-944-8262

Mass Bedford, Reptron, Inc., 110 Great Rd. 617-275-8585

NJ Cherry Hill, Stemler Assocs., Box 287 609-966-4070

NJ Montville, G & A Sls., 8 Brittany Rd. 201-227-3926

NY Rochester, J. Ryerson, Box 8369 716-442-1900

Ohio Columbus, Cain & Co., 2485 Lipton Rd. 614-861-2119

Tex Richardson, Lear Assocs., Box 1266 214-231-7696

Va Alexandria, Stemler, 206 N. Washington 703-548-7818

MICROWAVE DEVELOPMENT LABS., INC., 87 Cresent Rd., Needham Hgts., Mass., 02194, Tel: 617-449-0700, TWX: 710-325-1739; Sls. Mgr: R. Tucker

MICROWAVE DIODE CORP., 4 Hale Ct., Newburyport, Mass., 01950, Tel: 617-462-7462; Sls. Mgr: D.E. Shea

MICROWAVE DIV, Sanders Assocs., Inc., Ledge St, Nashua, N.H., 03060, Tel: 603-885-2445, TWX: 710-228-1887; Mktg. Mgr: M. Bloom

MICROWAVE FILTER CO., INC., 135 W. Manlius St., East Syracuse, N.Y., 13057, Tel: 315-437-4529; Sls. Mgr: G. Bostick

MICROWAVE INSTRS. CO., 3111 Second Ave., Corona del Mar, Calif., 92625, Tel: 714-673-7688; Gen'l Mgr: R. Botsco

MICROWAVE LABS. AMERICA, Box 13, Bay Sta., Brooklyn, N.Y., 11235; Sls. Mgr: H. Gindins

MICROWAVE MAGNETICS INC., 183 Newburyport Tpke., Danvers, Mass., 01923, Tel: 617-774-1072; Pres: C.R. Buffler

MICROWAVE PRODS., INC., 9533 Irondale Ave., Chatsworth, Cal., 91311, Tel: 213-882-3434; Sls. Mgr: C. Troesken

MICROWAVE/SYS., INC., 1 Adler Dr., E. Syracuse, N.Y., 13057, Tel: 315-437-9951, TWX: 710-541-0406; Sls. Mgr: R.J. Berk

MICTRON DIV. KMS, INC., Box 10126, Porter Rd., Sarasota, Fla., 33578, Tel: 813-955-4259; Sls. Mgr: R. Theetge

MID-EASTERN INDS., Div. of Eanco, Inc., 660 Jerusalem Rd., Scotch Plains, N.J., 07076, Tel: 201-233-5900; Sls. Mgr: D.R. Ellenback ..Pgs. 812-814

Cal Los Angeles, Dyna Sls., 5331 E. Olympic 213-268-1175

Fla Alamonte Spg., WMM Assocs., 515 Tivoli 305-831-4645

Fla Clearwater, WMM Assocs., Inc., 1260A S. Highland Ave. 813-446-0075

Fla Pompano Bch., WMM Assocs., Inc., 721 S.E. 6th Terr. 305-943-3091

Ill Evanston, Mauer & Co., 3308 Noyes 312-869-1644

Iowa Ft. Dodge, Heimann, 236 7th 515-576-2374

Kans Leawood, Leemark Engrs., Inc., Box 6175 913-648-0124

Mass Wellesley Hls., R. Sturdy, 204 Worcester 617-235-2330

Mich Detroit, Lowry Dietrich, 600 Michigan 313-961-4540
Minn Mpls., Heimann Co., 5603 Lyndale 612-861-6051
Mo St. Louis, Leemark Engrs., 9623 St. Charles Rock Rd. 314-647-4545
NY Huntington, C.R. Mayer Co., Box 152 516-WA-1-7876
Ohio Cleveland, Lowry Dietrich, 316 Marion 216-781-1855
Ohio Dayton, Lowry Dietrich, 333 W. 1st 513-223-6042
Pa Pittsburgh, Lowry Dietrich, 90 Clairton 412-892-2992
Pa Valley Forge, J.E. Cuesta Co. 215-265-5800
Tex Dallas, Bellingham Sls., 1002 Burlington 214-WH-2-6595
WashSeattle, Eicher-Richards Co., 2727 N.E. Blakeley St. 206-LA-3-7888
For: Can., Vancouver, B.C., Canadian Dynamics, Ltd., 8264 St. George St. 325-6014

MID-WEST COIL & TRANSFORMER CO., 1642 N. Halstead St., Chicago, Ill., 60614, Tel: 312-MI-2-4055; Sls. Mgr: G. Ortaggio

MID-WEST METAL PRODS., 456 E. Donovan Rd., Kansas City, Kans., 66115, Tel: 913-342-8171, TWX: 913-553-9260; Mgr: G.H. Turner

MIDDLESEX GEN'L. INDS., 58 Washington St., Somerville, Mass., 02143, Tel: 617-666-0100; Sls. Mgr: H. Foundas

MIDG-LINE INSTR. CO., Kendall Br., Box 487, Miami, Fla., 33156, Tel: 305-238-0864

MIDGET LOUVER CO., 800 Main Ave., Norwalk, Conn., 06901

MIDLAND STANDARD INC., 603 E. Chicago St., Elgin, Ill., 60120, Tel: 312-741-6600; Sls. Mgr: J. McGill

MIDTEX/AEMCO, 10 State St., Mankato, Minn., 56001, Tel: 507-388-2985, TWX: 910-565-2244; Sls. Mgr: G. Cheever ....Pg. 1761

Ala Huntsville, Twentieth Century Mktg., Box 6127 205-772-9237
Cal San Francisco, Tech. Mktg., 1485 Bayshore 415-467-8700
Cal Sherman Oaks, Judd Lynn, 14106 Ventura Blvd. 213-788-9911
Fla Clearwater, WMM Assoc., 1260 A S. Highland 813-446-0075
Ill Downers Grove, Richmar Elctrn. Comps., 915 Burlington 312-968-0118
Md Baltimore, D.K. Jones, 2100 N. Charles 301-752-0577
Mich Grand Rapids, R. Van Riper Sls., 1842 Newton, S.E. 616-452-0464
Minn Mankato, D.C. Larson, 10 State St. 507-388-2985
Mo St. Louis, Hill & Co., 915 Buder Bldg. 314-621-1818
NH Nashua, BELL Controls, 139 Peele Rd. 603-888-2021
NJ Haddonfield, Thomas, 138 Haddon 609-854-3011
NY Liverpool, E. Rhodes Messick, 4 Gerviston 315-685-3122
NY Rockville Centre, Magneco Inds., Box 187 516-538-0062
Ohio Cincinnati, F. Kahsar Sls., 5229-A Glenway 513-471-9011
Tex Garland, Carter Assocs., Box 87 214-276-7151
WashSeattle, C.B. Parsons, 5319 Fourth 206-762-7373
For: Can,Mont, Que., Future Elctrns., 6655 Cote Des Neiges Rd. 514-735-5775

MIDWEC CORP., Ind'l. Div., Box 417, Scottsbluff, Neb., 69361, Tel: 308-632-4127, TWX: 910-627-0061; Sls. Mgr: J. Tierney ....Pgs. 2430,2431

Ariz Tempe, Saguaro Tech. Serv., 1000 E. Apache 602-275-0431
Cal Long Bch., Kirk-Anderson, 4102 E. 7th 213-433-4929
Cal Santa Clara, Cal-Tronix, 916 Di Giulio 408-296-1366
Colo Denver, Checkmate Sls., Box 22411 303-771-4920
ConnNew Canaan, S. Pierce, 115 Bald Hill 203-966-4630
Fla Winter Pk., G. Duckett Sls., Box 59 305-424-3466
Ga Atlanta, G. Duckett Sls., Box 29067 404-451-3529
Ill Chicago, H-Sam Tollaksen, 304 S. Halsted 312-236-2964
Ind Greenwood, Valentine-Schillinger, Box 242 317-881-3547
Ind South Bend, Vallentine-Schillinger, 1811 Thornhill 210-291-6258
Md Baltimore, Kaufholz, Box 6232 301-488-6561
MassNorwood, S. Pierce, 24 Linden 617-762-3164
Mich Plymouth, Romarc, Box 257 313-455-0300
Minn Mpls., Siedare, 4724 42nd 612-533-2294
Neb Lincoln, Mktg. Assoc., 1200 N. 79th 402-434-5244
Neb Scottsbluff, Midwec Corp., P.O. Box 417
NY N. Syracuse, L.D. Allen, Inc., Box 205 315-458-7470
NY Port Washington, P.D. Aaron Assoc., Box 511 516-767-2600
NC Greensboro, G. Duckett Sls., Box 22002 919-273-4617
Ohio Cincinnati, J.O. Olsen, 5539 Stokeswood 513-922-2176
Ohio Cleveland, J.O. Olsen Co., 16201 Shaker 216-752-5444
Pa Newtown Sq., Kaufholz Assoc., Box 273 215-356-5000
Pa Pittsburgh, J.O. Olsen, 104 Elatan 412-279-2550
Tex Dallas, Blackburn Assoc., Box 20073 214-351-9991
WashSeattle, Fleehart & Sullivan, 10109 Aurora 206-522-1533

MIDWEST AUDIO CORP., 5707 W. Division, Chicago, Ill., 60651, Tel: 312-626-0030; Sls. Mgr: B.A. Menarik

MIDWEST AUTOMATIC, INC., 510 Third St., Des Moines, Iowa, 50309, Tel: 515-244-3103; Sls. Mgr: H. Frankle

MIDWEST ELECTRIC PRODUCTS, Box 910, Mankato, Minn., 56002, Tel: 507-387-4414; Sls. Mgr: H. Duane Neubauer

MIDWEST MOLDING & MFG. CO., Gurnee, Ill., 60031, Tel: 312-ON-2-1320; Sls. Mgr: T.E. Richards

MIKRON INSTR. CO., Box 211, Ridgewood, N.J., 07451, Tel: 201-445-0020; Sls. Mgr: D.S. Michael

MIL ELCTRNS. INC., Dracut Rd., Hudson, N.H., 03051, Tel: 603-889-6671, TWX: 617-458-8400; Sls. Mgr: E. Lavigueur

MILBAR, 530 Washington St., Chagrin Falls, Ohio, 44022, Tel: 216-247-4600; Sls. Mgr: R.C. Douglas

MILES REPRODUCER CO., INC., 598 Broadway, New York, N.Y., 10012, Tel: 212-925-6985; Sls. Mgr: J.M. Kuhlik

MILFORD RIVET & MACH., 857 Bridgeport Ave., Milford, Conn., 06460, Tel: 203-878-4631, TWX: 710-462-0538; V.P. Sls: D.W. Clark

MILGO ELECTRN. CORP., 7620 N.W. 36th Ave, Miami, Fla., 33147, Tel: 305-691-1220, TWX: 810-848-6588; Sls. Mgr: D. Crane

MILLEN, JAMES MFG., 150 Exchange St., Malden, Mass., 02148, Tel: 617-324-4108; Sls. Mgr: R. Wade Caywood
Pgs. 523,1488,1489,1999,2429,2497,2762,2763

Cal Los Angeles, W. Harmon, 6118 Venice 213-937-1460
Cal Millbrae, Polach & Bensinger, 231 E. Millbrae 415-697-2525
Cal Pasadena, D. Ellis Co., 123 N. Marengo 213-681-9108
ConnNew Haven, Gerber Sls., Box 2917 203-777-6279
Ill Chicago, Carlson Elctrn., 7448 N. Harlem 312-SP-4-0277
Md Hyattsville, L.D. Lowery, 6200 Annapolis 301-773-4977
MassE. Longmeadow, Gerber Sls., 26 Maple 413-525-3059
MassWaltham, Gerber Sls., 176 2nd Ave. 617-891-8040
Minn Mpls., Exon Elctrn., 5164 Ranier Pass 612-788-4111
NY Pt. Wash., J. DiBlasi, 14 Vanderventer 516-PO-7-0470
Pa Broomall, L. Lowery, 2801 W. Chester 215-EL-6-5300
Pa Harrisburg, L.D. Lowery, 1501 Allison 717-233-0917
Tex Dallas, J. Yount Co., Box 17270 214-EX-1-4125
EXP: N.J., Iselin, Tech. Equip., 487 Lincoln Hwy. 201-283-2340
For: Can., Markham, Ont., H.R. Gray, 14 Laidlaw 416-294-4833

MILLER ASSOCIATES, Mercersburg Academy, Mercersburg, Pa., 17236; Pres: R.R. Miller

MILLER DIAL, 4400 N. Temple City Blvd., El Monte, Calif., 91731, Tel: 213-283-5111, TWX: 910-587-3438; Sls. Mgr: C.A. Hall

MILLER ELEC. CO., Box 231, Woonsocket, R.I., 02895, Tel: 401-767-2800; Sls. Mgr: L.F. Wilkinson

MILLER ELEC. MFG. CO., 718 S. Bounds, Box 1087, Appleton, Wisc., 54911, Tel: 414-734-9821, TWX: 414-739-3395; Sls. Mgr: K.M. Ligare

MILLER ELECTRO-RESCH. LABS., 14800 W. Grange, New Berlin, Wisc., 53151, Tel: 414-425-6303; Sls. Mgr: A.W. Miller

MILLER, HARRY CORP., 4th & Bristol Sts., Philadelphia, Pa., 19140, Tel: 215-DA-4-4000; Sls. Mgr: R.W. Allen

MILLER, J.W. CO., 19070 Reyes Ave., Compton, Cal., 90221, Tel: 213-537-5200; Sls. Mgr: G.E. Hall
Pgs. 2492-2496

Ariz Phoenix, H.A. Moore, 4142 N. 18th St. 602-274-0060
Ark El Dorado, D. Bellew, 418 Maple Hill St. 501-833-8325
Cal Gardena, Bidwell Sls., Box 2032 213-770-0300
Cal Redwood City, Logan, 463 Brewster Ave. 415-369-6726
Colo Denver, R. Bowen, 1440 S. Santa Fe 303-722-4641
Fla Pompano Bch., Hawkins-Hutto, Inc., Box 1059 305-943-9593
Fla Tampa, Hawkins-Hutto, 10416 Butia Pl.
Fla Winter Pk., Hawkins-Hutto, 501 Park, N. 305-MI-7-7407
Ga Atlanta, Millar Elctrns., 3110 Maple, N.E. 404-261-6160
Ill Chicago, Markal, 5787 N. Lincoln 312-561-7290
Ind Indianapolis, J. Merritt, 225 Knollwood 317-291-9674
La Metairie, D. Bellew, 3017 D 18th St. 504-833-6496
Md Reisterstown, Par-Nell Sls., 69 Main St. 301-833-6444
MassN. Scituate, W. Hendrickson, 766 Country Way 617-545-0652
Minn Minneapolis, C.R. Gibb, 1311 W. 25th 612-377-1200
Miss Michigan City, D. Bellew, Box 43 601-768-2478
Mo Kansas City, Nevco, Inc., 1715 Baltimore 816-421-1751
NJ Teaneck, S. Fisher, 161 Cedar La. 201-836-6661
NM Albuquerque, C. Carlberg, 2611 Quincy, N.E. 505-265-1579
NY Schenectary, LSM Assocs., 2037 The Plaza 518-372-2144
NY Hamburg, LSM Assocs., 54 Puritan Pl. 716-649-8380
NY Phelps, LSM Assocs., Orchard Pk. 315-548-4891
NC Raleigh, Millar Elctrns., Inc., Box 17173 919-787-9564
Ohio New Bremen, T. Shelby, 17 S. Walnut 419-629-6511
Ore Portland, Earl & Brown, 2041 S.W. 58th 503-292-9145
Pa Holland, Par-Nell Sls. Co., 7 Patricia Rd. 215-355-9330
Tex Addison, Campion Sls., Box 396 214-239-9196
Utah Salt Lake City, R. Bowen, 1380 W. North Temple 801-364-4632
WashSeattle, Earl & Brown, 2047 14th, W. 206-284-1121
EXP: N.Y., N.Y., Roburn Agencies, 349 W. 14th 212-989-5939
For: Can., Toronto, Ont., Atlas Radio, 50 Wingold 416-RU-1-6174
For: Can., Vancouver, B.C., Atlas Radio, 909 Beach 604-MU-3-5848

MILLER, L.C. CO., 717 Monterey Pass Rd., Monterey Park, Calif., 91754, Tel: 213-268-3611; Sls. Mgr: E.J. Thompson

MILLER R.A. INDS., INC., 1525 Marion, Grand Haven, Mich., 49417, Tel: 616-842-9450; Pres: R.A. Miller

MILLER, SANFORD CORP., 89 Throop Ave., Brooklyn, N.Y., 11206, Tel: 212-387-0600; Sls. Mgr: A.L. Scheer

MILLER-STEPHENSON CHEM. CO., INC., Rte. 7, Danbury, Conn., 06810, Tel: 203-743-4447; Sls. Mgr: H.J. Robertson

MILLETRON, INC., 540 Alpha Dr., Pittsburgh, Pa., 15238, Tel: 412-781-5300; Sls. Mgr: J.J. Peters

MILLI-SWITCH CORP., Box 67, Gladwyne, Pa., 19035, Tel: 215-MI-2-9222; Sls. Mgr: B.W. Chandler

MILLIVAC INSTRS., Box 997, Curry Rd., Schenectady, N.Y., 12301, Tel: 518-355-8300; Sls. Mgr: D.P. Morey

MILMAN ENGRG. CO., INC., 1669 12th, Santa Monica, Calif., 90404, Tel: 213-451-1457; Sls. Mgr: E.I. Druckman

MILTON ROY CO., 5000 Park St., N., St. Petersburg, Fla., 33733, Tel: 813-544-2581; Sls. Mgr: H. Thomas

MILWAUKEE RESISTOR, 700 W. Virginia St., Milwaukee, Wisc., 53204, Tel: 414-271-9900; V.P-Sls. Mgr: R.J. Amacher ....Pgs. 2858-2863

Ala Birmingham, F.C. Nickerson, Box 9679 205-853-2852
Cal Inglewood, Ungar Sls. Assocs., 317 Glasgow Ave. 213-678-5371
Cal Concord, Jasin Co., 3506 Skylark Dr. 415-686-0905
Colo Denver, Nelson Co., 1294 S. Bannock St. 303-733-5528
Fla Tampa, F. Nickerson, Box 13126 813-833-4321
Ga Decatur, F. Nickerson, 1240 Clairmont 404-377-1575
Ill No. Brook, E.T. Champion, 1195 Longmeadow 312-498-4150
Ill Evanston, W.F. Swinke, 3014 Colfax St. 312-248-4343
Ind Ft. Wayne, W. Bieberich, 801 Leesburg 219-432-2537
Kans Mission, Tech. Sls., 5827 Outlook 913-831-2888
MassWellesley, Johnson, 471 Wash. St. 617-235-3977
Mich Southfield, J. Montgomery, 19400 W. Ten Mile 313-358-2616

Minn Mpls., C. Gibb, 1311 W. 25 612-377-1200
Mo St. Louis, Tech. Sls., 34 Brentwood Bl. 314-725-5361
NJ Haddonfield, Braddock Assocs., Box 305 609-429-0087
NY Great Neck, Cooper-Simon, 38 Middle Neck 516-487-1142
NY Hewlett, J. Kirshbaum, 1533 Peninsula 516-374-0111
NY N.Y., Sylvan Ginsbury, 425 Park Ave., S. 212-689-5212
NY Rochester, Gislason Sls., 82 St. Paul 716-454-4741
NC Charlotte, F. Nickerson, 5817 Haddington 704-537-2855
Ohio Rocky River, R. Staff, 19684 Center Ridge 216-331-5100
Ohio Toledo, CSC Assocs., 3855 Ellenridge La. 419-536-6606
Ore Portland, R. Minthorne, 6565 S.W. Macadam 503-246-4556
Tex Dallas, R. E. Nesbitt Co., Box 20816 214-357-4601
Tex Houston, R. E. Nesbitt Co., Box 66831 713-528-3811
Wisc Milwaukee, E. Dickinson, 3612 N. Green Bay 414-264-1080
For: Can., Toronto, Ont., N. Burgess, 418 Mt. Pleasant Rd. 416-489-1854

MINARIK ELEC. CO., 232 E. Fourth St., Los Angeles, Cal., 90013, Tel: 213-624-8876; Sls. Mgr: L. Jensen

MINI-CIRCUITS LAB., Div. Scientific Comps. Corp., 2913 Quentin Rd., Brooklyn, N.Y., 11229, Tel: 212-252-5252; Sls. Mgr: H. Kaylie

Advertisement

Complete line of double balanced mixers from 100 Hz to 2 GHz. Low cost, shielded case model SRA-1 $9.95 (6-49) features 40dB isolation, 6 dB conversion loss, DC-500 MHz Frequency response. High level, low intermod units also available.

MINIATURE ELCTRN. COMPS. CORP., Sub. Space & Sys. Div. General Time Corp., 600 South St., Holbrook, Mass., 02343, Tel: 617-963-7717, TWX: 710-348-0451; Sls. Mgr: W.J. Gillis, Jr.

MINISINK RUBBER CO., INC., 2 Orange County, Unionville, N.Y., 10988, Tel: 914-726-3311; Sls. Mgr: J. McNeil, Jr.

MINNEAPOLIS SPEAKER CO., 3806 Grand Ave., S., Minneapolis, Minn., 55409, Tel: 612-825-1010; Sls. Mgr: D.C. Ringham

MINNESOTA RUBBER CO., 3630 Wooddale Ave., Minneapolis, Minn., 55416, Tel: 612-929-6781, TWX: 910-576-2727; Sls. Mgr: D. Mattocks

MINNETECH LABS., INC., 8115 10th Ave., N., Minneapolis, Minn., 55427, Tel: 612-544-4431; Sls. Mgr: W.G. Christensen

MINOR RUBBER CO., INC., 60 Ackerman St., Bloomfield, N.J., 07003, Tel: 201-338-6800; Sls. Mgr: S. Messing

MIRRO ALUMINUM CO., Manitowoc, Wisc., 54220, Tel: 414-684-4421, TWX: 414-681-8953; Sls. Mgr: F.J. Timberlake

MISCO DIV., Howmet Corp., 221 W. Webster Ave., Muskegon, Mich., 49440, Tel: 616-726-3541, TWX: 616-726-5610; Vice Pres: K. Yonker

MISKELLA INFRA-RED CO., 7301 Grand Ave., Cleveland, Ohio, 44104, Tel: 216-HE-1-2210; Sls. Mgr: F.J. Zitek

MITCHELL, E.C., CO., 404 Boston St., Middleton, Mass., 01949, Tel: 617-774-1191; Owner: E. Mitchell

MITEQ, INC., 100 Ricefield La., Hauppauge, N.Y., 11787, Tel: 516-543-8873; Mktg. Mgr: D.L. McPherson

MKS INSTRS., INC., 45 Middlesex Tpke., Burlington, Mass., 01803, Tel: 617-272-9255; Sls. Mgr: F.H. Krauss

M M ELCTRN. ENCLOSURES, 111 Bloomingdale Rd., Hicksville, N.Y., 11801, Tel: 516-935-9400, TWX: 510-221-1857; Sls. Mgr: D.B. Elliott ....Pg. 2319
Ala Huntsville, BJR Inds., Box 4422 205-881-3569
Ariz Scottsdale, Vinson, 8325 E. Rancho VISta 602-947-7371
Cal Los Angeles, Daton Engrg. Co., 1609 Westwood Blvd. 213-479-4211
Cal Santa Clara, Vico Sls. Co., Box 372 408-298-5944
Colo Denver, Vinson Assocs., 2145 S. Clermont 303-757-5151
Conn Kensington, N.S. Stachalek, 52 Cole La. 203-VA-8-4587
Fla Indian Rocks Bch., Tech. Rep., Box 425 813-595-2834
Fla Melbourne, Tech. Rep. Assocs., Box 2095 305-723-9140
Ga Jonesboro, Tech. Rep. Assocs., Box 955 404-753-0111
Ill Northfield, Adcon Assocs., 466 Central 312-446-6486
Kans Mission, Tech. Sls. Assocs., 5827 Outlook 913-831-2888
Mass W. Acton, K.B. Reidy, 30 Villege Rd. 617-CO-3-7146
Mich Farmington, Carter, McCormic & Peirce, Inc., 23995 Freeway Pk. Dr. 313-477-7700
Minn Mpls., Hasse & Assocs., Box 22707 612-588-0551
Mo St. Louis, Tech-Sls., 34 N. Brentwood 314-725-5361
NJ Raritan, J & L Assocs., Box 235 201-722-0682
NJ Haddonfield, M & S Assocs., Box 185 609-HA-9-7055
NM Albuquerque, Vinson Assocs., Box 3827 505-298-7442
NY Utica, R. J. Davis Assoc., 107 James St. 315-724-5773
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain Rd. 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster St. 513-278-5873
Pa Pittsburgh, Carter, McCormic & Peirce, Inc., 201 Penn Ctr. Blvd. 412-824-3760
Tex Dallas, Blair Engrg. Sls., 10034 Monroe 214-352-8411

MMI INSTRUMENTS, Div. Microwave Magnetics, Inc., Rte. #1, Danvers, Mass, 01923, Tel: 617-774-1072; Sls. Mgr: C.R. Buffler

MOBAY CHEM. CO., Pkwy. W., Rte. 22 & 30, Pittsburgh, Pa., 15205, Tel: 412-923-2700

MOBIL ELCTRNS., INC., Box 1132, Anderson, Ind., 46015, Tel: 317-642-7976; Pres: J.M. Hart

MOBIL-TRONICS, Box 1022, Tustin, Cal., 92680, Tel: 714-832-6744; Sls. Mgr: R.J. Hatton

Advertisement

MOBIL-TRONICS' complete cart line includes carts and material handling equipment for all industries: Aerospace, Educational, Electronics, Hospitals, Industrial, Institutional, Printing, Trucking, Warehousing, etc. In addition to our standard line, we are well equipped to bid on any custom cart requirement.

MODEL RECTIFIER CORP., 2500 Woodbridge Ave., Edison, N.J., 08817, Tel: 201-985-7800; Sls. Mgr: G. Sadof

MODEL RECTIFIER, MRC Elctrns., 2500 Woodbridge Ave., Edison, N.J., 08817, Tel: 201-985-7800; Sls. Mgr: G. Sadof

MODELECTRIC PRODS. CORP., 9 Cindy La (Wayside), Asbury Park, N.J., 07712, Tel: 201-493-8586; Sls. Mgr: S.M. Nadler

MODERN IND'L. PLASTICS, 3337 N. Dixie Dr., Dayton, Ohio, 45414, Tel: 513-278-4281; Sls. Mgr: W.J. Keith

MODEX, INC., 3150 Pullman Ave., Costa Mesa, Cal., 92627, Tel: 714-557-6016; Sls. Mgr: E. Schwarm

MODULAR DEVICES, INC., 1265 West 135th St, Gardena, Calif., 90247, Tel: 213-327-5546; Sls. Mgr: R.H. Roth

MODULAR POWER, INC., 15302 Oak Canyon Rd., Poway, Cal., 92064, Tel: 714-748-3864; Sls. Mgr: R.J. McNaul

MODUTEC, INC., 18 Marshall St., Norwalk, Conn., 06854, Tel: 203-853-3636, TWX: 710-468-2039; Sls. Mgr: R.A. Eck ....Pgs. 524-527
Ala Huntsville, Beacon Elct., 8003 Benaroya La.C1 205-881-5031
Alas Anchorage, Alaska Instr., Box 807 279-7477
Ariz Phoenix, Aztec Entprs., 15 N. 40th 602-267-8103
Cal Pasadena, Luscombe Engrg., 610 S. Arroyo 213-684-2000
Cal San Mateo, Luscombe Engrg., 235 E. Third 415-342-7057
Colo Littleton, Aztec Entprs., 1449 W. Littleton 303-798-4573
Fla Ft. Lauderdale, Beacon Elctrn., 651 N.E. 45th 305-564-4298
Fla Maitland, Beacon Elctrn., Box 1278 305-647-3498
Ga Atlanta, Beacon Elctrn., 2285 Peachtree 404-351-3654
Ill Wilmette, Crest, 505 4th St. 312-256-5202
Iowa Cedar Rapids, Reid, 526 Merchants Bank Bl. 319-362-6302
Kans Leawood, G. Fixman Engrg., 8005 Ensley 913-649-0679
Kans Wichita, G. Fixman, 6631 E. Kellogg 316-682-9433
Md Silver Springs, Sel-Tronics, 721 Ellsworth 301-589-3391
Mass Canton, New England Elctrn., 515 Wash. 617-828-4835
Mich Farmington, Carter, McCormic & Peirce, 23995 Freeway Pk. Dr. 313-477-7700
Minn Mpls., R.J. Inc., 7100 S. France 612-922-1425
Mo St. Louis, G. Fixman Engrg., 8160 Stanford 314-725-5219
NJ Englewood Cliffs, Sprung/Nussbaum, 120 Sylvan 201-947-6767
NM Albuquerque, Aztec Entprs., 829 Pennsylvania, N.E. 505-255-2440
NY Hyde Pk., R. Kennedy, Green Tree Dr., N. 914-229-2269
NY Rochester, R. P. Kennedy Co., 39 Saginaw Dr. 716-271-6322
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster 513-278-5873
Pa Newtown Sq., Holdsworth & Co., 8 Smedley La. 215-356-8550
Pa Pittsburg, Carter, McCormic & Peirce, 201 Penn Ctr. 412-824-3760
Tex Richardson, Scien. Sls., 777 S. Central Pkwy. 214-231-6541
Tex Houston, Scien. Sls., 6400 West Park Dr. 713-781-2711
Wash Seattle, R.K. Squibb, 655 N.E. Northlake Pl. 206-ME-2-2450
EXP: N.Y., NY, Frathom Co., 202 E. 44th 212-687-9390
For: Can., Burlington, Ont., Motion Control Engrg., Box 374 416-637-9369

MOFFATT PRODS., INC., 727 Winnetka Ave., N., Minneapolis, Minn., 55427

MOHAWK DATA SCIENCE, Franklin Elctrns. Div., 3rd & Allendale Rds., King of Prussia, Pa., 19406, Tel: 215-265-7700, TWX: 510-660-2194; Sls: R.A. Potavin

MOHAWK DATA SCIENCES CORP., Box 630, Palisade St., Herkimer, N.Y., 13350

MOHAWK WIRE & CABLE, Box 707, Leominster, Mass., 01453, Tel: 617-537-9961, TWX: 710-347-7620; Sls. Mgr: R.B. Van Vleck

MOISTURE REGISTER CO., 1510 W. Chestnut St., Alhambra, Calif., 91802, Tel: 213-283-3143; Sls. Mgr: J.A. Barnes

MOLDED PLASTICS DIV., Cincinnati Milacron, 4760 Marburg Ave., Cincinnati, Ohio, 45209, Tel: 513-475-8444, TWX: 810-461-2616; Sls. Mgr: R.L. Voyles

MOLECTRON CORP., 930 Thompson PL., Sunnyvale, Cal., 94086, Tel: 408-738-2661; Sls. Mgr: B.W. McCaul

MOLECU-WIRE CORP., P.O. Box 495, Farmingdale, N.J., 07727, Tel: 201-922-9400, TWX: 710-723-6943

MOLECULAR DIELECTRICS, INC., Div. Synthone Taylor Corp., Box 496, Ledgewood, N.J., 07852, Tel: 201-473-4108

MOLEX PRODS. CO., 5224 Katrine Ave., Downers Grove, Ill., 60615, Tel: 312-969-4550; Sls. Mgr: J.H. Krehbiel, Jr.

MOLON MOTORS & COIL, 3737 Industrial Ave., Rolling Meadows, Ill., 60008, Tel: 312-259-3750; Mktg. Mgr: T.J. Bujewski

MONA INDS., INC., Paterson, N.J., 07524, Tel: 201-274-8220; Sls. Mgr: W.O. Schlimbach

MONARCH MARKING SYS., Dayton, Ohio, 45401, Tel: 513-866-7401; Sls. Mgr: J.L. Custer

MONITOR LABS, INC., 10451 Roselle St., San Diego, Cal., 92121, Tel: 714-453-6260, TWX: 910-337-1278; Sls. Mgr: E.E. Watkins, Sr. ....Pg. 364
Ala Huntsville, E.G. Holmes & Assocs., Box 3376 205-837-6900
Ariz Phoenix, Meas. Cons., Box 11099 602-264-1279
Cal Pasadena, Ward/Davis Assocs., 770 S. Arroyo Pkwy. 213-684-2840
Colo Arvada, Meas. Cons., Box 203 303-423-0010
Conn W. Hartford, Victor Assocs., 893 Farmington Ave. 203-523-5680
Fla Orlando, E. G. Holmes & Assoc., 316-1/2 Bumby St. 305-241-2128
Ga Chamblee, E. G. Holmes & Assoc., 4185 Claremont Rd. 404-451-6161
Md Rockville, M.E.S.A., 121 Congressional La. 301-881-8430
Mass Framingham, Victor Assocs., 280 Worcester Rd. 617-879-5710
Mich Detroit, B. Hocker Assocs., 26847 Grand River Ave. 313-531-1403
NJ Flanders, Meas. Tech., 2 Mildred Terr. 201-584-8099
NM Alburquerque, Meas. Conslts., Box 6081 505-344-3575
NY Great Neck, Meas. Tech., 295 Northern Blvd. 516-482-3500
NY Kingston, R.F. Lamb, Box 661, Upton Sta. 914-338-8833
Ohio Dayton, B. Hocker Assocs., 1400 Devereux Dr. 513-298-8638
Pa Jenkintown, Stein Instr., 413 Johnson St. 215-885-2370
Tex Dallas, Remtek, Inc., 11411 Central Expwy. 214-369-8146
Va Virginia Bch., E. G. Holmes, 928 Gen. Beauregard Dr. 703-340-3760
Wash Seattle, Showalter/Judd, 1806 S. Bush Pl. 206-324-7911

For: Can., Downsview, Ont., Electronetic Sys., 62 Alness St. 416-636-3673
For: Can., Vancouver, B.C., Canadian Dynamics, 8264 St. George St. 604-325-3201

MONITOR PRODS., 815 Fremont Ave., S. Pasadena, Cal., 91030, Tel: 213-682-3761; Sls. Mgr: J.W. Blasier Pgs. 1414-1416
Cal Mountain View, QuadRep, 943 Stierlin Rd. 415-964-3532
Cal W. Covina, Groh Assocs., 1824 Durness St. 213-338-8217
Fla Indian Rock Bch., Tech. Rep. Assocs., Inc., Box 425 813-595-2834
Ga Jonesboro, Tech. Rep. Assocs., Inc., Box 955 404-753-0111
Mass Wellesley Hills, R. H. Sturdy Co., Inc., 204 Worcester St. 617-235-2330
Mich Franklin, Berberich Assocs., 31425 Nottingham 313-851-5753
NY Great Neck, Trionic Assocs., Inc., 320 Northern Blvd. 516-466-2300
Ohio Dayton, Berberich Assocs., 4130 Linden Ave. 513-252-9981
Tex Dallas, Tesco, 2837 Anode St. 214-358-3521

MONITOR SYS., INC., An Aydin Co., 401 Commerce Dr., Ft. Washington, Pa., 19034, Tel: 215-646-8100, TWX: 510-661-1520; Sls. Mgr: D. Plager

MONOLITHIC DIELECTRICS, Box 647, Burbank, Cal., 91503, Tel: 213-848-4465; Sls. Mgr: J. Bruce Pgs. 2432,2433
Cal Burbank, Weightman, 1226 W. Olive 213-849-7711
Cal Menlo Pk., Weightman, 120 Santa Margaritta 415-325-2885
Colo Boulder, Mile High Elctrns., 1828 Pine 303-444-5615
Fla Winter Pk., Kirkwood & Assoc., Box 52 305-645-2220
Ill Grayslake, R. Klipp, Box 226 312-223-4837
Ill Palatine, Wood Sls., 200 Lake Cook 312-359-4550
Iowa Cedar Rapids, H. Brown, 3500 Indian S.E. 319-366-0635
Mass Newton, Normell Assoc., 10 Day St. 617-969-5478
NJ Belleville, RHB Sls., 95 Carpenter 201-687-6220
NJ Riverton, Given Assocs., Box 183 609-829-7249
NY Bayport, RHB Sls., 124 Fairview 516-997-8300
NY Niagara Falls, Watmet, 40 Falls St. 716-285-3595
Tex Dallas, Robert Sls., 9704 Lanward 214-348-4283
Va Falls Church, Jay Co., 2914 Annandale 703-534-7800

MONROE, Div. Litton Inds., 550 Central Ave., Orange, N.J., 07050, Tel: 201-673-6600; V.P. Sls: R.F. Kane

MONSANTO COMPANY, ELECTRONIC INSTRUMENTS, 620 Passaic Ave., W. Caldwell, N.J., 07006, Tel: 201-228-3800; Mktg. Mgr: M.C. Pogue .... Pgs. 528,529
Ala Huntsville, W. A. Brown Instr., 1314 Buford St. N.W. 205-539-4411
Ariz Scottsdale, F.Y. Gates Co., Prof. Bldg. Box 2908 602-947-2991
Cal Burlingame, Dynamic Assocs., 822 Airport Blvd. 415-344-2521
Cal Los Angeles, Dynamic Assocs., 2500 S. La Cienega Blvd. 213-837-0123
Cal San Diego, Dynamic Assocs., 3235 Hancock St. 714-291-1391
Colo Denver, F.Y. Gates Co., 700 E. Louisiana Ave. 303-722-4674
DC Washington, Eastern, 5410 Indian Head Hwy. 301-839-3800
Fla Orlando, W.A. Brown Instru., 222 Weber Ave. 305-425-5505
Fla Ft. Lauderdale, W.A. Brown Instr., 961 N.W. 53rd St. 305-566-5697
Fla Ft. Walton Beach, W.A. Brown Instr., 18 Chelsea Dr. 904-243-6424
Fla Orlando, W.A. Brown Instr., 222 Weber Ave. 305-425-5505
Ga Tucker, W.A. Brown Instr., 1590 Cooledge Rd. N.W. 404-939-1674
Ill Chicago, K.W. Meyers Co., 7256 W. Touhy Ave.
Ind Indianapolis, K.W. Meyers Co., 3512 Rociville Rd.
Mass Burlington, R.J. Sickles Assoc., 12 Cambridge St.
Mich Southfield, S. Sterling Co., 21250 Civic Ctr. Dr.
Minn Mpls., K.W. Meyers Co., 4725 Excelsior Blvd.
Mo St. Louis, S. Sterling Co., 11734 Lackland Dr. 314-542-3636
NM Albuquerque, F.Y. Gates Co., 2631 Texas N.E. 505-298-1875
NY Fayetteville, M. P. Andrews, 319 Mott Rd. 315-637-3144
NY Great Neck, Eastern Instru., 300 Northern Blvd. 516-466-9505
NC Winston-Salem, W.A. Brown Instr., 1108 Burke St. 919-725-5384
Ohio Cleveland, S. Sterling Co., 5827 Mayfield Rd. 216-442-8080
Ohio Dayton, S. Sterling Co., 2673 Culver Ave. 513-298-7573
Ore Tigard, McLaren-Topp Co., 12750 S.W. Pacific Hwy. 503-639-1136
Pa Philadelphia, Eastern Instru., 613 W. Cheltenham Ave. 215-927-7777
Pa Pittsburgh, S. Sterling Co., No. 2 Parkway Ctr. 412-922-5720
Tex Houston, Scien. Sls., 6400 W. Park Dr. 713-781-2711
Tex Richardson, Scien. Sls., 777 S. Central Expwy. 214-231-6541
Utah Salt Lake City, F.Y. Gates Co., 455 E. 4th St. 801-359-1101
Va Richmond, Eastern Instru., Ross Bldg. 703-644-6622
Wash Bellevue, McLaren-Topp Co., 13547 S.E. 26th St. 206-746-5750
Wisc Milwaukee, K.W. Meyers Co., 4359 S. Howell Ave. 414-482-1313

MONSANTO ELCTRN. MAT'LS., Box 8, St. Peters, Mo., 63376, Tel: 314-272-6281, TWX: 910-760-1591; Sls. Mgr: B. Reed

MONSANTO-ELCTRN. SPEC. PRODS., 10131 Bubb Rd., Cupertino, Cal., 95014, Tel: 408-257-2140, TWX: 910-338-0206; Sls. Mgr: C.R. Bruce

MONTGOMERY CO, Windsor Locks, Conn, 06096

MONTGOMERY MFG. CO., INC., 206 S. Main St., Owensville, Ind., 47565, Tel: 812-724-2505; Sls. Mgr: A.N. Montgomery

MOODY MACHINE PRODS. CO., INC., Box 2248, Providence, R.I., 02905, Tel: 401-421-3317; Sls. Mgr: J.H. Moody

MOOG, INC., Controls Div., Proner Airport, East Aurora, N.Y., 14052, Tel: 716-652-0220, TWX: 710-264-1441; Sls. Mgr: H.R. Warnock

MOORE INDS., 8158 Orion Ave., Van Nuys, Cal., 91406, Tel: 213-787-5550, Sls. Mgr: J.R. Rauke

MOORE JOHN B. CORP., Outer Main St., Box 65, So. Amboy, N.J., 08879, Tel: 201-727-2200; Sls. Mgr: W.H. McInnis

MOORE, SAMUEL & CO., Mantua, Ohio, 44255, Tel: 216-274-2276, TWX: 810-437-2430; Sls. Mgr: A. Grummey

MORAN INSTR. CORP., 170 E. Orange Grove Ave., Pasadena, Calif., 91103, Tel: 213-796-7158; Sls. Mgr: R.B. Moran

MORAN, T.R. CO., 137 Eucalyptus Dr., El Segundo, Cal., 90245, Tel: 213-772-1574; Pres: T.R. Moran

MOREY CORP, 2659 Wisconsin Ave., Downers Grove, Ill., 60515, Tel: 312-964-2300; Sls. Mgr: W.J. Morey, Jr.

MORGAN ADHESIVES CO., 4560 Darrow Rd., Stow, Ohio, 44224, Tel: 216-688-8255, TWX: 216-098-6487; Gen'l. Mgr: G. McMahon

MORIRICA ELCTRNS., LTD., 205 Tozuka-machi, Tozuka-ku, Yokohama, Japan

MORRIS, J.I. CO., 372 Elm St., Southbridge, Mass., 01550, Tel: 617-764-4394; Sls. Mgr: J.B. Dirlam

MORRISON PRODS., INC., 16816 S. Waterloo Rd., Cleveland, Ohio, 44110, Tel: 216-531-1460; V.P. Sls: J.W. Bolt

MORTON CHEMICAL CO., Div. Morton Int'l., Inc., 110 N. Wacker Dr., Chicago, Ill., 60606, Tel: 312-621-5732, TWX: 312-222-9394; Sls. Mgr: J.D. Frichette

MOSER JEWEL CO., 544 Fayette St., Perth Amboy, N.J., 08862, Tel: 201-442-3434; Sls. Mgr: J. Ackley

MOSINEE PAPER CORP., Mosinee, Wisc., 54455, Tel: 715-693-2111; Pres: C. Scholtens

MOSLER ELECTRONIC SYSTEMS DIV., Div. Mosler Safe Co., 9 South St., Danbury, Conn., 06810, Tel: 203-743-6766; Dir. Mktg: A.M. Marzano

MOSSMAN, DONALD P., INC., P.O. Box 265, Brewster, N.Y., 10509, Tel: 914-279-3725; Sls. Mgr: B.W. Rist

MOSTEK CORP., 1400 Upfield Dr., Carrollton,, Tex., 75006, Tel: 214-242-1494; Sls. Mgr: D. West

MOTOR GENERATOR DIV., Hobart Brothers, EE-61, Troy, Ohio, 45373, Tel: 513-339-6011; TWX: 513-797-0955; Sls. Mgr: J.H. Headapohl

MOTORESEARCH MFG. CO., 1600 Junction Ave., Racine, Wisc., 53403, Tel: 414-632-5131

MOTOROLA COMMUNICATIONS & ELECTRNS., Comp. Prods. Dept., 4501 W. Augusta Blvd., Chicago, Ill., 60651, Tel: 312-772-6500, TWX: 910-221-5565; Sls. Mgr: C. Calchopp ....Pg. 1417

MOTOROLA, Gov't. Elctrns. Div., Box 1417, Scottsdale, Ariz., 85252, Tel: 602-949-3033, TWX: 910-950-1286

MOTOROLA INSTR. & CONTROL, Box 5409, Phoenix, Ariz., 85010, Tel: 602-959-1000, TWX: 910-950-0088; Sls. Mgr: A. Marsh

MOTOROLA SEMICONDUCTOR PRODS., Tech. Info. Ctr., Box 20912, Phoenix, Ariz., 85036, Tel: 602-273-6900, TWX: 910-951-1334; Sls. Mgr: R.J. O'Connor

MOTRONICS CORP., Riverside Ind'l. Pk., Little Falls, N.Y., 13365, Tel: 315-823-4050; Sls. Mgr: R. Shapleigh Pg. 1624
Ariz Scottsdale, Fryco Eng. Rep., Box 460 602-945-3281
Cal Los Angeles, Halbar Assocs., 3261 W. Fourth St. 213-387-8283
Conn Meriden, Eagle Assocs., Box 921 203-237-5527
Fla Orlando, Buchanan & Abrams, Box 6026 305-423-8995
Ill Chicago, Gassner & Clark, 6644 N. Western 312-764-6121
Iowa Cedar Rapids, Iowa Midland Supply, 708 3rd St. S E 319-366-3555
Mich Detroit, Burcaw, 18236 W. McNichols 313-533-7700
NJ Bergenfield, H. Gray, 20 Foster St. 201-384-3643
NY Rochester, B. Tollefson, 110 Allen Creek 716-271-4141
Ohio Mansfield, Mong & Assocs., Box 1033 419-524-2835
Ore Portland, D. G. Weber, 1226 S.E. Seventh Ave. 503-234-0686
Pa Fairview Village, Danco Corp., Box 245 215-539-9300
Tex Dallas, EBR, 1339 Plowman Ave. 214-942-8486
Tex Houston, EBR, 4101 San Jacinto St. 713-529-3797
Tex Lubbock, EBR, 5119 B. 34th St. 806-792-6143
Wash Seattle, D. G. Weber, 403 Maritime Bldg. 206-623-5990
For: Can., Ville LaSalle, Que., Electrodesign, 840 Lafleur 514-363-5120

MP AUDIO CORP., Fairfield, Conn., 06430, Tel: 203-268-2385; Pres: M. Paneyko

MPB CORP., Precision Park, Keene, N.H., 03431, Tel: 603-352-0310, TWX: 710-366-1801; Grp. Sls. Mgr: W.A. Trace

MPC PRODS. CORP., 4200 W. Victoria Ave., Chicago, Ill., 60646, Tel: 312-583-5100, TWX: 910-221-2576; Dir. Mktg: A.V. Trozzo

MSE, INC., 811 Sharon Dr., Westlake, Ohio, 44145, Tel: 216-871-8900; Sls. Mgr: P. Douglas

MSI ELCTRNS. INC., 34-32 57th St., Woodside, N.Y., 11377, Tel: 212-672-6500; Sls. Mgr: A. Lederman

MSL STEEL CO., Div. MSL Ind., 3912 W. McLean Ave., Chicago, Ill., 60647, Tel: 312-342-5900; Sls. Mgr: L. Roewer

MUCKLE MFG. CO., 334 Medford, Owatonna, Minn., 55060, Tel: 507-451-7115; Sls. Mgr: Mort Armstrong

MUELLER BRASS CO., 1925 Lapeer Ave., Port Huron, Mich., 48060, Tel: 313-985-5111; V.P. Sls: J. Lorenzen

MUELLER ELEC. CO., 1589H E. 31st St., Cleveland, Ohio, 44114, Tel: 216-771-5225; Sls. Mgr: E.H. deConingh, Jr. ....Pg. 2649
Ariz Phoenix, Maddox Sls., 5709 N. 19th Pl. 602-274-3807
Cal Los Angeles, Maddox Sls., 2945 E. 12th 213-269-7291
Cal San Francisco, Maddox Sls., 2720 17th 415-431-2953
Colo Denver, L.B. Putnam, 7111 Larsh Dr. 303-TA-5-5066
Fla No. Miami Beach, Cartwright & Bean, 20100 N.E. 25th Ct. 305-WI-5-2962
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek 305-GA-5-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill Pl., N.W. 404-CE-7-2273
Ill Grayslake, R. Klipp & Assoc., Box 226 312-223-4837
Mass Lynn, Keene Sls. Co., 156 Broad St. 617-595-2300
Mich Detroit, Hilltronics, 13720 Puritan Ave. 313-342-3242
Minn Mpls., A.S. Miller, 6608 17th Ave., S. 612-UN-6-6677
Mo Kansas City, K & M Sls., 500 Davidson 816-GR-1-1355
NY Buffalo, R.W. Mitscher, Ellicott Sq. Bldg. 716-854-2517
NY Great Neck, Joseph & Bain, Box 486 516-487-9395
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-537-7965
NC Raleigh, Cartwright & Bean, 1016 Belfast 919-832-7128
Ohio Columbus, H H Seay, 1350 Crestwood 614-235-0265
Ore Portland, R. Legg Co., Box 25327 503-292-8824
Tenn Memphis, Cartwright & Bean, Box 4760 901-276-4442
Tex Waco, Sanders-Willis Co., Box 7452 817-PL-4-0441
Utah Salt Lake City, L.B. Putnam, Box 2435 801-277-0375

For: Can., Toronto, Ont., W. Cooper, 4480 Chesswood 416-630-3900
MUIRHEAD, INC., 1101 Bristol Rd., Mountainside, N.J., 07092, Tel: 201-233-6010; Pres: D. Semmels
MULLARD, INC., 100 Finn Ct., Farmingdale, N.Y., 11735, Tel: 516-694-8989; Mktg. Mgr: H. Zimmerman
MULTI-AMP CORP., 61 Myrtle St., Cranford, N.J., 07016, Tel: 201-276-8200; Sls. Mgr: A.H. Magnuson
MULTI-FLEX SEALS, INC., 1170 Commerce Ave., Bronx, N.Y., 10462, Tel: 212-792-9010; Sls. Mgr: M. Glicksman
MULTI MEDIA ENGRG., INC., 2385 Lewis Ave., Rockville, Md., 20851, Tel: 301-770-3500; Gen'l. Mgr: D.A. Wheeler

MULTICORE SLS. CORP., Div. BIC, Dept. RY-39, Westbury, N.Y., 11590, Tel: 516-ED-4-7450; Sls. Mgr: M. Zalkin ....Pg. 2942
Cal Inglewood, J. Berman Co., Inc., Box 6003 213-678-1281
Cal Oakland, F. Moulthrop, 1530 E. 12th St. 415-AN-1-7676
Colo Denver, McLoud & Raymond, 2151 S. Grape 303-SK-6-1589
Fla Winter Pk., Hawkins-Hutto, 501 Park, N. 305-MI-7-7407
Ga Atlanta, Millar Elctrns., 3110 Maple N.E. 404-261-6160
Haw Honolulu, G. Piety Factors, 160 Mokauea 810-185
Ill Oak Pk., G. Petitt, 6332 Roosevelt 312 F0-9-8940
Ind Indianapolis, H. Blind, 1060 E. 86th St. 317 846-5441
Iowa Cedar Rapids, Elctrn., 1310 Hertz 319-364-4342
Md Silver Spring, Lienau, 8537 2nd Ave. 301-588-1970
Mass Wellesley Hills, M. Scott, 20 Walnut 617-CE-5-0102
Mich Plymouth, J.M. Flora, Inc., 165 W. Liberty 313-453-4296
Minn Minneapolis, S. Clothier, 7400 Lyndale 612-869-3231
NY Buffalo, R. Mitscher, 496 Ellicott Sq. 716-TL-4-2517
NY Westbury, Carduner Sls. 516-ED-4-7450
Ohio Medina, J. Podolny, 3178 Country Club Dr. 216 723-1546
Tex Dallas, J. McKinney, 1303 Chemical St. 214-ME-1-9450
Wash Seattle, W. Lanphear, 4031 Stoneway 206-ME-3-4900

MULTIMETRIC IND., INC., 120-30 Jamaica Ave., Richmond Hill, N.Y., 11418, Tel: 212-441-4240; Sls. Mgr: D. Kohn ....Pg. 1524
Ariz Phoenix, Hytronic Meas., 1017 North 3rd 602-253-6104
Cal Mountain View, Gado Instr. Sls., 655 Castro 415-961-2222
Cal Torrance, Stark Instr. Sls., Box 6398 213-534-2876
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
Conn Hamden, Instr. Conslts., 2381 Whitney 203-288-5246
Iowa Cedar Rapids, Engrg. Svcs., 1026 3rd Ave. S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svcs., 7830 State Line 913-649-4000
Md Silver Spring, Gawler-Knoop, 10 Old Post Office Rd. 301-589-4406
Md Towson, Gawler-Knoop, 807 E. Seminary 301-825-3151
Mass Waban, Instr. Consultants, Box 25 617-969-9881
Mich Ypsilanti, Micro Sls., 217 Taft 313-482-1229
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NJ Roseland, Gawler-Knoop, 14 Beaufort 201-226-4545
NM Albuquerque, Hytronic Meas. Inc., 205 San Pablo, S.E. 505-268-3941
Ohio Dayton, Micro Sls., 1250 W. Dorothy 513-298-3033
Ohio Cleveland, Micro Sls., 2000 Lee 216-371-0522
Pa Doylestown, Gawler-Knoop, Box 794 215-348-4646
Utah Salt Lake Cy., Hytronic Meas., Inc., 2022 S. Main 801-466-4924
Wash Seattle, Datacom, 2207 Fairview 206-329-2989
EXP: NY, Melville, Rocke Int'l. Corp., 80 Marcus Dr. 516-694-7800
For: Can., Downsview, Ont., Componetics, Ltd., 62 Alness St. 416-636-3673
For: Can., Montreal, Que., Componetics, Ltd., 6420 Victoria Ave. 514-342-4117

MULTITECH AUTOMATION PRODS., 583 Monterey Pass Rd., Monterey Pk., Cal., 91754, Tel: 213-283-7773; Sls. Mgr: D.B. Froelich ....Pg. 362
Ala Huntsville, ALMEGA, Holiday Office Ctr. 205-881-6635
Cal Arcadia, Stark Instr. Sls., 2125 Louise Ave. 213-681-0532
Cal Torrance, Stark Instr. Sls., Box 6398 213-534-2876
Cal Santa Ana, Stark Instr. Sls., 2110 N. Wright 714-541-9821
Colo Boulder, J. Smith & Assocs., Box 3257 303-449-7509
NM Albuquerque, J. Smith & Assocs., Box 8412 505-255-2111
Ore Tigard, McLaren-Topp Co., 12750 S.W. Pacific Hwy. 503-639-1136
Wash Bellevue, McLaren-Topp Co., Box 250 206-746-5750

MULTITECH COMMUNICATIONS, 583 Monterey Pass Rd., Monterey Pk., Cal., 91754, Tel: 213-283-7773; Sls. Mgr: D.E. Cantrell ....Pg. 324
Ala Huntsville, ALMEGA, Holiday Office Ctr. 205-881-6635
Ariz Phoenix, J. Smith & Assocs., 11032 N. 34th Ave. 602-942-3233
Colo Boulder, J. Smith & Assocs., Box 3257 303-449-7509
Ill Chicago, P. Lind Elctrns., 5483 N. Northwest Hwy. 312-774-1246
Ind Indpls., P. Lind Elctrns., 3969 Meadows Dr. 317-547-9178
Kans Levenworth, McGraw Engrg., 512 McDonald Rd. 913-651-2929
Minn Circle Pines, P. Lind Elctrns., 10104 Sunset Rd. 612-786-5770
Mo Florissant, McGraw Engrg. Co., Box 511 314-831-0342
NJ Ridgewood, Hansen Assocs., Box 806 201-652-7055
NM Albuquerque, J. Smith & Assocs., Box 8412 505-255-2111
NY Huntington Sta., Hansen Assocs., 20 Rolling Hills Dr. 212-947-0379
Ohio Dayton, Instr. Sys., 3481 Office Pk. Dr. 513-293-8095
Ohio Cleveland, Instr. Systems, 21877 Euclid Ave. 216-486-0782
Ore Portland, McLaren-Topp Co., 5319 S.W. Westgate Dr. 503-297-2248
Wash Bellevue, McLaren-Topp Co., Box 250 206-746-5750

MULTITECH DATA PRODS., A Multitech Co., 583 Monterey Pass Rd., Monterey Pk., Cal., 91754, Tel: 213-283-7773; Div. Mgr: A.L. White ....Pg. 363

MULTITECH MICROELCTRNS., 583 Monterey Pass, Monterey Pk., Cal., 91754, Tel: 213-283-7773; Sls. Mgr: D. Bryant ....Pg. 1543
Ariz Phoenix, J. Swanson, 4134 N. 44th 602-947-4379
Cal San Bernardino, J. Pernett, 8738 Sorrento 714-687-5343
Colo Boulder, J. Smith, Box 3257 303-449-7509
Fla Orlando, G. Bohman, 5133 St. Charles 305-855-0274
Ill Bellwood, Flat Engrg., 5133 St. Charles 312-547-6200
Md Wheaton, K-G Elctrns., 11151 Veirs Mill 301-946-4055
Mo Florissant, Mc-Graw Engrg., Box 511 314-831-0342
NJ Ridgewood, Hansen Assocs., Box 806 201-652-7055
NM Albuquerque, J. Smith, 401-B San Pedro, N.E. 505-255-2111
NY Rochester, A & D Devices, 320 N. Washington St. 716-586-8033
Ore Tigard, McLaren-Topp, 12750 S.W. Pacific Hwy. 503-639-1136
Wash Bellevue, McLaren-Topp, Box 250 206-746-5750

MULTITECH POWER SYS., 3100 Pullman St., Costa Mesa, Cal., 92627, Tel: 714-557-3962 ....Pg. 816
Cal Canoga Park, Snavely Assocs., 22315 Hart St. 213-348-5258
Cal Tustin, Taylor Assocs., Box 986 714-543-0444
Mo Hazelwood, TechMark, Box 273 314-831-6446
NJ Richwood, Hansen Assocs., Box 806 201-652-7055

Advertisement

Design, prototype and production of Pulse Modulators, TWT Amplifiers, Signal Generators, High Voltage Power Sources and Computer Power Supplies for airborne and ground systems to military, commercial and custom requirements. Complete magnetic and chassis fabrication capabilities.

MURA CORP., 50 S. Service Rd., Jericho, N.Y., 11753, Tel: 516-334-2700; Sls. Mgr:

MURATA CORP. OF AMERICA, 2 Westchester Plaza, Elmsford, N.Y., 10523, Tel: 914-592-9180; Sls. Mgr: J. Alterescu ....Pg. 1418

MURATA MFG. CO. LTD., Nagaoka-Cho, Otokunigun, Kyoto, Japan, Tel: 075-921-9111; Sls. Mgr: T. Akebi ....Pg. 1418
MUTRON CORP., 646 Summer St, Brockton, Mass., 02402, Tel: 617-588-6110, TWX: 710-345-0194; Sls. Mgr: R.R. Forsberg
MYSTIK TAPE, BORDEN INC, 1700 Winnetka Ave., Northfield, Ill., 60093, Tel: 312-446-4000, TWX: 910-992-1436; Sls. Mgr: D. McGrew
N-H MICROWAVE, INC., Box 887, Red Bank, N.J., 07701, Tel: 201-842-3535; Sls. Mgr: L.H. Nilson
N/P CO., 5620 N. Rosemead Blvd., Temple City, Calif., 91780, Tel: 213-283-8854; Sls. Mgr: R.D. Anderson
NANO FAST, INC., 416 W. Erie, Chicago, Ill., 60610, Tel: 312-943-4223; Sls. Mgr: H. Maram
NANOSECOND SYSTEMS, INC., 176 Linwood Ave., Fairfield, Conn., 06431, Tel: 203-255-1008
NARCO AVIONICS, Div. Narco Sci. Inds., Commerce Dr., Ft. Washington, Pa., 19034, Tel: 215-643-2900; Pres: C. Husick
NARDA MICROWAVE CORP., Plainview, N.Y., 11803, Tel: 516-433-9000, TWX: 510-221-1867; V.P. Mktg: J.P. Schindler

NATEL ENGRG. CO., 8944 Mason Ave., Canoga Pk., Cal., 91306, Tel: 213-882-9620, TWX: 910-494-1959; Sls. Mgr: J. Naster ....Pgs. 366,367
Ala Huntsville, Reynolds, 904 Bob Wallace 205-536-1941
Cal Encino, Cardinal Assocs., 16024 Ventura 213-788-4540
Cal San Carlos, Elctrn. Engrg., Box 997 415-593-2189
Conn Hamden, J & J Assocs., 935 Dixwell Ave. 203-624-7800
Fla Clearwater, Perrott Assocs., Box 4532 813-531-5513
Fal Orlando, Perrott Assocs., 1607 Forsyth 305-275-1132
Ga Atlanta, Reynolds, 175 Wieuca N.E. 404-252-5360
Mass Burlington, J & J Assocs., 12 Cambridge 617-272-2606
Mo St. Louis, Palatine Engrg., 1573 Warson 314-426-7055
NM Albuquerque, Grady Moore, Box 6035 505-268-2038
Ohio Dayton, G.L. Ashby, 4130 Linden 513-252-5627
Pa Meadowbrook, J.A. D'Aquila, 2047 Washington 215-947-2589
Tex Dallas, Synthenetics, 8383 Stemmons Frwy. 214-631-1740
NATIONAL ACME, Acme-Cleveland Co., Elec. Controls, 170 E. 131 St., Cleveland, Ohio, 44108, Tel: 216-268-4200; Sls. Mgr: W.M. Marshall
NATIONAL ASTRO LABS., 2201 Hollywood Way, Burbank, Cal., 91504, Tel: 213-849-6701; Sls. Mgr: L.R. Evans
NAT'L. BAND & TAG, 721 York St., Newport, Ky., 41071, Tel: 606-261-2035; Sls. Mgr: E. Haas, Jr.
NATIONAL BERYLLIA CORP., Greenwood Ave, Haskell, N.J., 07420, Tel: 201-839-1600, TWX: 710-988-5363; Sls. Mgr: H.F. Schmit

Advertisement

Manufacturers of high-purity electronic and refractory oxide ceramics including beryllia, thoria, zirconia, magnesia and alumina. Specialty custom-shapes and standard tubing, crucibles and boats; ceramic-to-metal assemblies for semiconductor packaging, microwave windows and other electronic devices. Complete facilities for mtg. and research on compositions, processing and properties of oxide bodies, foams, fibers and composites.

NAT'L. CERAMIC CO., 500 Southard St., Trenton, N.J., 08602, Tel: 609-394-5373; Sls. Mgr: E.A. Domber
NAT'L. COIL CO., Box 1040, Douglas, Ariz., 85607, Tel: 602-364-4409; Sls. Mgr: P. Smith
NATIONAL ELCTRNS., A Varian Sub., Box 269, Geneva, Ill., 60134, Tel: 312-232-4300, TWX: 910-237-1685; Sls. Mgr: H. Albertine
NAT'L. INSTR. LABS., 12300 Park Lawn Dr., Rockville, Md., 20852, Tel: 301-881-2800; Sls. Mgr: D.I. Steele

NATIONAL LEAD CO., Elctrns. Dept., Box 420, Hightstown, N.J., 08520, Tel: 609-448-3200; Sls. Mgr: D.B. McCulloch ....Pgs. 1980-1982
Cal Burbank, Weightman & Assocs., 1226 W. Olive Ave. 213-849-7711
Cal Menlo Pk., Weightman & Assocs., 120 Santa Margarita Ave. 445-325-2885

Fla Boca Raton, Lynch-Gentry Assocs., 1680 N.W. 9th St. 305-391-7946
Fla St. Petersburg, Lynch-Gentry Assocs., Box 13248 813-347-5131
Ill Mt. Prospect, Magnuson Assocs., Box 130 312-956-0700
Ind Indianapolis, R.H. Newsom Assocs., 6320 Woburn Ave. 317-849-4442
Md Baltimore, R. A. Wafer Assocs., 616 Edmondson Ave. 301-744-1133
Mass Newton, Normell Assocs., 10 Day St. 617-969-5478
Mich Muskegon, NL Inds. Inc., Box 787 616-722-1154
Minn St. Paul, Magnuson Assocs., 1246 W. 7th St. 612-227-8495
NJ Riverton, Given Assocs., Box 183 609-829-7249
NJ Union City, Bressler Assocs., 4808 Bergenline Ave. 201-864-9577
NY New York, Bressler Assocs., Inc. 212-695-3727
NY Niagara Falls, NL Inds., Inc., Box C, Bridge Sta. 716-285-9304
Ohio Cleveland, Jay Engrg. Co., 4712 W. 130th St. 216-252-0486
Ohio Dayton, Jay Engrg. Co., 1721 E. 3rd St. 513-253-2151

NAT'L. LEAD CO., Metal Div., 111 Broadway, New York, N.Y., 10006, Tel: 212-732-9400; Mktg. Mgr: T.R. Zanardi

NAT'L. MIDCO INDS., INC., Box 5433, Trenton, N.J., 08638, Tel: 215-943-7010; Sls. Mgr: J.H. Carpenter, Jr.

NATIONAL MOLDITE, 250 South St., Newark, N.J., 07114, Tel: 201-589-6860; Sls. Mgr: S. Lowenberg

NATIONAL SEMICONDUCTOR, 2900 Semicndctr. Dr., Santa Clara, Calif., 95051, Tel: 408-732-5000, TWX: 910-339-9240; Sls. Mgr: F. Kvamme

NAT'L. SEMICONDUCTORS, 331 Cornelia St., Plattsburgh, N.Y., 12901, Tel: 518-561-3160; Mktg. Mgr: D.F. Clifton ....Pg. 1814
Ala Huntsville, BJR Research, Box 4422 205-881-3569
Cal Glendale, J. L. McCoy Co., 940 Alma St. 213-246-2134
Conn Farmington, Keyco Assocs., Box 357 203-677-1771
Ill Glenview, Nerc Elctrn., 2108 Valley Lo 312-729-5075
Mass Needham, Keyco Assocs., 10 Kearney 617-449-2600
Mich Farmington, Davis & Martensen Co., 22725 Orchard Lake Rd. 313-474-8300
NJ Upper Montclair, D & R, 248 Lorraine 201-744-8378
NY Huntington, Andrews & Andrews, Inc., 140 E. Main St. 516-692-8686
Ohio Wickliffe, D. Steffen, 30212 Lakeland 216-944-8080
Ohio Dayton, D. Steffen, 1201 Hempstead 513-293-3145
Pa Phila., H.A. Goodman, 401 W. Mt. Airy 215-247-7116
Tex Richardson, Thornton/Leeper Elctrn., 423 Melrose 214-231-6891
For: Can., Montreal 378, Que., Nat'l. Semiconductors, 2150 Ward 514-744-5507

NATIONAL SONICS, 43 Milbar Blvd., Farmingdale, N.Y., 11735, Tel: 516-694-5110; Sls. Mgr: N.J. Poulis

NAT'L-STANDARD CO., Niles, Mich., 49120, Tel: 616-683-8100, TWX: 616-684-2397; V.P. Mktg: W.D. Peace

NATIONAL-STANDARD CO., Auto Arc Div., 22000 Lunn Rd., Strongsville, Ohio, 44136, Tel: 216-238-5111; Sls. Mgr: D.C. Martinez

NATIONAL TEL-TRONICS CORP., 55 Northern Blvd., Great Neck, N.Y., 11021, Tel: 516-466-5100; Sls. Mgr: C.J. Siebert ....Pg. 2650
Cal Burbank, Shephard-Stern Co., 4109 W. Burbank Blvd. 213-849-6671
Cal San Mateo, L.H. Harriss Co., 204 E. Hillsdale Blvd. 415-341-2909
Cal Van Nuys, Shepard Comps. Co., 16152 Covello St. 213-787-4610
Colo Boulder, Straube Assoc., Box 1649 303-443-8600
Conn Hamden, H. Mandell Co., Box 5473 203-248-7441
Fla Coca Bch., T.G. Frazee, 4800 Ocean Bch. Blvd.
Fla Ft. Lauderdale, Sproch Sls. Inc., 3520 W. Broward Blvd. 305-587-3792
Ill Chicago, Rozner Sls. Co., 4720 N. Central Ave. 312-AV-3-0022
Ind Ft. Wayne, McNabb-Brase & Assocs., 424 W. Ludwig Rd. 219-484-8558
Ind Indianapolis, 3951 N. Meridian 317-926-2439
Ind Indianapolis, McNabb-Brase & Assocs., 4002 Meadows Dr. 317-545-8167
Iowa Ft. Dodge, H. Morrison, 236 Seventh Ave. N.
Mass Revere, H. Mandell Co., Box 24 617-284-5623
Mich St. Joseph, McNabb & Assocs., Inc., 606 Main St. 616-983-7242
Minn Minneapolis, Heimann Co., Inc., 5603 Lyndale Ave., S. 612-827-5457
NJ Nutley, Falk-Baker Assocs., 382 Franklin Ave. 201-661-2430
NY Massapequa, S.F. Elctrns., 234 Normandy Rd. 516-CL-2-9896
NY Pompey, S.F. Foster Co., Inc., 2806 Hennaberry Rd. 315-677-3333
NY Rochester, S.F. Foster Co., Inc., 386 Culver Pkwy. 716-288-9912
NC Raleigh, A.B. Andrews Co., Ste. 1401, Branch Bank & Trust Co. 919-833-5565
Ohio Cincinnati, W.F. Needles, 5539 Stokeswood Ct. 513-922-2176
Ohio Cleveland, J.O. Olsen Co., 16201 Shaker Blvd. 216-752-5444
Ohio Dayton, C.V. Clark Co., 1629 Shroyer Rd. 513-298-9066
Okla Tulsa, Allied Comps., Inc., Box 4768 918-939-2848
Ore Salem, M.K. Widdekind Co., Inc., 3292 Sunnyview Ave. N.E. 503-363-6445
Pa Philadelphia, R.J. Cooper, 2928 Sandyford Ave. 215-MA-4-5486
Pa Pittsburgh, E.A. Snefsky, 104 Elatan Dr. 412-279-2550
Tex Dallas, Allied Comps., Inc., Box 38009 214-348-6660
Tex Houston, Allied Comps., Inc., 6400 Westpark Dr. 713-782-5406
Wash Seattle, M.K. Widdekind Co., 815 W. Ewing St. 206-284-8020
EXP: Fla, No. Miami Beach, Manrep Corp., 1925 N.E. 150th St. 309-949-3457
EXP: N.Y., New York, Empire Exporters, Inc., 123 Grand St.
For: Can., Hamilton, Ont., Cartwright Agencies, 153 Main St. W 416-528-0294
For: Can., Montreal, Que., McIntyre Agencies, 3600 Barclay Ave. 514-731-9618

NATIONAL TIME & SIGNAL, 21803 Wyoming Ave., Oak Pk., Mich., 48237, Tel: 313-JO-4-6281; Sls. Mgr: J. Guay

NAT'L. UNION ELEC. CORP., Elctrns. Div., Bloomington, Ill., 61701, Tel: 309-828-2367, TWX: 510-352-2170; Sls. Mgr: B. Hart

NATIONAL VACUUM PLATERS, INC., 2641 E. Hagert St., Philadelphia, Pa., 19125, Tel: 215-GA-5-0166; Pres: S.H. Salop

NAT'L. WATER LIFT CO., Div. Pneumo Dynamics, 2220 Palmer Ave., Kalamazoo, Mich., 49001, Tel: 616-345-8641, TWX: 616-381-2944; Mktg. Mgr: J. Jarboe

NAT'L. WIRE & CABLE, Dept. EEM, Service Div., 136 San Fernando Rd., Los Angeles, Cal., 90031, Tel: 213-225-5611, TWX: 910-321-4155; Sls. Mgr: J.B. Miller Pgs. 3036-3045
Ariz Phoenix, K. Jahn Co., Box 15621 602-956-9060
Cal La Jolla, J.J. Colbert, 2501 Via Viesta 714-454-1500
Cal San Mateo, National Wire & Cable Corp., Box 226 415-344-3066
Conn Wethersfield, Compak Corp., Box 37 203-563-4784
Fla Orlando, J.W. Barrett Assocs., Box 14205 305-277-2857
Fla Orlando, J.W. Barrett, 1616 N. Orange 305-850-0165
Ill Elmhurst, Scott Assocs., 663 Fairview 312-279-5681
Kans Kansas City, Production Automation, Box 11584 816-763-2132
Md Glen Burnie, F. Lott Co., Box 534 301-744-4611
Mass Needham, Com/Pak, 77 Wexford St. 617-444-1259
Minn Mpls., Tech. Assocs., 6121 Excelsior 612-929-6721
NJ Pine Brook, J.W. Richardt Co., Box 357 201-227-0600
NY Ontario Ctr., Gehrs & Kehoe Assocs., 344 Rte. 104 315-524-8045
NC Behtania, Candor Co., Inc. 919-924-1480
Ohio Cincinnati, Luebbe Sls. Co., 2649 Erie Ave. 513-871-4211
Pa Wynnewood, H.J. Fairbanks Co., Box 124 215-MI-2-5816
Tex Ft. Worth, J. Gibbs Assocs., Box 16040 817-AX-2-1065
Wash Seattle, Bergford, 56 Calif. Ave. 206-937-6664
For: Can., Toronto, Ont., Devitronex, 2 Tycos 781-5401

(NES) NATIONWIDE ELCTRN. SYS., 7N662 Rte. 53, Itasca, Ill., 60143, Tel: 312-773-0370, TWX: 910-651-4713; Sls. Mgr: R. White ....Pg. 365

Advertisement

NES has a broad range of products which include such things as: digital clocks, accumulators, code translators, data acquisition systems, process control computers, system interface elements, electronic time clocks and various systems components.

Besides this large selection of standard products, NES is still interested and builds custom-fitted systems and equipment in any quantities, single to magnitudinous. This is economically feasible because of the modular and versatile construction designs and practices utilized by NES.

NATVAR CORP., Box 67, Rahway, N.J., 07065, Tel: 201-388-8800, TWX: 710-996-5860; Sls. Mgr: R.A. Reilly

NAUGLER ENGRG., INC., Off Dunham Rd., Beverly, Mass., 01915, Tel: 617-922-5634; Sls. Mgr: C.A. Osborn

NAYBOR, E.V. LABS., INC., 26 Manorhaven Blvd., Port Washington, N.Y., 11050, Tel: 516-PO-7-4300; Sls. Mgr: E.V. Naybor

NAZ-DAR INT'L., 1087 N. North Branch St., Chicago, Ill., 60622, Tel: 312-943-8338; Sls. Mgr: S.J. Nickels

NCI, INC., Capacitor Div., 5900 Australian Ave., W. Palm Beach, Fla., 33407, Tel: 305-842-3201, TWX: 510-952-7618; Sls. Mgr: J.R. Behrens

NEBEL, R.E. LAB., 31 Whitehall Blvd., Garden City, N.Y., 11530, Tel: 516-741-6603; Sls. Mgr: R.E. Nebel

NEC AMERICA INC., See Nippon Elec./NEC America

NEFF INSTR. CORP., 1088 E. Hamilton Rd., Duarte, Calif., 91010, Tel: 213-357-2281, TWX: 910-585-1883; Sls. Mgr: J.H. Hueckel ....Pg. 1291
Ala Huntsville, BCS Assocs., Box 1273 205-881-6220
Ariz Phoenix, Barnhill Three, 537 E. Osborn Rd. 602-263-1250
Cal Glendale, Instr. Specialists, 1109 S. Central Ave. 213-245-9404
Cal San Diego, Instr. Specialists, 1901 State St. 714-232-2017
Cal Santa Clara, Instr. Specialists, 2359 De La Cruz Blvd. 408-244-1505
Colo Denver, Barnhill One, 1170 S. Sheridan Blvd. 303-934-5505
Conn Brookfield Ctr., Webb Assocs., Junction Rd. 203-775-0055
Fla Orlando, BCS Assocs., Box 6578 305-843-1510
Ill Chicago, Carter Elctrns., 4919 W. 63rd St. 312-585-5485
Ind Indianapolis, Carter Elctrns., 6333 Hollister Dr. 317-293-0696
Kans Overland Pk., Tech. Reps., 9009 W. 95th St. 913-381-5852
Mass Bedford, Webb Assocs., 5 Shawsheen Ave. 617-275-8310
Mich Detroit, Electro Sls. Assocs., 11211 Morang Dr. 313-526-8800
Minn Minneapolis, Carter Elctrns., 1025B Evergreen La. 612-544-9393
Mo Hazelwood, Tech. Reps., 8618 Latty Ave. 314-524-6900
NJ Union, SBM Assocs., 1519A Stuyvesant Ave. 201-687-8737
NM Albuquerque, Barnhill Three, 1410 D Wyoming N.E. 505-299-7658
NY Pleasantville, SBM Assocs., 28 Hobby St. 914-769-1811
NY Rochester, SBM Assocs., 4515 Culver Rd. 716-266-1400
NC Greensboro, BCS Assocs., Box 6426 919-273-1918
Ohio Cleveland, Electro Sls. Assocs., 851 E. 222nd St. 216-261-5440
Ohio Dayton, Electro Sls. Assocs., Overlook Br., Box 3122 513-426-5551
Pa Jenkintown, PDC Corp., Benson-East 215-887-9610
Pa Pittsburgh, Electro Sls. Assocs., 201 Penn Ctr. Blvd. 412-371-9449
Tex Houston, Barnhill Two, 3810 Westheimer 713-621-0040
Tex Richardson, Barnhill Two, 312 N. Central Expwy. 214-231-2573
Wisc Milwaukee, Carter Elctrns., 6400 W. Capitol Dr. 414-464-5555
For: Can., New Westminster, B.C., A. Crawford Assocs., 721 Aldford Ave. 604-524-1161

For: Can., Malton, Ont., A. Crawford Assocs., 6427 Northam Dr. 416-678-1500
For: Can., Ottawa, Ont., A. Crawford Assocs., 376 Churchill Ave. 613-725-3354
For: Can., Longueuil, Que., A. Crawford Assocs., 157 St. Charles St. W. 514-670-1212

NEILL ENGRG. CO., 134 Western Ave., Akron, Ohio, 443313, Tel: 216-867-5458; Sls. Mgr: G. Neill

NELSON-HERSHFIELD ELCTRNS., 1848 W. Campbell Ave., Phoenix, Ariz., 85015, Tel: 602-264-1348; Sls. Mgr: R. Milne

NELSON ROSS ELCTRNS., 5 Delaware, Lake Success, N.Y., 11040, Tel: 516-328-1100, TWX: 510-223-0414; Sls. Mgr: E. Feldman .... Pgs. 536,537

Ala Huntsville, J. L. Highsmith, 3322 S. Memorial 205-881-3294
Alas Anchorage, Arva, Inc., Box 759 907-272-5231
Ariz Phoenix, T. L. Snitzer Co., 15 N. 40th Pl. 602-273-1673
Cal Cupertino, T. Snitzer, 10320 Saratoga-Sunnyvale 408-257-8333
Cal Los Angeles, T. Snitzer, 9005 Exposition 213-836-6170
Colo Denver, Bennewitz, 2801 E. Colfax 303-399-1132
Conn Hartford, Instr. Assocs., 234 Murphy 203-525-9367
Fla Orlando, J. Highsmith, 2543 Industrial 305-293-5202
Ill Chicago, L. Green, 5218 W. Diversey 312-286-6824
Ind Indianapolis, L. Green, 1111 E. 54th 317-253-2087
Iowa Cedar Rapids, Engrg. Svcs., 1026 3rd Ave., S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svcs., 7924 A State Line 913-649-4000
Md Bethesda, S & S Assocs., 7720 Wisconsin 301-654-1434
Mass Bedford, Instr. Assocs., 175 Middlesex 617-275-0700
Mich Detroit, H. Teplitz, 26847 Grand River 313-537-9058
Minn Mpls., L. Green, 6225 University, N.E. 612-781-1611
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NY Great Neck, Meas. Tech., 295 Northern 516-482-3500
NM Albuquerque, Bennewitz Assocs., 9720 Candelarie N.E. 505-298-6775
Ohio Cleveland, H. Teplitz, 3945 Meadowbrook 216-371-2044
NC Charlotte, J. Highsmith, 3733 Monroe 704-333-7743
Okla Tulsa , Data Engrg., 4580 E. 50th St. 918-622-3753
Ore Portland, Arva, Inc., 2035 S.W. 58th St. 503-292-8762
Pa E. King of Prussia, S & S, Boro Line 215-265-3450
Tex Richardson, Data Engrg., 777 S. Central 214-231-4846
Wash Seattle, Arva, Inc., 1320 Prospect St. 206-622-0177

NELSON STUD WELDING CO., United-Carr Div. TRW Inc., E. 28th & Toledo Ave., Lorain, Ohio, 44055, Tel: 216-245-6931; Sls. Mgr: R.E. Igoe

NEPTUNE ELCTRNS. CO., 30 West 15th St., New York, N.Y., 10011, Tel: 212-CH-3-8130; Partner: I.M. Affias

NES, INC., See Nationwide Elctrn. Sys.

NESHAMINY TRANSFORMER, Div. Neshaminy Elctrn., Edison-Furlong Rd., Furlong, Pa., 18925, Tel: 215-794-7411; Sls. Mgr: P.F. Klein .... Pg. 2965

Cal Altadena, D. Wagner Assoc., Box 485 213-MU-1-4060
Ill Downers Gr., Richmar Elctrn., 915 Burlington 312-968-0118
NH Nashua, Bell Controls, 139 Peele Rd. 603-888-2021
NJ Haddonfield, Thomas, 138 Haddon 609-UL-4-3011
NY Rockville Centre, Magneco Inds., Box 187 516-764-4000
NY Syracuse, W. Zimmerman, 112 DeWitt 315-GR-4-4889
Tex Houston, Tex. Special Elctrn., 7024 Mapleridge 713-666-5871

NESOR ALLOY CORP., 666 Passaic Ave., W. Caldwell, N.J., 07006, Tel: 201-228-0400; Sls. Mgr: M. Feldman

NESTER/FAUST MFG. CORP., 2401 Ogletown Rd., Newark, Dela., 19711, Tel: 302-737-6330; Sls. Mgr: J.F. Hofmann

NETWORK INDS., INC., Box 397, Bayonne, N.J., 07002, Tel: 201-437-3929; Sls. Mgr: A.A. Mercer

NETWORKS ELCTRN. CORP., 9750 De Soto, Chatsworth, Calif., 91311, Tel: 213-341-0440; Sls. Mgr: B.R. Maxwell

NEUMADE PRODS. CORP., 720 White Plains Rd., Scarsdale, N.Y., 10583, Tel: 914-725-4900; Sls. Mgr: R. NeuJones

NEUTRONIC CORP., Box 625, Bridgeton, Mo., 63044, Tel: 314-278-4446; Sls. Mgr: A.G. Tumminello

NEW ENGLAND ELEC. WIRE, 367 Main St., Lisbon, N.H., 03585, Tel: 603-838-6629; Sls. Mgr: C. McKenzie

NEW ENGLAND INSTR., 14 Kendall La., Natick, Mass., 01760, Tel: 617-873-9711, TWX: 710-346-0398; Sls. Mgr: P. Burns .... Pgs. 2920,2921

Ala Huntsville, Young & Lawrence, 2907 Governer 205-539-6575
Ariz Scottsdale, Compar Rocky Mt., 84th W. First 602-947-4336
Cal Palo Alto, O'Donnell, 1955B El Camino Real 415-327-9260
Cal Torrance, O'Donnell, 18053 Crenshaw 213-323-9243
Colo Denver, Compar Rocky Mt., 4600 E. Asbury 303-757-7621
Conn Wallingford, Underwood Sls., 50 S. Main 203-269-4845
Fla Orlando, G. Bohman, 6990 Lake Ellenor 305-855-0274
Fla Winter Pk., Young & Lawrence, 601 N. New York 305-647-6929
Ind Ft. Wayne, Tri-State, 3220 Broadway 219-456-3567
Ind Hobart, J. PopP Sls. Co., 1133 Lincoln St. 219-942-1962
Kans Overland Pk., Penzner-Mankus, Box 6264 913-381-0004
Md Lutherville, Daniel & Co., Box 124 301-VA-5-3330
Mass Wakefield, Underwood Sls., 591 North Ave. 617-245-3850
Mich Farmington, W. Hummon, Box 501 313-474-0661
Minn Mpls., R. Marshall, 6106 Excelsior 612-929-0457
Mo Hazelwood, Penzner-Mankus, 400 Brookes 314-731-4334
NJ Riverdale, Adamo Sls., Box 29 201-839-4463
NM Albuquerque, Compar Rocky Mt., 2129 San Mateo NE 505-265-1020
NY Ithaca, B. Dean, Inc., 714 W. Clinton St. 607-272-2187
NC Bethania, Candor Co., Inc. 919-924-1480
Ohio Cincinnati, Tri-State Mktg., 1717 Section 513-631-5060
Ohio Cleveland, Tri-State Mktg., 25000 Euclid 216-731-9207
Pa Glenside, Daniel & Co., Box 3 215-TU-7-0550
Tenn Bristol, Candor Co., Box 3204 703-669-7632
Tex Dallas, Evans & McDowell, Box 35093 214-FL-1-1839
Utah Salt Lake City, Compar Rocky Mt., Box 15006 801-364-1163
Wash Seattle, Associated Ind., 3711 S. Hudson 206-723-5600

NEW HAVEN WIRE & CABLE, INC., Box 266, New Haven, Ind., 46774, Tel: 219-749-1102; Sls. Mgr: W.F. Hackensmith, Sr.

NEW HERMES ENGRAVING MACH. CORP., 20 Cooper Sq., New York, N.Y., 10003, Tel: 212-777-3080; Sls. Mgr: H. Susskind

NEW LONDON INSTR. CO., INC., Box 189, New London, Conn., 06320, Tel: 203-443-8451; Sls. Mgr: I.A. Cohn

NEW PROD. ENGRG., Sub. Wabash Magnetics, First & Webster Sts., Wabash, Ind., 46992, Tel: 219-563-2191, TWX: 810-290-2722; Sls. Mgr: R.W. Bowers Pgs. 1792,1793

Cal Huntington Bch., Comps., 17875 Beach 714-847-8584
Cal Palo Alto, Comps., 1020 Corp. Way 415-961-9064
Colo Denver, Walter Engrg., 880 Bonnie Brae 303-777-5585
Ill Des Plaines, Coombs Assocs., 1001 E. Touhy 312-298-4830
Ind Wabash, New Prod. Engrg., 1st & Webster 219-563-2191
Md Gaithersburg, Wright Co., 19003 Coltfield 202-296-0979
Mass Milton, P.T. McCarthy, 69 Gulliver St. 617-696-3154
Mich Detroit, A. Blumenberg, 20250 Briarcliff 313-341-4737
NJ Clark, Dolan Assocs., 195 Dorset Dr. 201-382-2797
NY Syracuse, Carlen Reps., 3650 James St. 315-437-2921
Ohio Dayton, Neal Bear Corp., 1563 E. Dorothy 513-299-3566
Ohio W. Richfield, Neal Bear, 3435 Streetsboro 216-659-3331
Ore Portland, R. Legg Co., 4475 S.W. Scholls Ferry Rd. 503-292-8824
Pa Narberth, White/Keystone, 100 N. Essex 215-MO-4-6505
Tex Ft. Worth, W. Fralia, 6100 Camp Bowie 817-738-2002
Wisc Brookfield, R. Jenzake, 945 Apple Tree 414-251-4804
EXP: N.J., Matawan, MJK Int'l., 225 Matawan 201-583-9527

NEW-TRONICS CORP., 15800 Commerce Pk. Dr., Brookpark, Ohio, 44142, Tel: 216-267-3150; Sls. Mgr: W.C. McNeil

NEW YORK SOLDER CO., 684 East 133rd St., Bronx, N.Y., 10454, Tel: 212-CY-2-3740

N.Y. TESTING LABS., INC., 81 Urban Ave., Westbury, N.Y., 11590, Tel: 516-ED-4-7770; Sls. Eng: J. Gaspari

NEWBURY INDS., INC., 10975 Kinsman Rd., Newbury, Ohio, 44065, Tel: 216-564-2285; Sls. Mgr: P. Sorensen

NEWCOMB AUDIO PRODS. CO., 12881 Bradley Ave., Sylmar, Calif., 91342, Tel: 213-369-1921; Sls. Mgr: R. Newcomb

NEWMAN, M.M. CORP., 7 Hawkes St., Marblehead, Mass., 01945, Tel: 617-631-7100; Pres: M.M. Newman

NEWPORT LABS., INC., 630 E. Young St., Santa Ana, Cal., 92705, Tel: 714-540-4914, TWX: 910-595-1787; Sls. Mgr: L.H. Becker

NEY, J.M. CO., Maplewood Ave., Bloomfield, Conn., 06002, Tel: 203-242-2281; Dir. of Mktg: D.V. Landmann

NH RESEARCH, INC., 1510 S. Lyon St., Santa Ana, Calif., 92705, Tel: 714-835-1616; Sls. Mgr: F. Schlines

NIELSEN HARDWARE CORP., 770 Wethersfield Ave., Hartford, Conn., 06101, Tel: 203-522-8145, TWX: 710-425-2970; Sls. Mgr: G.E. Swanson

NILSEN MFG. CO., 920 Hwy. 27, Haines City, Fla., 33844, Tel: 813-422-1197; Sls. Mgr: M. Zamzow

NIPPERT CO., 825 Pittsburgh Dr., Delaware, Ohio, 43015, Tel: 614-363-1981; V.P: J.E. Nippert

NIPPON ELECTRIC/NEC AMERICA, 200 Park Ave., N.Y., N.Y., 10017, Tel: 212-661-3420, TWX: 710-581-3376; Pres: S. Abe .... Pg. 1487

Cal Los Angeles, Nippon Elec. Co., Ltd., 9841 Airport Blvd. 213-776-5923
Ill Chicago, Nippon Elec. N.Y., Inc., 500 N. Michigan Ave. 312-828-9494
NY New York, Nippon Elec. N.Y., Inc., 200 Park Ave. 212-661-3420

NITINE, INC., Div. of Shulton Inc., Rte. 46, Clifton, N.J., 07015, Tel: 201-779-4800; Sls. Mgr: J.W. Beckley

NJE CORP., Sub. of Condec Corp., 20 Boright Ave., Kenilworth, N.J., 07033, Tel: 201-272-6000, TWX: 710-996-5967; Sls. Mgr: J.R. Hoeffler ...... Pgs. 818-825

Ala Huntsville, Col-Ins. Co., Box 4246 205-881-1835
Ariz Phoenix, Moxon Elctrns., 15 N. 40th Pl. 602-273-7363
Cal Los Angeles, Moxon Elctrns., 2311 Pontius Ave. 213-272-9311
Cal San Diego, Moxon Elctrns., 2054 Garnet St. 714-274-6525
Cal Sunnyvale, Moxon Elctrns., 1259 Birchwood Dr. 408-734-4352
Colo Littleton, Sci. Devices-SW, 4943 E. Geddes Ct. 303-758-1888
Conn Hamden, Instr. Consits., 2381 Whitney Ave. 203-248-4174
Fla Orlando, Col-Ins-Co., Inc., Box 13189 305-423-7615
Ill Chicago, Carter Elctrns., Inc., 4919 W. 63rd St. 312-585-5485
Ind Indianapolis, Carter Elctrns., Inc., 6333 Hollis Dr. 317-293-0696
Kans Overland Pk., Tech. Reps., Inc., 9009 W. 95th St. 913-381-5852
Md Rockville, Mesa, Inc., 12601 Twinbrook Pkwy. 301-881-8430
Mass Waban, Instr. Consits., 81 Wyman St. 617-969-9881
Mich Grand Rapids, Sheridan Assocs., Box 6312 616-949-8110
Mich Lathrup Village, Sheridan Assoc., Box 128 313-353-3333
Minn Minneapolis, Carter Elctrns., 1025B Evergreen La. 612-544-9393
Mo Hazelwood, Tech. Reps., 8618 Latty Ave. 314-524-6900
NJ Fort Lee, Tech. Mktg. Assoc., 4 Horizon Rd. 201-224-6911
NJ Merchantville, Megargel/Himmelstein, 6705 Park Ave. 609-662-3081
NM Albuquerque, Sci. Devices-SW, 4300 Silver S.E. 505-268-6729
NY Depew, Labtronics, Inc., 5800 Transit Rd. 716-685-4111
NY Jonesville, Labtronics, Inc., 3 Eastwood La. 518-372-6649

NY Syracuse, Labtronics, Inc., 130 Pickard Bldg. 315-454-9314
NC Winston-Salem, Col-Ins-Co., Inc., Box 5597 919-765-3650
Ohio Cincinnati, Sheridan Assocs., Box 37826 513-761-5432
Ohio Dayton, Sheridan Assocs., Inc., Box 423 513-277-8911
Tex Houston, Sci. Devices, 3827 Richmond Ave. 713-667-8755
Tex Richardson, Scientific Devices, Inc., 312 N. Central Expwy. 214-231-8106
Wisc Milwaukee, Carter Elctrns., Inc., 6400 W. Capitol Dr. 414-464-5555

NL INDS., See National Lead Co.

NOBEX DIV., Griffith Plastics Corp., 1027 California Dr., Box 4365, Burlingame, Cal., 94010, Tel: 415-344-7691, TWX: 910-374-2840 ....Pgs. 1466-1471
Ala Montgomery, F. Wamble Sls., 3745 Marie Cook Dr. 205-542-5889
Alas Anchorage, Hoffer Entprs., 129 Fifth Ave.
Ariz Scottsdale, Leddy Assocs., Box 172 602-947-4379
Cal Burlingame, J. Logan & Assocs., 844 Stanton Rd. 415-697-6100
Cal Inglewood, V & L Assocs., 3412 W. Century Blvd. 213-671-7688
Colo Littleton, Leddy Assocs., 7386 S. Platte Canyon Dr. 303-794-3918
Ind Ft. Wayne, McDonald Sls. Co., Box 2848 219-745-9214
La Metairie, McKinney Sls. Co., 2012 Condon Ave. 504-887-1723
Md Baltimore, M/E Assocs., 320 Hillen Rd. 301-825-1130
Mass N. Scituate, W.A. Hendrickson Co., 766 Country Way 617-545-0652
Minn Minneapolis, Wenco Sls., 7728 Morgan Ave., S. 612-866-3639
NJ Cherry Hill, M/E Assocs., 314 Columbia Blvd. 609-667-6110
Okla Tulsa, McKinney Sls. Co., 1246 E. 28th St. 918-742-6791
Tex Dallas, McKinney Sls. Co., 1303 Chemical St. 214-631-9450
Wash Seattle, Reeve Mktg. Assocs., 4000 Aurora Ave. N. 206-632-4290
NOBLE ELCTRNS., INC., 5025 Seventh St., Carpinteria, Calif., 93013, Tel: 805-684-2410
NOBLE & WESTBROOK, Div. Bristol Brass Corp., 20 Westbrook St., E. Hartford, Conn., 06108, Tel: 203-289-2717; Gen'l. Sls. Mgr: N.P. Lord
NOEL MFG. CO. INC., 1415 Blondell Ave., Bronx, N.Y., 10461, Tel: 212-597-8900 N.L. Tuchy
NOLD, WALTER, CO., 24 Birch Rd.; Natick, Mass., 01760, Tel: 617-653-1635; Sls. Mgr: W. Nold
NON-LINEAR SYS., INC., Box N, Del Mar, Cal., 92014, Tel: 714-755-1134, TWX: 910-322-1132; Sls. Mgr: R.F. Shull
NOPCO CHEM. DIV., Diamond Shamrock Chem. Co., 350 Mt. Kemble Ave., Morristown, NJ, 07960, Tel: 201-267-1000, TWX: 710-986-7430; VP Mktg: C.E. Henry
NORCROSS CORP., 255 Newtonville Ave., Newton, Mass., 02158, Tel: 617-969-7020; Sls. Mgr: R.A. Norcross
NORELCOM INDS., INC., 200 Allen Blvd., Farmingdale, N.Y., 11735, Tel: 516-249-7245; V.P. & Sls. Mgr: R. Thaw

NORDEN DIV., United Aircraft Corp., Helen St., Norwalk, Conn., 06851, Tel: 203-838-4471, TWX: 710-468-0788; Sls. Mgr. Encoders: J.J. Cronan Pg. 370
Conn Thomaston, Nelson & Schoonmaker, Box 179 203-283-5959
Fla Orlando, F. Fausett & Co., 711 N. Magnolia Ave. 305-424-0701
Ga Smyrna, F. Fausett & Co., Box 278 404-436-5169
Ill Des Plaines, Martec Assocs., 1616 Linden St. 312-296-3331
Ind Ft. Wayne, D. C. Flanagan, 2512 East Dr. 219-748-1594
Kans Overland Pk., Palatine Eng. Sls., 7520 W. 63rd St. 913-262-5643
Mass Arlington, Nelson & Schoonmaker, Box 189 617-643-5454
Mich Southfield, Sterling-Lowell Co., 21251 Civic Ctr. Dr. 313-354-6130
Minn Minneapolis, M. Franklin Co., 7710 Computer Ave. 612-920-8014
Mo St. Louis, Palatine Eng. Sls., 8622 St. Charles Rock Rd. 314-426-7055
NJ Phillipsburg, Tronix Inc., Box 349 201-859-3944
NY New York, Haber-Ramp, 2315 Broadway 212-799-4040
NY Skaneateles, Nelson & Schoonmaker, Box 34 315-685-5058
SC Greenwood, F. Fausett & Co. 803-451-7847
Va Henry, F. Fausett & Co., Gen. Del. 703-365-5221
Wash Seattle, J. B. Jolly, 10119 51st St., S.W. 206-938-4166
EXP: Conn, E. Hartford, United Aircraft Intl., 400 E. Main St. 203-565-3394
For: Can., Longeuil, U.A.C., Ltd., Box 10 514-677-9411
NORGUS SILK SCREEN CO., INC., 58 Sylvan Ave., Dept E., Clifton, N.J., 07011, Tel: 201-471-9600; Sls. Mgr: E. Farrell

NORMAN INDS., 814 Diversey Pkwy., Chicago, Ill., 60614, Tel: 312-348-6888 ....Pg. 532
NORPLEX DIV. UOP, Norplex Dr., LaCrosse, Wisc., 54601, Tel: 608-784-6070, TWX: 910-287-2574; Sls. Mgr: C.J. Williams
NORTEC ELCTRNS. CORP., 3697 Tahoe Way, Santa Clara, Cal., 95051, Tel: 408-732-2204; Sls. Mgr: M.H. Phelps
NORTH AMERICAN ELEC. LAMP CO., 1520 North 13 St., St. Louis, Mo., 63106, Tel: 314-CE-1-2585; Sls. Mgr: L. Lander
NORTH AMERICAN ROCKWELL CORP., Air Maze Div., 25000 Miles Rd., Cleveland, Ohio, 44128, Tel: 216-292-6800, TWX: 810-422-2215; Sls. Mgr: G.O. Krueger

NORTH ATLANTIC INDS., 200 Terminal Dr., Plainview, N.Y., 11803, Tel: 516-OV-1-8600, TWX: 510-221-1879; V.P. Mktg: F.G. Roberts .... Pgs. 368,369,530,531
SERVICE CENTERS
Cal North Hills, Elect. Standards Repair Svc., 13418 Wyandott St. 213-765-4224
Fla Orlando, BCS Assocs., 940 N. Fern Creek Ave. 305-843-1510
Ala Huntsville, BCS Assocs., Box 1273 205-881-6220
Ariz Phoenix, Meas. Conslts., 4510 N. 27 Ave. 602-264-1279
Cal Long Beach, Product Data, 3760 Orange 213-595-1777
Cal San Diego, Product Data, 8799 Balboa 714-279-2342
Colo Arvada, Meas. Conslts., 8660 Ralston Rd. 303-423-0010
Conn Glastonbury, Instr. Reps., Box 165 203-633-0777
Fla Orlando, BCS Assocs., Box 6578 305-843-1510
Ill Chicago, P. Lind, 5483 Northwest Hwy. 312-774-1246
Ind Indianapolis, P. Lind, 3969 Meadows 317-547-9178
Kans Overland Pk., Tech. Reps., 9009 W. 95 St. 913-381-5852
Md Baltimore, Dyna Rep. Co. 301-539-5148
Mass Arlington, Instr. Reps., 1046 Massachusetts 617-646-1034
Minn Circle Pines, P. Lind, 10104 Sunset Bl. 612-786-5770
Mo Hazelwood, Tech. Reps., 8618 Latty Ave. 314-524-6900
NM Albuquerque, Meas. Conslts., Box 6081 505-344-3575
NY Depew, Labtronics, 5800 Transit 716-685-4111
NY Endicott, Labtronics, Inc. 607-748-0509
NY Schenectady, Labtronics, Inc. 518-372-6649
NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314
NC Greensboro, BCS Assocs., Box 6426 919-273-1918
Pa Fairview Vlg., Acromatix, 3118 Germantown 215-279-0377
Tex Houston, Scien. Sls., 6400 Westpark 713-781-2711
Tex Richardson, Sci. Sls., 777 S. Central Expwy. 214-231-6542
Va Springfield, Dyna Rep., 5265 Port Royal 703-321-8630
Wash Bellevue, Sci. Devices N.W., 854-106th Ave., N.E. 206-454-0900
Wisc Milwaukee, P. Lind Elctrns. Co. ENterprise 1611
EXP: N.Y., Plainview, North Atlantic, 200 Terminal 516-681-8600

NORTH ELEC. CO., Electronetics Div., 553 S. Market St., Galion, Ohio, 44833, Tel: 419-468-8279, TWX: 419-464-4860; Mktg. Dir: N.J. McCarty Pgs. 826,827,2651
Ala Huntsville, Winfield Southeast, 512 Lanier 205-536-0857
Cal San Fran., Artwel Elec., 1485 Bayshore 415-467-1880
Colo Denver, Franklin Sls., 1924 S. Navajo 303-922-3623
Fla No. Miami, Winfield Elctrn., 1875 N.E. 149th 305-945-6544
Ga Atlanta, Winfield Southeast Co., 2991-D N. Druid Hills Rd., N.E. 404-636-3023
Hawa Honolulu, Aloha Assoc., 225 Liliuokalani 808-922-3819
Ill Mt. Prospect, Laver & Stearns, 1030 E. NW Hwy. 312-259-6300
Ind Indpls., M. Cunningham, 720 E. 65th 219-485-3612
Mass Lexington, R. Purinton, Inc., 28 Park St. 617-475-7055
Minn Mpls., R. J. Siedare, 4724, 42nd 612-533-2294
Neb Lincoln, Mktg. Assocs., 1200 N. 79th 402-434-5244
NJ Fair Lawn, Bixon Assoc., Box 305 201-797-5356
NY Webster, E.A. Kershaw, 216 Shorewood 716-671-6365
NY Smithtown, J. McCarron Co., 82 River Hgts. Dr. 516-724-3809
NC Raleigh, Winfield Southeast Co., 4909 Carteret Dr. 919-787-2841
Ohio Wickliffe, D. Steffen, 30212 Lakeland 216-944-8080
Ohio Dayton, D. Steffen & Assoc., 1201 Hemp. 513-293-3146
Pa King of Prussia, Rivco, Box 338 215-265-5211
Tex Dallas, Jacobson Co., Box 9702 214-363-7584
Va Oakton, Prod. Mgt. Co., 11405 Vale Spring 301-948-0493

NORTH HILLS ELCTRNS., INC., Alexander Pl., Glen Cove, N.Y., 11542, Tel: 516-671-5700; Sls. Mgr: V. Macri Pgs. 817,1339,2967
NORTHEAST ELCTRNS. CORP., Box 649, Concord, N.H., 03301, Tel: 603-224-7466, TWX: 710-361-1886; Sls. Mgr: H.E. Corey, Jr.
NORTHEAST SCIENTIFIC CORP., 30 Wetherbee St., Acton, Mass., 01720, Tel: 617-263-2711

NORTHERN ENGRG. LABS., 357 Beloit St., Burlington, Wisc., 53105, Tel: 414-763-3591; Sls. Mgr: J.D. Holmbeck ....Pg. 1419
Cal Burbank, Tech-Source, 2104 W. Magnolia 213-849-6863
Fla Clearwater, W. B. Wimberly, 532 S. Ft. Harrison 813-446-7072
Ill Chicago, E. Schmeichel, 5968 W. Chicago 312-378-2070
Mass Needham, Hatch Assocs., 1233D Highland 617-444-3310
NJ Bergenfield, H. Gray, 20 Foster St. 201-384-3643
Ohio Wickliffe, W. J. Brauer, Box 305 216-943-0601
NORTHERN PRECISION LABS., INC., 202 Fairfield Rd., Fairfield, N.J., 07006, Tel: 201-227-4800, TWX: 710-734-4301; Sls. Mgr: T. Monaco
NORTHERN SCI., INC., Sub. TRACOR, Inc., 2551 W. Beltline, Middleton, Wisc., 53562, Tel: 608-836-6511, TWX: 910-280-2521; Sls. Mgr: W.J. Buffo

NORTHFIELD PRECISION INSTR. CORP., 4400 Austin Blvd., Island Pk., N.Y., 11558, Tel: 516-431-1112; Sls. Mgr: M. Farber ....Pg. 1625
Cal Pasadena, Electro-Mechanical Instr., Inc., 1388 E. Walnut 213-MU-1-2748

NORTON ASSOCS., INC., 10 Di Tomas Ct., Copiague, N.Y., 11726, Tel: 516-842-4666; Pres: R.S. Norton Pgs. 312-315
NORTON COATED ABRASIVE & TAPE DIVS., Dept. 7111, Troy, N.Y., 12181, Tel: 518-273-0100; Sls. Mgr: D.H. Paul
NORTON CO., 1 New Bond St., Worcester, Mass., 01606, Tel: 617-853-1000
NORTON CO., Metals Div., 45 Industrial Pl., Newton, Mass., 02164, Tel: 617-969-7690; Sls. Mgr: E.R. Einarsen
NORTON CO., Vacuum Equip. Div., 160 Charlemont St., Newton, Mass., 02161, Tel: 617-332-5800; Sls. Mgr: J. Flood

NORTRONICS, 8101 10th Ave., N., Mpls., Minn., 55427, Tel: 612-545-0401; Mktg. Mgr: M. Kronfeld Pgs. 316-319
Cal Van Nuys, Nortronics, 7120 Hayvenhurst 213-988-4290
Conn Essex, J. Stawicki Assoc., Westbrook Rd. 203-767-8566
NJ Cherry Hill, Trinkle Sls., 500 N. Kings Hwy. 609-667-3500
NJ Montclair, Comp. Marketers, 151 Valley 201-746-6717
NORWALK THERMOSTAT CO., 100 N. West St., Norwalk, Ohio, 44857, Tel: 419-663-0822; Sls. Mgr: D.H. Callihan

NOVA ELECTRIC MFG. CO., 263 Hillside Ave., Nutley, N.J., 07110, Tel: 201-NO-1-3434; Sls. Mgr: N.J. Gottfried Pg. 828
Cal Mountain View, Gado Instr., 655 Castro 415-961-2222
Colo Boulder, A.L.S. Elctrns., 1932 Fourteenth 303-447-2436

Conn Bristol, E-P-R, Inc., 281 Vera Rd. 203-584-2202
Ga Atlanta, Brennan Assocs., Inc., Box 372 404-469-8324
Ill Crystal Lake, Power Conversion Prods., 42 E. St. 815-459-9100
Ill Skokie, Custom Elect. Sys., 4821 Main 312-679-1424
Md Silver Spgs., Gawler-Knoop, Ten Old Post Off. 301-589-4406
Mass Concord, E-P-R, Inc., 1113 Lexington Rd. 617-259-8429
Minn Mpls., Electrical Jobbers Equip., 1120 Glenwood 612-377-7904
Mo St. Louis, Coombs Assocs., 11734 Lackland Indl. Dr. 314-542-3399
NJ Ridgewood, Hansen Assocs., Box 806 201-652-7055
NM Albuquerque, A.L.S. Elctrns., Box 11626 505-268-9600
NY Liverpool, Rayelco Elctrns., Inc., Box 189
NY New York, Henley & Co., 202 E. 44 212-986-5544
Ohio Worthington, Ohio Instr., 505 Whitney 614-885-0743
Utah Salt Lake City, A.L.S. Elctrns., 3385 South 2770 East 801-363-2921
Wash Seattle, Datacom Assocs., 2207 Fairview E. #12 206-329-2989
EXP: N.Y., N.Y., Henley & Co., 202 E. 44th St. 212-YU-6-5544
For: Can., Calgary, Alberta, Canadian Dynamics, 122-17th Ave. SE 403-265-6500
For: Can., Don Mills, Ont., York Instrs., 1262 Don Mills Rd. 416-445-1255
For: Can., Vancouver, B.C., Canadian Dynamics, 8264 St. George 604-325-3201

NOVATRONICS, INC., Box 878, Pompano Beach, Fla., 33061, Tel: 305-942-5200, TWX: 510-956-9878; Sls. Mgr: J. Cianciarulo

NUCLEAR-CHICAGO, 2000 Nuclear Dr., Des Plaines, Ill., 60018, Tel: 312-298-6600; VP Mktg: R.A. Hagglund

NUCLEAR CORP. AMER., Nuclear Div., 2 Richwood Pl., Denville, N.J., 07834, Tel: 201-627-4200, TWX: 710-987-8487; Sls. Mgr: D. Pessolano

NUCLEAR DATA, INC., 100 W. Golf Rd., Palatine, Ill., 60067, Tel: 312-529-4600; V.P. Sls: C.J. Long, Jr.

NUCLEAR DIODES, Box 135, Prairie View, Ill., 60069, Tel: 312-634-3870, TWX: 72-6407; Sls. Mgr: J.W. Orth

NUCLEAR EQUIP. CHEM. CORP., 165 Marine St., Farmingdale, N.Y., 11735, Tel: 516-CH-9-8454; Sls. Mgr: E. Backstrom

NUCLEAR MEAS. CORP., 2460 N. Arlington Ave., Indianapolis, Ind., 46218, Tel: 317-546-2415; Sls. Mgr: L.G. Vaughn

NUCLEAR PRODS. CO., Box 1178, El Monte, Calif., 91734, Tel: 213-283-2603; Sls. Mgr: R.M. Evleth

NUCLEAR RESCH. CORP., Street Rd. & 2nd St. Pike, Southampton, Pa., 18966, Tel: 215-357-5015; Sls. Mgr: D.S. Pollock

NUCLEAR SUPPLY CO., 422 Washington Bldg., Washington, D.C., 20005, Tel: 202-ST-3-3480; Sls. Mgr: A. Rochman

NUCLEAR SYS., Box 98, Garland, Tex., 75040, Tel: 214-276-0543; Mgr: R. Marlow

NUCLEONIC PRODS., 6660 Variel Ave., Canoga Pk, Cal., 91303, Tel: 213-887-1010, TWX: 910-494-1954; Sls. Mgr: J. Goldman

NUCLIDE CORP., AGV Div., 916 Main St., N. Acton, Mass., 01720, Tel: 617-263-2936; Gen'l. Mgr: D.J. Marshall

NURAD, INC., 2165 Druid Pk. Dr., Baltimore, Md., 21211, Tel: 301-462-1700; Sls. Mgr: H. Rutstein

NUS CORP., Underwater & Elctrn. Sys. Div., Box 248, Paramus, N.J., 07652, Tel: 201-265-2400; Sls. Mgr: J.W. Torrance

NUTEK INDUSTRIES, Box 651, Mountain View, Cal., 94040, Tel: 415-321-0495; Sls. Mgr: J.C. Meyer

NUTMEG SCREW MACH. PRODS., Box 1470, Waterbury, Conn., 06720, Tel: 203-879-1496; Sls. Mgr: T.J. Iorio

NVF CO., Box 68, Yorklyn, Del., 19736, Tel: 302-239-5281; Sls. Mgr: G. Le Van

NWL TRANSFORMERS, Nothelfer Winding Labs., Box 455, Trenton, N.J., 08603, Tel: 609-882-2500; Sls. Mgr: R. Graham ....Pg. 2966
Tex Dallas, Titan Reps, 6434 Maple Ave. 214-357-8266

NY-GLASS PLASTICS, 7314 E. Madison St., Paramount, Calif., 90723, Tel: 213-636-1035; Sls. Mgr: A. Willis

NYE, WILLIAM F., INC., P.O. Box G-927, New Bedford, Mass., 02742, Tel: 617-996-6721; Sls. Mgr: G.B. Mock

NYLOGRIP PRODS. CO., 281 Winter, Waltham, Mass., 02154, Tel: 617-891-8100, TWX: 710-324-4832; Sls. Mgr: N.R. Houghton

NYLOK CO. DIV., USM Corp., 611 Industrial Ave., Paramus, N.J., 07652, Tel: 201-261-9400, TWX: 201-262-2243; Sls. Mgr: R.W. Rundle

NYLOMATIC CORP., 137 Nolan Ave., Morrisville, Pa., 19067, Tel: 215-295-4151; Sls. Mgr: Calvin Engel

NYLTITE CORP. AMERICA, 3451 S. Clinton Ave., S. Plainfield, N.J., 07080, Tel: 201-561-1300; Sls. Mgr: F. Ramz

NYTRONICS, INC., Capacitor Div., Orange St., Darlington, S.C., 29532, Tel: 803-393-5421, TWX: 810-665-2182; Sls. Mgr: R.M. Andersen ....Pg. 2434
Ariz Phoenix, Barnhill Five, 537 E. Osborn Rd. 602-263-1250
Cal Los Angeles, Clemick-Neenan & Assoc., 654 N. Sepulveda Blvd. 213-476-1272
Cal San Lorenzo, W. Parks, Box 36 415-357-4240
Colo Denver, Barnhill Five, 1170 S. Sheridan 303-934-5505
Conn No. Haven, Comp. Rep., 22 Broadway 203-239-9762
Fla Orlando, Florida Elctrn. Engrg. Sls., 601 N. Fern Creek 305-425-0032
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill Pl., N.W. 404-237-2273
Ill Chicago, Balhorn & Welch, 1925 N. Harlem 312-889-5011
Iowa Cedar Rapids, Balhorn & Welch, Box 1521 319-363-9970
Kans Prairie Village, Thunderbird Tech. Sls. & Svc., 4014-A W. 95th St. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls., 7707 E. Osie 316-684-3941
La Metairie, Cartwright & Bean, Box 73336 504-887-5225
Mass Needham, Comp. Rep., 1116 Great Plain 617-444-2484
Md Bethesda, Warren Mount Co., 4924 St. Elmo Ave. 301-657-9312
Mich Ann Arbor, H. C. Heym, 1615 Chalmers 313-971-6552
Minn St. Paul, Wagner Comp. Conslts., 542 S. Snelling Ave. 612-698-0331
Mo Hazelwood, Thunderbird Tech. Sls. & Svcs., Inc., 400 Brookes Dr. 314-731-4343
Mo St. Louis, Thunderbird Tech. Sls., Box 12849 314-542-6488
NJ Englewood Cliffs, Sprung/Nussbaum, 120 Sylvan 201-947-6767
NM Albuquerque, Barnhill Five, 1410 D. Wyoming, N.E. 505-299-7658
NY Rochester, W.A. Franklin Sls., 179 Hillary 716-889-4849
NY Syracuse, W.A. Franklin Sls., 2 Standish 315-446-1120
NY Whitesboro, W. A. Franklin Sls., 42 Glenridge 315-736-0323
NC Charlotte, Cartwright & Bean, 625 Harwyn Dr. 704-333-6457
Ohio Cincinnati, G & H Sls., 10599 Chester 513-771-8231
Okla Tulsa, H.J. Daly, 5836 S. 70th East Ave. 918-627-4159
Pa Narberth, J. Bresson, 107 Forrest 215-839-6770
Tenn Memphis, Cartwright & Bean, 560 S. Cooper 901-276-4442
Tex Dallas, M.M.S. Comps., Box 20263 214-357-6893
Wash Bellevue, Antage Corp., 300 120th Ave., N.E. 206-455-3460

NYTRONICS, INC., Custom Comps. Grp., Third Ave., Alpha, N.J., 08865, Tel: 201-454-1143, TWX: 510-235-2918; Pres-Mag. Div: J. Potash

NYTRONICS, INC., Essex Elctrns. Div., Orange St., Darlington, S.C., 29532, Tel: 803-393-5421, TWX: 810-665-2182; Sls. Mgr: P.W. Shatusky ....Pg. 2498
Ariz Phoenix, Barnhill, 4900 E. Indian School 602-959-2115
Cal Gardena, Santa Monica Bell Elec., 306 E. Alondra Blvd. 213-321-5802
Cal Menlo Pk., Bell Elctrns., 1070 O'Brien 415-323-9431
Cal San Diego, Bell Elctrns., 8072 Engineer 714-278-4350
Colo Denver, Barnhill, 1170 S. Sheridan 303-934-5505
Fla Orlando, Fla. Elec. Eng. Sls., 601 N. Fern Creek 305-425-0032
Ill Chicago, Balhorn& Welsh, 1925 N. Harlem 312-889-5011
Kans Prairie Village, Thunderbird Tech. Sls. & Svc., 4014-A W. 95th St. 913-642-7220
Kans Wichita, Thunderbird Tech. Sls. & Svc., 7707 E. Osie 316-684-3941
Md Bethesda, W. Mount Co., 7735 Old Georgetown Rd. 301-657-9312
Mass Bedford, F.R. Lesser, 20 Haydon La. 617-275-7558
Mich Birmingham, H.C. Heym Assoc., 1688 Buckingham Rd. 313-644-9166
Minn St. Paul, Wagner Comps., 542 S. Snelling 612-689-0331
Mo St. Louis, Thunderbird Tech. Sls. & Svcs., Inc., Box 6156 314-838-6688
NJ Englewood Cliffs, Sprung/Nussbaum, 120 Sylvan Ave. 201-947-6767
NM Albuquerque, Barnhill Assocs., 827 Pennsylvania, N.E. 505-265-7766
NY Syracuse, W. A. Franklin Sls., 2 Standish Terr. 315-446-1120
Ohi Cincinnati, G & H Sls., 10599 Chester 513-771-8231
Okla Tulsa, H. J. Daly, 5836 S. 70th E. Ave. 918-627-4159
Pa Narberth, J. Bresson Assoc., 107 Forrest 215-839-6770
Tex Dallas, Southwest Elec. Inds., 621 Meadows Bldg. 214-363-1671
Tex Houston, Southwest Elec. Inds., 1405 S. Post Oak Rd. 713-621-3760
Utah Salt Lake City, Barnhill, 2459 S. Main 801-487-1327
Wash Bellevue, Vantage Corp., 300 120th Ave., NE 206-455-3460
EXP: N.Y., N.Y., Nat'l. Atlantic Corp., 50 E. 42nd St. 212-697-2584

O & S RESEARCH, INC., 1912 Bannard St., Riverton, N.J., 08077, Tel: 609-829-2800, TWX: 609-829-2836; Pres: E.R. Sanders

OAK MFG., Div. Oak Electro/Netics, Dept. EL, Crystal Lake Ave., Crystal Lake, Ill., 60014, Tel: 815-459-5000, TWX: 910-634-3353; Sls. Mgr: P.M. Hassett Pgs. 1942,1943
Ariz Phoenix, Shefler-kahn, 2017 N. 7th 602-258-7893
Cal Inglewood, J. Kent, 5005 W. Century Blvd. 213-678-4108
Cal Los Altos, P. Wheaton, 960 N. San Antonio 415-941-1237
Colo Denver, I.W. Strong, 635 Canosa Ct. 303-292-6900
Fla Ft. Laud., D. Green, 1040 Bayview Dr. 305-563-2681
Hawa Honolulu, B. Kolans & Co., Box 2098 811-628
La Metairie, J. McKinney Sls., 2012 Condon 504-887-1723
Md Baltimore, Sheffer, 4609 Old Frederick 301-233-0606
Mass Andover, R. Kolarik, 30 Park St. 617-475-9390
Mich Berrien Spg., C. Preston, Box 249 616-471-1072
Mo St. Louis, J.P. Carlson, 2316 Putter La. 314-241-4351
NJ Haddonfield, Gray Assocs., 8 E. Mt. Vernon 609-429-5300
NJ Mountainside, H. Richter, 608 Sherwood 201-233-4615
NM Albuquerque, Shefler-Kahn Co., 408 San Mateo Blvd., N.E. 505-265-7077
NY Fayetteville, H. G. Richter, Inc., Box 251 315-637-6713
NY New York, H. G. Richter, Inc. 212-962-5820
NY Rochester, E. Schomburg, 1850 Clover 716-244-0920
NC Charlotte, O.W. Jones, 9 Brittany Ct. 704-364-4700
Ohio Cincinnati, L. Grabinger, 8613 Winton Rd. 513-521-5689
Ore Portland, B. Bartos, 2035 S.W. 58th Ave. 503-292-0878
Tex Bellaire, J.F. McKinney Sls. Co., Box 1026 713-665-3653
Tex Dallas, J. McKinney Sls., 1303 Chemical 214-631-9450
EXP: Ill., Crystal Lake, Oak Electro/Netics 815-459-5000
For: Can., Aurora, Ont., Oak Electro/Netics Can., Ltd., Box 100 416-921-2133

OAKITE PRODS., INC., 50 Valley Rd., Berkeley Hgts., N.J., 07922, Tel: 201-464-6900; Sls. Mgr: F.J. McNally

OAKTRON INDS., Monroe, Wisc., 53566, Tel: 608-325-2121; Sls. Mgr: J.F. Disch

OAL ASSOCS., INC., 455A Union Ave., Westbury, N.Y., 11590, Tel: 516-334-1940; Sls. Mgr: O. Lohkemper

O'BRIEN, D. G., INC., 500 Cochituate Rd., Framingham, Mass., 01701, Tel: 617-872-6596, TWX: 710-380-0643; Prod. Mgr: P.C. Doringer

OCTAGON PROCESS, INC., 35 Archer St., Edgewater, N.J., 07020, Tel: 201-945-9400; Sls. Mgr: C. Maas

ODETICS, INC., 1845 S. Manchester, Anaheim, Cal., 92802, Tel: 714-530-6050, TWX: 910-594-1461; Sls. Mgr: J. Muench

OECO CORP., 712 S.E. Hawthorne Blvd., Portland, Ore., 97214, Tel: 503-232-0161, TWX: 910-464-6146; V.P. Gen'l. Mgr: S.A. Meek

O E M PRODS., Litton Automated Business Sys., 600 Washington Ave., Carlstadt, N.J., 07072, Tel: 201-935-2200; Sls. Mgr: F. Misiewicz

OGALLALA ELCTRNS., Div. Arnold Engrg. Co., Box 59, Ogallala, Neb., 69153, Tel: 308-284-4093, TWX: 910-620-0322; Sls. Mgr: H.L. Harrington Pgs. 2754,2755
Ariz Scottsdale, C.T. Fink & Assocs., Box 434 602-947-7981
Cal Palo Alto, Arnold Engrg., 701 Welch Rd. 415-326-9302
Ill Marengo, Arnold Engrg., Box G 815-568-2000
Ind Huntington, Arnold Engrg., UB Bldg. Rm. 306 219-356-5224
Mass Lexington, Arnold Engrg., Box 309 617-862-2804
Mich Jackson, Arnold Engrg., 1304 W. Michigan Ave. 517-784-5663
Minn Mpls., F.W. Ladky, 7601 Wayzata Blvd. 612-545-1494
Mo Grandview, Centech Sls., Box 310 816-763-2900
NJ Leonia, Arnold Engrg., Box E - 135 Fort Lee Rd. 201-461-815
NY Buffalo, Arnold Engrg., 1660 Kenmore Ave. 716-875-2470
NC Raleigh, Arnold Engrg., 204 N. Person 919-828-3270
Okla Tulsa, Arnold Engrg., Box 4768 918-939-2848
Tex Dallas, Allied Comps., 10464 N. West Hwy. 214-348-6660
Wisc Milwaukee, F.W. Ladky, 4604 N. Wilson Ave. 414-964-8060

OGDEN TECHNOLOGY LABS., 1536 E. Valencia Dr., Fullerton, Cal., 92634, Tel: 213-289-4425, TWX: 910-592-1284; Sls. Mgr: C.D. Richmond

O'HARA METAL PRODS. CO., 542 Brannan St., San Francisco, Calif., 94107, Tel: 415-989-5390; Sls. Mgr: M. Bollock

OHIO CARBON CO., 12508 Berea Rd., Cleveland, Ohio, 44111, Tel: 216-CL-2-6100; Sls. Mgr: D.I. Stoffel

OHIO SEMITRONICS, 1205 Chesapeake Ave., Columbus, Ohio, 43212, Tel: 614-486-9561; Sls. Mgr: J.R. Gillard Pgs. 533,1986
Ala Huntsville, M. D. Anderson, Box 1466 205-536-8484
Ariz Tempe, Windsor Dynamics, 3300 S. Mill 602-967-3222
Cal Sherman Oaks, Windsor Dynamics, Box 5500 213-989-3631
Cal Woodside, Windsor-Dynamics, 195 Greer Rd. 415-854-4870
Conn Meriden, Abott-Allison, Box 467 203-237-9232
Ill Lombard, Quadtron, Box 306 312-627-6800
Ohio Cleveland, Control Design, 7333 Fair Oaks 216-439-2299

OHIO STEEL TUBE DIV., Copperweld Steel Co., Shelby, Ohio, 44875, Tel: 419-347-2424, TWX: 810-490-2480; Sls. Mgr: J.E. Horner

OHMART CORP., 4241 Allendorf Dr., Cincinnati, Ohio, 45209, Tel: 513-272-0131

OHMITE MFG. CO., 3635 W. Howard St., Skokie, Ill., 60076, Tel: 312-675-2600, TWX: 910-223-0805; Sls. Mgr: F. Maiale Pgs. 1769,2869,2923,2968
Alas Anchorage, H. J. Lang & Assocs., 1406 47th Ave. 279-5741
Ariz Phoenix, Shefler-Kahn Co., Box 1587 602-AL-8-7893
Cal Los Angeles, Ohmite Mfg., 5300 Santa Monica Blvd. 213-466-3433
Cal Palo Alto, Ohmite Mfg. Co., 999 Commercial St. 415-321-6953
Colo Denver, I.W. Strong & Assoc., Inc., 635 Canosa Ct. 303-292-6900
Conn Waterbury, Coakley, Boyd & Abbett, 820 Hamilton Ave. 203-756-8766
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek Ave. 305-425-8284
Ga Atlanta, A. Brown Assocs., 1771 Tully Cir. 404-636-9446
Ill Skokie, Ohmite Mfg. Co., 3601 Howard St. 312-OR-5-2600
Iowa Des Moines, T. L. Dowell, Inc., 4127 27th St. 515-255-6580
Kans Overland Pk., T. L. Dowell, Inc., 8151 Marty 913-649-6069
La Metairie, Cartwright & Bean, 7010 Magnolia Ct.
Mass Needham, Coakley, Boyd & Abbett, 1424 Highland Ave. 617-444-5470
Mich Birmingham, Ohmite Mfg. Co., 725 S. Adams St. 313-642-6040
Minn Minneapolis, F.B. Hill Co., 7317 Cahill Rd. 612-941-5270
Mo St. Louis, T. L. Dowell, Inc., 4753 Titan Ct. 314-892-2859
NJ Hackensack, Ohmite Mfg. Co., 40 Zabriskie St. 201-488-3690
NJ Pennsauken, Ohmite Mfg., Cooper Pkwy. Off. Bldg., E. 609-663-1703
NY Rochester, Ohmite Mfg. Co., 3700 East Ave. 716-DU-1-1890
NC Charlotte, W.J. Suk Assoc., 1530 E. Blvd. 704-332-6191
Ohio Cleveland, Ohmite Mfg. Co., 25000 Euclid Ave. 216-261-6000
Ore Salem, M.K. Widdekind Co., 3292 Sunnyview, N.E. 503-363-6445
Tenn Memphis, Cartwright & Bean, Box 4760, Crosstown Sta. 901-276-4442
Tex Dallas, B. Wylds Co., 3505 Turtle Creek La. 214-522-0120
Tex Houston, B. Wylds Co., 8385 Westview Dr. 713-468-3264
Wash Seattle, M.K. Widdekind Co., 815 W. Ewing St. 206-284-8020

OHR-TRONICS, Sub. Mohawk Data Sciences Corp., Box 406, King of Prussia, Pa., 19406, Tel: 215-265-7700; Sls. Mgr: R.A. Potavin

OKI ELCTRNS. AMERICA, 500 S.E. 24th St., Ft. Lauderdale, Fla., 33316, Tel: 305-523-7202, TWX: 510-955-9837; Pres: G.A.S. Roberts

OKLAHOMA AEROTRONICS, 632 Penns. Ave., Hartshorne, Okla., 74547, Tel: 918-297-2566; Sls. Mgr: C. Oberst

OKONITE CO., Wire & Cable Div., Box 340, Ramsey, N.J., 07446, Tel: 201-825-0300; V.P. & Gen'l. Sls. Mgr: J. Hoss

OLEKTRON CORP., Box 248, Dudley, Mass., 01570, Tel: 617-943-8810; Sls. Mgr: B.D. McCarthy

Advertisement
Olektron Corporation designs and manufactures Signal Processing Components for adding, dividing, switching, frequency (mixers) converting. Package styles are Flat Packs, TO-5, BNC, 3mm, Type N. All components are to most MIL Standards.

OLYMPIC FASTENING SYS., Sub. Armco Steel, 11445 S. Dolan St., Downey, Cal., 90241, Tel: 213-773-2060, TWX: 910-583-1411; Dir. Mktg: F.B. Nance

OLYMPIC INSTRS., INC., Vashon, Wash., 98070, Tel: 206-463-2730; Pres: C.A. Crecelius

Advertisement
Wire Length Meters (Weights & Measures Approved) to accurately measure lengths of 1/64' to 1" diameter wire & flexible cable in feet to 9,999 feet and repeat. Reels, collapsible and rigid. Bench and floor mounts for all Olympic Equipment. Regional warehouse stocks.

OLYMPUS CORP. AMERICA, Two Nevada Dr., New Hyde Park, N.Y., 11040, Tel: 516-488-3880; Sls. Mgr: C.E. Knight

OMEGA ENGRG., INC., Box 4047, Stamford, Conn., 06907, Tel: 203-322-1666; Gen'l. Mgr: B.R. Hollander

OMEGA LABS., INC., Haverhill St., Rowley, Mass., 01969, Tel: 617-948-7757; Sls. Mgr: C.M. Watson, Jr.

OMNI SPECTRA, 24600 Hallwood Ct., Farmington, Mich., 48024, Tel: 313-477-1234, TWX: 810-242-1463; Sls. Mgr: W.A. Johnston

OMNI-SPECTRA, INC., Arizona Div., 253 S. Hinton, Scottsdale, Ariz., 85251, Tel: 602-947-4346, TWX: 910-950-1296; Sls. Mgr: R.J. Blaisdell

OMTRONICS MFG., 2406 Leavenworth St., Omaha, Neb., 68105, Tel: 402-348-9500, TWX: 910-622-8220; Sls. Mgr: J. Matejka Pgs. 2865-2868
Ariz Phoenix, Dorton Enterprises, Box 16127 602-263-0414
Cal Orange, F. Huddleston, 44 Plaza Sq. 714-639-1941
Cal Redwood City, Woodworth Co., Box 2165 415-365-0252
Colo Denver, Gossard, 12159 W. Dakota Dr. 303-985-0602
Fla No. Miami, Winfield Elctrn. Sls., 1875 N.E. 149th 305-945-6544
Ill LaGrange Pk., Bierhaus Sls., 1013 E. 31 St. 312-354-5100
Iowa Cedar Rapids, J. Vrbik Co., Three-50th 319-377-8244
Mass Canton, New England Elctrn., 590 Wash. 617-828-4835
Minn Mpls., Hasse & Assocs., Box 22707 612-588-0551
Mo Hazelwood, J.C. Mankus, 400 Brookes 314-731-4334
NJ Emerson, J. Rudy Assocs., 24 Bland 201-567-5880
Ohio Cincinnati, Comps., Inc., 11820 Knollsprings 513-721-2997
Ohio Cleveland, Comps., Inc., 7461 N. Linden 216-VI-2-2737
Tex Ft. Worth, W. Fralia, 6100 Camp Bowie 817-PE-8-2394
Wash Bain Bridge Is., Viking Sls., 59 Bill Pt. 206-842-5611
EXP: Conn., Stamford, Dage Corp., 757 Main St. 203-324-3123

ON-GUARD CORP. AMERICA, 350 Gotham Pkwy., Carlstadt, N.J., 07072, Tel: 201-939-5822; Sls. Mgr: J. Meyerson

ONAN DIV., Onan Corp., 1400 73rd Ave., N.E., Mpls., Minn., 55432, Tel: 612-786-6322, TWX: 910-576-2833; V.P. Mktg: W.J. Auger

OPAD ELEC. CO., INC., 43-12 Walker St., New York, N.Y., 10013, Tel: 212-WO-6-0380; Pres: H.L. Opad Pg. 829

OPAMP LABS., 172 S. Alta Vista Blvd., Los Angeles, Cal., 90036, Tel: 213-934-3566; Sls. Mgr: B. Losmandy Pg. 1292

OPTICAL ELCTRNS., Box 11140, Tucson, Ariz., 85706, Tel: 602-624-8358; Sls. Mgr: J.D. Ricks

OPTICAL GAGING PRODS., 26 Forbes St., Rochester, N.Y., 14611, Tel: 716-328-9090; Mktg. Mgr: J.A. Bernardini

OPTICAL INDS., 1218 E. Pomona St., Santa Ana, Cal., 92707, Tel: 714-547-4159; Sls. Mgr: C.A. French

OPTICON CHEM., Div. Dynalysis, Box 2445, Palos Verdes Peninsula, Cal., 90274, Tel: 213-830-8304; Sls. Mgr: C.W. Lolcoma

OPTICS TECHNOLOGY, 901 California Ave., Palo Alto, Calif., 94304, Tel: 415-327-6600, TWX: 415-492-9241; Sls. Mgr: R.J. Aplin

OPTIMA ENCLOSURES, Div. Scientific Atlanta, 2166 Mountain Ind'l Blvd., Tucker, Ga., 30084, Tel: 404-939-6340, TWX: 810-766-3967; Sls. Mgr: Philip A. Stokes .... Pg. 2320
Ala Huntsville, Gentry Assocs., 2109 W. Clinton 205-536-5306
Ariz Phoenix, Hytronic Meass., 1017 N. 3rd St. 602-253-6104
Cal Long Beach, Scien.-Atlanta, 4300 Long Beach Blvd. 213-428-7515
Cal Los Altos, Scien.-Atlanta, 960 N. San Antonio 415-941-1616
Colo Denver, Hytronic Meass., 4940 E. 39th Ave. 303-388-4081
Fla Orlando, Gentry Assocs., 550 N. Bumby Ave. 305-841-7740
Fla St. Petersburg, Genrty Assocs., 4152 49TH Ave. S. 813-867-7820
Ga Tucker, Scien.-Atlanta, 2166 Mtn. Ind. Blvd. 404-939-6340
Ill Rosemont, Cozzens & Cudahy, 9501 W. Devon 312-825-1144
Ind Indianapolis, Cozzens & Cudahy, 21 Beachway Dr. 317-244-2456
Me Bladensburg, Scien.-Atlanta, 5801 Annapolis 301-779-1515
Mass Lexington, Zieco, 18 Muzzey St. 617-861-8300
Minn Minneapolis, Cozzens & Cudahy, 750 France Ave. S. 612-920-1022
Mo Emundson, Cozzens & Cudahy, 10534 Natural Bridge 314-423-1234
NJ Leonia, Scien.-Atlanta, 135 Fort Lee 201-461-5340
NM Albuquerque, Hytronic Meas., 205 San Pablo, S.E. 505-268-3941
NC Burlington, Gentry Assocs., 116 E. O'Neal Ave. 919-227-2581
Ohio Medina, Cozzens & Cudahy, 735 S. Court St. 216-725-5660
Okla Tulsa, Carey-Wolf, Zerbe, Box 7425 918-622-9233
Ore Hillsboro, Showalter-Judd, 1445 N.E. Arrington 503-648-6372
Tex Ft. Worth, Carey-Wolf, Box 12425 817-738-1702
Tex Houston, Carey-Wolf, Zerbe, 4031 Broadway 713-643-2114
Utah Salt Lake City, Hytronic Meass.
Wash Seattle, Showalter-Judd, 1806 S. Bush Pl. 206-324-7911

OPTIMATION, INC., 9421 Telfair Ave., Sun Valley, Calif., 91352, Tel: 213-768-0830, TWX: 910-498-2710; Vice Pres: R.D. Webb

OPTIMIZED DEVICES INC., 220 Marble Ave., Pleasantville, N.Y., 10570, Tel: 914-769-6100; Sls. Mgr: C.A. Winick

OPTO-METRIC TOOLS, Sub/E. Leitz, Link Dr., Rockleigh, N.J., 07647, Tel: 201-767-1320

OPTOELECTRONICS, INC., 1309 Dynamic St., Petaluma, Cal., 94952, Tel: 707-763-4181; Sls. Mgr: L.L. Roberts

OPTOMECHANISMS, INC., 40 Skyline Dr., Plainview, N.Y., 11803, Tel: 516-GE-3-8100, TWX: 510-221-1882; Exec. V.P: W.D. MacLean

OPTRON CORP., 30 Hazel Terr., Woodbridge, Conn., 06525, Tel: 203-389-5384; Sls. Mgr: Bruce L. Adams

ORBIT, INC, Box 351, Deming Air Base, Deming, N.M., 88030, Tel: 505-546-7175; Pres: C. Tilden

ORBIT INDS., Div. Countis Inds., Box 1444, San Luis Obispo, Calif., 93401, Tel: 805-544-1770; Sls. Mgr: E.M. Countis

ORBIT INSTR. CORP., 131 Eileen Way, Syosset, N.Y., 11791, Tel: 516-WA-1-6310; Sls. Mgr: M. Dancik

ORGANIC PRODS. CO., Box 428, Irving, Tex., 75060, TWX: 214-254-4342; Pres: J.C. Walter

ORIEL OPTICS CORP., 1 Market St., Stamford, Conn., 06902, Tel: 203-348-4247; Sls. Mgr: D. Pomfret

ORION PRODS. CO., 155 San Lazaro, Sunnyvale, Cal., 94086, Tel: 408-245-4479; Sls. Mgr: J. Willis

ORTOFON DIV., Elpa Mktg. Inds., Inc., Thorens & Atlantic Aves., New Hyde Park, N.Y., 11040, Tel: 516-746-3002; Sls. Mgr: P.A. Stone

OSBORNE TRANSFORMER CORP., 3834 Mitchell Ave., Detroit, Mich., 48207, Tel: 313-568-0700; Pres: J.R. Osborne

OSTBY & BARTON CO., Box 6267, Providence, R.I., 02904, Tel: 401-739-7310, TWX: 710-381-1584; Sls. Mgr: W.A. Webb

OTIS RADIO & ELEC. CORP., 222 Ave. E., Hawarden, Iowa, 51023, Tel: 712-552-2144, TWX: 712-992-1790; Sls. Mgr: R. Otis

OVEN INDS., Sub. Greenray Inds., Box 229, Mechanicsburg, Pa., 17055, Tel: 717-766-0721; Sls. Mgr: T.M. Nolan .... Pg. 1394

Ala Huntsville, Beacon Elctrn., 3322 Memorial S.W. 205-881-5031
Cal Altadena, D. Wagner Assocs., Box 485 213-681-5021
Cal Burlingame, J. Striker, 1319 Howard Ave. 415-342-1425
Fla Ft. Lauderdale, Beacon Elctrn., 651 NE 45th 305-564-4298
Fla Maitland, Beacon Elctrn., Box 1278 305-647-3498
Ga Atlanta, Beacon Elctrn., 2285 Peach Tree 404-351-3654
Ill Skokie, Saffro & Assoc., 3736 Dempster 312-588-0905
Mass Reading, C. Geder, Box 232 617-944-3105
NJ Englewood, Andrews & Andrews, 44 N. Dean 201-569-8800
NY Huntington, Andrews & Andrews, 140 E. Main 516-692-8686
NY Syracuse, Falso Inc., Box 5211 315-463-0266
Ohio Medina, McShane, Box 523 216-725-4568
Pa Hatboro, De Shawn, 218 Beatrice 215-055-9111
Tex Dallas, J.A. Green Co., 7118 Envoy Ct. 214-631-7450
Tex Houston, J.A. Green Co., 3400 Montrose St.
Va Falls Church, Beacon Elctrns., 207 Park 703-534-1673
EXP: Pa., Mechanicsburg, Greenray, 840 W Church 717-766-0246
For: Can., Montreal, Que., Rutherford Agencies, Box 1013, St. Laurent

OVENAIRE, INC., 706 Forrest St., Charlottesville, Va., 22901, Tel: 703-293-5148, TWX: 510-587-5461; Sls. Mgr: L.A. Thacher .... Pgs. 1420-1423

Ariz Scottsdale, AR/TEC, 8214 E. Coolidge St. 602-947-6304
Ala Huntsville, Vaughn Electrosources, Sahara Off. Pk. 205-881-8830
Cal Millbrae, Melvin Sl., 113 El Camino Real 415-697-6922
Cal Van Nuys, R.L. Assocs. 213-780-1666
Colo Denver, Walter Engrg., 880 Bonnie Brae 303-777-5585
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1101
Ill Chicago, T. Hunter, 5653 W. Irving Pk. 312-777-2500
Ind Indpls., Scott Elctrns., 1300-02 N. Penna. 317-635-8951
Iowa Des Moines, KSW Assocs., 3831 43rd St. 515-279-9235
Md Baltimore, C. Emrich, Rolling & Wilkins Ave. 301-747-8348
Mass Natick, Naton-Neenan, 20 Strawberry Hill 617-235-1966
Mass Sudbury, Naton-Neenan Assocs., Box 203 617-893-0914
Minn St. Paul, Countryman, 1821 Univ. Ave. 612-645-9151
Mo Kansas City, KSW Assocs., 7546 Troost 816-363-5651
Mo St. Louis, KSW Assocs., 2319 Hampton 314-781-6111
NJ Haddonfield, Mesa Tech., 70 Tanner St. 609-429-9531
NY Buffalo, Quality Comps., 4541 Main St. 716-839-4170
NY Melville, TX Sls., Inc., 900 Walt Whitman 516-271-5850
NC Greensboro, L & D, Inc., Box 7243 919-292-3201
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-861-2627
Ohio Dayton, Scott Elctrns., 517 Hulman Bldg. 513-223-2652
Tex Dallas, Stevens Sls., Box 34493 214-241-2574
Wash Seattle, F. H. Haight Co., 3212 E. Lake 206-322-1818

OWATONNA TOOL CO., 395 Eisenhower Dr., Owatonna, Minn., 55060, Tel: 507-451-5310; V.P. Mktg: J.A. Mullenmaster

OWENS-CORNING FIBERGLAS, Fiberglas Tower, Toledo, Ohio, 43601, Tel: 419-259-3000; Sls. Mgr: J.A. MacLean

OWENS-ILLINOIS, C&TP Div., Elctrn. Mat'ls., Box 1035, Toledo, Ohio, 43601, Tel: 419-242-6543; Sls. Mgr: D.W. Towse

OWENS-ILLINOIS, Consumer & Tech. Prods., Box 1035, Toledo, Ohio, 43601, Tel: 419-242-6543; Vice Pres: R.F. Miller

OXFORD INSTR. CORP., 100 Cathedral St., Annapolis, Md., 21401, Tel: 301-268-2350; Sls. Mgr: J.E. Templeton

PABST ENGINEERING EQUIPMENT CO., INC., 676 Pennsylvania Ave., Elizabeth, N.J., 07201, Tel: 201-353-2880; Pres: R.D. Verkouille

PACE DIV., Pathcom, Inc., 24049 S. Frampton, Harbor City, Calif., 90710, Tel: 213-325-1290; Sls. Mgr: W.I. Thomas

PACE-TRONICS, 46 Main St., Newark, N.J., 07105, Tel: 201-232-1319

PACE WIRE & CABLE CORP., 3590 Oceanside Rd., Oceanside, N.Y., 11572, Tel: 516-678-2275; Sls. Mgr: S. Stadlen

PACIFIC ELECTRICORD, 747 W. Redondo Beach Blvd., Gardena, Cal., 90247, Tel: 213-532-6600; Sls. Mgr: D. Cory

PACIFIC ELECTRO DYNAMICS, 14220 Sunset Hwy, Bellevue, Wash, 98004, Tel: 206-747-7400, TWX: 910-443-2307; Sls. Mgr: J.M. Hopper

PACIFIC MEAS., INC., 940 Industrial Ave., Palo Alto, Calif., 94303, Tel: 415-328-0300, TWX: 910-373-1171; Sls. Mgr: D. Armann

PACIFIC PHOTOMETRIC INSTRS., 3024 Ashby Ave., Berkeley, Cal., 94705, Tel: 415-848-1141; Sls. Mgr: F.D. Weekes

PACIFIC RELAYS, INC., 13915 Saticoy St., Van Nuys, Calif., 91402, Tel: 213-782-2360

PACIFIC RESINS & CHEMS., Plastics Div., 3142 W. Mill Rd. Ct., Milwaukee, Wisc., 53209, Tel: 414-352-2510; Sls. Mgr: R.J. Peters

PACIFIC SCIEN. CO., Heat Treat Equip. Div., 6280 Chalet Dr., City Commerce, Cal., 90022, Tel: 213-773-2020; Sls. Mgr: R.L. Allgeier

PACIFIC SWITCH CONTROLS, INC., 14048 Burbank Blvd., Van Nuys, Calif., 91401, Tel: 213-873-4802, TWX: 910-495-1766; Sls. Mgr: J. Riley

PACIFIC TECHNOLOGY, 235 Airport Way, Renton, Wash., 98055, Tel: 206-226-8350; Sls. Mgr: E.H. Toombs Pg. 830

Mich Ann Arbor, H.C. Heym Assocs., 1615 Chalmers Dr. 313-971-6552
Pa Latrobe, Meas. & Control Assoc., 704 Spring St. 412-539-8200
Wash Seattle, Sperry Co., Box 6868 206-932-1101

PACIFIC TRANSDUCER CORP., 2301 Federal, Los Angeles, Calif., 90064, Tel: 213-478-1134; Pres: G.A. Argabrite

Advertisement

PACIFIC TRANSDUCER CORPORATION manufactures a complete line of heat measuring instruments which include Surface Temperature Thermometers; Thermographs for laboratory production; Stem Thermographs; Bimetallic Thermometers; Pyrometers, Hand Held; Pyromillivoltmeters. Also Durometers for elastomers and plastics; Portable Metal Hardness Testers; Polariscopes.

PACIFIC UNIVERSAL PRODS. CORP., 168 Vista Ave., Pasadena, Calif., 91107, Tel: 213-MU-1-7646; Pres: C. Chopnick

PACKAGED RESINS CO., 130 Wood Rd., Braintree, Mass., 02184, Tel: 617-843-4623; Sls. Mgr: A.P. Alexander

PACKARD INSTRUMENT CO., INC., 2200 Warrenville Rd., Downers Grove, Ill., 60515, Tel: 312-969-6000, TWX: 910-695-3220; Sls. Mgr: J. Connell

PACKER, B. L., CO., INC., 5-05 Burns Ave., Hicksville, N.Y., 11801, Tel: 516-433-4470; Sls. Mgr: L. Packer

PAISLEY, Standard Brands Chem. Inds., Box 987, Edison, N.J., 08817, Tel: 201-287-4350; Sls. Mgr: A.J. Miner

PAKTRON DIV., Illinois Tool Works, Inc., 1321 Leslie Ave., Alexandria, Va., 22301, Tel: 703-548-4400, TWX: 703-931-4207; Sls. Mgr: M.J. Waters

PALL CORP., 30 Sea Cliff Ave., Glen Cove, N.Y., 11542, Tel: 516-671-4000, TWX: 510-223-0606; Dir: N. Nickolaus

PALL TRINITY MICRO CORP., Rte. 281, Cortland, N.Y., 13045, Tel: 607-SK-6-7535, TWX: 510-252-0791; V.P. Mktg./Sls: A.L. Weiner

PALMER ELCTRNS., INC., 156 Belmont Ave., Garfield, N.J., 07026, Tel: 201-772-5900; Pres: V. Palmeri

PALOMAR ENGRS., Box 455, Escondido, Cal., 92025, Tel: 714-747-3343 J. Althouse

PAMOTOR, INC., 770 Airport Blvd., Burlingame, Cal., 94010, Tel: 415-347-1203, TWX: 910-374-2353; Sls. Mgr: D. Linzey .... Pg. 2789

Cal Burlingame, W. J. Purdy, 770 Airport 415-347-7701
Cal Los Angeles, P. F. Wiley, 1632 Silverlake 213-663-8028
Cal San Diego, King & Cassidy Elctrns., 8855 Balboa Ave. 714-278-7640
Colo Littleton, W. Purdy, 1449 W. Littleton 303-794-4283
Conn Meriden, P. R. Sturgeon, 99 Colony 203-237-1112
Fla No. Miami Beach, Cartwright & Bean, 20100 N.E. 25th Ct. 305-954-2962
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek 305-425-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill Pl., N.W. 404-237-2273
Ill Hinsdale, Hill-Gray, 2 Salt Creek La. 312-325-4810
Ind Indpls, Thomas & Sukup, 2060 E. 54th St. 317-251-4574
Iowa Cedar Rapids, Engrg. Svcs., 1026 - 3rd 319-366-1591
Kans Prairie Vlg, Engrg. Svcs., 7924 Stateline 913-649-4000
La Metairie, Cartwright & Bean, 1812 Bullard 504-887-0482
Md Hyattsville, L. Lowery, 6200 Annapolis 301-773-4977
Mass Chesnut Hill, P. Sturgeon, 1330 Boylston St. 617-734-7710
Mich Detroit, R. Merchant, 18411 W. McNichols 313-535-6000
Mich St. Joseph, R. Merchant, 505 Pleasant 616-983-7378
Minn Mpls, M. Foster, 228 S. Cedar Lake 612-374-2612
Mo St. Louis, Engrg. Svcs. Co., 6717 Vernon 314-726-2233
NJ Bergenfield, H. Gray Assoc., 20 Foster 201-384-3643
NM Albuquerque, C.T. Carlberg, 2611 Quincy 505-265-1579
NY Fayetteville, M. P. Andrews, 319 Mott 315-637-3144
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-537-7965
Ohio Dayton, N. Bear Corp., 1563 E. Dorothy 513-299-3566
Ohio W. Richfield, N. Bear, 3435 Streetsboro 216-659-3331
Pa Broomall, L.D. Lowery, 2801 W. Chester 215-356-5300
Pa Erie, Nebco Assocs., 1564 W. 42nd St. 814-868-2111
Pa Monroeville, Nebco, 1974 Gregory Ave. 412-824-2111
Tenn Memphis, Cartwright & Bean, 560 S. Cooper St. 910-276-4422
Tex Dallas, J. Schoonmaker, 2995 Ladybird 214-357-8481
Tex San Antonio, J. Schoonmaker Co., Box 5540 512-342-0251
For: Can., Willowdale, Ont., A. Simmonds & Sons, 285 Yorkland 416-491-1010

PAN AMERICAN TRADE DEV., 2 Park Ave., New York, N.Y., 10016, Tel: 212-686-7960, TWX: 710-581-6567; Sls. Mgr: R. White

PAN-L-FAST, 13161 Sherman Way, N. Hollywood, Cal., 91605, Tel: 213-764-1143; Sls. Mgr: J. Eliot

PANAMECH INC., 421 E. Beach Ave., Inglewood, Cal., 90302, Tel: 213-678-2534

PANDUIT CORP., 17301 S. Ridgeland Ave., Tinley Pk., Ill., 60477, Tel: 312-532-1800; Sls. Supv: D.G. Carson Pg. 3047

Ala Prattville, Holman-Lobsinger, Box 224 205-365-3230
Alas Anchorage, H.J. Lang & Assocs., 1406 W. 47th Ave. 279-5741

Ark Little Rock, Ransom Sls. Co., Box 9269 501-562-4090
Cal Los Altos, Ewing-Foley, Inc., Box 1107 415-941-4525
Cal Los Angeles, 5331 E. Olympic Blvd. 213-685-6980
Colo Denver, Lindberg Co., 5498 E. Evans 303-758-9033
Conn Glastonbury, Barton-Caron Assocs., Box 91 203-633-9417
Fla Palm Bch. Gdns., J.F. Griffin, 3902 Burns 305-622-1468
Fla Orlando, Triflex, Inc., 1400 Hillcrest Ave. 305-841-5440
Ga Atlanta, Holman-Lobsinger, 3110 Maple 404-261-5238
Ind Ft. Wayne, Val-Skol, 2005 Franklin 219-742-9122
Ind Indpls, Val-Skol Sls., 3556 Luewan 317-926-5063
Iowa Marion, Thomas & Modrcin, 890 - 17th 319-377-6261
Kans Shawnee Mission, Thomas & Modrcin Assoc., Box 189, 5450 Buena Vista Dr. 913-432-2131
Ky Louisville, A. Pickens, 130 N. Spring 502-587-1244
La Metairie, Derbes-Sarris, Box 9219 504-835-7383
Md Lutherville-Timonium, Naudain, Box 1 301-252-5378
Mass Auburndale, Barton-Caron Assocs., Box 51 617-332-2021
Mich Southfield, 24681 Northwestern Hwy. 313-354-1830
Minn Mpls, Elec. Comp. Sls., 6524 Walker St. 612-929-4494
Mo Hazelwood, Thomas & Modrcin, Box 545 314-838-6446
NJ Hackensack, 25 E. Salem St. 201-489-5335
NJ Mt. Laurel, Naudain Assocs., Rte. 73 Ramblewood Pkwy. 609-235-1801
NM Albuquerque, C.T. Carlberg, Box 3177 505-265-1579
NY Buffalo, R.W. Mitscher, 496 Ellicott Sq. Bldg. 716-854-2517
NY Fayetteville, R.W. Mitscher, 214 Palmer 315-637-9761
NY Vestal, R.W. Mitscher, 3845 Pembrooke 607-798-0868
NC Winston-Salem, L.G. White Southern, Inc., Box 2356, 1014 Brookstown Ave. 919-725-3612
Ohio Cincinnati, Val-Skol, 10515 Margate Terr. 513-563-6790
Ohio Cleveland Hgts., Val-Skol, 12417 Cedar 216-462-2822
Ohio Columbus, Val-Skol Sls., Box 13088 614-291-4123
Okla Tulsa, T. Ray, Box 45191, 8514 E. 31st 918-627-1515
Pa Pittsburgh, M. Smith, 2015 Swallow Hill 412-276-5363
Tenn Memphis, Ransom Sls., Box 16187 901-332-0036
Tex Dallas, 7701 Stemmons Frwy. 214-638-7280
Tex Houston, 6440 Hillcroft 713-771-9868
Utah Salt Lake Cy, Lindberg Co., 431 S. 3rd E. 801-364-6409
Wash Bellevue, Panduit Corp., 300 120th 206-454-7267
Wisc Appleton, Harold Mercer Co., Box 581 414-739-6223
Wisc Brookfield, Harold Mercer Co., Box 222 414-786-6431
For: Can., Montreal 355, Que., Deskin Sls. Corp., 1565 Louvain St., W. 514-384-1420

PANEL CONTROLS CORP., 1000 Mt. Elliott Ave., Detroit, Mich., 48207, Tel: 313-568-2400; Sls. Mgr: D. Miller

PANELOC CORP., Front & Main Sts., Collinsville, Conn., 06022, Tel: 203-693-8363; Sls. Mgr: G.M. Williams III

PANOB CORP., 49 Beech St., Port Chester, N.Y., 10573, Tel: 914-939-3066; Sls Mgr: M.T. Vita

PANTA-PAK PACKAGING DIV., Pantasote Co. of N.Y. Inc., 277 Park Ave., N. Y., 10017, 212-826-8900; Sls. Mgr: J.J. Hayman

PANTOGRAPHIC REPRODUCTION, 35 Elm Ridge Terr., Newington, Conn., 06111, Tel: 203-666-8128; Pres: L.J. Bakinow

PAR-METAL PRODS. DIV., Eon Corp., 1260 Atlantic Ave., Brooklyn, N.Y., 11216, Tel: 212-772-5800; Sls. Mgr: H.L. Miller

PARABAM, INC., 3017 E. Las Hermanas St., Compton, Cal., 90221, Tel: 213-537-1771; Sls. Mgr: J.N. Day, Jr. Pg. 371

Cal Van Nuys, Gordon-Elliot, Inc., 13615 Victory 213-873-6862
Ill Chicago, Actronic Sls. Engrg., Inc., 4750 N. Milwaukee Ave. 312-286-1037
Mass Sudbury, L.J. Maroni Assoc., Box 99 617-443-6231
Mo St. Louis, Richter Equip., 9567 Page 314-HA-7-0990
Ohio Medina, McShane, Box 523 216-725-4568
Pa Paoli, T. Griffin Co., 46 Darby Rd. 215-644-7710
Tex Dallas, R.W. Mureen Co., 5523 Dyer St. 214-369-7561
For: Can., Toronto, Ont., Lisle Instr. Sys., Ltd., 85 Colville Rd. 249-9151

PARAGON ELEC. CO., Sub. AMF Inc., 1600 12th St., Two Rivers, Wisc., 54241, Tel: 414-793-1161; Dir. Mktg: R.C. Van Haren

PARAMETRICS, INC., 284 Racebrook Rd., Orange, Conn., 06477, Tel: 203-799-2333; Sls. Mgr: D. Maass

PARAMETRIC INDS., INC., 742 Main St., Winchester, Mass., 01890, Tel: 617-729-7333 F.E. Fallon

PARAMOUNT INDS., INC., 1430 Progress Rd., Ft. Wayne, Ind., 46808, Tel: 219-484-4111; Sls. Mgr: R.R. Weimer

PARAPLEGICS MFG., 304 N. York Rd., Bensenville, Ill., 60106, Tel: 312-625-7740 V.J. Caricato

PARCOE, INC., 4501 Prospect Ave., Cleveland, Ohio, 44103, Tel: 216-881-3627; Sls. Mgr: M.W. Kerr

PARKER INSTR. CORP., 200 Harvard Ave., Stamford, Conn., 06904, Tel: 203-325-4361, TWX: 710-474-2277; Mktg. Mgr: Mr. Chambers

Advertisement

Parker Instrument's unique etched circuit coil produces a light weight, externally rugged meter movement. Use in panel, control, edgewise, and aerospace applications where low cost must be accompanied by reliability. Available in a wide choice of styles and ranges to fit any application. Broad Engineering background to assist in design and manufacture of special purpose instrumentation.

PARKER SEAL CO., 10567 Jefferson Blvd., Culver City, Calif., 90230, Tel: 213-837-5101, TWX: 910-340-6764; V.P-Mktg: W.A. Swan

PARKS, HENRY FRANCIS LAB., Box 25665, Seattle, Wash., 98125, Tel: 206-523-4832; Sls. Mgr: S.T. Parks

PASS & SEYMOUR, INC., Solvay Sta., Syracuse, N.Y., 13209, Tel: 315-468-6211; V.P. Mktg: N.L. Crescl

PATWIN DIV., United-Carr Inc., Box 710, Waterbury, Conn., 06720, Tel: 203-756-3636, TWX: 710-477-1219; Sls. Mgr: J.W. Powers

PAUL, F.H. & STEIN BROS., 235 5th Ave., New York, N.Y., 10016, Tel: 212-684-6370; Sls. Mgr: E. Stein

PCA ELCTRNS., INC., 16799 Schoenborn St., Sepulveda, Calif., 91343, Tel: 213-892-0761, TWX: 910-496-1525

PCB PIEZOTRONICS, INC., 3311 Walden Ave., Depew, N.Y., 14043, Tel: 716-684-0001; Sls. Mgr: J.F. Lally

PEARCE-SIMPSON, Div. Gladding Corp., Box 800, Biscayne Annex, Miami, Fla., 33152, Tel: 305-888-1551; Dir of Mktg: M. Parrish

PEARSON ELCTRNS., 4007 Transport St., Palo Alto, Cal., 94303, Tel: 415-326-7285; Sls. Mgr: D.D. Meacham

PECO, 450 Landess, Milpitas, Cal., 95035, Tel: 408-262-4050; Sls. Mgr: E.A. Gard

PEERLESS ELEC. PRODS., Div. LTV Ling Altec., 1515 S. Manchester Ave., Anaheim, Cal., 92803, Tel: 714-774-5373, TWX: 910-591-1142; Dir. Mktg: B. Wolpert

PEK, INC., Div. Varo, 825 E. Evelyn Ave., Sunnyvale, Calif., 94086, Tel: 408-245-4111, TWX: 910-339-9214; Mktg. Dir: Tiemo von Zweck

PELMOR LABS., INC., 401 Lafayette St., Newtown, Pa., 18940, Tel: 215-968-3825; Sls. Mgr: S.B. Moon

PEM MACH. TOOL CO., INC., 39A Myrtle St., Cranford, N.J., 07016, Tel: 201-276-8600; Sls. Mgr: J.A. Kostecki

PEMCO, 942 Commercial St., Palo Alto, Calif., 94303, Tel: 415-321-1177, TWX: 415-492-9484; V.P. Sls: R.L. Buckmaster

PENBERTHY DIV., Heath Tecna Corp., 6701 Maynard S., Seattle, Wash., 98108, Tel: 206-763-2170; Sls. Mgr: H.W. Sankey

PENINSULA MICROWAVE LABS., 875 Maude Ave., Mountain View, Cal., 94040, Tel: 415-969-3303, TWX: 910-379-6945; VP Mktg: D.P. DuVall

PENN AIRBORNE PRODS., Industrial Hwy., Southampton, Pa., 18966, Tel: 215-355-3400; Sls. Mgr: W. Williams .... Pg. 534

Cal Los Angeles, IFM South, 3455 Cahuenga 213-469-1641
Cal Palo Alto, Mauldin Co., 200 Calif. Ave. 415-326-5291
Iowa Des Moines, H.E. Ferris, 4005 Plainview 515-255-1757
Mass Natick, Andurss-Peskin, Box 268 617-653-3919
Mich Royal Oak, Stillings Instr. Sys., 4850 Leafdale 313-549-6030
Minn Mpls, Pilot Sls. & Engrg. , 7007 Walker St. 612-925-2464
NJ Summit, E. Smith & Assocs., 747 Springfield 201-273-8881
NY NY, E. Smith & Assocs., 60 E. 42nd 212-682-6890
NY Rochester, E. Smith & Assocs., 941 Granite Bldg. 716-546-5090
Ohio Dublin, Analytic Co., Box 356 614-889-1224
Ohio W. Carrollton, Analytic Co., Box 213 513-434-8940
Pa Downingtown, Reinbrecht, 125 Woodland 215-436-4340
Pa Pittsburgh, W. Wells, 172 Topsfield 412-833-1632

PENN ENGRG. & MFG. CORP., Doylestown, Pa., 18901, Tel: 215-766-8853, TWX: 510-665-9338; VP-Sls. Mgr: K.A. Swanstrom

PENN FIBRE & SPECIALTY, 2020 E. Westmoreland St., Phila., Pa., 19134, Tel: 215-RE-9-4862; Sls. Mgr: W.K. Davis

PENN KEYSTONE CORP., Division St., Ansonia, Conn., 06401, Tel: 203-734-3301; V.P. Sls: E.M. Parker

PENN RESISTOR CORP., 526 N. Broad St., Lansdale, Pa., 19446, Tel: 215-855-9516; Sls. Mgr: R.C. Pollsen

PENN SCI. PRODS. CO., INC., 1000 Old York Rd., Abington, Pa., 19001, Tel: 215-887-0375; Sls. Mgr: N.H. Koslow

PENNSYLVANIA ELCTRNS. TECHNOLOGY, 1397 Frey Rd., Pittsburgh, Pa., 15235, Tel: 412-243-3816; Sls. Mgr: F.K. Ross

PENNSYLVANIA IND'L. CHEM. CORP., 120 State St., Clairton, Pa., 15025, Tel: 412-233-8600, TWX: 412-233-3051; Sls. Mgr: L.J. Wolfe

PENNWALT CORP., Pennwalt Bldg. - Three Pkwy., Phila., Pa., 19102, Tel: 215-587-7000, TWX: 215-569-9748; Mktg. Mgr: L.E. Robb

PENNWOOD NUMECHRON, Tymeter Elctrns., 7249 Frankstown Ave., Pittsburgh, Pa., 15208, Tel: 412-371-4200; Sls. Mgr: J. Bergman .... Pg. 372
EXP: N.Y., Westbury, Minthorne Int'l., 2200 Shames Dr.

PENTA LABS., Div. Kilovac, Box 4422, Santa Barbara, Cal., 93103, Tel: 805-684-4560, TWX: 910-336-1141; Sls. Mgr: J.L. Dysart .... Pgs. 1744,1745,2428
(Refer to Kilovac Corp. for Sales Office Information)

PENTRONIX, DIV., Wolverine Pentronix, 1737 Cicotte St., Lincoln Pk., Mich., 48146, Tel: 313-388-3100; Sls. Mgr: F.J. Lohan

PERFECT GEAR & INSTR. CORP., [illegible] Napa, Northridge, Calif., 91324, Tel: 213-885-1781, TWX: 910-493-1241; Sls. Mgr: A. Cazier

PERFECTION MICA CO., Magnetic Shield Div., 740 Thomas Dr., Bensenville, Ill., 60106, Tel: 312-766-7800, TWX: 910-256-4815; Sls. Mgr: R. Vance Pgs. 2002,2003,2321,2764,2765

Cal Menlo Pk., Frauman Assoc., Box 969 415-322-8461
Colo Denver, E. Johnson, 10130 W. Ashbury 303-985-4810
Conn Meriden, A. Allison Co., Box 467 203-BE-7-9232
Ill Westchester, W. Brouillette, 9855 Roosevelt 312-FI-5-6500
Md Baltimore, D. Jones, 2100 N. Charles 301-752-0577
Minn St. Paul, E. Melius, 3758 N. Dunlap 612-484-8541
NJ Moorestown, Elec. Comps., 355 Crider 609-235-3012
NJ Union City, Bressler, 4808 Bergenline 201-UN-4-9577
NM Albuquerque, Bennewitz, 9720 E. Candelaria, NE 505-298-6775
NY New York, Bressler Assocs. 212-OX-5-3727
Ohio Dayton, F. Ohmer, Box 2013 513-434-1454
Pa Phila., D. Jones, 6520 Rising Sun 215-342-3990
Tex Dallas, Techno Assocs., Box 20544 214-FL-7-9213
Utah Salt Lake Cy., P. Bowthorpe Agency, 143 S. 4th 801-328-8173
Wash Seattle, Jon B. Jolly, Pier 59 206-624-2152
For: Can., Westmount, Que., R. Griffith, 455 Mt. Stephen WE 7-1167

PERIPHERAL EQUIP. CORP., 9600 Irondale Ave., Chatsworth, Cal., 91311, Tel: 213-882-0030, TWX: 910-494-2093; Sls. Mgr: G. Held

Advertisement

Peripheral Equipment Corp. is recognized by industry as the leader in latest-generation digital magnetic tape transports. PEC is the largest independent supplier of low-cost tape transports with thousands of units in the field and more than 300 models to choose from. PEC also offers a complete line of data formatters for use with its magnetic tape transports. A new addition is PEC's line of low-cost disc drives designed especially for mass storage in mini and small computer systems. Send for a complete set of literature from PEC.

PERKIN-ELMER CORP., Elctrn. Prods. Dept., Ind'l. Prods. Div., 131 Danbury Rd., Wilton, Conn., 06897, Tel: 203-762-4786, TWX: 710-479-3213; Sls. Mgr: M. Redovian ....Pg. 2969

Ariz Scottsdale, Mercury Engrg., 6031 E. Windsor 602-945-1927
Cal Encino, Perkin-Elmer, 18075 Ventura Blvd. 213-881-4655
Cal Los Angeles, 6023 S. Garfield Ave. 213-685-9600
Cal Mtn. View, Western Sls., Box 96 415-967-5913
Cal San Carlos, R.W. Rayburn, 607 Knoll Dr. 415-593-2630
Cal San Francisco, 320 Shaw Rd. 415-761-1155
Colo Littleton, Alden Sls., 7386 S. Platte Canyon 303-794-1531
Conn Wilton, Perkin-Elmer, 131 Danbury Rd. 203-762-4786
Fla Ft. Lauderdale, Snow Co., 3109 N.E. 25th 305-563-2448
Ga Chamblee, 5925 Peach tree Ind'l. Blvd. 404-451-1661
Ill Bedford Pk., 6850 S. Harlem Ave. 312-458-2200
Ill Chicago, Electro-Tech Mktg., 3525 W. Peterson 312-588-4535
Ill Lisle, A.L. Maple, 6006 Forest View
Mass Natick, W. Beaver, 41 Indian Ridge Rd. 617-655-1529
Mass Needham Hghts., 155-4th Ave. 617-449-0300
NC High Point, 2401 Brevard St. 919-883-0141
Minn St. Paul, Box 3211 612-733-5960
Mo St. Louis, Box 510 314-991-1320
NJ Moorestown, E.W. Ball, 31 S. Shirley Ave. 609-235-3737
NJ Rutherford, K.W. Kuenzle, 65 Lincoln Ave. 201-939-6779
NJ Tenafly, R.T. Gustafson, 45 Oak St. 201-567-3083
NJ W. Caldwell, Box 76, 15 Henderson Dr. 201-227-9100
NY Buffalo, Box 2012 716-894-5214
Ohio Cincinatti, J.J. O'Brien, 740 Northland Rd 513-825-0455
Ohio Cincinatti, 4835 Para Dr. 513-242-2313
Ohio Cleveland, 12200 Brookpark Rd. 216-267-1800
Ohio Cleveland Hghts., Baron Sls., 1001 Englewood 216-381-7186
Ohio Rocky River, W.J. Flynn, 21017 Aberdeen Rd. 216-333-8734
Pa Berwyn, B.J. Graham, 840 Old State Rd. 215-644-5840
Pa Phila., Sencor Inc., 2222 Glendale St. 215-342-0223
Pa Phila., 5698 Rising Sun Ave. 215-742-0200
Tex Dallas, 2121 Santa Anna Ave. 214-327-7311
Tex Dallas, Southern Engrg., 6434 Maple 214-357-0669
Wash Bellevue, Conrard Engrg., 12880 Bellevue Redmond 206-455-1336
Wash Seattle, 100 Andover Pk. W. 206-244-7200

PERKIN-ELMER CORP., Instr. Div., Main Ave., Norwalk, Conn., 06852, Tel: 203-762-1000, TWX: 710-468-3213; Sls. Mgr: W.B. Ferguson

PERKINS MACHINE & GEAR, Circuit Ave., W. Springfield, Mass., 01089, Tel: 413-737-4751; V.P: J.D. Elbaum

PERMACEL, Div. Johnson & Johnson, U.S. Highway #1, New Brunswick, N.J., 08903, Tel: 201-524-0400; Sls. Mgr: A. Callahan

PERMACOR, A Div. of Radio Cores, Inc., 9540 S. Tulley Ave., Oak Lawn, Ill., 60454, Tel: 312-422-3353; Sls. Mgr: J.W. Loughlin

PERMAG CORP., 88-06 Van Wyck Expwy., Jamaica, N.Y., 11418, Tel: 212-OL-7-1818, TWX: 710-582-2952; Sls. Mgr: J. Kaelin

PERMALUSTER, INC., 1844 N. Keystone St., Burbank, Calif., 91504, Tel: 213-849-4543; Sls. Mgr: H. Walker

PERMANENT MAGNET CO., INC., 4437 Bragdon St., Indianapolis, Ind., 46226, Tel: 317-547-1336; Sls. Mgr: R.M. Burns

PERMAVOLT TRANSFORMERS, INC., Box 2582, S. Bend, Ind., 46613, Tel: 219-282-1255, TWX: 810-299-2532

PERMONITE MFG. CO., 910 W. Jackson Blvd., Chicago, Ill., 60607, Tel: 312-738-2220, TWX: 312-431-1173; Sls. Mgr: A.L. Kaye

PERRY AMPLIFIER, 138 Fuller St., Brookline, Mass., 02146, Tel: 617-734-0844; Sls. Mgr: H. Rodman

Advertisement

Ultra low noise (IDB typical) transistor amplifiers for use with infrared detectors and electrical transducers; voltage mode, current mode and automatic bias control. Standard models are available to match all infrared detectors and transducers produced in the U.S. and Europe. Multi-Element amplifier arrays are available in all operating modes with hybrid modules containing up to 100 signal channels. Standard secondary function amplifiers such as; logarythmic, AGC, video, RF, etc., are also available from stock.

PESCHEL INSTRS., 1412 Viscaya Pkwy., Cape Coral, Fla., 33904, Tel: 813-LI-2-3164

PESCO PRODS., Div. Borg-Warner Corp., 24700 N. Miles Rd., Bedford, Ohio, 44146, Tel: 216-292-6100, TWX: 810-422-2212; Sls. Mgr: R.L. Schroeder

PETERSEN RADIO, 2800 W. Broadway, Council Bluffs, Iowa, 51501, Tel: 712-323-7539; Sls. Mgr: N. Anderson

PETTY GEOPHYSICAL ENGRG., 700 Tower Life Bldg., San Antonio, Tex., 78206, Tel: 512-226-5131; VP Mktg: H. J. Jones

PFC MFG. DIV., Arco Elctrns., Inc., Community Dr., Great Neck, N.Y., 11022, Tel: 516-487-0500, TWX: 510-223-0804; Sls. Mgr: M. Samuels ....Pgs. 2339-2345

Cal Hawthorne, W.C.V. Co., 14125 Inglewood 213-772-4479
Cal Mountain View, W.C.V. Co., 2015 Latham 415-961-5096
Md Towson, Habco Elctrns., 603 Alleghany 301-825-9637
Mass Brookline, Technology Prods., 233 Harvard 617-731-0858
NJ Fairlawn, Bixon Assoc., Box 305 201-797-5356
NY Great Neck, Pacent Engrg., 300 Northern 516-482-4678
NY Syracuse, J.A. Hotze, 112 Dewitt St. 315-479-6641
Pa Fairview Vlg., R. Hilderbrande, Germantown Pike 215-247-6225
Tex Richardson, C. Hoffman, 777 S. Central 214-235-3600
Wash Seattle, Underwood & Underwood, Box 66581 206-243-2133

PFIZER-MINERALS, Pigments & Metals Div., 235 E. 42nd St., New York, N.Y., 10017, Tel: 212-LR-3-2816; V.P. Sls: R.W. Linnett

PHAOSTRON INSTR. & ELCTRN. CO., 151 Pasadena Ave., So. Pasadena, Cal., 91030, Tel: 213-255-1417, TWX: 910-321-4134

PHELPS DODGE COMM., No. Haven Div., 60 Dodge Ave., North Haven, Conn., 06473, Tel: 203-239-3311, TWX: 710-465-0244; Sls. Mgr: D. McGalliard

PHILADELPHIA QUARTZ CO., 1146 Pub. Ledger Bldg., Phila., Pa., 19106, Tel: 215-627-7200; Sls. Mgr: J.R. Forrest

PHILADELPHIA SCI. CONTROLS, 1135 Cedar Ave., Croydon, Pa., 19020, Tel: 215-785-3282; Sls. Mgr: R.J. Zeigler ....Pg. 1770

Cal Burbank, Tech-Ser, 2435 N. Naomi 213-846-9631
Cal Palo Alto, Tech-Ser, 800 San Antonio 415-326-6400
Cal San Diego, Tech-Ser, 3760 Midway 714-222-1121
Conn Hamden, Northeast Engrg., 3013 Dixwell 203-248-4481
Fla Clearwater, J. Barber, 1813 Brentwood 813-442-8713
Ill Northfield, Laub Engrg., 456 Frontage 312-446-4166
Kans Shawnee Mission, M. Bettis, Box 598 816-362-0772
Kans Wichita, M. Bettis, 423 N. Fountain 314-MU-5-7441
Md Landover Hills, Eastern Comps., 6200 Annapolis 215-927-6262
Mass Danvers, Northeast Engrg., 5 Elm 617-774-3010
Mich Detroit, H. Teplitz, 26847 Grand River 313-537-9058
Mo St. Louis, M. Bettis, 9103 Bessemer 316-HA-9-2099
NY Manhasset, Northeast Engrg., 124 Trumbull 516-365-9633
NY Syracuse, G. Miller, 700 E. Water 315-478-3113
Ohio Cleveland, H. Teplitz, 3945 Meadow Brook 216-371-2044
Ohio Dayton, H. Teplitz, 3718 Salem 513-277-6531
Ore Portland, J. Edstrom, 407 S.W. Eleventh 503-777-3582
Pa Philadelphia, Eastern Comps., 1349 W. Cheltenham 215-927-6262
Tex Dallas, Tech-Ser, 10210 Monroe 214-358-2504

PHILAMON, INC., 90 Hopper St., Westbury, N.Y., 11590, Tel: 516-333-1700, TWX: 510-222-4749; Sls. Mgr: Pg. 1424

EXP: N.Y., New York, B. Freudenberg, 50 Rockefeller Plaza 212-757-9130

PHILBRICK/NEXUS RESEARCH, See Teledyne Philbrick

PHILCO-FORD CORP., 815 Conn. Ave., N.W., Washington, D.C., 20006, Tel: 202-298-7800

PHILIPS BROADCAST EQUIPMENT CORP., Government Systems Division, One Philips Pkwy., Montvale, N.J., 07645, Tel: 201-391-1000, TWX: 710-990-7301; Dir. of Mktg: W.L. Portugal

PHILIPS ELCTRN. INSTRS., 750 S. Fulton Ave., Mt. Vernon, N.Y., 10550, Tel: 914-664-4500, TWX: 710-562-0127; Sls. Mgr: R. Rude

Advertisement

All Philips Electronic Measuring Apparatus (T & M) is available with immediate delivery from stock-Oscilloscopes, Meters, Pulse Generators, Transistor Curve Tracers, Low Frequency Measuring Systems and instrumentation Recorders. Contact Philips Electronic Instruments, 750 S. Fulton Ave., Mt. Vernon, N.Y. 10550 Phone 914/664-4500.

PHILIPS ELCTRNS. INDS., LTD., 116 Vanderhoof Ave., Toronto 17, Can., Tel: 416-425-5161; Sls. Mgr: A.J. Hutcheon

PHILIPS ELMET CORP., Lisbon Rd., Box 1041, Lewiston, Me., 04240, Tel: 207-784-5478; Sls. Mgr: J.D. Hix

PHILIPS METALONICS, Div. PEPI Inc., 888 S. Columbus Ave., Mt. Vernon, N.Y., 10550, Tel: 914-664-4500, TWX: 710-562-0127; Sls. Mgr: B.E. Lawton

PHILLIPS MFG. CO., 7334 N. Clark St., Chicago, Ill., 60626, Tel: 312-338-6200; Sls. Mgr: G.W. Vines

PHILLIPS PROCESS CO., INC., 192 Mill St., Rochester, N.Y., 14614, Tel: 716-232-1825; Sls. Mgr: W.D. Geib

PHILMORE MFG. CO., 130-01 Jamaica Ave., Richmond Hill, N.Y., 11418, Tel: 212-HI-1-5000; Sls. Mgr: J. Granat

PHILWAY PRODS., 701 Virginia Ave., Ashland, Ohio, 44805, Tel: 419-322-1587; Sls. Mgr: J.W. Miller

PHOENIX MATERIALS CORP., Box 9, Kittanning, Pa., 16201, Tel: 412-548-1531; Sls. Mgr: M. Baggott

PHOENIX WIRE, INC., 100 Teflon Ave., S. Hero, Vt., 05486, Tel: 802-372-4561; Sls. Mgr: W.A. Legge

Advertisement

Micro-Miniature High-Reliability Wires. Phoenix Wire specializes in the custom application of Teflon to fine wires. Guages 26 to 60 of any composition can be insulated with less than .000025 to over .006 inches of Teflon. Custom cut & strip service for all types of insulated wires also available.

PHOTO CHEMICAL PRODS. CAL., 1715 Berkeley, Santa Monica, Cal., 90404, Tel: 213-393-9761; Sls. Mgr: J.S. Clavell

PHOTO-CRYSTALS, 605 Prairie St., St. Charles, Ill., 60174, Tel: 312-JU-4-3813; Sls. Mgr: W.A. Bailey

PHOTO DIGITIZING SYS., 820 S. Mariposa St., Burbank,, Cal., 91506, Tel: 213-849-6251; Sls. Mgr.: A.M. Pezzuto

PHOTO RESCH. CORP., 3000 N. Hollywood Way, Burbank, Calif., 91502, Tel: 213-849-6017; Sls. Mgr: R. Lattin

PHOTO-SONICS, INC., 820 S. Mariposa St., Burbank, Calif., 91506, Tel: 213-849-6251; Sls. Mgr: D. Lassiter

PHOTO TECH. PRODS., Sub. Ehrenreich Photo Optical, 623 Stewart Ave., Garden City, N.Y., 11530, Tel: 516-248-5200; Mktg. Mgr: S. Held

PHOTOBELL CO., INC., 12M East 22nd St., New York, N.Y., 10010, Tel: 212-674-2121; Sls. Mgr: A. Edelman

Advertisement

Photoelectric devices, methods, ideas for machines, instruments, production lines; to trigger, control, sort, alarm, count, inspect, reject, measure, sense. Low quantity prices, custom designs, for projectors, receivers, reflex photoheads, solid-state logic circuits to fit need.

PHOTOLOGIC CO., 3704 E. Walnut Ave., Orange, Cal., 92669, Tel: 714-538-7977; Sls. Mgr: R. Arnold cont'd

cont'd

Advertisement

Photologic Company manufactures Kelvin type (dual contact) relay test sockets in more than 500 different configurations including TO-5 types. Relay testers are manufactured in standard types or specials to meet customer specifications. Complete literature is available on request.

PHOTOMATION, INC., 280 Polaris Ave., Mountain View, Calif., 94040, Tel: 415-967-8992; Pres: R.W. Heimsoth

PHOTOMECHANISMS DIV., INC., Sub. LogEtronics, Inc., 15 Stepar Pl., Huntington Sta., N.Y., 11746, Tel: 516-423-4411; Sls. Mgr: C.J. Brasser

PHOTON SOURCES, INC., Box 636, Ann Arbor, Mich., 48107, Tel: 313-455-1220; Sls. Mgr: R.P. Scherer

PHOTOVOLT CORP., 1115 Broadway, New York, N.Y., 10010, Tel: 212-989-2900; Sls. Mgr: P. Merrett

PHOTRON INSTR. CO., 6516 Detroit Ave., Cleveland, Ohio, 44102, Tel: 216-281-7020; Sls. Mgr: N.H. Fayerweather

PHYSICAL ELCTRN. LABS., 1185 O'Brien Dr., Menlo Park, Calif., 94025, Tel: 415-323-9092; Pres: R.A. Craig

PHYSICAL SCIENCES, 312 E. Live Oak Ave., Arcadia,, Cal., 91006, Tel: 213-445-2611, TWX: 910-582-3215; Sls. Mgr: H. Potter

PHYSITECH, INC., 645 Davisville Rd., Willow Grove, Pa., 19090, Tel: 215-657-2900; Sls. Mgr: T.J. Padden

P.I. TAPE, 7951 North Ave., Lemon Grove, Calif., 92045, Tel: 714-466-2255; Sls. Mgr: L. Cochran

PIC DESIGN CORP., Sub. Benrus, Box 335, Benrus Ctr., Ridgefield,, Conn., 06877, Tel: 203-438-0345, TWX: 710-467-0666; Mktg. Mgr: F. Novak

PICKARD & BURNS INC., 90 E. Montauk Hwy., Lindenhurst, N.Y., 11757, Tel: 516-888-5200; Pres: D. Fiore

PICKERING & CO., INC., 101 Sunnyside Blvd., Plainview, N.Y., 11803, Tel: 516-OV-1-0200; Dir. of Mktg: D.P. Collins

PICKERING & CO., Meas. & Controls Div., 101 Sunnyside Blvd., Plainview, N.Y., 11803, Tel: 516-681-0200; Sls. Mgr: G.P. Petetin

PICKETT INDUSTRIES, INC., P.O. Box 1515, Santa Barbara, Calif., 93102, Tel: 805-963-3501; Sls. Mgr: H. Edmondson

PICO CRIMPING TOOLS CO., 9832 Jersey Ave., Santa Fe Springs, Calif., 90670, Tel: 213-723-2150; Pres: D.E. Smiley

PICO ELCTRNS INC., 316 W. First St., Mount Vernon, N.Y., 10550, Tel: 914-699-5514; Sls. Mgr: J. Sweeney Pg. 2970

Ariz Scottsdale, C. Hower & Co., Box 1627
Mass Waltham, Selmark Assocs., 181 West St.
Minn Mpls., F.B. Hill, 7317 Cahill Rd.
Ohio Dayton, Bek Assocs., 1700 Needmore Rd.
Tex Dallas, J.Y. Schoonmaker Co., 2995 Ladybird La.

PICONICS INC., Cummings Rd., Tyngsboro, Mass., 01879, Tel: 617-649-7501; Sls. Mgr: M. Wiggin

Advertisement

Specializing in microelectronic inductors and transformers, we offer fixed and tunable devices ranging in sizes smaller than transistor dice to as large as 1/3 To-5 can volume. Extended tuning range units give 10:1 tuning range. Our devices are considered the most stable in the industry irregardless of size. Present applications include sattelites, military i-f amplifiers, minature transmitters.

PIEZO TECHNOLOGY, 2400 Diversified Way, Orlando, Fla., 32804, Tel: 305-425-1574, TWX: 810-850-4136; Sls. Mgr: J. Dinnan ....Pg. 1425

Ariz Scottsdale, Erskine Assocs., Box 1586 602-947-7255
Cal Millbrae, Melvin Sls., 113 El Camino Real 415-697-6922
Cal Van Nuys, R.L. Assocs., 14401 Gilmore 213-782-7826
Colo Denver, Walter Engr., 880 Bonnie Brae 303-777-5585
Fla Maitland, Ellis Assocs., Box 1261 305-644-9014
Ill Chicago, T. Hunter, 5653 W. Irving Pk. 312-777-2500
Ind Ft. Wayne, Scott Elctrns., 124 W. Wash. 219-743-1586
Ind Indianapolis, Scott Elctrns., Hullett Bldg. 317-635-8951
Kans Mission, Midland Engr., 5460 Buena Vista 913-262-6565
Ky Louisville, Scott Elct., 334 Francis Bldg. 502-583-3220
Md Baltimore, C. Emrich, Rolling & Wilkens 301-747-8348
Mass Sudbury, Naton-Neenan Assocs., Box 203 617-893-0914
Minn St. Paul, Countryman Assoc., 1821 University 612-698-9151
NJ Haddonfield, Mesa Tech., Box 466 609-429-9531
NY Buffalo, Bowser & Sapecky, 4541 Main 716-839-4170
NY Dewitt, Bowser & Sapecky, 4317 E. Genessee St. 315-446-5920
NY Melville, TX Sls., 900 Walt Whitman Rd. 516-271-5850
NY Poughkeepsie, Bowser & Sapecky, Box 1684 914-452-5730
NC Greensboro, L & D, Inc., Box 7234 919-292-3201
Ohio Cincinnati, Scott Elct., 9505 Montgomery 513-791-2513
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-861-2627
Ohio Dayton, Scott Elctrns., 517 Hulman Bldg. 513-223-2652
Tex Dallas, Stevens Sls., Box 34493 214-350-2476
For: Can., Scarborough, Ont., Lake Engrg., 123 Manville 751-5980

PILOT CHEMICALS, INC., 36 Pleasant St., Watertown, Mass., 02172, Tel: 617-WA-4-5445; Staff Physicist: F.R. Dunnill

PINKERTON ELECTRO-SECURITY CO., Div. Pinkerton's, Inc., 61 Sutton Rd., Webster, Mass., 01570, Tel: 617-943-1518; Sls. Mgr: J.F. McKenna

PINLITES, 1275 Bloomfield Ave., Fairfield, N.J., 07006, Tel: 201-226-7724; Sls. Mgr: D. Rovine ....Pg. 1490

Ala Huntsville, Powertronics, Box 3384 205-852-6347
Ariz Scottsdale, E. Foley, 441 N. Winfield Scott Plaza 602-945-2655
Cal Burlingame, J. Logan, 844 Stanton Rd. 415-697-6100
Cal Pasadena, Comp. Corp., 232 N. Lake 213-681-7448
Colo Denver, I. Strong, 635 Canosa 303-292-6900
Conn Woodbury, C. Lueders, Westwood Rd. 203-263-4446
Fla Melbourne, Hanson Assocs., Inc., Box 26 305-727-7474
Ill Chicago, Lightner, 6322 N. Milwaukee 312-774-1500
Kans Overland Pk., Buse Sls., 6920 W. 82nd 913-649-1913
Md Silver Spring, R. Davies, 10 Old Post Off. 301-587-3910
Mass Needham Hgts., C. Lueders, Box 161 617-449-0345
Mich Birmingham, J. Hofstetter, 700 Maple E. 313-642-0590
Minn St. Paul, Cahill, 3000 Hudson Rd. 612-739-8445
Mo St. Charles, Buse Sls., 608 S. Main St. 314-724-6667
NJ Cherry Hill, Mid-Eastern, 1759 Country Club 609-428-7977
NY New Hartford, KLM, 1 Nouvelle Pk. 315-735-8525
NY N.Y., Haber-Ramp, 2315 Broadway 212-799-4040
NC Raleigh, Powertronics, 2911 Essex Cir. 919-787-9090
Ohio Medina, J. Hofstetter, 5168 Valley View 216-241-4880
Okla Tulsa, Allied Comps., Box 4768 918-939-2848
Pa Pittsburgh, J.C. Hofstetter Co., 176 Reed Dr. 412-922-3890
Tex Dallas, Allied, 10464 E. Northwest 214-348-6660
Wash Seattle, R. Johnston, 1011 N.E. 69th 206-524-5170

PIONEER ELEC. & RESCH. CORP., 743 Circle Ave., Forest Park, Ill., 60130, Tel: 312-771-8242; Sls. Mgr: J.W. Bullock

PIONEER FOOT SWITCH CO., 3720 N. New England Ave., Chicago, Ill., 60634, Tel: 312-MU-5-3119; Pres: S. Mack

PIONEER MAGNETICS, 1745 Berkeley St., Santa Monica, Cal., 90404, Tel: 213-829-3305; Sls. Mgr: H. Kohnen

PIONEER METALS, INC., Hwy. 127, N., Harrodsburg, Ky., 40330, Tel: 606-734-4373, TWX: 810-535-3211; Sls. Mgr: P. Meadows

Advertisement

Pioneer Metals, Inc. manufactures a special Honeycomb for R.F.I. sheilding. This material is commonly referred to as "Copper Brazed Honeycomb", and is made from a mild steel foil .005 to .010" thick. The cell is hexagonal in shape, and is brazed with copper under vacuum or Hydrogen atmosphere. We also have facilities for contract furnace brazing and complete manufacture of component parts.

PIRGO ELCTRNS., Affilate Sprague, 130 Central Ave., Farmingdale, N.Y., 11735, Tel: 516-694-9880; Sls. Mgr: G.R. Levy

PITTMAN CORP., Sellersville,, Pa., 18960, Tel: 215-257-5117; VP & Sls. Mgr: C.A. Pittman, III

PLAN HOLD CORP., 21611 Perry St., Carson, Cal., 90745, Tel: 213-775-6711; Sls. Mgr: J.W. Doll

PLANET INSTR., T.A. Edison Instr. Div. McGraw Edison, 1520 Progress Rd., Ft. Wayne, Ind., 46808, Tel: 219-483-8194, TWX: 810-332-1419; Mktg. Mgr: J. Rusler Pgs. 1340,1626

Ariz Scottsdale, Mercury Eng., 6031 E. Windsor 602-945-1927
Cal Palo Alto, E.E. Enterprises, 770 Welch Rd. 415-324-4448
Cal Van Nuys, E.E. Enterprises, 5901 Noble 213-787-5360
Colo Littleton, Alden, 7386 S. Platte Canyon 303-794-1531
Fla Miami Beach, Geartner, 1125 71st 305-861-3661
Fla Orlando, Geartner Assoc., 1221 Lee 305-299-1000
Ill Mt. Prospect, Magnuson, 2420 Oakton 312-622-6322
Ind Ft. Wayne, McDonald Sls. Co., Box 2848 219-745-9214
Mass Bedford, F.R. Lesser, Box 241 617-275-7558
Minn St. Paul, Magnuson Assocs., 1246 W. 7th St. 612-227-8495
NJ Summit, R. Potter, 64 Woodland 201-277-0220
NY Hyde Pk., R. Kennedy, Green Tree 914-229-2269
NY N.Y., Haber-Ramp, 2315 Broadway 212-799-4040
NY N.Y., Metro N.Y., Corp., 210 W. 78th 212-682-5844
NY Rochester, R. Kennedy, 39 Saginaw 716-271-6322
Tex Houston, P.J. Scanlon Co., Box 1643 713-466-6897
Tex Richardson, P. Scanlon, 724 S. Sherman 214-231-4661
Wash Bellevue, Conrard, 12880 Bellevue Redmond 206-455-1336
EXP: N.Y., N.Y., Technitron, 41 W. 57th St. 212-758-2790
For: Can., Pte. Claire, Dorval, Que., C. Pipe, Box 57 514-697-2784
For: Can., Weston, Ont., C. Pipe, 65 Waterford 416-249-1766

PLASMADYNE, Div. Geotel, Inc., 3839 S. Main, Santa Ana, Calif., 92707, Tel: 714-545-7171; Sls. Mgr: A. Bernstein

PLASTIC ASSOCS., INC., 60 Inip Dr., Inwood, N.Y., 11696, Tel: 212-327-5600; Sls. Mgr: A. Tonnesen

PLASTIC WIRE & CABLE CORP., Sub. Triangle Inds., Inc., E. Main St., Jewett City, Conn., 06351, Tel: 203-376-4411; V.P. Mktg: J.T. Daly

PLASTICS MACH. DIV., New Britain Mach. Co., Box 1320, New Britain, Conn., 06050, Tel: 203-229-1641

PLASTIGLIDE MFG. CORP., 1757 Stanford St., Santa Monica, Cal., 90404, Tel: 213-870-9208; Sls. Mgr: S. Powell

PLASTOFILM INDS., 916 W. Union Ave., Wheaton, Ill., 60187, Tel: 312-668-2838; Sls. Mgr: G. Wiss

PLASTOID CORP., 42-61 24th St., Long Island City, N.Y., 11101, Tel: 212-ST-6-6200; Sls. Mgr: W. Grant

PLECTRON CORP., Overton, Neb., 68863, Tel: 308-987-2416; Sls. Mgr: M. Meyer

PLESSEY ELCTRNS. CORP., 170 Finn Ct., Farmingdale, N.Y., 11735, Tel: 516-694-7377; Sls. Mgr: B.R. Erde

PLYMOUTH RUBBER CO., INC., Canton, Mass., 02021, Tel: 617-828-0220, TWX: 617-828-4546; Sls. Mgr: F.E. Harris, Jr.

PMC DESIGNING, 1832 Amberlawn Ave., Cincinnati,, Ohio, 45237; VP & Sls. Mgr: J. Restle

POCO GRAPHITE, INC., Subs. Union Oil Co. Cal., Box 2121, Decatur, Tex., 76234, Tel: 817-627-2121, TWX: 910-890-5724; Sls. Mgr: T.M. Todd

PODGOR, JOSEPH CO., 7895 Browning Rd., Pennsauken, N.J., 08109, Tel: 609-NO-3-7878; Sls. Mgr: F.C. Kline

PODGOR, JOSEPH E. CO., INC., Box 1714, Phila., Pa., 19105, Tel: 215-WA-5-7878; Sls. Mgr: F. Kline

POLACOAT, INC., 9750 Conklin Rd., Cincinnati,, Ohio, 45242, Tel: 513-791-1300; Pres. B.J. Benton

POLARAD ELCTRN. INSTRS., 5 Delaware Dr., Lake Success, N.Y., 11040, Tel: 516-328-1100, TWX: 510-223-0414; Sls. Mgr: E. Feldman ....Pgs. 538-540

Ala Huntsville, J. Highsmith, 3322 S. Memorial 205-881-3294
Alas Anchorage, Arva, Inc., Box 759 907-272-5231
Ariz Phoenix, T. L. Snitzer Co., 15 N. 40th Pl. 602-273-1673
Cal Cupertino, T. Snitzer, 10320 Saratoga-Sunnyvale 408-257-8333
Cal Del Mar, T. Snitzer, Box 805 714-454-2191
Cal Los Angeles, T. Snitzer, 9005 Exposition 213-836-6170

Colo Denver, Bennawitz, 2801 E. Colfax 303-399-1132
Conn Hartford, Instr. Assocs., 234 Murphy 203-525-9367
DC Wash., Eastern Instr., 2600 Virginia, N.W. 202-333-8880
Fla Orlando, J. Highsmith, 2543 Industrial 305-293-5202
Ill Chicago, L. Green, 5218 W. Diversey 312-286-6824
Ind Indpls., L. Green, 1111 E. 54th St. 317-253-2087
Iowa Cedar Rapids, Engrg. Svcs., 1026 3rd, S.E. 319-366-1591
Kans Prairie Vlg., Engrg. Svcs., 7830 State Line 913-649-4000
Md Silver Spring, Brimburg, 814 Thayer 301-588-7790
Mass Bedford, Instr. Assocs., 175 Middlesex 617-275-0700
Mich Detroit, H. Teplitz, 26847 Grand River 313-537-9058
Minn Mpls., L. F. Green, 6225 University, N.E. 612-781-1611
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NJ Red Bank, Eastern Instr., 157 Broad 201-842-4242
NM Albuquerque, Bennawitz, 9720 Candelaria, N.E. 505-298-6775
NY Great Neck, Meas. Tech., 295 Northern Blvd. 516-482-3500
NY No. Syracuse, NACO Elctrns., Box 248 315-699-2651
NY Poughkeepsie, NACO Elctrns., 14 Levi St. 914-462-2730
NY Rochester, NACO Elctrns., 74 Park Ave. 716-244-4720
NY Utica, NACO Elctrns., 2631 Edgewood 315-732-1801
NC Charlotte, J.L. Highsmith, 3733 Monroe 704-333-7743
Ohio Cleveland, H. Teplitz, 3945 Meadowbrook 216-371-2044
Ohio Dayton, H. Teplitz Co., 3718 Salem Ave. 513-277-6531
Okla Tulsa, Data Engrg. Corp., 4580 E. 50th St. 918-622-3753
Ore Portland, Arva, Inc., 2035 S.W. 58th Ave. 503-292-8762
Pa Phila., Eastern Instr., 613 Chelthanham 215-927-6269
Tex Houston, Data Engrg., 2120 S. Post Oak 713-622-2820
Tex Richardson, Data Engrg., 777 S. Central Expy.1-W 214-231-4846
Tex San Antonio, Data Engrg., 4438 Centerview 512-732-7176
Wash Seattle, Arva, Inc., 1320 Prospect St. 206-622-0177

POLLAK, JOSEPH CORP., 195 Freeport St., Boston, Mass., 02122, Tel: 617-282-9550; Sls. Mgr: C.G. Darsch

POLY-SCIENTIFIC, Litton Sys., 1213 N. Main St., Blacksburg, Va., 24060, Tel: 703-552-3011, TWX: 710-875-3692; Sls. Mgr: W.M. Mader

POLYGON INDS. LTD., 50 Northline Rd., Toronto 16, Ont., Canada, Tel: 416-755-3301; Sls. Mgr: A.E. Shaw

POLYMER CORP., 2120 Fairmont Ave., Reading, Pa., 19603, Tel: 215-929-5858, TWX: 510-651-5396; Sls. Mgr: R.E. Barthold

Advertisement

Nylons, Fluorocarbons, cross-linked polystyrene and Acetal stock shapes, fabricated or sintered parts for electrical and mechanical components. Filled nylons, molding resins; non-conductive ferromagnetic plastic materials; copper-clad dielectric materials; plastic powders for integral insulation applied by heat fusion processes.

POLYMER RESCH., 3330 W. Cameron Ave., Milwaukee, Wis., 53209

POLYPHASE INSTR. CO., 126 E. Fourth St., Bridgeport, Pa., 19405, Tel: 215-279-4660; V.P. Sls: R.H. Simmons

POMONA ELCTRNS. CO., INC., 1500 E. 9th St., Pomona, Cal., 91766, Tel: 714-623-3463, TWX: 910-581-3822; Sls. Mgr: C.W. Musarra ....Pgs. 2652-2704
Ariz Phoenix, H.A. Moore Sls. Co., Box 7245 602-CR-4-0060
Cal Beverly Hills, Intercontinental Aviation, Box 1705 213-274-7579
Cal La Selva Bch., Belchamber & French, 308 Playa 408-688-3281
Cal Palo Alto, Engineering Assoc., 999 Commercial 415-DA-6-7842
Cal Pasadena, P. Nurches, 2396 E. Foothill 213-681-8957
Cal Whittier, DeAngelo,Rothman, 11936 E. Washington 213-945-2341
Colo Aurora, AES, Inc., 12891 E. Nevada 303-EM-6-0208
Conn W. Haven, R.S. Reiss Assocs., 70 Jessie 203-WE-3-8542
Fla Brandon, L. Haas, 604 Dall Dr. 813-689-3271
Fla No. Miami, L. Haas, 1826 N.E. 150th 305-949-9143
Ga Atlanta, V. McCorvey, 2187 Briarcliff N.E. 404-636-2502
Ill Chicago, W.M. Linz, 4001 W. Devon 312-MU-5-6060
Mass Sharon, R.S. Reiss, 199 E. Foxboro 617-SU-4-3439
Mich Grand Rapids, C. Geer, 4601 Blaine SE 616-534-9449
Minn Mpls., Northern States, 1109 W. 78 1/2 St. 612-866-3468
Mo Kansas City, NEVCO, Inc., 1715 Baltimore 816-421-1751
Mo St. Louis, NEVCO, 2427 Brentwood Blvd. 314-962-5629
Neb Omaha, NEVCO, 12308 Grey Fawn Dr. 402-333-6850
NY NY, J. Weber, 2700 Henry Hudson Pkwy. 212-546-8306
NY Woodside, Tobias, 49-01 31st Ave. 212-726-4551
Ohio Hilliard, P. Lohse & Co., 590 Mengel La. 614-876-4394
Ohio Novelty, P. Lohse, 13932 Fox Hollow 216-338-8120
Pa Philadelphia, D.S. Linz, 238 Shelmire St. 215-ES-9-0734
SC Greenville, V. Avis McCorvey, Box 5185 803-244-6254
Tex Dallas, Techno Assocs., Box 20544 214-FL-7-9213
Wash Seattle, R.K. Squibb, 655 N.E. Northlake 206-632-2450
For: Can., Downsview, Ont., Electronetic Sys., 62 Alness 416-636-3673
For: Can., Montreal, Que., Electronetic Sys., 6420 Victoria 514-342-4117
For: CAN., Vancouver, B.C., A. Deskin, 1641 Venables 604-253-6396
For: Can., Ottawa, Ont., Electronetic Sys., 1342 Bank St. 613-733-3781

POPPER & SONS, INC., 300 Park Ave. S., New York, N.Y., 10010, Tel: 212-674-5500; Sls. Mgr: H.P. Leighton

PORCELAIN PRODS. CO., Div. Clarken Co., 225 N. Patterson St., Carey, Ohio, 43316, Tel: 419-396-2211

PORT-O-VOX ENTERPRISES, CORP., 130 West 57th St., New York, N.Y., 10019, Tel: 212-CI-6-2491; Ch. Engr: K. Saari

PORT PLASTICS, INC., 8037 E. Slauson Ave., Montebello, Cal., 90640, Tel: 213-685-6200

PORTABLE ELEC. TOOLS, DIV., G.W. Murphy Inds., 1200 E. State St., Geneva, Ill., 60134, Tel: 312-CE-2-2500, TWX: 910-237-1683; Sls. Mgr: R. Melius

PORTER, H.K. CO., INC., Porter Bldg., Pittsburgh, Pa., 15219, Tel: 412-391-1800

PORTER, H.K., INC., 74 Foley St., Somerville, Mass., 02143, Tel: 617-776-8200; V.P-Mktg: H.M. Webster

POSITRONIC INDS., Gorn Connector Div., 1906 S. Stewart, Springfield, Mo., 65804, Tel: 417-883-3434; Sls. Mgr: J.T. Gentry ....Pg. 2631
Ariz Phoenix, Hecht, Henschen, 2435 E. University 602-275-4411
Cal Alhambra, M. Riedel, 2215 W. Valley 213-283-7694
Cal Santa Clara, Richards, 2938 Scott Bl. 408-246-5860
Colo Littleton, R. Entprs., 7272 S. Lincoln Way 303-794-6164
Ill Evanston, Rendell, 2201 W. Oakton 312-866-8060
Mass Newtonville, Edcom, 815 Washington 617-969-9710
Mich Farmington, L. George, 32500 Grand River 313-474-1505
Minn Mpls., Furber, 6500 Nicollet Ave., S. 612-861-1518
Mo Springfield, P. Plus, 1906 S. Stewart 417-883-5660
NY Fayetteville, F. Darcy, 808 Fay-Manlius 315-637-6587
NY Port Washington, P.D. Aaron, Box 511 516-767-2600
Ohio Dayton, Myers, 298 Pleasant Hill 513-299-3215
Pa Phila., Professional Svc., 1207 Ferndale 215-676-0980
Tex Dallas, W. Reese, 3131 Stemmons Frwy. 214-638-6575
Wash Seattle, B. Hirsh, 4013 Learyway 206-783-3423
EXP: Stamford, Conn., J.P. Int'l., 1989 Summer 203-348-2691

POSSIS MACH., 825 Rhode Island Ave., S., Minneapolis, Minn., 55426, Tel: 612-545-1471; Div. Mgr: G.H. Baillie

POST ELCTRN. PRODS., 12 Lothrop St., Beverly, Mass., 01915, Tel: 617-922-5005; Sls. Mgr: E.B. Renwick

POTTER & BRUMFIELD, Div. American Machine Foundry Co., 1200 E. Broadway, Princeton, Ind., 47570, Tel: 812-385-5251, TWX: 812-291-4125; Sls. Mgr: D. Morrow ....Pgs. 1771-1782
Ariz Phoenix, Howe & Howe, 4109 N. 18th 602-264-7971
Cal Los Altos, Recht, 900 N. San Antonio 415-941-0336
Cal Los Angeles, Black & Strong, Inc., 1728 S. LaCienega Blvd. 213-UP-0-9191
Cal San Diego, Black & Strong, Inc., 7961 Engineer Rd. 714-279-6363
Cal San Juan Capistrano, Potter & Brumfield, 26181 Avenida Aeropuerto 714-493-4507
Colo Littleton, Simpson Assocs., 2552 Ridge 303-798-8439
Conn New Canaan, G. Hathaway Elctrns., 129 Oenoke 203-966-2580
Fla Orlando, Irby & Connolly, Inc., Box 6034B 305-423-8270
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill 404-237-2273
Ill Chicago, Balhorn & Welch, Inc., 1925 N. Harlem Ave. 312-889-5011
Ill LaGrange Pk., Bierhaus Sls., 1013 E. 31st 312-354-5100
Ind Ft. Wayne, R. O. Whitesell, 3426 Taylor 219-432-5591
Ind Kokomo, R. O. Whitesell & Assoc., Inc., 3827 S. Lafountain Sq. 317-453-6868
Ind Indpls, R. O. Whitesell, 6691 E. Wash. 317-359-9283
Ky Louisville, R. O. Whitesell, 3620 Lexington 502-893-7303
La Metairie, Cartwright & Bean, Inc. of Tenn., Box 73336 504-887-5225
Mass Arlington, Hathaway Elctrns., 7-11 Mystic 617-646-1380
Mich Detroit, Hilltronics, 13720 Puritan Ave. 313-342-3242
Mich St. Joseph, R. O. Whitesell & Assoc., Inc., Shepard & Benning Bldg, Rm. 214 616-983-7337
Minn Mpls, Mel Foster, 228 S. Cedar Lake 612-374-2612
Mo Grandview, L. R. Harry, Box 288 816-763-3634
Mo St. Louis, L. R. Harry, Box 12608 314-872-3183
NJ Cherry Hill, J. McCoy, Box 20 HA 8-3444
NM Albuquerque, C. Carlberg, 2611 Quincy 505-265-1579
NY Buffalo, R. Lamb Co., 1865 Kenmore 716-874-4900
NY Garden Cy, Comtronic, 370 Old Country 516-PI-1-8966
NY Kingston, R. Lamb Co., Box 661 914-338-8833
NY Rochester, R. Lamb Co., 4515 Culver 716-544-5580
NY Syracuse, R. Lamb Co., E. Molloy Rd. 315-454-2469
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-537-7965
NC Raleigh, Cartwright & Bean, 1016 Belfast 919-832-7128
Ohio Cincinnati, R. Whitesell, 1172 Galbraith 513-521-2290
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-861-2626
Ohio Columbus, Scott Elctrns., 79 E. State 614-228-2313
Ohio Dayton, R. Whitesell, 4133 S. Dixie 513-298-9546
Okla Tulsa, Comps., Inc., Box 50277 918-LU-3-9149
Pa Camp Hill, Beil & Whittaker, Inc., 849 Foxcroft Dr. 717-233-1254
Pa Easton, Beil & Whitaker, 2470 Forrest 215-434-5220
Pa Harrisburg, Beil & Whittaker, 5610 Akron 717-652-0184
Pa Pittsburgh, Scott Elctrns., 1050 Freeport Rd. #7 412-471-5233
Pa Reading, Beil & Whittaker, Inc., 3623 Jacksonwald Ave. 215-779-2610
Tenn Memphis, Cartwright & Bean, 560 S. Cooper 901-276-4442
Tex Dallas, J. Guenther, 5121 McKinney 214-528-6286
Tex Houston, J. B. Guenther, Inc., Box 55525 713-468-0232
Va Alexandria, Potomac Elctrns., Inc., 604 Montgomery St. 836-1630
Va Alexandria, Potter & Brumfield, 604 Montgomery St. 836-1630
Va Richmond, Potomac Elctrns., Box 4971 703-270-3682

Wash Seattle, R. Johnston, 1011 N.E. 69th 206-524-5170
Wisc Milwaukee, E. Dickinson, 3612 N. Green Bay 414-264-1080
EXP: N.Y., NY, AMF Int'l., 261 Madison 212-687-3100
For: Can., Guelph, Ont., Potter & Brumfield, 135 Oxford St. 519-822-0390
For: Can., Montreal, Que., Braydon Electro, Ltd., 360 Montee De Liesse Rd. 514-748-6378
For: Can., No. Vancouver, B.C., C. L. Thompson Ltd., 1121 W. 15th St. 604-987-9388
For: Can., Weston, Ont., F. Eakin, 9 Milvan Dr. 416-741-7485
For: Can., Winnipeg, Manitoba, C. L. Thompson Ltd., 870 Bradford St. 204-783-0848

"THE POTTER CO.", Sub. Potter-Englewood Corp., 500 W. Florence Ave, Inglewood, Calif, 90301, Tel: 213-678-2651, TWX: 910-328-6138; Mktg. Mgr: D. Flowers

POTTER INSTR. CO., 532 Broad Hollow Rd., Melville, N.Y., 11746, Tel: 516-694-9000, TWX: 510-224-6485; V.P. Mktg: W.P. Sharpe

POWER APPLICATIONS, INC., Box 305, Bayside, N.Y., 11361, Tel: 212-631-7784; Sls. Mgr: W.R. Wright

POWER CONTROL CORP., Box 11432, Pittsburgh, Pa., 15238, Tel: 412-782-3120; Sls. Mgr: C.W. Duffett

POWER CONVERSION PRODS. INC., Forty Two East St, Crystal Lake, Ill., 60014, Tel: 815-459-9100, TWX: 910-634-3356; Sls. Mgr: C.F. Seyer

POWER DESIGNS, 1700 Shames Dr., Westbury, N.Y., 11590, Tel: 516-333-6200, TWX: 510-222-6561; Sls. Mgr: H. Roth .... Pgs. 832-835

Ariz Phoenix, Hytronic Meas., 1017 N. 3rd 602-253-6104
Cal Palo Alto, Ward/Davis, 3941 Bayshore 415-968-7116
Cal Pasadena, Ward/Davis, 770 S. Arroyo 213-684-2840
Cal San Diego, Ward/Davis, 9045 Balboa 714-277-8081
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
Conn New Haven, H.J. Schuft, 965 Dixwell 203-UN-5-1365
Fla Maitland, EIR, Inc., Box 943 305-644-9595
Ill Chicago, L. Green, 5218 W. Diversey 312-286-6824
Ind Indianapolis, L. Green, 1111 E. 54th 317-253-2087
Md Silver Spring, QED Elctrns., 850 Sligo 301-588-8134
Mass Newtonville, H. Schuft, 815 Washington 617-527-5304
Mich Detroit, H. Teplitz, 26847 Grand River 313-537-9058
Minn Mpls., L. Green, 6225 University, N.E. 612-781-1611
NJ Camden, QED Elctrns., 2916 Federal St. 215-925-8711
NM Albuquerque, Hytronic Meas., 205 San Pablo, S.E. 505-268-3941
NY Mt. Vernon, QED Elctrns., 500 Nuber Ave. 914-664-0080
NY Rochester, Ossmann Instrs., 474 Thurston 716-271-4565
NY Syracuse, Ossmann Instr., 6666 Old Collamer 315-437-6666
NY Vestal, Ossmann Instrs., Vestal Pkwy., E. 607-785-9947
NY Wappingers Falls, Ossmann Inst., 122 E. Main 914-297-7777
Ohio Cleveland, H. Teplitz, 39-45 Meadowbrook 216-371-6531
Ohio Dayton, H. Teplitz, 3718 Salem Ave. 513-277-9178
Tex Dallas, Applied Sci. Acc., 2929 Ladybird 214-352-4829
Tex Houston, Applied Sci. Acc., 7211 Hillcroft 713-781-1441
Utah Salt Lake City, Hytronic Meas., 2022 S. Main 801-466-4924
EXP: N.Y., Melville, Rocke Int'l., 80 Marcus 516-694-7800
For: Can., Dartmouth, Nova Scotia, Computing Devices of Can., Ltd., Comm. Grp., Box 763 902-466-7461
For: Can., Ottawa, Ont., Computing Devices, Box 508 613-828-9143
For: Can., Vancouver, B.C., Computing Devices, 683 E. Hastings 604-255-7366

POWER DESIGNS PACIFIC, Miranda Ave., Palo Alto, Cal., 94304, Tel: 415-321-6111, TWX: 910-373-1251; Sls. Mgr: J.K. Levin

POWER ELCTRNS. CO., 5701 Savoy La., Houston, Tex., 77036, Tel: 713-SU-2-7200; Sls. Mgr: W.F. Mayfield

POWER ENGRG. & EQUIP. CO., INC., 1826 213th St., Torrance, Cal., 90501, Tel: 213-328-6677, TWX: 910-349-6659; Sls. Mgr: C.R. Lever

POWER INC., 12809 Eagle Ridge Dr., Burnsville, Minn., 55378, Tel: 612-890-1360; Sls. Mgr: D.L. Carlson Pg. 831

Cal L.A., American Tech., 1460 S. Sherbourne 213-659-3791

POWER INSTRS., 7352 N. Lawndale Ave., Skokie, Ill., 60076, Tel: 312-676-2300; Sls. Mgr: A.L. Svanascini

POWER/MATE, 514 S. River St., Hackensack, N.J., 07601, Tel: 201-343-6294, TWX: 710-990-5023; Sls. Mgr: M. Charter .... Pgs. 836-859

Ariz Phoenix, Recording Sciences, Box 27806 602-275-1372
Cal Inglewood, L & M Engrg., 9911 Inglewood 213-674-6850
Cal Santa Clara, L & M Engrg., 3242 McKinley Dr. 408-243-2891
Colo Littleton, Radco Elctrns., 2552 Ridge Rd. 303-794-4279
Conn W Hartford, Victor Assoc., 893 Farmington Ave. 203-523-5680
Fla Orlando, Gra-Mar, 3113 Lawton Rd. 305-841-2330
Ill Chicago, K. W. Meyers, 7256 Touhy Ave. 312-774-6440
Ind Indianapolis, K.W. Meyers Co., 3512 Rockville Rd. 317-243-6681
Md Towson, Mark-Tron, 202 W. Penn. 301-825-8222
Md Rockville, Mark-Tron, 651 Lofstrand 301-762-6210
Mass Framingham, Victor Assoc., 280 Worcester Rd. 617-879-5710
Mich Grand Rapids, Urban-Ferris, 1119 Burton St. SE 616-245-0511
Mich Southfield, Urban-Ferris, 21711 W. 10 Mile Rd. 313-354-9066
Minn Mipls., K. W. Meyers, 4725 Excellsior Bl. 612-920-7080
NJ Hackensack, PMC Sls., 520 S. River St. 201-343-6295
NM Albuquerque, Recording Science, 1811 Carlisle, N.E. 505-265-7631
NY Fayetteville, Crayden Sherman, Davis Bl. 315-637-9861
Ohio Cleveland, Gibson Elect. Mktg., 26100 Brush Ave. 216-731-8330
Ohio Dayton, Gibson Elect. Mktg., 122 W. Park Rd. 513-433-3521
SC Rock-Hill, Gra-Mar, 709 Myrtle Ave. 803-328-9773
Wash Seattle, Hayes Tech., 3611 Terminal Ct. 206-PA-3-4141
Tex Dallas, Remtek, 11411 N. Central Expwy. 214-369-8146
Wisc Milwaukee, K. W. Meyers Co., 4359 S. Howell Ave. 414-482-1313
EXP: Hackensack, Power/Mate Internat'l, 516 S. River St. 201-343-6294

POWER PHYSICS CORP., Box 626, Eatontown, N.J., 07724, Tel: 201-542-1393, TWX: 710-722-6646; V.P. Mktg: V. Melin

POWERCUBE CORP, 214 Calvary St., Waltham, Mass., 02154, Tel: 617-924-1758, TWX: 710-327-9216; Sls. Mgr: N. E. Chapman

POWERTEC, Div. of Airtronics, Inc., 9168 De Soto Ave., Chatsworth, Cal., 91311, Tel: 213-882-0004, TWX: 910-494-2092; Sls. Mgr: F. Barthold .... Pgs. 860-864

Cal Santa Clara, Richards, 2938 Scott 408-246-5860
Cal Torrance, O'Donnell, 18053 Crenshaw 213-323-9243
Colo Denver, D.E. Bond, 5505 E. Evans 303-756-1234
Fla Orlando, Geartner, 1221 Lee Rd. 305-299-1000
Fla Miami Bch., Geartner Assoc., 350 Lincoln 305-531-0200
Ind Indianapolis, Holsapple Assoc. 317-894-0513
Kan Wichita, Thunderbird Tech., 7707 E. Osie 316-684-3941
Kans Prairie Vlg., Thunderbird Tech., 4014A W. 95th 913-642-7220
Md Baltimore, Dyna-Rep. 301-539-5148
Mass Needham, Garrettson, 50 Kearney Rd. 617-449-2640
Minn Mpls., Comstrand, 6279 University 612-560-5300
Mo St. Louis, Thunderbird Tech., Box 12849 314-542-6488
NJ Livingston, Garrettson Co., Box 226
NM Albuquerque, D.E. Bond Assoc., Box 14237
NY Glen Cove, Garrettson Co., 29 Jefferson Ave.
NY White Plains, Garrettson Co., Box 149
NY Williston Pk., Garrettson Co., Inc., 275 Hillside Ave. 516-747-6610
Pa Phila., Garrettson, 92-14 Masland St. 215-HO-4-2275
Tex Dallas, W. Reese, Box 24410 214-638-6575
Tex Houston, W. Reese, 2400 W. Loop , S. 713-621-3134
Va Springfield, Dyna-Rep., 5625 Port Royal 703-321-8630
Wash Bellevue, A. Smith, 405 166 S.E. 206-746-6770

POXYLUBE, Div. Gen'l. Devices, 541 S. Webster Ave., Indianapolis, Ind., 46219, Tel: 317-359-5407; Sls. Mgr: J.R. Young

PPM, INC., 32 W. Monroe, Bedford, Ohio, 44146, Tel: 216-232-1880; Sls. Mgr: A.L. Bletcher .... Pg. 535

Cal Mountain View, Morse Assocs., Box 507 415-968-7722
Cal Santa Fe Spgs., SLS. Engrs., 15408 Cornet 714-521-8673
Colo Boulder, J. Smith, Box 3257 303-449-7509
Conn Meriden, Abbott-Allison, Box 467 203-237-9232
Mich Livonia, Palmer Elec., 33645 Wood 313-538-5125
Minn Mpls., Container Sys., 5605 Lyndale Ave. S. 612-861-1566
Mo St. Louis, Wells-White, 7607 Page Blvd. 314-726-2511
NM Albuquerque, J. Smith, 5301 Central NE 505-255-2111
NY Syracuse, J. D. Birchard, Box 736 315-469-4689
NY Westbury, OAL Assocs., Box 788 516-334-1940
Ohio Cincinnati, Nelcor, Box 6506 513-751-0200
Wisc Milwaukee, Ellsworth Co., 9715 N. Lake 414-352-1230

PRACTICAL AUTOMATION, INC., Trap Falls Rd., Shelton, Conn., 06484, Tel: 203-929-1495; Sls. Mgr: D. Shaw

PRD ELCTRNS., INC., Sub. Harris-Intertype Corp., 1200 Prospect Ave., Westbury, N.Y., 11590, Tel: 516-334-7810, TWX: 510-222-4494; Sls. Mgr: E.T. McDonald

PRECISION DIPBRAZE TOR., 14715 Arminta St., Van Nuys, Cal., 91402, Tel: 213-786-6524; Sls. Mgr: J. Graham

PRECISION ELCTRNS. CORP., 427 Plain St., Marshfield, Mass., 02050, Tel: 617-834-6677; Pres: K.A. Williams

PRECISION ELECTRONICS, INC., 9101 King Ave., Franklin Park, Ill., 60131, Tel: 312-678-5350; Sls. Mgr: William Stow

PRECISION ELCTRNS., INC., 1 Di Tomas Ct., Amityville, N.Y., 11701, Tel: 516-598-2300; Sls. Mgr: J. Salit

PRECISION EXTRUSIONS, 702 E. Green Ave.. Bensenville, Ill., 60106, Tel: 312-766-0340; Sls. Mgr: J.W. Anderson

PRECISION INC., 3415-48th Ave., N., Minneapolis, Minn, 55429, Tel: 612-588-9441; Sls. Mgr: E.N. Honebrink

PRECISION INSTR. CO., 3170 Porter Dr., Palo Alto, Calif., 94304, Tel: 415-493-2222, TWX: 910-373-1752; Nat'l. Sls. Mgr: C.A. Paisley

PRECISION LAMP ENGRS., 114 Hamilton Dr., Novato, Cal., 94947, Tel: 415-883-5916; Sls. Mgr: H. McGill, Jr.

PRECISION MECHANISMS, 44 Brooklyn Ave., Westbury, N.Y., 11590, Tel: 516-ED-3-5955; Sls. Mgr: L.N. Canick .... Pg. 1876

Cal N. Hollywood, Comps. Sls., 11484 Oxnard 213-980-3400
Cal San Diego, Comps. Sls., 12696 Pacato Cir., N. 714-291-5799
Mass Lexington, Comps. Sls., 1789 Mass. 617-VO-2-1633
NY Hartsdale, Comps. Sls., 221 E. Hartsdale 914-SC-5-1050
NY Rochester, A & D Devices, 320 N. Washington 716-586-8033

PRECISION METAL PRODS. CO., 41 Elm St., Stoneham, Mass., 02180, Tel: 617-438-3650, TWX: 710-393-0113; Sls. Mgr: R.A. Degnan .... Pg. 2705

Ariz Scottsdale, J. Osborn Assocs., Box 968 602-948-0501
Cal Los Angeles, Galaxie Sls. Int'l., 1930 Wilshire 213-483-0910
Colo Denver, McLoud & Raymond Co., 2151 S. Grape St. 303-756-1589
Fla Orlando, W.R. Lehmann Co., Box 20275 305-841-4901
Ga Atlanta, W.R. Lehmann Co., Box 52786 404-237-0600
Ill Chicago, Rusz Sls. Co., 7740 Ardmore 312-NE-1-7322
Ind Ft. Wayne, B. F. Homsher, 418 E. Berry 219-432-1164
Md Baltimore, M/E Assocs., 320 Hillen 301-VA-5-1130
Mass W. Concord, Sls. Engrg., Baker Ave. 617-VO-2-7320
Mich Lathrup Village, R.C. Nordstrom, Box 32 313-444-4417
Minn Minneapolis, F. Peterson Co., Box 16224 612-927-4453
Mo St. Louis, J.J. Vondras & Co., Box 10121 314-837-0645
NJ Cherry Hill, M/E Assocs., 314 Columbia 609-667-6110
NY Mt. Vernon, Zauderer Assocs., Box 342 914-664-7385

NY Syracuse, C.W. Floring & Assoc., Box 175 315-478-2149
Ohio Dayton, Electro-Com, 1700 Needmore 513-276-3993
Tex Dallas, Engineers Int'l. Co., Box 35601 214-352-2666
Va Richmond, M/E Assocs., 8300 E. Buckeye Dr. 703-266-3457
Wash Seattle, W.J. Stulgis, 608 W. Crockett 206-AT-2-7870

PRECISION MONOLITHICS, 1500 Space Park Dr., Santa Clara, Cal., 95050, Tel: 408-246-9220, TWX: 910-338-0528; Sls. Mgr: F. Burge ....Pgs. 1545-1547
Ala Huntville, W. A. Brown Comps., 1314 Buford St. N.W. 205-539-4411
Ariz Scottsdale, C. T. Fink & Assoc., Box 434 602-947-7981
Cal Burbank, Tech-Ser, 2435 N. Naomi St. 213-846-9631
Cal Palo Alto, Tech-Ser, 800 San Antonio Rd. 415-326-6400
Cal San Diego, Tech-Ser, Box 10544 714-222-1121
Colo Denver, Electro-Rep., 1051 S. Platte River Dr. 303-744-2821
Conn West Hartford, Instr. Dynamics, 345 N. Main St. 203-233-5503
Fla Ft. Lauderdale, W.A. Brown Comps., 961 N.W. 53rd St. 305-564-8000
Fla Orlando, W.A. Brown Comps., Box 513 305-425-5505
Ill Chicago, G. McL. Cole, 6514 W. Higgins Rd. 312-774-3535
Ind Greenwood, Valentine-Schillinger, Box 242 219-291-6258
Ind South Bend, Valentine-Schillinger, 1811 Thornhill Dr. 317-881-3547
Md Baltimore, Stemier Assoc., 6707 Whitestone Rd. 301-944-8262
Mass Wakefield, Instr. Dynamics, Lakeside Off. Pk. 617-245-5100
Mich Detroit, A. Blumenberg, Box 25, College Pk. 313-341-4737
Minn St. Paul, Cahill Assocs., 3000 Hudson Rd. 612-739-8445
Mo Kansas City, Harris-Hanson, 7916 Paseo St. 816-444-9494
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood Blvd. 314-962-0111
NJ Cherry Hill, Stemier Assocs., Box 287 609-966-4070
NM Alburquerque, Electro-Rep, 3211 Silver S.E. 505-256-1749
NY Fayetteville, M. P. Andrews, 319 Mott Rd. 315-637-3144
NY Great Neck, H. J. Krasner, 33 Great Neck Rd. 516-487-0690
NC Winston-Salem, W. A. Brown Comps., 1108 Burke St. 919-725-5384
Ohio Dayton, Whelan Corp., 2600 Far Hills Ave. 513-298-9997
Pa. Paoli, Stemier Assoc., Box 711 215-644-3477
Tex Dallas, R. R. Thomas Co., 8616 N.W. Plaza Dr. 214-363-8591
Tex Houston, E. Smith Sls. Co., 7007 Gulf Frwy. 713-649-5756
Va Alexandria, Stemier Assocs., 206 N. Washington St. 703-548-7818
Wash Seattle, Showalter-Judd, 1806 S. Bush Pl. 206-324-7911

PRECISION PAPER TUBE CO., 1033 S. Noel Ave., Wheeling, Ill., 60090, Tel: 312-537-4250; Sls. Mgr: A. Johnson

PRECISION RESISTOR CO., 109 U.S. Hwy. 22, Hillside, N.J., 07205, Tel: 201-926-3036; Sls. Mgr: R.L. Wright

PRECISION SCI. CO., Sub. GCA Corp., 3737 W. Cortland St., Chicago, Ill., 60647, Tel: 312-227-2660, TWX: 910-221-3122; Sls. Mgr: J.W. Black

PRECISION SENSORS, INC., P.O. Box 297, Trumbull, Conn, 06611, Tel: 203-377-3773, TWX: 710-453-2069; Sls. Mgr: R.F. Wolfe

PRECISION STANDARDS CORP., 1701 Reynolds, Santa Ana, Cal., 92705, Tel: 714-546-0431; Sls. Mgr: E.M. Zimmer, Jr. ....Pgs. 541-544
Ala Huntsville, W.A. Brown Comps., 1314 Buford St., N.W. 205-539-4411
Cal Redwood City, General Inline Tech., 688 Main St. 415-365-1859
Cal Los Angeles, General Inline Tech., 11660 Chenault St. 213-476-5103
Colo Denver, J.F. Hurlbut Co., 1295 S. Bannock St. 303-744-1451
Conn Hamden, Instrument Conslts., 2381 Whitney Ave. 203-288-5246
Fla Ft. Lauderdale, W.A. Brown Comp., 961 N.W. 53rd St. 305-566-5697
Fla Orlando, W.A. Brown Comp., 222 Weber Ave. 305-425-5505
Ill Chicago, L.F. Green & Assocs., 5218 W. Diversey Ave. 312-286-6824
Ill Chicago, Carter Elctrns., 4919 W. 63rd St. 312-585-5485
Ind Indpls., L.F. Green & Assocs., 1111 E. 54th St. 317-253-2087
Ind Indpls., Carter Elctrns., 6333 Hollister Dr. 317-293-0696
Mass Needham, Addelco, 56 Pickering St. 617-444-4754
Mass Waban, Instr. Conslts., 81 Wyman St. 617-969-9881
Minn Minneapolis, Carter Elctrns., 1025B Evergreen La. 612-544-9393
Minn Minneapolis, L.F. Green & Assocs., 6225 University Ave., N.E. 612-781-1611
Mo Hazelwood, Carter Elctrns., 400 Brooks Dr. 314-731-2237
Mo St. Louis, B. Adler Assocs., 2573 Woodson Rd. 314-423-7200
NJ Hohokus, Hansen Assocs., 215 Brookside Ave. 201-652-7055
NY Huntington, Hansen Assocs., Box 175 212-947-0379
NY Fayetteville, M.P. Andrews, 319 Mott Rd. 315-637-3144
NC Winston-Salem, W.A. Brown Comps., 1108 Burke St. 919-725-5384
Ohio Worthington, Ohio Instr., 505 Whitney Ave. 614-885-0743
Pa Fairview Vill., Acromatix Assocs., 3118 Germantown Pike 215-279-0377
Pa King of Prussia, Letronix, 251 W. De Kalb Pike 215-265-1020
Tex Dallas, Southwest Elctrn. Inds., 621 Meadows Bldg. 214-363-1671
Tex Houston, Southwest Elctrn. Inds., 1405 S. Post Oak Rd. 713-621-3760
Utah Salt Lake City, J.F. Hurlbut, 3605 S. Bannock St. 801-299-4321
Va Alexandria, W.A. Brown Equip., 325 First St. 703-836-1800
Wash Seattle, J.K. Dooley Co., 4110 Stone Way., N. 206-632-1618
Wisc Milwaukee, Carter Elctrns., 6400 W. Capitol Dr. 414-464-5555
For: Can., Montreal, Que., Electro-design, 840 La Fleur 514-363-5120
For: Can., Toronto, Ont., Electro-design, 3433 Bathurst St. 416-787-0991
For: Can., Vanier-Ottowa, Ont., Electro-design, 290 Montreal Rd. 613-745-0541

PRECISION SWITCH, 181 Westchester Ave., Port Chester, N.Y., 10573, Tel: 914-937-5247; Sls. Mgr: G.M. Blaney

PRECISION TIMER, Westbrook Ind'l. Commons, Westbrook, Conn., 06498, Tel: 203-399-6253; Sls. Mgr: A.B. Hunicke ....Pgs. 1341-1344

PRECISION TUBE, Church Rd. & Wissahickon, No. Wales, Pa., 19454, Tel: 215-699-5801, TWX: 510-661-8427; Sls. Mgr: J.P. Johnson

PREFERRED ELECTRONICS, INC., Main Line Dr., Westfield, Mass., 01085, Tel: 413-568-2301; Sls. Mgr: P.A. Muto

PREFORMED LINE PRODS. CO., 5349 St. Clair Ave., Cleveland, Ohio, 44103, Tel: 216-881-4900; Sls. Mgr: M.A. Lekson

PREIS, H.P. ENGRAVING MACH. CO., 651 U.S. Hwy. 22, Hillside, N.J., 07205, Tel: 201-686-7736; Sls. Mgr: M.H. Preis

PREMAX PRODS. DIV., Chisholm-Ryder Co., Inc., Highland & College Aves., Niagara Falls, N.Y., 14305, Tel: 716-285-9186; Pres: M.C. Llop

PREMIER METAL PRODS. CO., Div. of Sunshine Mining Co., 337 Manida St., Bronx, N.Y., 10474, Tel: 212-991-6600; Sls. Mgr: B. Klinger ....Pgs. 2322,2323
Cal Whittier, DeAngelo, Rothman, 11936 E. Wash. 213-945-2341
Colo Denver, R. Bowen Co., 1440 S. Sante Fe 303-722-4641
Fla Orlando, Atcheson & Adams, Box 2171 305-424-9491
Ga Decatur, Atcheson & Adams, Box 877
Ill Chicago, Ellinger Sls., 6580 N.W. Hwy. 312-763-1570
Md Baltimore, E-K-P Assocs., 1626 Forest Pk. 301-747-3170
Mass Needham, Eagle Assocs., Inc. 617-444-3446
Mich Farmington, Carter, McCormic & Pierce, 23995 Freeway Pk. Dr. 313-477-7700
NJ Marlton, E-K-P Assocs., N. Maple 609-983-0650
NY Great Neck, Harris & Aldrich, 320 Northern 516-466-4122
NY Liverpool, Lewis-Dunnigan, 107 Riverline 315-622-2133
NY Mt. Vernon, D. Sonkin, 10 Fiske Pl. 914-MO-8-9809
NC Greenboro, Adams, 1300 Westover 919-272-6838
Ohio Cleveland, Mike Roth, 678 S. Green 216-382-9090
Okla Tulsa, G.V. Peck Co., Box 15671 918-LU-5-5853
Pa Easton, E-K-P, 1346 Spring Garden 215-252-6373
Tenn Knoxville, Atcheson & Adams, Maloney Rd., Rte. 3 615-577-4241
Tex Dallas, G. Peck, 210 Casa Linda Plaza 214-DA-8-3511
Tex Houston, G. Peck, 5757 Bellaire Blvd. 713-MO-4-1435
Utah Salt Lake City, R.G. Bowen, 1380 W.N. Temple 801-364-4632
EXP: N.Y., Hicksville, Emec, Inc., 55 E. Old Country Rd. 516-WE-1-3700

PREMIER MICROWAVE, 35 New Broad St., Port Chester, N.Y., 10573, Tel: 914-939-8900, TWX: 914-937-5080; Sls. Mgr: J. Simmonds

PRENTICE ELCTRNS. CORP., 795 San Antonio Rd., Palo Alto, Calif., 94303, Tel: 415-327-0490; Dir. Mktg: W. Backus

PRESS-ON PRODS., 39 Factory Rd., Addison, Ill., 60101, Tel: 312-543-9466; Sls. Mgr: T. Cummins

PRESIN CO., INC., Trap Falls Rd., Shelton, Conn., 06484, Tel: 203-929-1495; Sls. Mgr: M. Tyler ....Pg. 1345
Cal Los Angeles, Tucul Engrg., 6402 Crenshaw 213-750-0338
Cal San Fran., Electro Pacific, 2524 Franklin 415-776-8582
Colo Denver, D.E. Bond, 5505 E. Evans Ave. 303-756-1234
Conn W. Hartford, Instr. Dynamics, 345 N. Main 203-233-5503
Fla Melbourne, Reynolds, 822 E. Strawbridge 305-727-3205
Md Towson, Kraft Elctrn., 510 Woodbine 301-828-5838
Mass Wakefield, Instr. Dynamics, Lakeside Off Pk-Door #7 617-245-5100
Mich Ann Arbor, H.C. Heym, 1615 Chalmers 313-971-6552
NJ S. Hackensack, Engrd. Prods., 290 Huyler 201-488-4040
Minn Mpls., Wenco Sls., 7728 Morgan Ave., S. 612-866-3639
NY Syracuse, Lightstone, E. Molloy 315-454-3209
Ohio Chagrin Falls, J. Kilroy, Box 365 216-247-8997
Pa. Newtown Sq., Holdsworth, 8 Smedley 215-356-8550

PRESSTEEL CO., 9705 E. Garvey Ave., El Monte, Calif., 91733, Tel: 213-283-1225; Pres: W.H. Mead

PRESTOLITE WIRE & CABLE, Box 649, Port Huron, Mich., 48060, Tel: 313-985-6131, TWX: 313-985-8529; Dir. Sls: V.R. Steinmeyer

PRESTON SCIENTIFIC, 805 E. Cerritos Ave., Anaheim, Cal., 92805, Tel: 714-776-6400; Sls. Mgr: B. Spear Pgs. 373,549,1293
Ala Huntsville, Int'l. Sci. Instrs., Box 2091 205-837-1601
Ariz Phoenix, Williams Assocs., 2250 N. 16th. 602-254-6085
Cal Palo Alto, B. Oppenheim, Inc., Box 11127 415-321-7323
Cal Westchester, Burtis Instr. Sls., 8921 S. Sepulveda Blvd. 213-670-5863
Colo Denver, Williams Assocs., 4971 Jackson 303-388-4391
Conn W. Hartford, Instr. Dynamics, 345 N. Main 203-233-5503
Fla Orlando, Truex Assocs., 3165 McCrory 305-841-8931
Ill Chicago, Megatek, 1915 N. Harlem 312-889-1277
Md College Pk., Riffe Assocs., 4313 Knox Rd. 301-779-7770
Mass Wakefield, Instr. Dynamics, Lakeside Off. Pk. 617-245-5100
Mich Detroit, B. Hocker, 26847 Grand River 313-531-1403
Minn Hopkins, Megatek, Inc., 128 N. Jackson 612-935-5243
NM Albuquerque, Williams, 420 Wash. S. E. 505-255-1838
NY Cortland, RJC Assocs., 26 Morningside Dr. 315-457-3220
Ohio Dayton, B. Hocker, 1400 Devereux Dr. 513-298-8638
Okla Tulsa, Applied Science Assocs., 7966 E. 41st 918-NA-7-6199
Pa Jenkintown, Stein Instr., 413 Johnson 215-885-2370
Tex Dallas, Applied Science, 2929 Ladybird 214-352-4829

Tex Houston, Applied Science Assocs., 7211 Hillcroft Rd. 713-781-1441
WashBellevue, Brennan, 208 Carlson Bldg. 206-454-9332

PRICE ELEC. CO., E. Church & 2nd Sts., Frederick, Md., 21701, Tel: 301-663-5141, TWX: 710-862-0901; Sls. Mgr: B.L. Reeder

PRICE & RUTZEBECK, Box 30, Hayward, Calif., 94543, Tel: 415-582-3062; V.P: L. Steinberger

PRIMO CO., LTD., 1 - 25, 6-chome, Mure, Mitakashi, Tokyo, Japan, Tel: 0422-43-3121; Sls. Mgr: M. Nomura Pg. 320
Ill Chicago, Primo Co., Ltd., 530W Surf St. 312-472-6142

PRINCETON APPLIED RESCH. CORP., Box 565, Princeton, N.J., 08540, Tel: 609-452-2111; Sls. Mgr: B. Lubow

PRINCETON ELCTRN. PRODS., Box 101, New Brunswick, N.J., 08902, Tel: 201-297-4448; Sls. Mgr: W.M. Herbener

PRINCO INSTRS., Industrial Pk., Southampton, Pa., 18966, Tel: 215-EL-5-1500; Sls. Eng: G.G. Pfaff

PRINTACT RELAY DIV., Executone Inc, Box 1430EM, Long Island City, N.Y., 11101, Tel: 212-EX-2-4800; Div. Mgr: J.A. Richards ....Pg. 1784
Ala Birmingham, F. Nickerson, Box 9679 205-853-2852
Ariz Scottsdale, OEN Specialties, 6625 E. MacDonald 602-946-4617
Cal San Diego, Qualtronics, 3731 6th Ave. 714-291-3991
Cal San Francisco, R. Slater, 420 Market 415-392-9154
Cal Tarzana, R. Capell Co., Box 723 213-987-2233
Colo Colorado Spgs., Elctrn. Mfrs. Cons., Box 503 303-636-5131
Fla Oldsmar, F. C. Nickerson Co., Box 40 813-855-4209
Fla Tampa, F.C. Nickerson, Box 13126 813-833-4321
Ga Decatur, F. C. Nickerson, Box 33185 404-377-1575
Ill Chicago, Matthews-Midwest, 5439 W. Lawrence 312-725-1500
MassNorthboro, Lewis & Tupper, Box 132 617-393-8449
NJ Livingston, A.A. Budde, Box 226 201-994-1210
NJ Cherry Hill, Billis Sls., 14 Galway La. 609-428-3650
NY Baldwinsville, Scibetta Reps., 7484 River 315-652-7324
NY Jamaica, S.A.M. Assocs., 150-08 87th 212-658-8881
NC Charlotte, F. C. Nickerson, 5817 Haddington 704-537-2855
Okla Tulsa, G. V. Peck, Box 15671 918-585-5853
Pa Phila., H. Goodman, 401 W. Mt. Airy 215-CH-7-7116
Tex Dallas, G. V. Peck, Box 18627 214-328-3511
Tex Houston, G. V. Peck, 5757 Bellaire 713-664-1435
WashSeattle, R. R. Slater, Terminal Sls. Bldg. 206-622-3860
For: Can., Scarborough, Ont., Banke Elctrns., Ltd., 1149 Bellamy Rd. 416-291-7529

PRIVATE TELE-COMMS., INC., 1300 W. Belmont Ave., Chicago, Ill., 60657, Tel: 312-477-0100; Sls. Mgr: D.L. Erickson

PRO-CHEM, INC., 16530 Broadway Ave, Cleveland, Ohio, 44137, Tel: 216-663-6618; Sls. Mgr: J. Brillhart

PROCESS & INSTRS. CORP., 1943 Broadway, Brooklyn, N.Y., 11207, Tel: 212-452-8380; Sls. Mgr: J. Greenspan

PRODELIN, INC., Box 131, Hightstown, N.J., 08520, Tel: 609-448-2800; Gen'l Sls. Mgr: K. Robinson

PRODUCTS FOR RESEARCH, INC., 78 Holten St., Danvers, Mass., 01923, Tel: 617-774-3250; Sls. Mgr: M.R. Cole

PROFILE ELCTRNS., INC., Box 314, Concord, N.H., 03301, Tel: 603-224-2556; Sls. Mgr: A.W. Wright

PROGRAM DATA CO., 739 E. 223rd St., Torrance, Cal., 90502, Tel: 213-830-3016; Sls. Mgr: R. Russo Pg. 2706
ConnOld Saybrook, M.L. Assocs., 5 Ruth Dr. 203-388-9414
Ill Des Plaines, Martec Assocs., 1616 Linden 312-296-3331
MassMarlboro, M.L. Assocs., 96 Helen Dr. 617-485-6190

PROJECTS UNLIMITED, INC., 1926 E. Siebenthaler Ave., Dayton, Ohio, 45414, Tel: 513-278-4244, TWX: 810-459-1970; Sls. Mgr: G. Gianopulos

PROTO TOOL CO, Div. of Pendelton Tool Inds. Inc., 2209 Santa Fe Ave., Los Angeles, Calif., 90054, Tel: 213-589-3311, TWX: 910-321-4180; Mgr. Mktg: P.I. Keables

PROTOTYPE TRANSFORMER CORP., 545 N. Arlington Ave., E. Orange, N.J., 07017, Tel: 201-672-2400; Vice Pres: H.J. Gaynor

PRYOR MARKING PRODS., 21 E. Hubbard, Chicago, Ill., 60611, Tel: 312-527-2048

PULSE ENGRG., INC., Box 12235, San Diego, Cal., 92112, Tel: 714-453-6010, TWX: 910-322-1134; Sls. Mgr: L.C. Oakley

PULSE MONITORS, INC., Sub. Tele Sciences Inc., 351 New Albany Rd., Moorestown, N.J., 08057, Tel: 609-234-0556; Sls. Mgr: E. Hoeg

PULSE TECHNIQUES, INC., 1411 Palisade Ave., W. Englewood, N.J., 07666, Tel: 201-837-2575; Sls. Mgr: W.O. Summerlin

PURE CARBON CO., INC., 441 Hall Ave., St. Marys, Pa., 15857, Tel: 814-834-1573; Sls. Mgr: J.M. Clark

PUREGAS EQUIP. CORP., Div. General Cable Corp., 1445 Strongs Rd., Copiague, N.Y., 17726, Tel: 516-226-8000; Sls. Mgr: R. Dale

PURITAN-ZEP, Div. Puritan Equip., 11 Penn St., El Segundo, Cal., 90245, Tel: 213-772-1421; Dir. Mktg: J.A. McBride

PYCO, INC., 604 E. Lincoln Hwy., Penndel, Pa., 19047, Tel: 215-757-3704; Sls. Mgr: T.E. Wehr

PYLE-NATIONAL CO., Div. Harvey Hubbell, Inc., 1334 N. Kostner Ave., Chgo., Ill., 60651, Tel: 312-342-6300, TWX: 910-221-0335; Sls. Mgr: C. Currie

PYLE-NATIONAL DIV., HARVEY HUBBELL, Military Connector Div., 1334 N. Koster, Chicago, Ill., 60651, Tel: 312-DI-2-6300; V.P. Sls: R.F. Felgenhauer

PYLON CO., INC., 51 Newcomb St., Attleboro, Mass., 02703, Tel: 617-222-3726; Sls. Mgr: R.M. Pozzo

PYROFERRIC-ILLINOIS, INC., 200 Madison St., Toledo, Ill., 62468, Tel: 217-849-3300; V.P. & Sls. Mgr: E.T. Brooks

PYROFERRIC - N. Y., INC., Bronx Blvd. at 216th St., Bronx, N.Y., 10467, Tel: 212-654-3930

PYROFILM CORP., 60 S. Jefferson Rd., Whippany, N.J., 07981, Tel: 201-887-8100, TWX: 710-986-8220; V.P. Mktg: J.A. Cook

PYROMETER INSTR. CO., INC., 234 Industrial Pkwy., Northvale, N J, 07647, Tel: 201-768-2000, Sls. Mgr: J.R. Reilly

Q.V.S., INC., 20 North 15th St., East Orange, N.J., 07017, Tel: 201-673-3996; Sls. Mgr: F.D. Fogle

QUALIDYNE CORP., 3699 Tahoe Way, Santa Clara, Cal., 95014; Mktg. Mgr: D. Hauer

QUALITY DOCUMENTS CO., 18 Hamilton St., Bound Brook, N.J., 08805, Tel: 201-469-3212; Sls. Mgr: R. Diamond

QUAM-NICHOLS CO., Marquette Rd. at Prairie Ave., Chicago, Ill., 60637, Tel: 312-HU-8-5800; Sls. Mgr: W. Johns

QUAN-TECH, Div. KMS Inds., Inc., 43 S. Jefferson Rd., Whippany, N.J., 07981, Tel: 201-887-5508, TWX: 710-986-8251; Sls. Mgr: B. Whitlock ....Pgs. 545-548
Cal Los Altos, J. Stone, 339 S. San Antonio 415-948-4563
Cal Pasadena, A-F Sls. Engrg., 1000 E. Walnut 213-MU-1-5631
Colo Denver, J. Hurlbut, 1295 S. Bannock St. 303-744-1451
Fla Windemere, R. Attaway, Box 433 305-424-9983
Ill Chicago, K. Meyers, 7256 W. Touhy 312-774-6440
Ind Indianapolis, K. Meyers, 3512 Rockville 317-243-6681
Md Silver Spring, Sel-Tronics, 721 Ellsworth Dr. 301-589-3391
MassBelmont, Vector Sls., 774 Pleasant St. 617-489-1400
Mich Detroit, S. Sterling, 17500 W. McNichols 313-255-1970
Minn Mpls., K. Meyers, 4725 Excelsior Blvd. 612-920-7080
Mo St. Louis, S. Sterling, 11734 Lackland Ind'l. Dr. 314-542-3636
NJ Saddle Brook, L&M Assoc., 511 Victor 201-843-8700
NY Brentwood, L&M Assoc., 7 Mayflower 516-231-8363
NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314
NC Winston-Salem, Radco, 614 Nissen Bldg. 919-722-9671
Ohio Cleveland, S. Sterling, 5827 Mayfield 216-442-8080
Ohio Dayton, S. Sterling, 2673 Culver 513-298-7573
Pa Andalusia, L&M Assoc., 965A Bristol Pike 215-639-3100
Pa Pittsburgh, S. Sterling, 2 Parkway Ctr. 412-922-5720
Tex Dallas, True Technology, 12016 Fieldwood 214-239-7741
Utah Granger, J. Hurlbut, 3817 W. 3280 S. 801-299-4321
WashSeattle, J. Dooley, 4110 Stone Way N. 206-ME-2-1618
EXP: N.Y. N.Y., S. Ginsbury, 425 Park Ave. S. 212-689-5212
For: Can., Edmonton, Alberta, Can. Marconi, Box 3812 403-429-3387
For: Can., Calgary, Alberta, Can. Marconi, Box 5037 403-243-7751
For: Can., Vancouver, B. C., Can. Marconi, 3636 E. 4th Ave. 604-291-2331
For: Can., Winnipeg, Man., Can. Marconi, 1865 Sargent Ave. 204-775-0347
For: Can., St. John's, Newfoundland, Can. Marconi, 20 Barnes 709-578-2881
For: Can., Halifax, N.S., Can. Marconi, 3480 Prescott 902-454-8321
For: Can., Don Mills, Ont., Can. Marconi, 103 Railside 416-445-9900
For: Can., Ottawa, Ont., Can. Marconi, 880 Welling 613-232-1672
For: Can., Montreal, Que., Can. Marconi, 2442 Trenton 514-343-3411

QUANTROL ELCTRNS., INC., 1820 Mills Ave., El Paso, Tex., 79901, Tel: 915-532-4651; Sls. Mgr: C. Schlachte

Advertisement

Quantrol Electronics Inc. manufactures a complete line of photoconductive devices including custom design arrays that have been unavailable from suppliers using other manufacturing techniques. Consulting available for all photosensor problems.

QUANTRONIX CORP., 225 Engineer Rd., Smithtown, N.Y., 11787, Tel: 516-273-6900; Sls. Mgr: E. Fruchter

QUANTUM SENSING, INC., 1650 Locust Ave., Bohemia, N.Y., 11716, Tel: 516-589-0456; Sls. Mgr: G.D. Jones

QUARTZ RADIATION CORP., 1275 Bloomfield Ave., Fairfield, N.J., 07006, Tel: 201-228-4200; Sls. Mgr: W.J. Hennessy

QUARTZ & SILICE, 8 Rue d'Anjou, Paris 8e, France, Tel: 265-1730, TWX: 65290 Silis Paris

QUARTZITE PROCESSING, INC., 6 Holyoke St., Malden, Mass., 02148, Tel: 617-322-1380; Sls. Mgr: P.S. Yanofsky

QUEENSBORO TRANSFORMER & MACH., 115-25 15th Ave., College Pt., N.Y., 11356, Tel: 212-461-5552; Sls. Mgr: K. Simon

QUINDAR ELCTRNS., INC., 60 Fadem Rd., Springfield, N.J., 07081, Tel: 201-379-7400; Sls. Mgr: J.S. Tennant Pg. 953
Alas Ankorage, Comm. Engrg., 350 Mountainview
Ariz Mesa, Special Sys., 105 Horne 602-964-5807
Ark Little Rock, G. Salisbury, 500 E. Markham 501-375-1383
Cal L.A., Garland Affolter Eng., 417 S. Hill 213-MA-4-1864
Cal Los Altos, Westec Elctrns., 110-1st St. 415-948-8880
Cal San Francisco, Garland Affolter Eng., 58 Sutter 415-EX-7-1800
Cal San Jose, Quindar Elctrns., 1741 Saratoga 408-257-3028
Colo Denver, Hamilton Assocs., 1236 Elati St. 303-244-2901
Del Delmar, Good Elctrns., 908 Grove St. 302-846-9759
Fla Coral Gables, Taulman, 417 Biltmore Way 305-443-4601
Fla Melbourne, Dickerson Eng. Sls., 905 N. Harbor City Blvd. 305-254-1591
Ga Atlanta, Taulman, 415 E. Paces Ferry 404-237-0311
Ga Doraville, Taulman, 3264 McCall Dr. 404-458-2283
Haw Honolulu, Intelect, 818 Kapioloni Blvd. 510-437
Ill Arlington Hgts., C.M.D. Corp., 1114 N. Arlington Hgt. 312-394-5200
Ill Chicago, Bell & Gustus, 4331 N. Elston 312-478-9353
Ill Chicago, Quindar Elctrns., 428 E. Carpenter Dr. 312-358-3955
Ill Glen Ellyn, J. Becker, 799 Roosevelt 312-858-1910
Ind Connersville, Relcon, Box 307 317-825-2194
Ind Indianapolis, Utility & Ind'l Prod., 3925 N. College 317-924-3607
La Baton Rouge, G. Salisbury, Box 15767 504-342-2873
La New Orleans, G. Salisbury, 805 S. Front 504-524-5207
La Shreveport, G. Salisbury, Box 5487 318-865-7677
MassNewton, Techmar, Inc., 56 Elmwood 617-444-8130
Mich Marquette, NWR Elctrns., 1010 W. Washington 906-226-7578

Minn Virginia, NWR Elctrns., Box 118 Hoover Rd. 218-741-5080
Miss Jackson, G. Salisbury, 350 N. Mart Plaza 601-EM-2-1671
Neb Omaha, N.V.S., Inc., 8945 "J" St. 402-397-3414
NJ Springfield, Quindar Elctrns., 60 Fadem 201-379-7400
NY Lynbrook, Puleo Elctrns., 39 Hutcheson Pl. 516-599-4875
NC Charlotte, Ranson Wallace, 116-1/2 E. 4th St. 704-334-4244
Ohio Cleveland, P. E. Lax, 13945 Lake Ave. 216-226-8815
Okla Tulsa, D. Allert, Box 7351 918-743-1107
Ore Portland, Garland Affolter Eng., 1233 NW 12th Ave. 503-CA-3-7349
Pa Media, Sys. Control, 10 S. Orange 215-565-2077
Pa Pittsburgh, P. E. Lax, 1725 Washington 412-833-5477
Tenn Memphis, G. Salisbury, 240 S. Parkway E. 901-948-0496
Tex Dallas, J. Almond, Box 20815 214-241-6369
Tex Ft. Worth, J. B. Doran, 3705 Bellaire Dr. S. 817-926-1301
Tex Houston, Quindar Elctrns., 12315 Woodthorpe 713-HO-4-1178
Tex San Antonio, R. D. Erb Co., Box 12428 512-227-7070
Va McLean, Quindar Elctrns., 6438 Noble Dr. 202-296-0094
Wash Bellevue, Garland Affolter Eng., 10843 NE 8th St. 206-GL-4-2485

R-COLUMBIA PRODS., INC., 2008 St. John's Ave., Highland Park, Ill., 60035, Tel: 312-432-7915; Sls. Mgr: E. Smith

REM-TRONICS, 192 Central Ave., Silver Creek, N.Y., 14136, Tel: 716-934-2692, TWX: 510-246-6940

RACAL COMMUNICATIONS, 5 Research Pl., Rockville, Md., 20850, Tel: 301-948-4420; R.H. Foley

RADIAL CONTROLS DIV. NICELY CORP., 2555 E. 55th Pl., Indianapolis, Ind., 46220, Tel: 317-255-2796; Sls. Mgr: R. Newsom

RADIATION DEVICES CO., Box 8450, Baltimore, Md., 21234; Sls. Mgr: P.E. Benson

Advertisement

Radiation Devices Co. manufactures an economical line of instruments and accessories for the measurement of basic electrical quantities from D-C to 2GHz. Included in this line are the RF Multimeter, RFM-1; Reflection Coefficient Bridges, Terminations, VSWR Standards, Coaxial RF Detectors, Broadband RF Amplifiers, Frequency and Time Base Calibrators, Active Filters and Active Filter Components.

RADIATION DYNAMICS, INC., 1800 Shames Dr., Westbury, N.Y., 11590, Tel: 516-334-3990; Sls. Mgr: R.L. Malnati

RADIATION SYS., INC., 1755 Old Meadow Rd., McLean, Va., 22101, Tel: 703-893-5500, TWX: 710-833-9896; Sls. Mgr: G.E. Winkler

RADIO FREQUENCY CO., INC., 50 Park St., Medfield, Mass., 02052, Tel: 617-762-4900

RADIO MATERIALS CO., Div. P.R. Mallory, 4242 W. Bryn Mawr Ave., Chicago, Ill., 60646, Tel: 312-478-3600, TWX: 910-221-2195; Sls. Mgr: R. Merritt ....Pg. 2435

Ariz Phoenix, J. Berman, 2101 W. Shangri La 602-944-3361
Cal Burlingame, W.C. Stafford, 801 Mahler 415-697-6766
Cal La Mirada, RMC Div. P.R. Mallory, 14659 Alondra Blvd. 213-921-7939
Conn Meriden, Eagle Assocs., Box 921 203-237-5527
Fla Orlando, RMC Div. P.R. Mallory, 7040 Lake Ellenor Dr. 305-855-6353
Ill Chicago, RMC Div. P.R. Mallory, 4242 Bryn Mawr Ave. 312-724-1468
Kans Leawood, Vasen Sls., 8005 Ensley 913-649-0679
Mass Needham, Eagle Assocs. 617-444-3446
Minn St. Paul, Rhode Elctrn. Sls., 3000 Hudson 612-739-0050
NJ Marlton, J. Kornberger, Box 218 609-428-4050
NY Plandome, F. Spellman, 24 West Dr. 516-MA-7-3399
NY Syracuse, N. Matchuk, 4312 W. Genesee 315-488-3251
Ohio Cincinnati, A. Wahl, Box 15220 513-821-3270
Ohio Columbus, A. Wahl, 1153 Trentwood 614-486-7719
Ohio Dayton, A. Wahl, 2122 Mershon 513-252-0961
Okla Tulsa, G.V. Peck Co., Box 15671 918-585-2853
Ore Portland, Earl & Brown, Box 25408 503-292-9145
Tex Dallas, G. Peck, 210 Casa Linda 214-328-3511
Tex Houston, G. Peck, 5757 Bellaire Blvd. 713-664-1435
Wash Seattle, Earl & Brown, Box 9285 206-AT-4-1121
EXP: Ind., Indianapolis, Mallory, 3029 E. Wash. 317-636-5353
For: Can., Toronto, Ont., P. Heenan, 12 Donoliffe 416-486-5353

RADIO RESCH. CO., 189 Mt. Pleasant Ave., Rockaway, N.J., 07866, Tel: 201-627-1754; Sls. Mgr: A.W. Adler

RADIO SPECIALTY MFG. CO., 2023 Southeast 6th Ave., Portland, Ore., 97214, Tel: 503-232-8123; Sls. Mgr: K.C. Johnson

RADIO SWITCH, State Hwy. 79, Marlboro, N.J., 07746, Tel: 201-462-6100; Sls. Mgr: F.L. Gaskill

RADIOEAR CORP., 375 Valley Brook Rd., Canonsburg, Pa., 15317, Tel: 412-941-9000; Sls. Mgr: R.M. Tatum

RAE CO. INC., 3725 East 13th St., Indianapolis, Ind., 46201, Tel: 317-638-6443; Sls. Mgr: J. Brown

RAE MOTOR CORP., Box 518, McHenry, Ill., 60050, Tel: 815-385-3500; Sls. Mgr: T.C. Hansen

RAFEC ELCTRNS., Box 566, Temple City, Calif., 91780, Tel: 213-285-4078; Sls. Mgr: R.A. Hergert

RAGEN PRECISION INDS., INC., 9 Porete Ave., N. Arlington, N.J., 07032, Tel: 201-997-1000; Sls. Mgr: W.J. Saunders

RAILWAY COMM., 9351 E. 59th St., Raytown, Mo., 64133, Tel: 816-353-2100; Sls. Mgr: E.E. Tuel

RAM CHEMS., Div. Whittaker Corp., 210 E. Alondra Blvd., Gardena, Calif., 90248, Tel: 213-FA-1-0710; Sls. Mgr: R.M. Simpson

RAM METER, INC., 1100 Hilton Rd., Ferndale, Mich., 48220, Tel: 313-LI-7-1000; Sls. Mgr: R.M. Whalen

RAMA CORP., 39651 Esplanade St., San Jacinto, Calif., 92383, Tel: 714-654-7351; Sls. Mgr: M.M. Renshaw

RAMM RECTIFIER CO., INC., 340 Coster St., Bronx, N.Y., 10474, Tel: 212-991-4200; Sls. Mgr: T. Mendel

RAMSAY ENGRG. CO., 707 N. Anaheim Blvd., Anaheim, Calif., 92805, Tel: 714-774-5511; Pres: S.P. Ramsay

RANDAM ELCTRNS., INC., 3091 Shadycrest Dr., Cincinnati, Ohio, 45239, Tel: 513-522-3322; Sls. Mgr: J.L. Hummeldorf

RANDOLPH PRODS. CO., 12th St., Carlstadt, N.J., 07072, Tel: 201-438-3700; Sls. Mgr: J. Randolph

RANDTRONICS, INC., 2165 Park Blvd., Palo Alto, Cal., 94306, Tel: 415-328-2640; Sls. Mgr: M. Apcar

RANK PRECISION INDS., 260 N. Rte. 303, Box 463, W. Nyack, N.Y., 10994, Tel: 914-358-4450; Sls. Mgr: M. Russin

RANTEC DIV., Emerson Elec. Co., 24003 Ventura Blvd., Calabasas, Calif., 91302, Tel: 213-347-5446, TWX: 910-494-1218; Dir. Mktg: C. Lindsay

RAPID ELEC. CO., 1300 Herschell St., Bronx, N.Y., 10461, Tel: 212-828-2200

RAPID SPECIALTIES CO., 327 W. Huron St., Chicago, Ill., 60610, Tel: 312-337-1440; Sls. Mgr: E.M. Tate

RAPIDPRINT TIME RECORDERS, INC., Box 580, Middletown, Conn., 06457, Tel: 203-346-9283; Sls. Mgr: R.B. Bagwell

RATELCO, INC., 610 Pontius Ave. N., Seattle, Wash., 98109, Tel: 206-624-7770; Sls. Mgr: P. Burton

Advertisement

Designers and Manufacturers of custom and standard DC Power Supplies, Automatic Battery Chargers, Battery Eliminators, Power Packs. Outputs 12 to 240 Volt to 12 KW Standard.

RAULAND, Div. Zenith Radio Corp., 2407 W. North Ave., Melrose Pk., Ill., 60160, Tel: 312-647-8000; Adv. Cordinator: J.P. Curry

RAWAY BEARING CORP., 141 Chrystie St., New York, N.Y., 10002, Tel: 212-WA-5-8150; Pres: A. Baskin

Advertisement

World's largest Stockist of Aeronautic and Instrumentation Bearings - Aircraft Control, Jet Engine, Rod Ends, Instrument, and Miniature Bearings.

O.E.M. Rep for Kubar Inc.; Cambridge, Mass. mfg. of Precision Miniature Bearings.

RAWCO INSTRS., INC., P.O. Box 1286, Ft. Worth, Tex., 76101, Tel: 817-926-7185; Sls. Mgr: E.R. Basham

RAWN CO., INC., Box 9, Spooner, Wisc., 54801, Tel: 715-635-2324; Sls. Mgr: V. Rawn

RAY-O-VAC CO., Div. Elec. Storage Battery Co., 212 E. Washington Ave., Madison, Wisc., 53711, Tel: 608-255-7201

RAY PRODS., INC., 703 S. Palm Ave., Alhambra, Calif., 91803, Tel: 213-289-6175; Sls. Mgr: R. Atinsky

RAY PROOF CORP., 50 Keeler Ave., Norwalk, Conn., 06856, Tel: 203-838-4555; Sls. Mgr: E.S. Kesney

RAYBESTOS-MANHATTAN, INC., 205 Middle St., Bridgeport, Conn., 06603, Tel: 203-367-8661; Sls. Mgr: R.B. Park

RAYCHEM CORP., 300 Constitution Dr., Menlo Park, Calif., 94025, Tel: 415-329-3333, TWX: 910-373-1728; Sls. Mgr: R.E. Gesell

RAYCLAD TUBES, INC., 300 Constitution Dr., Menlo Park, Calif., 94025, Tel: 415-329-3333, TWX: 910-373-1728; Sls. Mgr: R.E. Gesell

RAYMOND CONTROLS CORP., 217 Smith St., Middletown, Conn., 06457, Tel: 203-347-5611, TWX: 710-428-7944; Sls. Mgr: J.E. Coppage

RAYMOND ENGRG., INC., 217 Smith St., Middletown, Conn., 06457, TWX: 710-428-7944; Gen'l. Mktg. Mgr: Jack Dubin

RAYTEK, INC., 1277 Terra Bella Ave., Mountain View, Cal., 94040, Tel: 415-961-1650; Sls. Mgr: P. Bliven

RAYTHEON DATA SYSTEMS CO., 1415 Boston-Providence Tpke., Norwood, Mass., 02062, Tel: 617-762-6700, TWX: 710-336-0646; Mktg. Mgr: C. Hesner

RAYTHEON CO., Gov't. Mktg., 141 Spring St., Lexington, Mass., 02173, Tel: 617-862-6600, TWX: 710-324-6568; V.P. Corp. Dev: H.L. Evans

RAYTHEON CO., Ind'l. Comps. Oper., 465 Centre St., Quincy, Mass., 02169, Tel: 617-479-5300, TWX: 710-337-6879; Mktg. Mgr: J.F. Regan ....Pg. 2005

Cal Los Angeles, 8939 Sepulveda Blvd. 213-641-3103
Cal Mtn. View, 350 Ellis St. 415-968-9211
DC Washington, 1000 Sixteenth St., N.W. 202-638-5200
Ill Des Plaines, 3158 Des Plaines Ave. 312-296-6677
Md Glen Burnie, 300 Hospital Dr. 301-768-0040
Mass Waltham, 130 Second Ave. 617-899-8080
NJ Englewood, 475 S. Dean St. 201-567-4911
Ohio Dayton, 333 W. First St. 513-223-8128
Tex Dallas, 6250 LBJ Frwy. 214-239-1661
EXP: Mass., Lexington, Raytheon Overseas, Ltd., 141 Spring St. 617-862-6600
For: Can., Waterloo, Ont., Raytheon Can., Ltd., 400 Phillips St. 519-745-6831

RAYTHEON CO., Microwave & Power Tube Div., 190 Willow St., Waltham, Mass., 02154, Tel: 617-899-8400, TWX: 710-324-6568; Mkt. Mgr: A.F. Vacaro

RAYTHEON INSTRS., Raytheon Co., 141 Spring St., Lexington, Mass., 02173, Tel: 617-862-6600, TWX: 710-324-6568; Sls. Mgr: A.P. Johnson

RAYTHEON CO., Semiconductor Div., 350 Ellis St., Mt. View, Calif., 94040, Tel: 415-968-9211, TWX: 910-379-6445; Mktg. Mgr: C.R. Marshall

RAYTHEON CO., Sorensen Power Supplies, 676 Island Pond Rd., Manchester, N.H., 03103, Tel: 603-668-1600, TWX: 710-220-1339 ....Pgs. 878,879

Ala Huntsville, BCS Assoc., 3322 S. Memorial Pkwy. 205-881-6220
Alas Anchorage, Arva, Box 759 907-272-5231
Ariz Phoenix, Barnhill Assoc., 537 E. Osborn Rd. 602-263-1250
Cal Glendale, Instr. Specialists, 1109 S. Central Ave. 213-248-9494
Cal San Diego, Instr. Specialists, 1909 State St. 714-232-2017
Cal Santa Clara, Instr. Specialists, 2359 De La Cruz Blvd. 408-244-1505
Colo Denver, Barnhill Assoc., 1170 S. Sheridan Blvd. 353-934-5505
Conn Hartford, Instr. Assocs., 234 Murphy Rd. 203-525-9367
Fla Orlando, BCS Assocs., 940 N. Fern Creek 305-843-1510
Haw Honolulu, Earl Assocs., 2825-B Valena St. 808-547-3028
Ill Chicago, Pivan Engrg., 3535 W. Peterson Ave. 312-539-4838
Ind Indianapolis, Pivan Engrg., 1259 N. 86th St. 317-253-1681
Kans Shawnee Mission, Pivan Engrg., 5801 Outlook 913-722-1030
Mass Bedford, Instr. Assocs., 175 Middlesex Tpke. 617-275-0700
Mich Detroit, S. Sterling, 17500 W. McNichols Rd. 313-255-1970
Minn Minneapolis, Pivan Engrg., 3307 N. Highway 100 612-537-4501
Mo St. Louis, Pivan Engrg., 725 Old Bellas Rd. 314-872-8424
NJ Union, SBM Assocs., 1519-A Stuyvesant Ave. 201-687-8737
NM Albuquerque, Barnhill Assoc., 1410-D Wyoming, N.E. 505-299-7658
NY Pleasantville, SDM Assocs., 28 Hobby St. 914-769-1811
NY Rochester, SDM Assocs., 4515 Culver Rd. 716-266-1400
NC Greensboro, BCS Assocs., 1039 E. Wendover Ave. 919-273-1918
Ohio Dayton, S. Sterling Co., 2673 Culver Ave. 513-298-7573
Ore Portland, Arva, 2075 S.W. 58th Ave. 503-292-8762
Pa Glenside, Dyna Rep., 216 Edgehill Rd. 215-855-2950

Pa Pittsburgh, S. Sterling Co., 2 Pkwy. Ctr. 412-922-5720
Tex Houston, Barnhill Assoc., 3810 Westheimer 713-621-0040
Tex Richardson, Barnhill Assoc., 312 N. Central Expwy. 214-231-2573
Va Springfield, Dyna Rep., 5265 Pt. Royal Rd. 703-321-8630
Wash Seattle, Arva, Inc., N. Prospect St. 206-622-0177
Wisc Brookfield, Pivan Engrg., 3055 N. Brookfield Rd. 414-706-1940
EXP: Lexington, Mass., Raytheon Co., Int'l., 141 Spring St. 617-862-6600

RAYTHEON COMPUTER, 2700 S. Fairview St., Santa Ana, Cal., 92704 ....Pgs. 374-376

RBM CONTROLS, Distributor Mktg. Sec., Essex Int'l., 131 Godfrey St., Logansport, Ind., 46947, Tel: 312-463-7400, TWX: 910-221-5466; Sls. Mgr: C.E. Dunderman

RBM CONTROLS, Essex Int'l., 131 Godfrey St., Logansport, Ind., 46947, Tel: 219-753-7521, TWX: 219-732-8235; V.P-Gen. Mgr: W.T. Hopkins

RCA CORP., Communications Sys., Front & Cooper, Camden, N.J., 08102, Tel: 609-963-8000, TWX: 609-365-5939; Sls. Mgr: E.C. Tracy

RCA ELCTRNS. COMPS., 415 S. 5th St., Harrison, N.J., 07029, Tel: 201-485-3900, TWX: 201-621-7840; Sls. Mgr: R.B. Means ....Pgs. 550-552
Cal Hollywood, 6363 Sunset Blvd. 213-461-9171
Cal Los Altos, 4546 El Camino Real 415-948-8996
Cal San Diego, 5252 Balboa Ave. 714-279-0420
Fla Riviera Bch., 2828 Broadway 305-842-1577
Ill Des Plaines, 446 E. Howard Ave. 312-827-0033
Ind Ft. Wayne, Maplewood Plaza, 6012 Stellhorn Rd. 219-485-9683
Ind Indianapolis, 2511 E. 46th St., Atkinson Sq. 317-546-4001
Kans Overland Pk., 5750 W. 95th St. 913-642-7656
Mass Needham Hgts., 360 First Ave. 617-444-7200
Minn Minneapolis, 6750 France Ave., S. 612-929-0676
NJ Clark, Central & Terminal Aves. 201-485-3900
NJ Haddonfield, 605 Marlton Pike 609-428-4802
NY Hicksville, 550 Old Country Rd. 516-935-5240
NY Syracuse, 731 James St. 315-474-8221
Ohio Cleveland, 1621 Euclid Ave. 216-241-7900
Tex Dallas, 210 C Ct. Terr., Exchange Pk., N. 214-351-5361
Va Arlington, 1901 N. Moore St. 703-558-4161

RCA GOVT. & COMM. SYS., Marne Hwy., Moorestown, N.J., 08057, Tel: 609-963-8000, TWX: 609-365-5939; Mgr. Mktg. Adm: W.P. Davison

RCA SERVICE CO., Div. RCA Corp., Govt. Svcs. 206-2, Camden, N.J., 08101, Tel: 609-963-8000, TWX: 609-662-5872; V.P. Mktg: W.F. Tait

RCA SOLID STATE DIV., Rte. 202, Somerville, N.J., 08876, Tel: 201-485-3900, TWX: 710-480-9333; Sls. Mgr: W.A. Glaser

RCA SERVICE CO., Tech. Prods. Svc., Bldg. CHIC-225, Cherry Hill, Camden, N.J., 08110, Tel: 609-963-8000, TWX: 710-892-0905; Sls. Mgr: B.L. Grossman

RCL ELCTRNS., INC., 700 S. 21st St., Irvington, N.J., 07111, Tel: 201-374-3311, TWX: 710-999-5511; Sls. Mgr: John Jacobs ...... Pgs. 1946-1948,2750,2751,2870-2873
Ala Huntsville, Bostick Assocs., Box 4165 205-881-3677
Ariz Phoenix, Dorton Entprs., 364 E. Virginia 602-263-0414
Cal Oakland, F. Moulthrop, 1530 E. 12th 415-261-7676
Colo Wheatridge, Waugaman, 4643 Wadsworth 303-423-1020
Conn No. Haven, Kitchen & Kutchin, 22 Bwy. 203-239-0212
Fla Clearwater, Dyne-A-Mark, 1665 Magnolia 813-446-3229
Fla Fern Pk., Dyne-A-Mark Corp., Box 128 305-831-5100
Fla Pompano Beach, Dyne-A-Mark, 1010 E. Atlantic 305-942-5870
Ill Chicago, Gassner & Clark, 6644 N. Western 312-RO-4-6121
Ind Indianapolis, L. DeVoe, 665 E. 61st 317-257-1227
Iowa Marion, Ensco Rep, 888 Tenth 319-377-6313
Kans Overland Park, Ensco-Rep, 8001 Conser 913-381-7557
Md Towson, Burgin-Kreh, Box 9787 301-661-1120
Mass Lexington, Kitchen & Kutchin, 17 Waltham 617-VO-2-8230
Mich Farmington, Davis-Martenson, 22725 Orchard Lake 313-474-8300
Minn Minnetonka, T. Ayre, 5509 Eden Prairie 612-935-2191
Mo St. Louis, Ensco-Rep, 11714 Lackland Ind'l. 314-543-3935
NJ Haddonfield, T.A.I., 138 Haddon Ave. 609-UL-4-3011
NY Garden City, Comtronic, 370 Old County 516-741-8966
NY Rochester, W. Zimmerman, 3100 Monroe 716-LU-6-4450
NY Syracuse, W.H. Zimmerman, 112 DeWitt 315-GR-4-4889
Ohio Akron, A. Natalino, 209 Harmony Hills 216-725-6087
Ore Portland, Almac/Stroum, 888 S. Canyon 503-292-3534
Pa Pittsburgh, A. Natalino, 530 6th 412-281-8283
Tex Dallas, Allied Comps., 10464 E. Northwest 214-348-6660
Tex Houston, Allied Comps., 6400 Westpark 713-782-5406
Va Lynchburg, Burgin-Kreh, 2600 Memorial
Wash Seattle, Almac/Stroum, 5811 6th Ave. 206-763-2300
For: Can., Montreal, Que., S. Hooker, 144 Ronald 514-487-5151
For: Can., Toronto, Ont., S. Hooker, 761 Jane 416-767-7725

RDF CORP., 23 Elm Ave., Hudson, N.H., 03051, Tel: 603-882-5195, TWX: 710-228-1882

RDI, Reed Devices, Inc., 21W183 Hill Ave., Glen Ellyn, Ill., 60137, Tel: 312-858-2050; Sls. Mgr: T.H. Herlache Pg. 1785
Cal Pasadena, P. Nurches, 2396 E. Foothill 213-681-8957
Ga Atlanta, B. Fancher, 4226 Pleasantdale 404-448-7078
Ill Glen Ellyn, Rockford Contr., 21W181 Hill 312-469-6016
Kans Wichita, Avionics Engr., Box 786 316-264-6201
Mich Detroit, R. McBride, 17618 W. McNichols 313-532-8040
Minn Mpls., Automated Controls, 402 Cedar Lake 612-377-7727
NJ Pitman, Colrud Co., 601 Ardmore 609-589-5866
NJ Short Hills, Grimm, Siegel, Box 305 201-376-3834
NY Buffalo, H.C. Johnson Agencies, Box 315 716-632-7880
NY Rochester, H. Johnson, 111 Mt. Hope 716-232-2688
NC Charlotte, B. Fancher, Box 1503 704-376-1753
Ohio Cleveland, Rockford Controls, 26100 Brush 216-531-4841
Ohio Columbus, Rockford Controls, Box 6523 614-231-5890
Ohio Dayton, Rockford Controls, 2077 Embury Pk. 513-278-7362
Tex Dallas, Carey & Assocs., 725 Preston 214-363-7813
Tex Houston, Carey, 3315 W. 12th St. 713-869-3623
Utah Salt Lake City, D. Stuart, 2270 E. 4800 S. 801-IN-6-8605
Wash Seattle, R. Johnston, 1001 N.E. 69th 206-524-5170

RE-EL CIRCUITS, INC., Box 167, Totowa Boro, N.J., 07512, Tel: 201-271-1800; V.P. Sls: G. Snedecor Pgs. 326,327

REA MAGNET WIRE CO., 3600 E. Pontiac St., Ft. Wayne, Ind., 46806, Tel: 219-743-8032, TWX: 810-332-1411; V.P. Sls: M.J. Pastrick

REACH ELCTRNS., INC., Box 308, Lexington, Neb., 68850, Tel: 308-324-4608; Pres: K.H. Wycoff

RECOTON CORP., 46-23 Crane St., Long Island City, N.Y., 11101, Tel: 212-EX-2-6442; Sls. Mgr: P. Wish

RECTICO, INC., 20 Village Park Rd., Cedar Grove, N.J., 07009, Tel: 201-239-6464; Sls. Mgr: F.W. Sandler

RECTIFIER COMPS. CORP., 124 Albany Ave., Freeport, N.Y., 11520, Tel: 516-868-0470; Sls. Mgr: E.H. Pollacek Pg. 1815
Ill Chicago, Lightner, 6322 N. Milwaukee 312-SP-4-1500
Ill Chicago, M & S Sls., 4750 N. Milwaukee 312-545-1771
Mass Needham Hgts., Todino Engrg., Box 201 617-HI-4-7925
Mich Detroit, A. Blumenberg, Box 25 313-341-4737
NJ Haddonfield, Gray Assoc., 8 E. Mt. Vernon 609-429-5300
NJ Ridgewood, Balloy, Box 306 201-444-6990
NY Syracuse, N. Matchuk, 4312 W. Genesee 315-488-3251
NC Raleigh, A. B. Andrews & Co., Box 2627 919-833-5565

RECTIFIER ENGRG. & SUPPLY, 8754 Big Bend Blvd., St. Louis, Mo., 63119, Tel: 314-968-0303; Sls. Mgr: F.A. Waelterman

RED DEVIL MFG. CO., INC., 1416 N. Ogden Ave., Chicago, Ill., 60610, Tel: 312-642-5161; Pres: M. Kassnel

RED LAKE LABS, INC., 2991 Corvin Dr., Santa Clara, Calif., 95051, Tel: 408-739-3034, TWX: 910-339-9241; Dir. Mktg: A.J. Rock

RED POINT CORP., 105 W. Spazier, Burbank, Calif., 91503, Tel: 213-842-4895; Sls. Mgr: R.P. Craig

RED SEAL ELEC. CO., 3835 W. 150th St., Cleveland, Ohio, 44111, Tel: 216-941-3900

REDCOR CORP., 21200 Victory Blvd., Woodland Hills, Cal., 91364, Tel: 213-348-5892, TWX: 910-494-1228; Pres: E.R. Borgers

REDINGTON COUNTERS, INC., 130 Addison Rd., Windsor, Conn., 06095, Tel: 203-688-6207; Sls. Mgr: T. Nelson

REDMAN ELCTRNS. CORP., P.O. Box 72, Enfield, Conn., 06082, Tel: 203-745-8024; Sls. Mgr: E. Tavidian

REED SWITCH DEV., 34 Lincoln Ave., Greenwich, Conn., 06830, Tel: 203-661-9410; Pres: J.S. Hammond

REEDER CHARLES M. & CO., 196 Victor Ave., Detroit, Mich., 48203, Tel: 313-268-8348, TWX: 810-243-4047; Sls. Mgr: C.M. Reeder

REEVE ELCTRNS., INC., 601-EEM-West Lake St., Chicago, Ill., 60606, Tel: 312-726-9755; Sls. Mgr: W.J. Madeley

REEVES-HOFFMAN DIV., Dynamics Corp. America, 400 W. North St., Carlisle, Pa., 17013, Tel: 717-243-5929; V.P. Sls: J.D. Harlin ....Pgs. 1426,1427
Cal Inglewood, L & M Engrg., 9911 Inglewood 213-678-5409
Cal Santa Clara, L & M Engrg., 3242 McKinley 408-243-6661
Fla Winter Pk., Young & Lawrence, 601 N. New York Ave. 305-647-6929
Iowa Cedar Rapids, Seltec Sls., 501 36th St., NE 319-362-8155
Md Baltimore, R.F. Assocs., 6630 Baltimore Nat'l. Pike 301-747-0111
Mass Wakefield, H. Jappe Co., 37 Hillcrest Rd. 617-245-9359
NJ Ridgefield, G.M. Moch, 595 Broad 201-945-0080
NY E. Aurora, Harries & Kershaw, 654 Main 716-652-1221
NC Bethania, Candor Co. 919-924-1480
Ohio Cincinnati, Tri-State Mktg., 1717 Section 513-631-5060
Pa Philadelphia, C. Newson, 711 Bethlehem Pike 215-248-3377
Tex Dallas, Weinreich, 11554 E. Northwest Hwy. 311-2800
For: Can., Scarborough, Ont., Lake Engrg., Ltd., 123 Manville Rd. 416-751-5980

REEVES SOUNDCRAFT, Div. Reeves Industries, Inc., 15 Great Pasture Rd., Danbury, Conn., 06810; Sls. Mgr: C.H. Berman

REFLECTONE, INC., 2051 W. Main St., Stamford, Conn., 06904; V.P-Mktg: N.C. Graniere

REGENCY ELCTRNS., INC., 7900 Pendleton Pike, Indianapolis, Ind., 46226, Tel: 317-547-3581; V.P. Sls. Mgr: A. Harling

REHAU PLASTIKS, INC., 50-22 49th St., Woodside, N.Y., 11377, Tel: 212-ST-4-5785; Sls. Mgr: K.W. Loeb

REICHHOLD CHEMICALS, INC., 525 N. Broadway, White Plains, N.Y., 10602, Tel: 914-WH-8-6200, TWX: 914-997-1708; Sls. Mgr: C.S. Stryker

REL-QUAL ASSOCS., 18 Hamilton St., Bound Brook, N.J., 08805, Tel: 201-469-3212; Pres: C.H. Garrod

RELAY SLS., INC., 604 Danley Dr., Ft. Myers, Fla., 33901, Tel: 813-936-8171; Pres: A. Fradono

RELAY SERVICE CO., 1310 N. Pulaski, Chicago, Ill., 60651, Tel: 312-AL-2-2700; Sls. Mgr: C. H. Badger

RELAY SPECIALTIES, INC., 3 Godwin Ave., Fair Lawn, N.J., 07410, Tel: 201-797-3313; Sls. Mgr: J.G. Sauer

Advertisement

From stock a complete selection of thermal time delay relays, motor driven timers, solid state timers, general purpose relays, counters and power relays. Also available are temperature and photo electric controls, timing modules, digital timing controls, solid state flashers, buzzers and foot switches.

RELAYS, INC., 162 West 83rd St., New York, N.Y., 10024, Tel: 212-TR-3-4500; Sls. Mgr: S.H. Hartley

RELCO PRODS., 5594 E. Jefferson Ave., Denver, Colo., 80237, Tel: 303-756-1143; Pres: R.A. Ruehle

RELCOM, 2329 Charleston Rd., Mt. View, Calif., 94040, Tel: 415-961-6265, TWX: 910-379-6979; Sls. Mgr: J.B. Cochrane

RELIANCE DIV., Eaton Yale & Towne, Inc., 25 Charles Ave., S.E., Massillon, Ohio, 44646, Tel: 216-832-1511, TWX: 216-445-9004; Gen'l. Sls. Mgr: J.L. Knott

RELIANCE ELEC. CO., 24701 Euclid Ave., Cleveland, Ohio, 44117, Tel: 216-266-7000, TWX: 216-486-5630; Sls. Mgr: E.G. Orahood

REMEX ELCTRNS., Div. Ex-Cell-O Corp., 1733 Alton St., Santa Ana, Cal., 92705, Tel: 714-557-6860, TWX: 910-595-1715; Gen. Sls. Mgr: W.E. Walker ....Pg. 377
Ala Huntsville, Gentry, 2109 W. Clinton 205-536-5306
Conn W. Hartford, Instr. Dynamics, 345 N. Main 203-233-5503
Fla Orlando, Gentry Assocs., 550 N. Bumby 305-841-7740
Ill Chicago, SEA, Inc., 4210 W. Irving Pk. 312-282-6694
Ind Carmel, SEA, Inc., 620 S. Range Line Rd. 317-846-2593
Md Wheaton, K-G Elctrns., 11151 Viers Mill Rd. 301-946-4055
Mass Wakefield, Instr. Dynamics, Lakeside Off Pk. 617-245-5100
Mich Farmington, Carter, McCormic & Peirce, Inc., 23995 Freeway Pk. Dr. 313-477-7700
Minn Mpls., SEA, Inc., 7601 N. Kentucky 612-425-4455
NJ Ridgewood, Hansen Assocs., Box 806 201-652-7055
NY New York, Hansen Assocs. 212-947-0379
NY Ogdensburg, Whittaker Elctrns., Ltd., Bridge & Port Auth. Adm. Bldg. 315-393-0710
NY Rochester, Ossmann Instrs., 474 Thurston 716-328-2230
NY Vestal, Ossman Instrs., 1901 Vestal E. 607-785-9947
NY Wappinger Falls, Ossmann Instr., 122 E. Main 914-297-7777
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, Box 1472 513-278-5873
Pa Pittsburgh, Carter, McCormic & Peirce, 5423 Webster 412-824-3760
Pa Wayne, Emlen-Peterson, 34 West Ave. 215-687-3535
Tex Dallas, Data Mktg., 10048 Monroe 214-358-4646
Tex Houston, Data Mktg., 3925-C Dacoma 713-686-9627
Wash Seattle, R. Drake, 6133 Maynard S. 206-763-2755
Wisc Waukesha, S-E-A, Inc., 142 South St. 414-547-6637
For: Can., Downsview, Ont., Whittaker Elctrns., Troutbrooke 416-247-7454
For: Can., Ottawa 5, Ont., Whittaker Elctrns, 42 Howden Ave. 613-224-1221
For: Can., Roxboro, Que., Whittaker Elctrns., Box 216 514-683-3621
For: Can., W. Vancouver, B.C., Whittaker Elctrns., Ltd., 1144 Millstream Rd. 604-926-3411

REMLER CO., 2101 Bryant St., San Francisco, Calif., 94110, Tel: 415-824-3435; Sls. Mgr: H.A. Greene

RENBRANDT, INC., 6 Parmelee St., Boston, Mass., 02118, Tel: 617-445-8910; Sls. Mgr: M. Rogers

RENCO CORP., Box 246, 150 Aero Camino, Goleta, Cal., 93017, Tel: 805-968-1525; Sls. Mgr: K.B. Kannard Pg. 378
Ariz Phoenix, Thorson Co., 2505 E. Thomas Rd. 602-956-5300
Cal Hollywood, Kittleson Co., 7046 Hollywood 213-463-8134
Cal Sante Fe Sps., Sls. Engrs., 15408 Gornet 213-921-4337
Colo Denver, Thorson Co., 5040 E. 41st Ave. 303-355-3521
Conn Hartford, Meas. Equip., Box 8192 203-528-8192
Fla Ft. Lauderdale, Snow Co., 3109 N.E. 25th St. 305-563-2448
Ind Ft. Wayne, McDonald Sls., Box 2848 219-745-9214
Mass Wakefield, Meas. Equip., 591 North Ave. 617-245-4870
NY Jericho, Electro Rep., 366 N. Broadway 516-938-0540
Utah Salt Lake City, Thorson Co., 445 E. 2nd S. 301-322-2127
Wash Seattle, Thorson Co., 209 N.E. 43rd St. 206-632-0710
EXP: Schenectady, NY, EMB Elctrns., Box 660 518-372-5841

RENCO ELCTRNS., INC., 240-1 Old Country Rd., Hicksville, N.Y., 11801, Tel: 516-WE-8-0022; Sls. Mgr: I. Morse

RENTAL ELCTRNS., 16600 Oakmont Ave., Gaithersburg, Md., 20760, Tel: 301-948-0620; Sls. Mgr: O. Rothfuss

REPUBLIC ELCTRNS. CORP., 176 E. 7th St., Paterson, N.J., 07524, Tel: 201-279-0300, TWX: 710-988-5908; Sls. Mgr: W. Eisenberger ....Pg. 2436
Ariz Tucson, Hamilton Reps., Inc., Box 50526 602-297-2279
Cal Santa Clara, Richards Assoc., 2938 Scott Blvd. 408-246-5860
Cal Pico Rivera, Westrep, 9519 Telegraph Rd. 213-949-2551
Colo Eastlake, Hamilton Reps., Box 216 303-466-6061
Conn Shelton, Comark Assoc., 28 Walnut Tree Hill 203-929-4884
Fla Miami Beach, Geartner, 1125 71st St. 305-861-3661
Fla Orlando, Geartner, 122 Lee Rd. 305-299-1000
Ill Chicago, Ropek & Cahill, 5439 W. Division 312-287-7292
Ind LaFontaine, Kirsch Sls., 107 N. Wabash 317-981-2801
Kans Leawood, Vasen Sls., 8005 Ensley La. 913-649-0679
Mass Belmont, Vector Sls., 774 Pleasant St. 617-489-1400
Mich Warren, Ardon Elctrn. Sls., 13969 13 Mile Rd. 313-294-2292
Minn Hopkins, Grayden & Flemmer, Hamilton 612-941-1120
NJ Paterson, Mucon Corp., 176 E. 7th St. 201-279-0300
NJ Riverdale, Comp-Tech., Box 50 201-835-0332
NY Lynbrook, Comp-Tech. Sls., Box 384 516-593-2628
NY Cazenovia, A.L. Perkins Co., Box 246 315-682-5005
NC Charlotte, J. Rudisill Assocs., Box 4245 704-377-6901
Ohio Dayton, Owen Assocs., 2401 E. Aragon 513-298-9723
Pa Ardmore, Rothenheber & Wurts, 53 Cricket 215-642-6911
Tex Richardson, Vista Eng., 777 S. Central Expwy. 214-235-4547
Tex Houston, Vista Eng., 3003 Yale St. 713-869-0109
Wash Seattle, Blum & Assoc., 2300 N.W. 97th 206-782-1600

REPUBLIC FOIL, INC., Aluminum Sub of National Steel Corp, 55 Triangle St., Danbury, Conn., 06810, Tel: 203-743-2731, TWX: 710-456-2439; V.P. Mktg: J.M. McKibbin

REPUBLIC LENS CO., INC., 31 East 169th St., Bronx, N.Y., 10452, Tel: 212-CY-3-2790; Gen'l. Mgr: J. Lurie

REPUBLIC STEEL CORP, Box 6778, Cleveland, Ohio, 44101, Tel: 216-574-7100; V.P.-Sls: E.A. Murray

RESALAB INC., ADVANCED DEVELOPMENT LAB., 5315 W. 102 St., Los Angeles, Cal., 90045, Tel: 213-641-6640; Gen'l. Mgr: H.W. Pass

RESDEL CORP., Bldg. #22-County Airport, Rio Grande, N.J., 08242, Tel: 609-886-1111; Sls. Mgr: J.F. Dieffenderfer

Advertisement

Centrifugally cast epoxy tubing, with or without fillers, for electrical and mechanical applications. Cast in lengths of 57 inches with no taper inside or outside. Some of the present applications are encapsulating and potting forms, stand-offs, connecting links, spacers, insulators, bolt and cooling holes or wire ducts in castings.

RESEARCH CHEM., Div. Nuclear Corp. America, 8220 W. Harrison, Phoenix, Ariz., 85031, Tel: 602-936-1481; Sls. Mgr: J.W. Cunningham

RESEARCH DEVICES, Box 526, Elizabeth, N.J., 07207, Tel: 201-464-0668; Sls. Mgr: B.G. Cohen

RESEARCH, INC., Box 24064, Minneapolis, Minn., 55424, Tel: 612-941-3300, TWX: 612-292-4066; Sls. Mgr: J.M. Law

RESEARCH INSTR. CO., 558 Main St., Westbury, N.Y., 11590, Tel: 516-333-7440; Sls. Mgr: G.W. Williams

RESEARCH PRODS. CORP., 1015 E Washington, Madison, Wisc, 53701, Tel: 608-257-8801; Sls. Mgr: V.J. Hellenbrand

RESIN FORMULATORS CO., Div. Evra, Inc., 9601 Jefferson Blvd., Culver City, Cal., 90230, Tel: 213-870-9561, TWX: 910-340-6363; Sls. Mgr: V. E. Benson

RESINITE CORP. DIV., Precision Paper Tube Co, 1047 S Noel Ave, Wheeling, Ill, 60090, Tel: 312-537-4250; Sls. Mgr: A. Johnson

RESISTANCE PRODS., 914 S. 13th St., Harrisburg, Pa., 17104, Tel: 717-236-5081, TWX: 510-650-4920; Sls. Mgr: K. Ensminger ....Pgs. 2874,2875
Ariz Scottsdale, Walter Eng. Assoc., Apts. #3, 3031 N. 69th Pl.
Cal San Marino, Van Gott & Assoc., Box 8401 213-282-1125
Cal Mountain View, G.C. Woempner, 1101 San Antonio Rd. 415-964-5454
Colo Denver, Walter Engrg. Assoc., 880 Bonnie Brae Blvd. 303-777-5585
Fla Lighthouse Pt., W. R. Lehmann, Box 5010 305-941-2150
Ga Atlanta, W. R. Lehmann, Box 52786 Northside 404-451-2949
Fla Orlando, W. R. Lehman Co., Box 20275 305-841-4901
Ill Bellwood, Fiat Engrg. Assoc., 5133 St. Charles Rd. 312-547-6200
Ind Muncie, Fiat Eng. Assoc., Box 1165 317-282-5676
Ind So Bend, Valentine-Schillinger Co., 1811 Thornhill Dr. 219-291-6258
Kans Leawood, Vasen Sls. Co., 8005 Ensley La. 913-649-0679
Md Glen Burnie, Faion Lott & Co., 6409 Frederick Ave., Box 534 301-744-4611
Mass Canton, New England Elec. Sls. Co., 590 Washington St. 617-828-4835
Minn St. Paul, Wagner Comp. Consits., 542 S. Snelling Ave. 612-698-0331
Mo St. Louis, Vasen Sls. Co., 8160 Stanford Ave. 314-725-5219
NJ Westwood, Clarfield-Stollmack Assoc., 175 Westwood Ave. 201-666-8989
NY Syracuse, C. W. Floring & Assoc., Inc., Box 175, Onondaga Br. 315-478-2149
Ohio Wickliffe, D. Stiffen Assocs., 30212 Lakeland Blvd.
Pa Flourtown, Avenir Ind'l. Sls., Box 234 215-836-4400
Tex Dallas, MMS Comps., 10303 Carry Back Cir. 214-357-6893
Tex Houston, MMS Comps., 6306 Schevers St. 713-645-3581
Wash Seattle, D. Smith Sls. Co., 2320 N. 45th St. 206-623-3160
EXP: N.Y., Westbury, Minthorne Int'l. Co., Inc., 2200 Shames Dr. 516-334-3303
For: Can., Markham, Ont., Wilson Enterprises, 19 Abercorn Rd. 416-231-7536
For: Can., Roxboro, Que., Wilson Ent., Box 115 514-684-0383

RESISTORS, INC., 5226 W. 26th St., Chicago, Ill., 60650 Pg. 2876
Cal Los Angeles, W. S. Harmon Co., 6118 Venice Blvd. 213-937-1460
Cal Palo Alto, W. Tompkins, 2875 Middlefield Rd. 415-DA-6-7940
Conn Berlin, White Sls. Co., Box 122 203-224-0423
Ill Chicago, L-Tec, Inc., 5808 Higgins Rd. 286-1500
Iowa Cedar Rapids, J.R. Sls. Engrg., 3550 Cottage Grove Ave., S.E. 319-EM-5-2864
Kans Overland, Penzner Assocs., Inc., Box 6264, 5600 W. 95th St. 913-DE-1-0004
Mass Needham, White Sls. Co., 20 Chestnut St. 617-444-3676
NJ Moorestown, A. Foley Assocs., Box 155 609-663-4545
NY Buffalo, J.J. Glass, 220 Delaware Ave. 716-TL-6-9272
NY N.Y., Symon Assocs., 663 - 5th 212-PL-7-3638
Ohio Vandalia., W. Brauer & Assocs., Box 35 513-898-1224
Ohio Wickliffe, W. Brauer & Assocs., Box 305 216-943-0601
Pa Pittsburgh, W. Brauer & Assocs., Box 2466 412-921-3213
Tex Garland, Whiteside Sls. Co., Box 22 214-BR-6-8382
Wisc Milwaukee, Honkamp Sls., 11120 W. Ruby 414-463-2530

REUTER-STOKES, 18530 S. Miles Pkwy., Cleveland, Ohio, 44128, Tel: 216-475-3434; Sls. Mgr: T.B. Fleming

REVERE COPPER & BRASS, INC., 605 Third Ave., New York, N.Y., 10016, Tel: 212-687-4111, TWX: 710-581-6718; Exec. V.P: R.M. Lake

REVERE ELCTRN. DIV., Neptune Meter Co., 845 N. Colony Rd., Wallingford, Conn., 06492, Tel: 203-269-7701, TWX: 710-476-3197; Sls. Mgr: G.W. Grace

REX RHEOSTAT & CO., 149 Babylon Tpke., Roosevelt, N.Y., 11575, Tel: 516-379-1030

REYNOLDS METALS CO., 6601 W. Broad St., Richmond, Va., 23230

RF COMMUNICATIONS, INC., 1680 University Ave., Rochester, N.Y., 14610, Tel: 716-244-5830, TWX: 510-253-7469; Mktg. Mgr: W. Lucas

RF COMMUNICATIONS, Elctrn. Instr., 1680 University Ave., Rochester, N.Y., 14610, Tel: 716-244-5830, TWX: 510-253-7469; Sls. Mgr: R. J. Hesselberth ....Pg. 553
Ala Huntsville, BCS Assocs., 3322 S. Memorial 205-534-1648
Cal N. Hollywood, O'Halloran, 10700 Ventura 213-877-0173
Cal Palo Alto, O'Halloran, 3921 E. Bayshore 415-326-1493
Conn Glastonbury, Instr. Reps., Box 165 203-633-0777
Fla Orlando, BCS Assocs., 940 N. Ferncreek 305-843-1510

Ill Chicago, Data Elctrns., 5505 N. Menard 312-774-1452
Mass Arlington, Instr. Rep., 1046 Massachusetts 617-646-0134
Mich Ypsilanti, Micro Sls., 217 Taft Rd. 313-482-1229
Minn Mpls., Data Elctrns., 821 2nd N. 612-377-8383
NJ Merchantville, Megargel/Himmelstein, 6705 Park 215-925-7948
NJ Union, SBM Assocs., 1519 Stuyvesant 201-687-8737
NM Albuquerque, ALS. Elct., 209 San Pablo, SE 505-268-9600
NY Pleasantville, SBM Assocs., 28 Hobby St. 914-769-1811
NY Rochester, SBM Assocs., 4515 Culver Rd. 716-266-1400
NC Greensboro, BCS, 1039 E. Wendover 919-273-1918
Ohio Dayton, Micro Sls., 1250 W. Dorothy 513-298-3033
Tex Dallas, Texas Avionics, 4515 Prentice 214-368-3566
Va Springfield, Dyna-Rep, 5265 Port Royal 703-321-8630
For: Can., Downsview, Ont., Megatronix, Ltd., 954 Wilson Ave. 416-630-7672

RF INTERONICS, 100 Pine Aire Dr., Bay Shore, N.Y., 11706, Tel: 516-231-6400, TWX: 510-227-6233; Sls. Adm: R.W. Fitzpatrick ....Pg. 1528
Ariz Phoenix, Williams-Assocs., 2250 N. 16th St. 602-254-6085
Cal Santa Monica, Rep. Assoc., 1710 Santa Monica 213-451-8901
Cal Millbrae, Melvin Sls., 113 El Camino Real 415-697-6922
Colo Denver, Williams-Assocs., 4971 Jackson 303-388-4391
Fla Indian Rocks Bch., Tech-Rep., Box 425 813-595-2834
Fla Melbourne, Tech Rep. Assoc., Box 2005 305-723-9140
Ga Jonesboro, Tech-Rep. Assoc., Box 955 404-753-0111
Ill Chicago, J. Pop Sls., 5661 W. Chicago Ave. 312-261-1259
Ind Ft. Wayne, Ryan Sls., Box 2151 219-493-1569
Iowa Marion, ENSCO-REP, 888 10th St. 319-377-6313
Kans Overland Pk., ENSCO-REP, 8001 Conser 913-381-7557
La Baton Rouge, Roberts Sls., Box 15218 504-924-1010
Md Silver Spring, Mechtronics, 11700 Old Columbia Pike 202-622-2420
Mass Newton Upper Falls, Brookdale/Richter, 1214 Chestnut St. 617-244-6969
Mich Cleveland, F.G. Mahannah, 20599 Almar 216-561-3024
Minn Minneapolis, P.J. Codute, 4542 4th St. N.E. 612-560-1222
Mo St. Louis, ENSCO-REP, 11714 Lackland Ind'l. Dr. 314-542-3935
NM Albuquerque, Williams-Assocs., 420 Washington St., S.E. 505-255-1638
NY Great Neck, Trionic Assoc., 320 Northern 516-466-2300
NY Rochester, W.A. Franklin, 179 Hillary Dr. 716-889-4849
NY Syracuse, W.A. Franklin, 2 Standish 315-446-1120
NY Whitesboro, W.A. Franklin, 42 Glenridge 315-736-5356
Ohio Cincinnati, J.O. Olsen, 5539 Stokeswood 513-922-2176
Ohio Cleveland, J.O. Olsen, 16201 Shaker 216-752-5444
Pa Jenkintown, Arnold Assoc., Box 1012 215-742-0600
Pa Pittsburgh, J.O. Olsen, 104 Elatan Dr. 412-279-2550
Tex Dallas, Roberts Sls., 9704 Lanward Dr. 214-348-4283
EXP: N.Y., Westbury, Minthere, 2200 Shames 515-334-3303

RF SYSTEMS, INC., 155 King St., Cohasset, Mass., 02025, Tel: 617-383-1200; V. Pres.-Sls: J.E. Hayes

Advertisement
R F System's total antenna capability includes reflector antennas for radar, telemetry, tropE and communications; yagi antennas for all applications. Contract and specification work is undertaken as well as standard products. A complete line of antennas products for CATV. Commercial and military designs in all product categories.

RFD, INC., 5024 Nassau St., Tampa, Fla., 33607, Tel: 813-872-1502; Sls. Mgr: S. Bailey

RFL INDS., Comms. Div., Powerville Rd., Boonton, N.J., 07005, Tel: 201-334-3100, TWX: 710-987-8352; Sls. Mgr: R. Treible

RFL INDS., Comps. Div., Powerville Rd., Boonton, N.J., 07005, Tel: 201-334-3100, TWX: 710-987-8352; Sls. Mgr: J. Simon

RFL INDS., Instr. Div., Powerville Rd., Boonton, N.J., 07005, Tel: 201-334-3100, TWX: 710-987-8352; Sls. Mgr: R. O'Donnell ....Pg. 554
Ala Huntsville, Space Engrg. Sls., Inc., 4306 Governors Dr., S.W. 205-837-6060
Ariz Phoenix, Williams, 2250 N. 16th 602-254-6085
Cal Los Angeles, IFM South, 3455 Cahuenga 213-469-1641
Cal Los Altos, IFM - North, 2235 Grant 415-961-2828
Colo Denver, Williams Assocs., 4971 Jackson 303-388-4391
Fla Orlando, Space Engrg. Sls., Inc., 999 Woodcock Rd. 305-841-2271
Ill Des Plaines, Marsland, 1000 Exec. 312-298-2620
Ind Indpls, Marsland, 3734 Carrollton 317-924-3568
Mass Needham Hgts., Cowperthwait & Brodhead, 570 Hillside Ave. 617-444-9410
Mich Farmington, Carter, McCormic & Pierce, Inc., 23995 Freeway Pk. Dr. 313-477-7700
Minn Mpls, Marsland Assocs., Inc., 231 N. Edgewood Ave. 612-545-4481
Mo Florissant, Marsland, 100 St. Francois 314-831-0015
NM Albuquerque, Williams, 420 Wash. 505-255-1638
NY Latham, L-Tron Corp., Box 336 518-785-5032
NY Rochester, L-Tron, 47 Devanshire 716-436-4410
NY Skaneateles, L-Tron Corp., Drawer 67 315-685-6172
NY Tonawanda, L-Tron, 123 Dalewood 716-691-8887
NC Greensboro, Space Engrg. Sls., Box 8298 919-294-2754
Ohio Cleveland, Carter, McCormic & Pierce, 21380 Lorain Rd. 216-333-5650
Ohio Dayton, Carter, McCormic & Pierce, 5423 Webster St. 513-278-5873
Pa Pittsburgh, Carter, McCormic & Pierce, 201 Penn Ctr. Blvd. 412-824-3760
Tex Richardson, Scientific Sls. Co., 777 S. Central Expwy. 214-231-6541
Va Springfield, Dyna Rep. Tech. Svcs., 5265 Port Royal Rd. 703-321-8630

RFL INDS., Thermocontrol Div., Boonton, N.J., 07005, Tel: 201-334-3100, TWX: 710-987-8352; Sls. Mgr: R. O'Donnell ....Pg. 1983
Ala Huntsville, Space Engrg. Sls., 4306 Governors Dr. S.W. 205-837-6060
Ariz Phoenix, Williams, 2250 N. 16th 602-254-6085
Cal Los Altos, IFM North, 2235 Grant 415-961-2828
Cal Los Angeles, IFM South, 3455 Cahuenga 213-469-1641
Colo Denver, Williams Assocs., 4971 Jackson 303-388-4391
Fla Orlando, Space Engrg. Sls., 999 Woodcock Rd. 305-841-2271
ILL Des Plaines, Marsland, 1000 Exec. 312-298-2620
Ind Indpls, Marsland, 3734 Carrollton 317-924-3568
Mass Needham Hgts., Cowperthwait & Brodhead, 570 Hillside Ave. 617-444-9410
Mich Farmington, Carter, McCormic & Peirce, 23995 Freeway Pk. Dr. 313-477-7700
Minn Mpls, Marsland, 231 N. Edgewood 612-545-4481
Mo Florissant, Marsland, 100 St. Francois 314-831-0015
NJ Boonton, RFL Inds., Inc., Powerville Rd. 201-334-3100
NM Albuquerque, Williams, 420 Wash. 505-255-1638
NY Latham, L-Tron Corp., Box 336 518-785-5032
NY Rochester, L-Tron, 47 Devonshire 716-436-4410
NY Skaneateles, L-Tron Corp., Drawer 67 315-685-6172
NY Tonawanda, L-Tron, 123 Dalewood 716-691-8887
NC Greensboro, Space Engrg. Sls., Box 8298 919-294-2754
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Loran Rd. 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster St. 513-288-5873
Pa Phila, MCW, Inc., 709 W. Atlantic 215-228-7459
Pa Pittsburgh, Carter, McCormic & Peirce, 201 Penn Central Blvd. 412-824-3760
Va Springfield, Dyna Rep. Co., 5265 Port Royal Rd. 703-321-8630

RHA-AUDIO COMMUNICATIONS, 625 60th St., W. New York, N.J., 07093, Tel: 201-854-1950; Sls. Mgr: N.J. Mayo

RHG ELCTRNS. LAB., 94 Milbar Blvd., Farmingdale, N.Y., 11735, Tel: 516-694-3100; Sls. Mgr: S. Wolin Pgs. 612,1562
Ala Huntsville, Gentry Assoc., 2109 W. Clintoy 205-534-9771
Cal Los Altos, Cain, 175 S. San Antonio 415-948-6533
Cal Los Angeles, Cain, 522 S. Sepulveda 213-476-2251
Cal San Diego, Cain, 7854 Compass Lake 714-461-1033
Fla Orlando, Gentry, 550 N. Bumby 305-841-7740
Ill Mt. Prospect, Cain, 1203 Ironwood 312-253-3578
Md Annapolis, Hayden Assoc., 16 Decatur 202-296-6059
Mass Reading, Gedev Assoc., Box 232 617-944-3105
NJ Montville, G & A Sls., 8 Brittany Rd. 201-227-3926
NM Albuquerque, A. L. S. Elctrns., Box 11626 505-268-9600
NY New Hartford, KLM Assoc., 1 Nouvelle Pk. 315-735-8525
NY Rochester, KLM Assocs., 39 Saginaw Dr. 716-442-0820
NY Syracuse, KLM Assocs., 401 S. Main St. 315-458-6214
NC Burlington, Gentry, 116 E. O'Neal 919-227-2581
Ohio Reynoldsburg, Cain, 1467 Grahm 614-861-2119
Pa Lafayette, M. Ladev, 628 Ridge Pike 215-825-3177
Tex Dallas, Cain & Co., 8609 N.W. Plaza Dr. 214-369-3797
Wash Seattle, Paratech, Box 5427 206-783-3900

RHO ENGRG. CO., 2234 Colby Ave, Los Angeles, Calif, 90064, Tel: 213-272-1163 P.T. Swarts

RHODE ISLAND INSULATED WIRE CO., 50 Burnham Ave., Cranston, R.I., 02910, Tel: 401-726-0700; Sls. Mgr: G.R. Dubois

RHODES, M.H., INC., 99 Thompson Rd., Avon, Conn., 06001, Tel: 203-673-3281; Sls. Mgr: E.J. Doyle

R I METPRO, INC., 139 Jefferson Blvd., Warwick, R.I., 02888, Tel: 401-463-8200; Sls. Mgr: J.C. Murphy

RICHARDS ARKLAY S., 1 Winchester St., Newton Highlands, Mass., 02161, Tel: 617-527-4385

RICHARDSON CO., 2400 E. Devon Ave., Des Plaines, Ill., 60018, Tel: 312-297-3570

RICHLAND GLASS CO., INC., Richland, N.J., 08350, Tel: 609-691-1697; Sls. Mgr: F.R. Barrale

RIESTER & THESMACHER CO., 1526 West 25th St., Cleveland, Ohio, 44113, Tel: 216-241-0154; Pres: C.D. Burt

RIL ELCTRNS., INC., Street Rd. at 2nd St. Pike, Southampton, Pa., 18966, Tel: 215-EL-5-1361; Sls. Mgr: D.G. Shylan

RIPLEY CO., INC., 1 Factory St., Middletown, Conn., 06457, Tel: 203-346-6677; Sls. Mgr: R.S. Clark Pg. 2791
Cal Concord, P.W. Jasin, 3506 Skylark 415-686-0905
Cal Downey, Sierra Pacific Engr., 7332 Florence 213-928-1815
Ill Chicago, S. C. Blaker, 6416 N. Central 312-774-8252
Ky Louisville, Scott Elctrns., 366 Francis Bldg. 502-583-3220
Mass Wellesley Hills, M. Scott, 20 Walnut 617-235-0102
Minn Minneapolis, J.D. Bayle, 3516 E. 50th 612-722-6771
NJ Mt. Laurel, Naudain Assocs., Rte. 73 & Ramblewood Pkwy. 215-564-3194
NY Buffalo, Application Specialists, Inc., 4548 Main St. 716-839-2243
NY Great Neck, F. Tylinski, 338 Northern 516-466-9070
NY Rochester, Application Specialists, Inc., 3700 East Ave. 716-586-6226
NY Syracuse, Applications Specialists, Inc., 1719 Teall Ave. 315-437-2813
Ohio Cincinnati, Scott Elctrns., 9505 Montgomery St. 513-791-2513
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-861-2626
Ohio Columbus, Scott Elctrns., 79 E. State 614-228-2313
Ohio Dayton, Scott Elctrns., 517 Hulman Bldg. 513-223-2652
Tex Ft. Worth, W.P. Fralia Co., Box 12625 817-738-2394

RIVERBANK LABS., Dept. Engrg., Box 110, Geneva, Ill., 60134, Tel: 312-232-2207

R L C ELCTRNS., INC., 83 Radio Cir., Mt. Kisco, N.Y., 10549, Tel: 914-241-1334; Sls. Mgr: R.W. Knight Pg. 1563
Cal Los Altos, Systems Mktg. Conslt., 1 Fist St. 415-941-4777
Cal No. Hollywood, Crown Elctrns., 5657 Lankershim Blvd. 213-877-3550

Fla Orlando, F. M. Assoc., 5018 Mortier Ave. 305-851-5710
Md Endicott City, Applied Engrg. Conslt., 9051 Baltimore Nat'l Pike 301-465-1272
Mass S. Chelmsford, I M R, Box 132 617-256-8251
Mo Florissant, Marsland Assocs., Inc., 100 St. Francois 314-831-0015
NJ Englewood, Central Assoc., 44 N. Dean St. 201-568-0808
NJ Plainview, Central Assoc., 11 Commercial St. 516-433-0808
NC Greensboro, F. M. Assoc., 904 Montrose Dr. 919-294-2754
Pa Philadelphia, Applied Engrg. Conslt., 8605 Bayard St. 215-247-9007

RO ASSOCS., 3705 Haven Ave., Menlo Pk., Cal., 94025, Tel: 415-322-5321, TWX: 910-378-5929; Sls. Mgr: R.H. Okada ....Pgs. 865-869
Ala Huntsville, Lee Assocs., Inc., Box 1506 205-539-0761
Ariz Scottsdale, F.Y. Gates Co., Box 1908 602-947-2991
Cal San Diego, RDP Instrs., Inc., Box 10449 714-224-3729
Cal San Francisco, Wm. J. Purdy, 770 Airport Blvd. 415-347-7701
Cal Downey, RDP Instrs., 11565-B Paramount 213-923-6781
Colo Denver, F.Y.Gates Co., 700 E. Louisiana 303-722-4674
Fla Orlando, Lee Assocs., 200 E. Marks 305-241-4445
Ga Chamblee, Lee Assocs., Inc., Box 80666 404-457-7117
Ill Chicago, Lightner, 6322 N. Milwaukee 312-774-1500
Md Ellicott City, Gans-Fryling, 9516 Michaels 301-837-6311
Mass Newton, Techmar, 56 Elmwood 617-444-8130
Mich Birmingham, H.C. Heym, 1688 Buckingham 313-644-9166
NJ So. Hackensack, Engrd. Prods., Inc., 290 Huyler St. 201-488-4040
NM Albuquerque, F.Y.Gates Co., 2631 Texas, N.E. 505-298-1875
NC Winston-Salem, Lee Assocs., 825 Burke 919-724-2406
Pa Narberth, L. G. White - Keystone, 100 N. Essex 215-839-3445
Tex Dallas, Compar Southwest, 8609 N.W. Plaza Blvd. 214-363-1526
Tex Houston, Compar Southwest, 5757 Bellaire Blvd. 713-667-3420
Utah Salt Lake City, F.Y. Gates Co., 455 E. 4th, S. 801-359-1101
Va Arlington, Gans-Fryling, 2030 16th 703-527-3262
For: Can., Toronto, Ont., B.H. McGregor, Box 156, Sta. "H" 416-699-5521
ROANWELL CORP., 180 Varick St., New York, N.Y., 10014, Tel: 212-989-1090, TWX: 710-581-6555; Sls. Mgr: R.T. Ennis
ROBBINS & MYERS, INC., 1345 Lagonda Ave., Springfield, Ohio, 45501, Tel: 513-323-6461, TWX: 513-324-5961; Sls. Mgr: R. A. Arlt
ROBERTS DIV., Rheem Mfg. Co., 5922 Bowcroft St., Los Angeles, Cal., 90016, Tel: 213-870-9631; Sls. Mgr: L. Winn

ROBERTSHAW CONTROLS, Acro Div., Box 449, Columbus, Ohio, 43216, Tel: 614-875-2351, TWX: 810-335-2560; Dir. Mktg: A.D. Unetic ..Pgs. 1944,1945
Cal Inglewood, V & L, 3412 W. Century 213-671-7688
Colo Denver, D. Bond Assocs., 5505 E. Evans 303-756-1234
Conn Woodbury, Tygren Co., Box 398 203-264-6880
Ill Elk Grove Village, Robertshaw Controls Co., 190 Gordon St. 312-437-6060
Mo Maryland Hgts., Robertshaw Controls Co., 11645 Adie Rd. 314-432-1260
NJ Paramus, Robertshaw Controls, 600 Ind'l 201-265-6670
NM Albuquerque, D.E. Bond Assoc., Box 14237 505-248-4203
Wash Seattle, C.B. Parsons, 5319 4th Ave., S. 206-762-7373
ROBERTSHAW CONTROLS CO., Ind'l. Instr. Div., 333 N. Euclid Way, Anaheim, Cal., 92803, Tel: 714-535-8151, TWX: 714-776-1790; Gen. Mgr: G. Bazaco
ROBERTSON INSTR., 1760 W. First St., Azusa, Cal., 91702, Tel: 213-334-3101; Pres: H.L. Robertson
ROBICON CORP., Plum Ind'l. Pk., Pittsburgh, Pa, 15239, Tel: 412-327-7000; Sls. Mgr: N. Altman

Advertisement

SCR Thyristor Power Control and Conversion Equipment. Robicon supplies standard devices and custom packaged systems in two fields: (1) temperature control for process and comfort heating, and (2) motor speed/position control for integral HP motors, 5 HP-500 HP, both unidirectional and reversing.

ROBINS INDS. CORP., Data Prods. Div., 15-58 127th St, Flushing, N Y, 11356, Tel: 212-445-7200; Sls. Mgr: D. Hubbinett
ROBINSON-HALPERN CO., 5 Union Hill Rd., W. Conshohocken, Pa., 19428, Tel: 215-825-1300, TWX: 510-660-8416; Sls. Mgr: I.E. Robinson
ROBINSON-NUGENT, 800 E. 8th St., New Albany, Ind., 47150, Tel: 812-945-0211, TWX: 810-540-4082
ROBISON ELCTRNS., 2134 W. Rosecrans Ave., Gardena, Cal., 90249, Tel: 213-321-0080; Sls. Mgr: J.D. Robison
ROBOT INDS., INC., 7041 Orchard, Dearborn, Mich., 48126, Tel: 313-TI-6-2623; Sls. Mgr: F.J. Osuch
ROBOTRON CORP., 21300 West 8 Mile Rd., Detroit, Mich., 48219, Tel: 313-444-1444; Sls. Mgr: R. Lachner
ROCHE, PAUL C. CO., INC., 11 Park Pl., New York, N.Y., 10007, Tel: 212-227-8288; Sls. Mgr: R. Humphrey
ROCHESTER INSTR. SYS., 275 N. Union St., Rochester, N.Y., 14605, Tel: 716-325-5120; V.P-Mktg:
ROCKLAND INSULATED WIRE & CABLE, 87 Broadway, Haverstraw, N.Y., 10927, Tel: 914-429-3103; Sls. Mgr: E. Kigler

ROCKLAND SYS. CORP., 131 Erie St., E., Blauvelt, N.Y., 10913, Tel: 914-359-1818; Sls. Mgr: P.D. Beckwith Pgs. 1526,1527
Ala Huntsville, Lee Assocs., 827 Wheeler 205-881-8008
Ariz Phoenix, Cleveland Entprs., Box 16103 602-264-1969
Cal Los Altos, Instrs. For Meas., 2235 Grant 415-961-2828
Cal Los Angeles, Instrs. For Meas., 3455 Cahuenga 213-469-1641
Colo Denver, Cleveland Entrps., 2120 S. Holly 303-758-2409
Conn Hamden, Scientific Devices, 2315 Whitney 203-248-9361
Fla Orlando, Lee Assocs., 200 E. Marks 305-241-4445
Ga Chamblee, Lee Assocs., Box 80666
Md Rockville, Mesa, Inc., 12601 Twin Brook Pkwy. 301-881-8430
Mass Wakefield, Scientific Devices, 591 North Ave. 617-246-0920
NJ Englewood, Scientific Devices, 95 Cedar 201-871-3916
NM Albuquerque, Cleveland Enterprises, Box 11314 505-298-7671
NY Hyde Park, Scientific Devices, 158 S. Albany Post Rd. 914-229-5655
NY Syracuse, Scientific Devices-N.Y., 140 Pickard Bldg., E. Molloy Rd. 315-445-5696
NC Winston Salem, Mesa, 955 Burke 919-724-2406
Pa Plymouth Mtg., Scientific Devices, Box 201 215-825-9515
Tex Dallas, Data Mktg. Assoc., 10048 Monroe St. 214-358-4643
Tex Houston, Data Mktg., 3925 C. Dacoma 713-686-9627
Wash Bellevue, Scientific Devices, 854-106th 206-454-0900
EXP: N.Y., New York, Ancrona Corp., 65 E. 55 St. 212-688-6285
EXP: N.Y., New York, Multiparts Corp., 52 Wall St. 212-WH-4-4370
For: Can., Montreal 261, Que., R-O-R Assocs., 3330 Cavendish Blvd. 514-482-8430
For: Can., Scarborough, Ont., R-O-R Assocs., 21 Rolark Dr. 416-291-7121
For: Can., Vancouver, B.C., 283 E. 11th 604-876-4311
ROCKWELL ENGRG. CO., 2125 E. 45th St., Indianapolis, Ind., 46205, Tel: 317-251-9453; Pres: H.R. Rockwell
RODALE MFG. CO., INC., Emmaus, Pa., 18049, Tel: 215-965-9071; Sls. Mgr: T. Taliaferro
RODALE ELCTRNS., INC., 603 Chestnut St., Garden City, N.Y., 11530, Tel: 516-CH-8-5050; Exec. V.P: J.P. Lester
RODAN INDS., 2905 Blue Star St., Anaheim, Cal., 92806, Tel: 630-0081; Sls. Mgr: J. Burns
RODE, INC., 5 Green St., Woburn, Mass., 01801, Tel: 617-933-3580; Sls. Mgr: H. Doiron
RODELCO, 356A Commack Rd., Deer Park, N.Y., 11729, Tel: 516-643-5110; Sls. Mgr: J. Rodgers

ROGAN BROS., 8019 N. Monticello Ave., Skokie, Ill., 60076, Tel: 312-675-1234, TWX: 910-223-4547; Sls. Mgr: E. Rogan, II ....Pg. 1491
Cal Palo Alto, O'Donnell Assocs., Inc., 1955 "B" El Camino Real 415-327-9260
Cal Torrance, O'Donnell Assocs., Inc., 18053 Crenshaw Blvd. 213-323-9243
Colo Broomfield, Arrowhead Sls. Corp., Box 335 303-222-6462
Conn W. Hartford, F. Kosowicz, 2 Madsen Rd. 203-233-7883
Ill Chicago, J.U. Willman, 6034 N. Cicero Ave. 312-286-1614
Ill Skokie, Rogan Bros., Inc., 8019 N. Monticello 312-675-1234
Mich Southfield, J.L. Montgomery, Inc., 19400 W. Ten Mile Rd. 313-358-2616
Minn Minneapolis, R.W. Marshall Co., 6106 Excelsior Blvd. 612-929-0457
NJ Pitman, Colrud Co., 601 Ardmore Ave. 609-589-5866
NJ Rutherford, Lydon Sls. Co., Box 64 201-939-6290
NY New York, Lydon Sls. Co., 500 Madison Ave. 201-939-6290
Ohio Medina, J.C. Hofstetter Co., 5168 Valley View Dr. 216-241-4880
Tex Dallas, W. Reese Assoc., Box 4410 214-638-6575
Utah Salt Lake City, Arrowhead Sls. Corp., 49 W. Malvern 801-487-3444
Va Lynchburg, Royelec Elctrn. Rep.; Box 254 703-846-7117
EXP: Ill., Wheaton, CHS Int'l., 1512 Wadsworth Rd. 312-665-3402
ROGERS ANTI-STATIC CHEMS., INC., 22 W. Madison, Chicago, Ill., 60602, Tel: 312-DE-2-4250; Pres: S.J. Rogers
ROGERS CORP., Rogers, Conn., 06263, Tel: 203-774-9605, TWX: 710-448-0094; Sls. Mgr: W.A. Hayes, Jr.
ROHDE & SCHWARZ SLS., 111 Lexington Ave., Passaic, N.J., 07055, Tel: 201-773-8010; Sls. Mgr: R. Feldt

Advertisement

Electronic Test and Communications Equipment: Frequency Synthesizers DC-1000 MHz, programmable, with and without AM and FM modulation; programmable attenuators DC-2.7 GHz AM-FM Signal Generators 1-1000 MHz; Power Signal Generators 100 kHz-12.7 GHz; Polyskop Sweep Generators 10 kHz-1250 MHz; Wave Analyzer 100 dB dynamic range; Selective Microvoltmeters 10 kHz-12.7 GHz; Field Strength Meters; Power Meter DC-15 GHz; Impedance Plotters; RLC Meters; Sound Level Meters; Tera-Ohmmeter for insulation resistance measurements; Semi-Conductor and IC Measuring Equipment; TV and CATV Test Equipment for Amplitude Response, Group Delay, Differential Phase/Gain, Sideband Analysis; TV Demodulator; FM Exciters, Antennas; Compact VHF Direction Finders; Radiotelephone Test Assembly.

ROHN MFG. CO., 6718 W. Plank Rd., Peoria, Ill., 61601, Tel: 309-697-4400, TWX: 910-652-0646; Sls. Mgr: R.A. Kleine
ROL-A-CHART DIV., Wm. A. Steward Co., Somerset, Cal., 95684, Tel: 916-622-2437; Sls. Mgr: L. Walton
ROLA DIV., Muter Co., 21010 Miles Pkwy., Cleveland, Ohio, 44128, Tel: 216-475-9200; Sls. Mgr: W.N. Chapman
ROLLAN ELECTRIC CO., 8233 S. Princeton Ave., Chicago, Ill, 60620, Tel: 312-723-4000
ROLLER BEARING CO. AMERICA, Sullivan Way, W. Trenton, N.J., 08628, Tel: 609-882-7400; Sls. Mgr: S. Beimfohr
ROLTEC, INC., 825 Boone Ave. N., Minneapolis, Minn., 55427, Tel: 612-544-3934; Sls. Mgr.: G.R. Bluem
ROMAC ELCTRNS., 48-01 25th Ave., L. I. City, N.Y., 11103, Tel: 212-721-2222; Pres: M. Bloomberg
ROMAR PLASTICS, INC., 1311 E. Main St., St. Charles, Ill., 60174, Tel: 312-584-6571; Sls. Mgr: C.W. Peterson
ROME CABLE, Div. Cyprus Mines Corp., Rome, N.Y., Tel: 315-337-3000, TWX: 510-243-9732; Sls. Mgr: J.W. Hayes
RONSON METALS CORP., 55 Manufacturers Pl., Newark, N.J., 07105, Tel: 201-589-1380; Pres: L.V. Aronson II
ROSEMOUNT, Instr. Sls., Box 35129, Minneapolis, Minn., 55435, Tel: 612-941-5560, TWX: 910-576-3103; Sls. Mgr: D. Sullivan
ROSEMOUNT ENGRG. CO., Box 35129, Minneapolis, Minn., 55435, Tel: 612-941-5560, TWX: 910-576-3103; Mktg. Mgr: D.M. Sullivan

ROSEMOUNT PLUG-IN, Comp. Sls., Box 107, Nashville, Tenn., 37202, Tel: 615-244-1330, TWX: 810-371-1699; Sls. Mgr: P. Kelso ....Pg. 870
Ala Huntsville, Craft Assocs., Box 1053 205-837-0221
Cal Chatsworth, Rosemount, 9549 DeSoto 213-341-3944
Cal Downey, Rosemount, 8542 E. Florence 213-773-7413
Cal San Diego, Rosemount, 4508 Mission Bay 714-274-4703
Cal San Francisco, Rosemount, 960 Palisade 415-327-1420
Fla Maitland, Craft Assocs., Box 986 305-645-2242
Ga Atlanta, Craft Assocs., Box 11716 404-237-2282
Ill Berkeley, Lesman Instr., 5642 St. Charles 312-287-9128
Mass Framingham, J. Lancaster, 147 Concord 617-TR-3-8893
Minn Mpls., ARJAY Sls., 6121 Excelsior Blvd. 612-925-1833
Mo St. Ann, Rosemount, 500 N.W. Plaza 314-739-2707
NJ Englewood Cliffs, Rosemount, 600 Palisade 201-568-6366
NY Williamsville, Alpha Co., Box 282 716-854-4121
NC Charlotte, Rosemount, Box 17375 704-364-1700
Ohio Dayton, RDP Assocs., 5877 Huberville 513-CL-3-6175
Pa Newtown Sq., Rosemount, 3415 W. Chester 215-353-3344
Tex Houston, Rosemount, 3810 Westheimer 713-621-7850
Wash Seattle, Rosemount, 13240 N.E. 20th 206-747-4900
For: Can., Montreal, Que., Willer, 1179 Decarie 514-747-9316
For: Can., Toronto, Ont., Willer, 1800 Avenue 416-783-3373

ROSEMOUNT PLUG-IN, INC., Instrumentation Sales, Box 107, Nashville, Tenn., 37202, Tel: 615-244-1330, TWX: 810-371-1699; Sls. Engr: P. Kelso

ROSENBERG BROS. & CO., 100 Landing Ave., Smithtown, N.Y., 11787, Tel: 516-AN-5-2200; Sls. Mgr: R. Rosenberg

ROSENTHAL CHINA CORP., Tech. Ceramic Div., 411 E. 76th St., New York, N.Y., 10021, Tel: 212-249-1400; Sls. Mgr: E.B. Wiest

ROSS ENGRG. CORP., 559 Westchester Dr., Campbell, Cal., 95008, Tel: 408-377-4621; Pres: H.C. Ross Pg. 1786
Cal Diablo, Thomas Assocs., Box 684 415-837-8411
Cal Menlo Pk., Western Power Prods., 424 Claremont Way 415-327-6385
Colo Denver, Space Sys. Sls., 5810 W. 38th Ave. 303-424-5574
NJ Haddonfield, M & S Assocs., Box 185 609-429-7055
NM Albuquerque, Space Sys. Sls., 4005 Univ. Blvd. 505-247-0458
NY Sodus, A. E. DeCew Agency, Box F 315-483-3261
ND Fargo, Dakota Elec. Supply, 1017 4th 701-237-9440
Tex Dallas, Synthenetics, 8383 Stemmons Frwy. 214-631-1740
Wash Bellevue, F. Broom Sls., 4424 95th 206-454-1375
EXP: Can., Ville LaSalle, Que., Electrodesign, Ltd., 840 La Fleur 514-363-5120

ROSS ENGRG. DIV., Midland-Ross Corp., Box 751, New Brunswick, N.J., 08903, Tel: 201-249-1040; Gen'l. Sls. Mgr: R.J. Yunghahn

ROSS LABS., INC., 3138 Fairview Ave., E., Seattle, Wash., 98102, Tel: 206-EA-4-3950; Sls. Mgr: H. Pollack

ROSTONE CORP., 2451 S. Concord Rd., Lafayette, Ind., 47902, Tel: 317-474-2421; Sls. Mgr: J.R. Jamison

ROTATING COMPS., Div. Instr. Sys. Corp., 1560 Fifth Ave., Bay Shore, N.Y., 11706, Tel: 516-MO-6-8500, TWX: 516-666-7047; Gen'l. Sls. Mgr: M. Richardson Pgs. 1627-1629,2792,2793
Ala Huntsville, 20th Century Mktg., Box 6127 205-772-9347
Cal Encino, King-Way, 17100 Ventura 213-788-4124
Cal Mountain View, Daniels-Padgett, 2620 Bayshore Frtge. 415-969-1700
Conn Essex, Winslow Elec., Gates Rd. 203-767-8229
Fla Winter Pk., Spartak, 1320 Minnesota 305-644-3023
Ga Atlanta, Control Sys., 265 Brighton 404-355-4015
Ill Chicago, LGS Elctrns., 5642 W. Diversey 312-622-8183
Mich Southfield, Sterling-Lowell, 24691 Telegraph 313-355-3030
Minn St. Paul, Cahill, 3000 Hudson 612-739-8445
NJ Fairfield, ISY Assocs., 3 Martin Pl. 201-227-2522
NY Rochester, J. Semple, 21 Edgewater 716-342-1413
Ohio Yellow Springs, Motors, Inc., Box 274 513-878-2484
Wash Seattle, Marbell Assoc., 1016 1st Ave. 206-622-7975
EXP: N.Y., N.Y., Milano Bros., 250 W. 57th 212-CI-6-3210

ROTOHMETERS, INC., 46 Pospect St., Yonkers, N.Y., 10701, Tel: 914-YO-3-5900; Sls. Mgr: J.J. Wilentchik

ROTOLITE, TELEDYNE CO., P.O. Box 7G, Stirling, N.J., 07980, Tel: 201-647-1040; Sls. Mgr: L.A. Nelligan

ROTOR CLIP CO., 1323 Randall Ave., Bronx, N.Y., 10474, Tel: 212-329-0400; Sls. Mgr: R. Slass

ROTRON, INC., Hasbrouck La., Woodstock, N.Y., 12498, Tel: 914-679-2401, TWX: 510-247-9033; Sls. Mgr: D.P. Ridgway ....Pgs. 2794-2807
Ala Huntsville, Bostick, 3322 S. Memorial 205-881-3677
Ariz Scottsdale, Fryco, Box 460 602-945-3281
Cal Burbank, Rotron/Pacific, 1912 W. Burbank 213-849-7871
Cal Mt. View, Rotron/Pacific, 2680 Bayshore Frontage Rd. 415-328-6633
Colo Denver, Gossard, 12159 W. Dakota 303-985-0602
Conn Trumbull, Circuit Sls., 90 Haviland Dr. 203-261-4832
Fla Orlando, G. Bohman, 6990 Lake Ellenor 305-855-0274
Ill Chicago, Gassner & Clark Co., 6644 N. Western Ave. 312-764-6121
Kans Shawnee Mission, Thomas & Modrcin, 5450 Buena Vista 913-432-2131
Mass Lexington, Circuit Sls., One Militia Dr. 617-861-0567
Mich Dearborn, Villani-Pitcher, 20233 Ann Arbor Trail 313-271-4600
Minn Mpls, E.C. Elctrn. Sls., 10108 Abbott 612-888-4626
Mo Hazelwood, Thomas & Modrcin, 47 Village Sq. 314-838-6446
NJ Springfield, F. Sylvester, 649 Morris 201-376-3324
NY Great Neck, F. Sylvester, 260 Northern 516-487-6447
NC Charlotte, A. Over, 3723 Country Ridge 704-366-8601
Ohio Cincinnati, F. J. Campisano, 3985 Race Rd. 513-662-1616
Ohio Cleveland, Comp., Inc., 7461 N. Linden 216-842-2737
Okla Okla Cy, Ammon & Champion, Box 12274 405-942-8222
Pa Ardmore, B. R. Roome, 121 Coulter Ave. 215-649-4101
Tex Dallas, Ammon & Champion, Box 34555 214-357-8441
Tex Houston, Ammon & Champion, Box 35552 713-729-1233
Wash Seattle, Blum & Assocs., 2300 N.W. 97th 206-782-1600
EXP: N.Y., NY, A. Auriema, 120 Liberty 212-349-8220
For: Can., Hamilton, Ont., Cartwright Agencies 416-545-5893
For: Can., Montreal, Que., McIntyre Agencies 514-731-9617
For: Can., No. Vancouver, B.C., C. Thompson 604-987-9388
For: Can., Winnipeg, Manitoba, C. Thompson 204-783-0848

ROWAN CONTROLLER, Box 306, Bethel Rd., Westminister, Md., 21157, Tel: 301-876-2214, TWX: 710-862-0845; Sls. Mgr: P.G. Eaton

ROWE ENGRAVERS, 68 Union Ave., Clifton, N.J., 07011, Tel; 201-546-2776; Sls. Mgr: P. Rosefield

ROWE INDS., DIV., Coleman Cable & Wire, 6100 Benore Rd., Toledo, Ohio, 43612, Tel: 419-729-9761, TWX: 810-442-1734; Sls. Mgr: R.L. Smith ....Pg. 2707
Cal Anaheim, L & M Sls., Box 6255 714-774-0492
Mass Wakefield, Rowe Inds., Inc., Box 452 617-246-0415
Mo Maryland Hgts., Tri "J" Power, 11540 Adie 314-872-8824
NJ Madison, A. Livera Assocs., 2 Green Village Rd. 201-377-3220
NY Fayetteville, H.C. Johnson Agencies, Box 215 315-637-9383
NY Rochester, H. C. Johnson Agencies, 111 Mt. Hope 716-232-2688
NY Roslyn Hgts., A. Livera Assocs., 275 Warner Ave. 516-484-1276
NY Schenectady, H. C. Johnson Agencies, Box 86 518-882-9303
NY Williamsville, H. C. Johnson Agencies, Box 315 716-632-7880
NC Charlotte, Dula Assocs., Box 6096 704-334-7090
NC Winston-Salem, Dula Assocs., Box 5316 919-768-7165
Ohio Cleveland, Richardson-Champ, 3691 Lee 216-991-2885
Pa Pittsburgh, H. C. Johnson Agencies, Box 13127 412-923-2877
Tex Dallas, Berry Co., Box 20461 214-528-0461

Advertisement

Rowe's Corona Free, Hi-Voltage connectors, lead/cable assemblies, molded terminations and bulkhead feed-thrus are widely used at sea level and Hi altitude in commercial, military and industrial applications such as: Radar-Display Systems - R.F. - Lasers - Accelerators - X-Ray - Infrared - Power Supplies-Coaxial, Triaxial, Twinaxial, single/multiple contact types plus others are available in almost any size and configuration. Rowe designs to your applications. See Page. 2529

ROWE L. L. CO., 70 Hichborn St., Boston, Mass., 02135, Tel: 617-783-1067; Sls. Mgr: H. Molan

ROYAL INDS, Tetrafluor Div, 2051 E Maple Ave, El Segundo, Calif, 90245, Tel: 213-332-8030, TWX: 910-348-6697; Pres: A. Schachter

ROYCO INSTRS., INC., 141 Jefferson Dr., Menlo Pk., Cal., 94025, Tel: 415-325-7811; Sls. Mgr: J.D. Theis

ROYLYN, Div. Rucker Co., 620 Paula Ave., Glendale, Cal., 91201, Tel: 213-245-8521, TWX: 910-497-2063; Gen'l. Sls. Mgr: W.H. Grumet

RTRON CORP., Box 743, Skokie, Ill., 60076, Tel: 312-327-4020; Sls. Mgr: N. Williams

RUBATEX CORP, Bedford, Va., 24523, Tel: 703-586-2611, TWX: 703-845-0117; Sls. Mgr: C.R. Thaxton

RUSSELL, BURDSALL & WARD BOLT & NUT CO., Port Chester, N.Y., 10573, Tel: 914-WE-9-6000; Sls. Mgr: T. Toby

RUSSELL INDS., INC., 96 Station Plaza, Lynbrook, N.Y., 11563, Tel: 516-887-9000; Sls. Mgr: H. Russell

RUST CORP., 168 Tremont St., Everett, Mass., 02149, Tel: 617-389-3380

RUSTRAK INSTR. DIV., Gulton Inds., Inc., Municipal Airport, Manchester, N.H., 03103, Tel: 603-623-3591, TWX: 710-220-1878; Sls. Mgr: R.L. Castle ....Pg. 595
Ala Huntsville, W. Brown Comps., 1314 Buford 205-539-4411
Alas Anchorage, ARVA, Inc., Box 759 907-272-5231
Cal Culver City, E. Roberts, 9601 W. Jefferson 213-870-9561
Cal Palo Alto, E. Roberts, 800 San Antonio 415-324-1671
Cal San Diego, E. Roberts, 4379-30th 714-282-7691
Colo Denver, Williams, 4971 Jackson 303-388-4391
Conn Hartford, Gibson Engrg. Co., Inc. 203-247-6919
Fla Ft. Laud, W. Brown Comps., 3039 N.E. 32nd 305-564-8000
Fla Orlando, W. Brown Comps., 222 Weber 305-425-5505
Haw Honolulu, Yett Co., 429 Waiakamilo 808-847-2521
Ill Chicago, Warner Instr. & Sls. Co., Inc., 6548 W. Higgins Ave. 312-631-6778
Ind Ft. Wayne, Scott Elctrns., 124 W. Wash. 219-743-1586
Ind Indpls., Scott Elctrns., 1300-02 N. Penn. St. 317-635-8951
Kans Wichita, Aero-Hill Sls., Box 1312 316-267-7167
Ky Louisville, Scott Elctrns., 366 Francis Bldg. 502-583-3220
Mass Norwood, Gibson Engrg., 90 Broadway 617-769-3600
Mich Detroit, L. Dickelman, 18315 W. 7 Mile Rd. 313-255-3300
Minn Mpls, Heimann, 5603 Lyndale Ave., S. 612-861-6051
NJ Newark, N. Bragar Co., 350 Lafayette 212-344-1100
NM Albuquerque, Williams, 420 Wash. 505-255-1638
NY E. Syracuse, Ossman Instrs., 6666 Old Collamer Rd. 315-437-6666
NY Rochester, Ossman Instrs., 2425 Clover 716-271-4565
NY Vestal, Ossman Instrs., 1901 Vestal 607-785-9947
NY Wappingers Falls, Ossmann Instrs., Inc., 122 E. Main St. 914-297-7777
NC Winston-Salem, W. Brown Comps., 1108 Burke 919-725-5384
Ohio Cincinnati, Scott Elctrns., Inc., 9505 Montgomery Rd. 513-791-2513
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-861-2626
Ohio Columbus, Scott Elctrns., 79 E. State 614-228-2313
Ohio Dayton, Scott Elctrns., 517 Hulman Bldg. 513-223-2652
Okla Tulsa, Kemp Engrg. Co., 7667 E. 46th Pl. 918-628-0309

Ore Portland, ARVA, 2035 S.W. 58th Ave. 503-292-8762
Pa Havertown, Massey, 1325 W. Chester 215-789-2320
Pa Monroeville, Whitaker Controls, 607 Laurel 412-371-6220
Pa Newtown Sq., Holdsworth, 8 Smedley 215-356-8550
Tex Dallas, Kemp Engrg., 2618 Manana 214-357-6663
Tex Houston, Kemp Engrg., 6001 Gulf Frwy. 713-928-5426
Va Alexandria, W. Brown Comps., 325 First 703-836-1800
Wash Seattle, ARVA, Inc., 1320 Prospect St. 206-622-0177
Wisc Mequon, Automation Engrg. Co., Inc., 12740 N. River Rd., 43 West 414-242-1520
For: Can., Montreal, Quebec, R.H. Nichols Co., Ltd, 4900 Rue Fisher 514-735-5881
For: Can., Downsview, Ont., R.H. Nichols Co., Ltd., 4544 Dufferin St. 416-633-8190
For: Can., Vancouver, B.C., 736 Granville St. 604-683-0119

RYE INDS., INC., 125 Spencer Pl., Mamaroneck, N.Y., 10543, Tel: 914-698-0080; Sls. Mgr: C.H. David Pg. 2708
Cal Los Angeles, Marshank, 7422 Melrose 213-938-2591
Colo Colorado Springs, Norris, 915 Cheyenne 303-685-9319
Haw Honolulu, Av-Tronic Sls., 825 Keeaumoku St.
Ill Chicago, W.J. Doyle, 7426 N. Western 312-BR-4-6685
Kans Overland Pk., Penzner, Box 4362 913-DU-1-0004
Mass Cohasset, Montague, 404 Jerusalem 617-383-0634
NY Oceanside, Bittan, 400 Merrifield 516-678-6222
NC Charlotte, Clymer Entprs., 1605 Chatham 704-376-5951
Ohio Columbus, McFadden Sls., 150 E. Broad 810-482-1623
Ore Portland, Van Voorhees, 4415 N.E. Sandy 503-287-6633
Pa Havertown, J. Mustico, 206 Bewley 215-HI-6-1961
Tex Addison, Campion Sls., Box 396 214-239-9196

RYERSON, J.T. & SON, INC., 2558 West 16th St., Chicago, Ill., 60608, Tel: 312-RO-2-2121, TWX: 312-265-1460

RYKA SCIENTIFIC, INC., 641 N. Pastoria Ave., Sunnyvale, Cal., 94086, Tel: 408-738-0930, TWX: 910-339-9266; Sls. Mgr: L.C. Meeks ....Pg. 1564
Ariz Phoenix, Thorson Co., 2505 E. Thomas Rd. 602-956-5300
Cal Los Angeles, Thorson Co., 347 S. Ogden Dr. 213-937-0790
Cal San Diego, Thorson Co., 444 Olive St. 714-298-8385
Cal Tustin, Thorson Co., 17461 Irvine Blvd. 714-544-5121
Colo Denver, Thorson Co., 5040 E. 41st Ave. 303-355-3521
Ill La Grange, Berberich Assoc., 5707 Linden Ave. 312-246-6333
Md Ellicott City, Applied Engrg. Conslts., 9051 Baltimore Nat'l. Pike 301-465-1272
Mass Burlington, Tritek, 165A Bedford St. 617-272-4550
Mich Franklin, Berberich Assocs., 31425 Nottingham 313-626-7508
NM Albuquerque, Thorson Co., 5921 Lomas Blvd., N.E. 505-265-5655
NY Great Neck, E.R.A., Inc., 330 Great Neck Rd. 516-482-9320
NY Marcellus, ROBTRON, Clark Terr. E. Hill 315-685-5731
Ohio Dayton, Berberich Assocs., 4130 Linden Ave. 513-252-9981
Pa Philadelphia, Applied Engrg. Consts., 8605 Bayard St. 215-247-9007
Tex Dallas, Thorson Co., 7700 Carpenter Frwy. 214-631-5440
Tex Houston, Thorson Co., 6655 Hillcroft 713-771-3504
Utah Salt Lake City, Thorson Co., 445 E. 2nd S. 801-322-2127
Wash Seattle, Thorson Co., 909 N.E. 43rd. St. 206-632-8037
EXP: Can., Ont., R.D.B. Sheppard Agcs., Box 8, Georgetown 416-877-9846

RYSTL ELCTRNS. CORP., 328 N.W. 170th St., N. Miami Beach, Fla., 33160, Tel: 305-621-2351 R.E. Taylor

S & A ELCTRNS., INC., 202 W. Florence St., Toledo, Ohio, 43605, Tel: 417-693-0528; Sls. Mgr: P. Wilson

S & E I MFG., 18800 Parthenia St., Northridge, Cal., 91324, Tel: 213-349-4111, TWX: 910-493-1252; Sls. Mgr: J. Schlenker ....Pgs. 2438,2439
Cal Los Altos, Parsons Co., One First St. 415-941-4745
Cal San Diego, D. Allen Co., 7969 Engineer Rd. 714-278-9250
Fla Largo, EPF, 621 N. Clearwater-Largo Rd. 813-584-4678
Ill Chicago, Ropek-Cahill, 5439 W. Division 312-287-7292
Mass Needham, Hatch Assocs., 1233D Highland Ave. 617-444-3310
Minn Mpls, Tech. Assocs., 4915 W. 35th 612-929-6721
NY Hempstead, Kahgan Sls., 556 Peninsula 516-538-2300
NY Rochester, B. Tollefson, 110 Allen Creek 716-271-4141
NC Charlotte, J. Rudisill, 1225 Harding Pl. 704-377-6901
Ohio Dayton, L. Berberich, 4130 Linden 513-252-9981
Pa Philadelphia, C & F Sls., 5451 Oakland St. 215-CU-8-9406
Tex Ft. Worth, Dyna-Reps, Box 8446 817-451-1392
Va Fairfax, T. Davis, 10713 Almond St. 703-591-7390
For: Can., Montreal, Que., B. Manis Assoc., 2690 Pitfield Blvd. 514-336-4500

S & S OPTICAL CO., INC., 7812 Stellhorn Rd., Ft. Wayne, Ind., 46805, Tel: 219-748-1955; Sls. Mgr: A.C. Stein, Jr.

SAE ADVANCED PACKAGING, Sub. Stanford Applied Engrg., 2165 S. Grand Ave., Santa Ana, Cal., 92705, Tel: 714-540-9256, TWX: 910-595-1122; Sls. Mgr: L. Nordeen Pgs. 2712,2713
Ala Huntsville, Col-Ins-Co., 2109 W. Clinton St. 205-539-1771
Cal Palo Alto, Western Int'l. Trade, 499 Hamilton Ave. 415-321-1240
Cal Santa Clara, SAE Sls., 340 Martin Ave. 408-243-9200
Colo Denver, Franklin Sls., 1924 Navajo St. 303-922-3623
Fla Orlando, Col-Ins-Co., 1313 44th St. 305-423-7615
Ill Des Plaines, Coombs Assosc., 1001 E. Toughy 312-298-4830
Ill Addison, Coombs Assocs., 315 Laura Dr.
Ind Indpls., Coombs Assocs., 5027 N. Kenmore Rd. 317-545-6081
Md Timonium, Heller-Freedman, Box 293 301-252-4780
Mass Needham, Addelco Corp., 56 Pickering St. 617-444-4754
Minn Mpls., Compar-Twin Cities, Box 16095 612-922-7011
Mo St. Louis, Coombs Assocs., 11734 Lackland Ind.
NJ Morristown, Graydon-Sherman, 230 Madison Ave. 201-538-9246
NY Albany, Caompar-Albany, 6 Highland Ave. 518-489-7408
NY Cicero, Compar-Albany, Box 336
NY Endwell, Compar-Albany, Box 135 607-723-8743
NY Fairport, Compar-Albany, 42 Winding Brook Dr. 716-271-2230
NC Winston-Salem, Col-Ins-Co., Box 5597
Ohio Dayton, Whelan Corp., 2600 Far Hills Ave. 513-298-9997
Okla Tulsa, Allied Comps., Box 4768 918-939-2848
Tex Dallas, Allied Comps., 10464 E. Northwest Hwy.
Tex Houston, Allied Comps., 6400 Westpark Dr. 713-782-5406
Wash Seattle, Rowe/Northwest, 1123 38th Ave. 206-325-2792

SAFEWAY PRODUCTS INC., 440 Middlefield St., Middletown, Conn., 06457, Tel: 203-347-5611, TWX: 710-428-7944

SAG HARBOR INDS., INC., Bayview St., Sag Harbor, N.Y., 11963, Tel: 516-725-0440; Sls. Mgr: S.A. Miller

Advertisement

In addition to Hi-Rel coils for minimum outgassing, S.H. makes custom fabricated bobbins of Kapton and/or teflon for the industry and also custom stripping of close tolerance miniature leads for jumpers and coils.

SAGE ELCTRNS., Box 3926, Rochester, N.Y., 14610, Tel: 716-586-8010, TWX: 510-254-2861; Sls. Mgr: R.C. Greene ....Pgs. 2878,2879
Ala Birmingham, F. Nickerson, 1148 Cheyeene 205-853-3181
Cal Los Angeles, M. Stolaroff, 4622 W. Slausen 213-295-7781
Cal San Mateo, J. Pyle Co., 1611 Borel Pl. 415-349-1266
Colo Denver, Todd & Assocs., 1260 Inca St., S. 303-777-4381
Conn Milford, Tesco, Inc., Box 402 203-874-6643
Fla Tampa, F. Nickerson, 4513 S. Camerson 813-833-4321
Ga Decatur, F. Nickerson, Box 33185 404-377-1575
Ill Oak Pk., Wasson-Gallagher, 1024 N. Blvd. 312-383-6572
Ind Angola, Southern Sls., 105 Lakeshore 219-665-3961
Ind Indls., Southern Sls., 1111 E. 54th 317-253-3359
Kans Mission, Tech. Sls. Assocs., 5827 Outlook 913-831-2888
Ky Louisville, Southern Sls. Co., 429 Walnut 502-583-6902
Mass Needham Hgts., Tesco, Box 201, Kearney 617-444-7925
Mich Ann Arbor, H. Heym, 1615 Chalmers 313-971-6552
Minn St. Paul, Wagner Comp. Sonslts., 542 S. Snelling 612-698-0331
Mo St. Louis, Tech. Sls., 34 N. Brentwood 314-725-8200
NY Clay, Reed Elctrns., 5677 Williamson Pkwy. 315-699-7375
NY New York, E. Glass, 250 W. 57th St. 212-586-8440
NY Rochester, Reed Rlctrns., 2815 Monroe 716-473-2767
NY Vestal, Reed Elctrns., Inc., Box 187 607-748-7391
NC Charlotte, F. Nickerson, 5817 Haddington 704-537-2855
Ohio Vandalia, W. J. Brauer & Assocs., Box 35 513-898-1224
Ohio Wickliffe, W. Brauer, Box 305 216-943-0601
Okla Tulsa, H. J. Daly, 5836 S. 70th E. Ave. 918-627-4159
Pa Ardmore, W. K. Metz, Box 309 215-649-3966
Pa Pittsburgh, W. J. Brauer, Box 8466 412-921-3213
Tex Dallas, Solid State Sls. Co., Box 20054 214-352-2601
Wash Bellevue, Vantage Corp., 300 120th Ave. N E 206-455-3460
For: Can., West Hill, Ont., Electromechanical Prods., 6087 Kingston Rd. 416-282-3870

SAGE INSTRUMENTS, INC., 2 Spring St., White Plains, N.Y., 10601, Tel: 914-949-4121; Sls. Mgr: J. Schwartz

SAGE LABS. INC., Instr. Div., 14 Huron Dr, Natick, Mass., 01760, Tel: 617-653-0844, TWX: 710-346-0390; Sls. Mgr: P. Pollins

SAMARIUS, INC., 300 Seymour Ave., Derby, Conn., 06418, Tel: 203-735-7405, TWX: 710-451-2495; Sls. Mgr: R.C. Heitz

SAMPSON ELCTRNS. PRODS. DIV., 2244 S. Western Ave., Chicago, Ill., 60608, Tel: 312-VI-7-6363, TWX: 312-265-1384; Sls. Mgr: J. Alschuler

SAMS, HOWARD W. & CO., INC., 4300 W. 62 St., Indianapolis, Ind., 46268, Tel: 317-291-3100; Dir. Sls: T.V. Surber

SAN FERNANDO ELEC. MFG., 1501 1st St., San Fernando, Cal., 91341, Tel: 213-365-9411, TWX: 910-496-1535; Sls. Mgr: L.R. Smith ....Pg. 2437
Ariz Tucson, Ruby Sls. Co., Box 11277 602-294-0762
Cal San Fernando, San Fern. Elec. 213-365-9411
Cal Santa Clara, Ruby Sls. Co., Box 487 408-243-1694
Colo Denver, Ruby Sls. Co., 1200 S. Alton 303-755-1714
Conn Stratford, G. Rosen, 194 Plymouth St. 203-375-5456
Fla Clearwater, Perrott Assocs., Box 4532 813-531-5513
Fla Orlando, Perrott Assocs., 1607 Forsyth 305-275-1132
Fla W. Palm Beach, Perrott, 7515 W. Lake 305-967-1770
Ill Park Ridge, San Fernando Elec., Box 391 312-763-2255
Ind Huntington, San Fernando Elec., Box 184 219-356-7391
Mass Natick, G. Rosen, 563 Worcester Rd. 617-655-2211
Minn St. Paul, Smith Engrg., 2278 Como Ave. 612-646-4851
Tex Dallas, Ruby Sls. Co., Box 9894 214-827-6630
Wash Seattle, B. Hirsh, 4013 Leary Way, N.W. 206-783-3423
EXP: Conn., Stamford, Dage Corp., 757 Main 203-324-3123
For: N.Y., Ogdensburg, Whittaker Elctrns., Ltd., Ogdensburg Bridge Bldg.
For: Can., Ottawa, Ont., Whittaker Elctrns., Ltd., 42 Howden Ave. 613-224-1221
For: Can., Roxboro, Que., Whittaker Elctrns., Ltd., Box 216 514-683-3621
For: Can., Weston, Ont., Whittaker Elctrns., Ltd., 1885 Wilson Ave. 416-247-7454

SANDERS ASSOCS., Daniel Webster Hwy., S., Nashua, N.H., 03060, Tel: 603-885-6660, TWX: 710-228-1894; Sls. Mgr: J. Melrose
SANDERS DATA SYS., Daniel Webster Hwy., Nashua, N.H., 03060, Tel: 603-885-4220, TWX: 710-228-1896; Sls. Mgr: J.T. Griffin
SANDERS ASSOCS., INC., Data Sys. Div., Daniel Webster Hwy., S., Nashua, N.H., 03060, Tel: 603-885-6340, TWX: 710-228-1896; Sls. Mgr: J. Griffin
SANDERS ASSOCS., EMC Dept., 95 Canal St., Nashua, N.H., 03060, Tel: 603-885-6362
SANDERS ASSOCS., Flexprint, Grenier Field, Manchester, N.H., 03103, Tel: 603-669-4615, TWX: 710-220-1845; Sls. Mgr: T.W. Stewart
SANDERS ASSOCS., GPL P.C. Prod. Equip., Grenier Field, Manchester, N.H., 03103, Tel: 603-669-4615, TWX: 710-220-1845; Sls. Mgr: T.W. Stewart
SANDERS ASSOCS., INC., Instr. Div., Grenier Field, Manchester, N.H., 03103, Tel: 603-669-4615, TWX: 710-220-1845; Sls. Mgr: G. Lathrop
SANDERS ASSOCS., Microwave, Ledge St., Nashua, N.H., 03060, Tel: 603-885-2445, TWX: 710-228-1887; Sls. Mgr: L. Sternlicht
SANDERS ASSOCS., OCEAN SYS., Daniel Webster Hwy., So. Nashua, N.H., 03060, Tel: 603-885-2596, TWX: 710-228-6954; Sls. Mgr: R. Crisp
SANDERS NUCLEAR CORP, 95 Canal St, Nashua, N H, 03060, Tel: 603-885-2230, TWX: 710-228-1894; Sls. Mgr: N. Van Dine
SANDS, LEO G. & ASSOCS., INC., 250 Park Ave., New York, N.Y., 10017, Tel: 212-697-0235; Sls. Mgr: R.F. Burns
SAN-EI INSTRUMENT CO., LTD., Enoki Bldg 2-chome 223-2, Nishi-Okubo, Shinjuku-ku, Tokyo 160, Japan, Tel: 209-0811, TWX: 232-2426

SANGAMO ELEC. CO., Capacitor Div., Box 128, Pickens, S.C., 29671, Tel: 803-878-6311, TWX: 810-397-2496; Sls. Mgr: W.C. Bakes ....Pg. 2440
Ariz Scottsdale, El-Kap Sls., 7155 E. Thomas 602-946-2457
Cal Menlo Pk., El-Kap Sls. Co., 3945 Bohannon Dr. 415-325-1513
Cal Menlo Pk., Sangamo Elec. Co., 3945 Bohannon Dr. 415-322-6271
Cal Placentia, El-Kap, 709 Monroe Way 714-528-3750
Cal Placentia, Sangamo, 709 Monroe Way 714-528-3750
Fla Clearwater, Dyne-A-Mark, 1665 Magnolia 813-446-3229
Fla Fern Pk., Dyne-A-Mark, Box 128 305-831-5100
Fla Pompano Beach, Dyne-A-Mark Corp., 1010 E. Atlantic Blvd. 305-942-4041
Haw Honolulu, Pacific Factors, 1204 Waimanu 808-533-7135
Ill Palatine, Sangamo, 111 S. Northwest Hwy. 312-359-6080
Mass Braintree, Sangamo, 817 Washington 617-848-0532
Mich Detroit, D.E. Poulin, 17222 E. Warren 313-886-4990
Mich Kentwood, D. E. Poulin, 1635 Pembroke S.E. 616-452-7408
Minn Mpls., S. Clothier, 7400 Lyndale, S. 612-869-3231
Mo Kansas City, Harris-Hanson, 7916 Paseo 816-444-9494
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood 314-962-0111
NJ Cherry Hill, Sangamo Elec., 1103 N. Kings Hwy. 609-667-4848
NY DeWitt, Sangamo Elec. Co., Box 6 315-446-2299
NY Elmont, E. Schmitt, 311 Meacham 516-437-8150
Ohio Columbus, Sangamo, 1646 W. Lane 614-486-1508
Ore Portland, C.K. Shanks & Assocs., Box 25375 503-292-5656
SC Pickens, Sangamo Elec. Co., Box 128 803-878-6311
Tex Dallas, R.E. Nesbitt Co., 2930 Merrell Rd. 214-357-4601
Tex Houston, R. Nesbitt, 4208 Mt. Vernon 713-528-3811
For: Can., Clarkson, Ont., D. Beattle, 2104 Bromsgrove 416-822-4414

SANGAMO ELEC. CO., Data Sys., Box 3347, Springfield, Ill., 62708, Tel: 217-544-6411, TWX: 910-242-0533; Sls. Mgr: A. Tucker ....Pg. 379
Ala Huntsville, W. A. Brown Instrus., 1314 Buford St. N.W. 205-539-4411
Ariz Tempe, Recording Sci. Assocs., Box 27806 602-275-1372
Cal Los Angeles, Scien. Devices - Cal., 8621 Bellanca Ave. 213-641-4800
Cal Mountain View, Scien. Devices - Cal., 655 W. Evelyn Ave. 415-964-4230
Cal San Diego, Scien. Devices - Cal., 8098 Engineer Rd. 714-279-6643
Colo Littleton, RADCO Elctrns., 2552 Ridge Rd. 303-794-4279
Conn Hamden, Scien. Devices - N.E., 3515 Whitney Ave. 203-248-9361
Fla Ft. Lauderdale, W. A. Brown Instrs., 961 N.W. 53rd St. 305-949-1022
Fla Orlando, W. A. Brown Instrs., 222 Weber Ave. 305-425-5505
Ga Tucker, W. A. Brown Instrs., 1682 Weymouth Ct. 404-939-1674
Haw Honolulu, Pacific Factors, Ins., 1204 Waimanu St. 808-533-7135
Ill Chicago, SEA, Inc., 4210 W. Irving Park Rd. 312-282-6694
Ind Carmel, SEA, Inc., 620 S. Range Line Rd. 317-846-2593
Iowa Cedar Rapids, Palatine Engrg. Sls., 720 3rd Ave. S.E. 319-365-8071
Kans Andover, Palatine Engrg. Sls., 1722 N. Terry La. 316-683-7512
Kans Overland Pk., Palatine Engrg. Sls., 7520 W. 63rd St. 913-262-6820
Mass Wakefield, Scien. Devices-N.E., 591 North Ave. 617-246-0920
Mich Detroit, WKM Assocs., 1474 E. Outer Dr. 313-892-2500
Minn Minneapolis, SEA, Inc., 7601 N. Kentucky Ave. 612-425-4455
Mo St. Louis, Palatine Engrs. Sls., 1573 Warson Rd. 314-426-7055
NJ Fairfield, KLS Assocs., 387 Passaic Ave. 201-227-2900
NM Albuquerque, Recording Sci. Assocs., 1811 Carlisle, N.E. 505-265-7631
NY Hyde Pk., Scien. Devices-N.E., 158 S. Albany Post Rd. 914-229-5655
NY N. Syracuse, NACO Elctrns., Box 248 315-699-2651
NY Rochester, NACO Elctrns., 74 Park Ave. 716-244-14607
NY Schenectady, NACO Elctrns., 1032 Merlin Dr. 518-785-3750
NY Utica, NACO Elctrns., 2631 Edgewood Rd. 315-732-1801
NC Winston-Salem, W. A. Brown Instrs., 1108 Burke St. 919-725-5384
Ohio Cleveland, WKM Assocs., 16141 Puritas Ave. 216-267-0445
Ohio Dayton, WKM Assocs., 6073 Far Hills Ave. 513-434-7500
Pa King of Prussia, J. E. Cuesta & Co., Rt 202 & Allendale Rd. 215-265-5800
Pa Pittsburgh, WKM Assocs., 90 Clairton Blvd. 412-892-2953
Tex Dallas, Data Mktg. Assocs., 10048 Monroe Dr. 214-358-4643
Tex El Paso, Recording Sci. Assocs., Box 4033 915-565-5530
Tex Houston, Data Mktg. Assocs., 3925 Dacoma 713-686-9627
Va Springfield, Engrg. Tech., 6615 Backlick Rd. 703-451-6500
Wash Seattle, R. S. Drake Assocs., 6133 Maynard Ave. S. 206-763-2755
Wisc Waukesha, SEA, 142 South St. 414-547-6637
For: England, Enfield, Middlesex, G. W. Disbrey, Great Cambridge Rd. Keats 1100

SANKYO SEIKI MFG. CO., LTD., 17-2, 1-Chome, Shimbashi, Minato-Ku, Tokyo, Japan, Tel: 591-8371; Sls. Mgr: T. Iijima ....Pg. 1630
NY New York, American Sankyo, 95 Madison 212-LE-2-8020

SANTA BARBARA RESCH. CTR., 75 Coromar Dr, Goleta, Calif., 93017, Tel: 805-968-3511, TWX: 213-871-5210; Sls. Mgr: P.J. Granke

Advertisement

The world's largest supplier organization devoted solely to the research, development and manufacture of the most complete selection of Infrared components and associated equipment.

A respectable variety of standard Infrared Detectors, matched cryogenic and electronic components are in stock or available on short delivery.

Over 100,000 square feet of modern integrated facilities staffed with real experts are organized to respond effectively to your needs - one-of-a-kind or production-runs of thousands.

We furnish to Military, Industrial, Medical and Scientific requirements.

Learn more, call or write - - - IR (Infrared) is SBRC.

SANTA FE MFG. CO., 2343 Jerome Ave., Bronx, N.Y., 10468, Tel: 212-LU-4-8900; Sls. Mgr: V.J. Sarrica
SANWA CORP. AMERICA, 2500 Woodbridge Ave., Edison, N.J., 08817, Tel: 201-985-7800; Sls. Mgr: A.P. Iati
SARA SCIENTIFIC CO., P.O. Box 321, San Francisco, Calif., 94101, Tel: 415-421-3172; Sls. Mgr: S. Fishman
SARGENT WELCH SCI. CO., Vacuum Prods. Div., 7300 N. Linder Ave., Skokie, Ill., 60076, Tel: 312-677-0600; Sls. Mgr: N.C. Brunner
SARKES TARZIAN, INC., Semiconductor Div., 415 N. College Ave., Bloomington, Ind., 47402, Tel: 812-332-1435, TWX: 810-351-1384; Sls. Mgr: F. Lucas
SARTRON, INC., 114 N. Main St., Newberg, Ore., 97132, Tel: 503-538-3191; Sls. Mgr.: L.A. Lawson
SAUEREISEN CEMENTS CO., 160 Gamma Dr., Pittsburgh, Pa., 15238, Tel: 412-781-2323; Sls. Mgr: G.W. Read

SAWYER INDS., 5445 Peck Rd., Arcadia, Cal., 91006, Tel: 213-442-5981, TWX: 910-587-3534; Sls. Mgr: J.J. Marino ....Pg. 1631
Cal Lafayette, Persons & Assocs., 32 Diablo Rd., 415-283-3760 910-587-3534
Ill Rolling Meadows, Sumer, Inc., 5105 Tollview Dr. 312-392-7370
NJ Teaneck, Budd-Tronics, Inc., 71 Grayson Pl. 201-837-1660
Ohio Middletown, Transco Prods., Inc., Box 129 513-423-0332
Tex Ft. Worth, Carey-Wolf Co., Box 12425 817-738-1702

SAWYER RESCH. PRODS., INC., 35400 Lakeland Blvd., Eastlake, Ohio, 44094, Tel: 216-942-8747; V.P. Sls: D.P. Larsen

SAXTON PRODS., 215 N. Rte. 303, Congers, N.Y., 10920, Tel: 914-268-6848; Ind Sls. Mgr: A. Abbo Pgs. 3048-3053
Cal Culver City, W. Anderson, Box 206 213-870-1030
Cal Los Angeles, L. Gould, Sausalito, Canoga 213-463-3123
Cal Oakland, Sinclair Elctrns., 1085 Clarendon 415-451-3428
Conn Hartford, J. Colavecchio, 122 Grant 203-522-0596
Ga Decatur, A. Stayton, 3383 Wilkham Rd.
Ill Chicago, D. Abo, 4100 Marine Dr. 312-262-1718
Minn So. St. Paul, G. Johnson, 115 Highland Ave.
Ore Lake Oswego, McMillan Elec., 16679 S.W. Maple Cir.
Pa Phila., L. Feinstein, 2035 Beyer Ave. 215-OR-7-6497
Tex Garland, K. Treuter, 1221 W. Miller Rd. 214-278-4355
Utah Bountiful, P. E. Anderson, 131 N. 5th, W.

SBD SYSTEMS, INC., 275 Dixon Ave., Amityville, N.Y., 11701, Tel: 516-598-0100, TWX: 510-224-6697; Ch. Exec. Off: A. Schneider
SCALA RADIO CORP., 1970 Republic Ave., San Leandro, Cal., 94577, Tel: 351-3792; Sls. Mgr: B. Zucconi

Advertisement

Complete antenna coverage - 40 to 2500 MHz. Custom made arrays, Yagis, Ground Planes, Corner Reflectors, Omni-Directional (vertical or horizontal), Paraflectors, Log Periodics, Slot Arrays, Radomes. Power Dividers, Inter-Connecting Cables, Phasing Harnesses and Fastening Hardware.

SCAM INSTR. CORP., 7401 N. Hamlin Ave., Skokie, Ill., 60076, Tel: 312-675-2500, TWX: 910-223-3606; Sls. Mgr: R.W. Choronzy

SCANBE MFG. CORP., 3445 Fletcher Ave., El Monte, Cal., 91731, Tel: 213-579-2300, TWX: 910-587-3437; V.P. Mktg: J. Rose ....Pg. 2324
Ariz Scottsdale, BFA Corp., 503 N. Brown Ave. 602-946-4215
Cal Los Altos, Ewing-Foley
Cal San Diego, Earl Assocs., 4433 Convoy St. 714-278-5441
Colo Denver, Vinson Assoc., 2145 S. Clermont 303-757-5151
Conn Watertown, R. P. Mahan 203-274-2363
Fla Clearwater, WMM Assocs., 1260 A So. Highland 813-446-0075
Ga. Tucker, Watkins & Assocs., Stephens Ct. 404-939-3371
Ill Chicago, J.C. Angel Co., 2743 W. Peterson Ave. 312-878-0653
Kans Mission, Inland Assocs., 6047 Howe Dr. 913-362-2366
Md Baltimore, Kaufholz Assocs., Box 6232 301-488-6561
Mass Wellesley, R.P. Mahan Co., 572 Washington St. 617-237-1040
Mich St. Clair Shores, J. M. Thorpe, 28915 Harper Ave. 313-779-6363
Minn St. Paul, H. Cullen & Assocs., 1595 Selby Ave. 612-646-7372
Mo Creve Coeur, Inland Assocs. 314-993-0301
NM Albuquerque, BFA Corp., 1238 Ortiz, S.E. 505-268-4387
NY Great Neck, H. J. Krasner, 33 Great Neck Rd. 516-487-0690
NY New Hartford, KLM Assocs., One Nouvelle Pk. 315-735-8525
Ohio Akron, A. Natalino, 209 Harmony Hills 216-725-6087
Pa Newtown Sq., Kaufholz Assocs., Box 273 215-356-5000
Tex Dallas, Techno Assocs., 2324 Shorecrest Dr. 214-357-0213
Wash Seattle, Datacom Assocs., 2207 Fairview E. #12 206-329-2989
EXP: Can., Ottawa 5, Whittaker Elctrns., 42 Howden Ave. 613-224-1221

SCANIVALVE, INC., Box 20005, San Diego, Calif., 92120, Tel: 714-283-0010; Sls. Mgr: J.C. Pemberton

SCHAEVITZ ENGRG., U.S. 130, Union Ave., Pennsauken, N.J., 08110, Tel: 609-662-8000, TWX: 710-892-0714; Sls. Mgr: J.R. Volin Pgs. 390,948,1346,1988-1991
Ala Huntsville, B.J.R., Box 4422 205-881-3569
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd, #5 602-253-6104
Cal San Carlos, Elctrn. Engrg., 1293 Laurel 415-593-2189
Cal S. Pasadena, Schaevitz Tech., 2056 LaFrance 213-682-3886
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
Conn E. Hartford, Meas. Equip., Box 8192 203-528-8192
Fla Orlando, Datarep, Box 5929 305-855-8945
Fla Pompano Bch., Datarep, Box 5277 305-781-9279
Kans Wichita, Avionics Engrg., Box 786 316-AM-4-6201
Mass Wakefield, Meas. Equip., 591 North Ave. 617-245-4870
Mich Farmington, Anderson Elctrns., 30785 Grand River 313-476-9161
Minn Mpls., Industra, 6504 Walker 612-929-6224
Mo St. Louis, Ozark Elctrn., 2573 Woodson 314-423-7200
NJ Cherry Hill, Markey Engrg., 14 Jade 609-667-3809
NJ Frenchtown, Schuler Engrg., Box 128 201-782-0497
NM Albuquerque, Hytronic Meas., 205 San Pablo, S.E. 505-268-3941
NC Winston-Salem, Radco Co., 614 Nissen Bldg. 919-722-9671
Ohio Columbus, Meas. Instrs., 2074 Arlington 614-488-9753
Pa Pittsburgh, Meas. Instrs., 908 Perry Hwy. 412-366-1906
Tex Richardson, Vista Engrg., 777 Central Expwy. 214-235-4547
Tex Houston, Vista Engrg., 3003 Yale St. 713-869-0109
Utah Salt Lake City, Hytronic Meas., 2022 S. Main 801-466-4924
Wash Bellevue, A. Smith, 405 - 166 S.E. 206-746-6770
Wisc Milwaukee, O'Meara Co., 647 W. Virginia 414-271-7360

SCHAUER MFG. CORP., 4516 Alpine Ave., Cincinnati, Ohio, 45242, Tel: 513-791-3030; Sls. Mgr: S.E. Wright Pg. 1821
Cal Palo Alto, Ellis Ent., 4020 Fabian St. 415-328-5151
Cal Orange, F. Huddleston, 44 Plaza Sq. 714-639-1941
Conn Meriden, Eagle Assocs., Box 921 203-237-5527
Fla Orlando, F. Fausett, 2213 Merritt Pk. 843-4598
Ga Smyrna, F. Fausett & Co., Box 378 404-436-5169
Ill Chicago, Ellinger, 6580 N. Northwest Hwy. 312-763-1570
Iowa Clarion, D. Sharp, 309 Fourth, S.E.
Mass Needham, Eagle Assocs., 52 Pickering 444-3446
Mich Detroit, Rathsburg, 16621 E. Warren 313-882-1717
Minn Mpls., C. Gibb, 1311 W. 25 612-377-1200
Mo St. Louis, E. Rea, 4969 Bancroft 352-2027
NY Buffalo, J. Glass, 220 Delaware 716-856-9272
NY Woodside, D. Tobias, 49-01 31st 212-726-4551
Ohio Cleveland, J. Olsen, 16201 Shaker Blvd. 216-752-5444
Pa Phila., K.B. Erdman, 7906 Montgomery 224-1833
Pa Pittsburgh, E.A. Snefsky, 104 Elatan Dr. 179-2550
Pa Pittsburgh, R.A. Stone, 1843 Maydell St. 241-8391
Tex Dallas, J. Schoonmaker, 2995 Ladybird 214-357-8481
Va Salem, F. Fausett, 1338 Pulaski St. 305-424-0701
Wash Seattle, D. Miller, 7821 Fremont, N. 206-784-6800

SCHENCK TREBEL CORP, 120 Finn Ct., Farmingdale, N. Y., 11735, Tel: 516-694-7965; V.P. Sls: D.G. Stadelbauer

SCHENECTADY CHEMS., Box 1046, Schenectady, N.Y., 12301, Tel: 518-346-8711; Sls. Mgr: A.C. Sheals

SCHERMA, F.A. MFG. CO., INC., 424 Broome St., New York, N.Y., 10013, Tel: 212-WA-5-2077; Sls. Mgr: M. Scherma

SCHINDLERS, Box 24978, Los Angeles, Cal., 90024, Tel: 213-GR-2-0146

SCHJELDAHL, G.T. CO., Elec. Prods. Div., Box 170, Northfield, Minn., 55057, Tel: 507-645-5633, TWX: 910-565-2180; Mktg. Mgr: E.S. Lyman

SCHNEIDER INSTR. CO., 8115 Camargo Rd., Madeira, Cincinnati, Ohio, 45243, Tel: 513-561-6803

SCHOEFFEL INSTR. CORP., 24 Booker St, Westwood, N.J., 07675, Tel: 201-664-7263; Sls. Mgr: W. Sweet

SCHONSTEDT INSTR. CO., 1775 Wiehle Ave., Reston, Va., 22070, Tel: 703-471-1050; Sls. Mgr: T.W. Bennett

SCHRACK ELEC. SLS., 1140 Broadway, New York, N.Y., 10001, Tel: 212-MU-3-0790; Sls. Mgr: H. Siegell Pg. 1787
Cal Redwood City, Warren-Hickey, 175 Fifth 415-368-3849
Cal Sherman Oaks, R. Hopkins, 15016 Ventura 213-788-5501
Colo Denver, Walter Engrg., 880 Bonnie Brae 303-777-5585
Conn Old SayBrook, M.L. Assocs., 5 Ruth Dr. 203-388-9718
Fla Lutz, S. Wallace, Box 67 813-949-1817
Fla Miami, S. Wallace, 3115 N.W. 81st Terr. 305-691-1654
Ga McDonough, S. Wallace, Box 190 404-957-2156
Ill Chicago, Actronic Sls. Engr., Inc., 4750 N. Milwaukee Ave. 312-286-1037
Kans Shawnee Mission, M. Bettis, Box 598 913-362-0772
Kans Wichita, M.E. Bettis Co., 423 N. Fountain 316-685-7441
Md Silver Spring, H. Sieber, 1005 Bonifant 301-589-9110
Mass Marlboro, M.L. Assocs., 96 Helen 617-485-6190
Mich Jackson, Norwood Scroggs, 2221 Arbor Hill 517-782-5211
Minn Mpls., Pilot Sls., 7007 Walker 612-921-2464
Mo St. Louis, M. Bettis, 9103 Bessemer 314-439-2099
NJ Nutley, S. Glassman, 326 Hillside 201-667-0653
NY Glen Cove, S. Glassman, 28 Prestwick 516-676-1039
NY Sodus, A.E. DeCew Agency, 27 State 315-483-3261
NC Kernersville, S. Wallace, 204 Westwood 919-993-3993
NC Mathews, S. Wallace, Box 215 704-847-9262
Ohio Euclid, Barron Inds., 19770 St. Clair 216-486-9488
Pa Narberth, L. White-Keystone, 100 N. Essex 215-664-6505
Pa Pittsburgh, Baron Inds., 371 S. Graham 412-441-9049
Tenn Memphis, S. Wallace, 5960 Brierdale Cove 901-682-2281
Tex Irving, Lee Sls., 2838 Posey 214-255-5043
Wash Bellevue, A. Smith & Co., 405-166 S.E. 206-746-6770
For: Can., Montreal, Que., Deskin, 1565 Louvain 514-384-1420
For: Can., Toronto, Ont., Data Comp., 1477 Eglinton W. 416-789-5732
For: Can., Vancouver, B.C., Deskin, 1641 Venables 604-253-6396

SCHUTTER MICROWAVE, Div. Cardwell Condenser Corp., 80 E. Montauk Hwy., Box 519, Lindenhurst, N.Y., 11757, Tel: 516-888-5200

SCHWEITZER, PETER J. DIV., Kimberly Clark Corp., Lee, Mass., 01238, Tel: 413-243-1000, TWX: 413-243-2121; Sls. Mgr: R. Plaut, Jr.

SCIAKY BROS., INC., 4915 West 67th St., Chicago, Ill., 60638, Tel: 312-PO-7-5600, TWX: 910-224-3809; Sls. Mgr: W. Farrell

SCIENTIFIC-ATLANTA, INC., Box 13654, Atlanta, Ga., 30324, Tel: 404-938-2930, TWX: 810-766-4912; Sls. Mgr: H. Crispin

SCIENTIFIC COLUMBUS, Div. Esterline Corp., 1035 W. 3rd Ave., Columbus, Ohio, 43212, Tel: 614-291-4681; Sls. Mgr: W. Traetow ....Pg. 1987
Ala Birmingham, J. Spader Co., Box 6074 205-879-1366
Ariz Phoenix, B.F.A., Inc., 503 N. Brown Ave. 602-946-4215
Ark El Dorado, L. C. Byrne Co., 632 Champagnolle 501-UN-3-9435
Cal Emeryville, G.E. Honn, 1421 Park 415-781-7352
Cal Los Angeles, Esterline Angus, 617 W. Beverly Blvd. 213-721-5141
Colo Denver, C. Beabout Co., 666 Sherman St. 303-244-3151
DC Washington, Hildenbrand Co., Box 1060 703-280-2330
Fla Orlando, R.G. Cheney, Box 14673 305-843-4491
Ill Chicago, Murphy & Dickey, 10001 Derby 312-344-5660
Ind Indpls, Electro Engrg. Sls., 6909 E. 32nd 317-546-4053
Iowa Des Moines, H. Ferris, 4005 Plainview 515-255-5008
La New Orleans, Mid-South Sls., Box 13625 504-822-3030
Mass Boston, Esterline Angus, Box 385 617-235-5343
Mich Detroit, G. R. Peters Assocs., Box 1042 313-564-6325
Mich Marquette, NWR Elctrns., 1010 W. Wash. 906-226-7578
Minn Minneapolis, Electrical Jobbers Equip., Inc., 1120 Glenwood Ave. 612-377-7904
Minn Virginia, NWR Elctrns., Box 118 218-741-5080
Mo Kansas City, C. B. Fall Co., 11301 Bennington St. 816-SO-1-6545
Mo St. Louis, C. B. Fall Co., 317 N. 11th St. 314-CH-1-2433
NJ Lodi, Esterline Angus, 34-23 Wisse St. 201-471-0084
NM Las Cruces, B.F.A. Corp., Box 1237 505-523-0601
NY Buffalo, R. F. Lamb Co., Inc., 1865 Kenmore Ave. 716-874-4900
NY Kingston, R. F. Lamb Co., Inc., Box 661 914-338-8833
NY Syracuse, R. F. Lamb Co., Inc., Box 28 315-454-2469
NC Charlotte, R. Chapman, Box 4430 704-375-4495
NC Raleigh, R. Chapman, Box 10503 919-828-3604
Ohio Cincinnati, Beedle Equip. Co., Box 36061 513-793-0140
Ohio Cleveland, Waldrip Blankenburg & Co., 7650 Chippewa Rd. 216-526-1100
Ore Portland, Shaffer & Nelson, Inc., 1001 S.E. Water Ave. 503-BE-4-7437
Pa Philadelphia, Esterline Angus, Rydal W., The Fairway 215-887-2268
Pa Pittsburgh, Scientific Columbus, 1035 W. 3rd 614-291-4681
SC Columbia, R. Chapman, 912 Daly 803-776-1954
Tenn Knoxville, W. Massey Co., Box 10102 615-577-9553
Tex Dallas, P. Kreager Co., 9230 Cliffmere Dr. 214-348-3521
Tex Houston, E. Smith Sls., 7007 Gulf Frwy. 713-649-5756
Utah Salt Lake City, Shaffer & Nelson, Inc., 805 W. 2500 S. 801-484-3382
Wash Seattle, Shaffer & Nelson, Inc., 314 N.E. 72nd St. 206-LA-3-0664
Wash Spokane, Shaffer & Nelson, Box 3343 509-FA-7-9528
Wisc Milwaukee, T. R. Bicker, Box 7245 414-453-3772
For: Can., Calgary, Alberta, Showalter Agencies, Ltd., 2510 4th St., S.W. 403-269-6411
For: Can., Toronto, Ont., R. G. Shelley, Ltd., 3154 Yonge St. 416-481-2122
For: Can., Vancouver, B.C., Ahearn & Soper, Ltd., 1234 Marine Dr. 604-988-6822

SCIENTIFIC COMMUNICATIONS, 2710 National Dr., Garland, Tex., 75040, Tel: 214-271-3685; Sls. Mgr: J.L. Halpain
SCIENTIFIC EDUCATIONAL PRODS., SEP Instrs. Div., 310 Madison Ave., N.Y., N.Y., 10017, Tel: 212-867-9480; Sls. Mgr: J. Asch
SCIENTIFIC ELEC., INC., 111 Monroe St., Garfield, N.J., 07026, Tel: 201-478-7050
SCIENTIFIC INDS., INC., 150 Herricks Rd., Mineola, N.Y., 11501, Tel: 516-746-5200; Mktg. Dir: R.J. Bulger
SCIENTRONICS, 25 Clark Dr., Barrington, N.J., 08007, Tel: 609-546-5792; Sls. Mgr: R. Patterson
SCINTILLONICS, INC., P.O. Box 701, Ft. Collins, Colo., 80521, Tel: 303-482-4752; Sls. Mgr: T.J. Grippen

Advertisement

Scintillonics manufactures a complete line of regulated DC power supplies, as well as the proven HV15 Microwave Generator-100 watt-2450 MHz. Electronic, Electrical, and Electro-mechanical design, assembly and total manufacturing is an ever expanding portion at our business. If you have need for harnesses, board loading and assembly or other requirements, call us at the above number.

SCOTT ELECTRNS. LABS., Box 8474, Universal City, Calif., 91608, Tel: 213-980-6151; Sls. Mgr: H.F. Wilson

SEACOR, INC., 598 Broadway, Norwood, N.J., 07648, Tel: 201-768-6070, TWX: 710-991-9758; Sls. Mgr: M. Fink Pgs. 1949,2441
Cal Palo Alto, Abbott Engrg., 2450 El Camino Real 415-327-0830
Cal San Diego, Dorado Elctrns., 1253 Univ. Ave. 714-298-4877
Cal Van Nuys, Dorado Elctrns., 13615 Victory Blvd. 213-787-4125
Conn New Milford, Conti Younger, RR 1, Overlook Dr. 203-748-8080
Iowa Fort Dodge, Heimann Co., 236 7th 515-576-2374
Ill Skokie, Mar-Con, 4836 Main 312-675-6450
Kans Mission, TSA Tech. Sls., 5827 Outlook 913-831-2888
Md Timonium, Heller Freeman, Box 293 301-252-4780
Mass Waltham, Conti-Younger, 181 West St. 617-891-4582
Mich Detroit, Skip Greiner, 15318 Mack 313-882-7570
Minn Mpls., Heimann Co., 5603 Lyndale 612-861-6051
Pa Ardmore, Heller Freeman, Box 391 215-649-3679
NY N.Y., P. Saftler Assoc., 157 West 57th 212-247-3855
NY Pittsford, Len G. Taggart, 48 Benedict, Box 304 716-381-3380
NY Rochester, W. Franklin Sls., 179 Hilary 716-889-4849
NY Syracuse, W. Franklin Sls., 2 Standish Terrace 315-446-2246
NY Whitesboro, W. Franklin Sls., 42 Glenridge 315-736-5460
Ohio Chargrin Falls, Midwest Mktg., 15435 Dale 216-247-6655
Ohio Dayton, Midwest Mktg., 137 Lakeview 513-433-2511

SEAL-PEEL, INC., 775 Stephenson Hwy., Royal Oak, Mich., 48073, Tel: 313-588-1055; Sls. Mgr: F. Evans
SEALECTRIC SWITCH & RELAY CO., 6025 N. Keystone, Chicago, Ill., 60646, Tel: 312-539-3108; Pres: E.M. Paradise

SEALECTRO CORP., 225 Hoyt St., Mamaroneck, N.Y., 10543, Tel: 914-698-5600, TWX: 710-566-1110; V.P. Sls: S. Lescarboura .... Pgs. 380,2709-2711
Ala Huntsville, Reynolds & Assoc., 904 Bob Walace Ave. 205-536-1941
Ariz Phoenix, Sealectro West, 55 E. Thomas Rd. 602-277-3921
Cal Los Altos, Sealectro West, 885 N. San Antonio Rd. 415-949-7995
Cal Los Angeles, Sealectro West, 3003 Glendale Blvd. 213-666-4040
Colo Denver, Regan & Assoc. 303-936-7280
Fla Ft. Lauderdale, Reynolds & Assoc., 161 S.W. 75th Ave. 305-581-6611
Fla Melbourne, Reynolds & Assoc., 822 E. Strawbridge Ave. 305-727-3205
Fla Miami Bch., Geartner Assocs., 1125 71st St. 305-861-3661
Fla Orlando, Reynolds & Assoc., Box 8877 305-843-6440
Fla Orlando, Geartner Assocs., 1221 Lee Rd. 305-299-1000
Ga Atlanta, Reynolds & Assocs., 175 W. Wieuca Rd., N.E. 404-252-5360
Ill Arlington Hghts., R. Diethert Co., 2420 E.Oakton Rd. 312-593-7600
Iowa Des Moines, Beams, 517 Fifth St. 515-282-0292
Md Silver Spring, Mechtronics Sls., Inc., 11700 Old Columbia Pike 301-622-2420
Mass Concord, Sls. Engrg. Co., Baker Ave. 617-369-3943
Mass Needham, J.J. Wild Co., 570 Hillside Ave. 617-444-2366
Mich Farmington, Carter, McCormic & Peirce, 23995 Freeway Pk. 313-477-7700
Mich Grand Rapids, Elko Sls. Corp., 3119 Midland Dr., S.E. 616-949-1451
Mich Grosse Pointe Woods, Elko Sls. Co., 970 N. Oxford Rd. 313-884-7893
Minn St. Paul, Northport Engrg., 2027 Grand Ave. 612-698-3841
NJ Mountainside, J.J. Wild Co., Box 1217 201-654-3272
NJ So. Hackensack, Engineered Prods., Inc., 290 Huyler St. 201-488-4040
NY Hastings-on-Hudson, J.J. Wild Co., Box 266 914-963-3803
NY Jericho, J.J. Wild Co., 400 Jericho Tpke. 516-921-7100
NY Mt. Vernon, Friedman-Smith Sls., 519 S. Fifth Ave 914-664-4866
NY Syracuse, I.A. Hotze, 112 DeWitt St. 315-GR-9-6641
NC Raleigh, R. Diethert Co., 3026 North Blvd. 919-832-1562
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain Rd. 216-333-5650
Ohio Columbus, McFadden Sls. Co., 150 E. Broad St. 614-CA-1-3363
Ohio Dayton, Carter, McCormic & Peirce, 3406 N. Main St. 513-278-5873
Okla Tulsa, G.V. Peck, Box 15671 918-585-5853
Pa Delmont, T. F. Laslo & Assocs., 411 Manor Rd. 412-468-5045
Pa Narberth, S.A. Jeffries, 105 Forrest Ave. 215-664-8500
Pa Philadelphia, C. H. Newson & Assocs., 711 Bethlehem Pike 215-248-3377
Pa Pittsburgh, Carter, McCormic & Pierce, 201 Penn Ctr. Blvd. 412-824-3769
Pa Southampton, J.J. Wild Co., 80 Second St. Pike 215-357-6645
Tex Houston, G.V. Peck, 5757 Bellaire Blvd. 713-664-1435
Wash Seattle, Blum & Assocs., 2300 N.W. 97th St. 206-SU-2-1600
For: Can., Willowdale, Ont., Avotronics, Ltd., 5 Allenbury Gardens 416-491-7491
For: Can., Pierresfonds, Que., Avotronics, Ltd., 13189 Shelborne 514-626-6511

SEALED AIR CORP, 19-01 State Hwy. 208, Fair Lawn, N.J., 07410, Tel: 201-791-7600
SEALOL, INC., Warwick Industrial Park, Providence, R.I., 02905, Tel: 401-781-4700, TWX: 401-944-1475; Sls. Mgr: H.F. Greiner
SEASTROM MFG. CO. INC., 701 Sonora Ave., Glendale, Cal., 91201, Tel: 213-245-9121, TWX: 910-497-2271; Sls. Mgr: R. Remington
SECO ELCTRNS. CORP., 1001 2nd St., S., Hopkins, Minn., 55343, Tel: 612-935-6963; Sls. Mgr: E. Hintz
SECODE ELCTRNS., 908 Dragon St., Dallas, Texas, 75207, Tel: 214-742-7231 R.R. Atkins
SECS, INC., 19-58 38th St., Long Island City, N.Y., 11105, Tel: 212-932-4545, TWX: 710-582-2605; Sls. Mgr: A. Palattella
SEDCO SYS., INC., 130 Schmitt Blvd., Farmingdale, N.Y., 11735, Tel: 516-694-7440; Sls. Mgr: I. Bardash

SEG ELCTRNS., 120-30 Jamaica Ave., Richmond Hill, N.Y., 11418, Tel: 212-441-3200; Sls. Mgr: B. Bender Pg. 1525
Cal Arcadia, Mar-Land Enterprises, Box 101 213-681-9440
Colo Loveland, Kelley Enterprises, 336 E. 4th St. 303-667-1376
Fla Clearwater, Brennen Assocs., Box 5006 813-446-5006
Minn Minneapolis, Heimann Co., 5603 Lyndale Ave., S. 612-861-6051
Mo St. Louis, PEM Sls. Co., 9537 Lackland Rd. 314-HA-7-7200
NJ Moorestown, L.E. Brown Assoc., 174 Ramblewood Pkwy. 609-234-0382
NY New Hartford, Reed Elctrns., Inc., 17 Larchmont Dr. 315-797-0437
NY New York, Haber Ramp Corp., 2315 Broadway 212-799-4040
NY Rochester, Reed Elctrns., Inc., 2815 Monroe Ave. 716-473-2767
NY Vestal, Reed Elctrns., Inc., Box 187 607-262-0275
Ohio Cincinnati, A.C. Wahl & Assoc., Box 15220 513-821-3270
Tex Richardson, J.R. Lavender, 725 S. Central Expwy. 214-231-5040
Va Annandale, J. Hopkins Assocs., 4520 Starr Jordon Dr. 703-280-2086
For: Can., Montreal, Que., Commonwealth Engrg. & Sls., Box 531, St. Laurent 514-744-1004

SEGAL, EDWARD, INC., 132 Lafayette St., New York, N.Y., 10013, Tel: 212-966-3935; Sls. Mgr: R.V. Garretson
SEL-REX CORP., 75 River Rd., Nutley, N.J., 07110, Tel: 201-667-5200; Sls. Mgr: C. Stevens
SELAS CORP. AMERICA, Box 200, Dresher, Pa., 19025, Tel: 215-MI-6-6600; Gen'l Sls. Mgr: J.H. Brindle
SELECTRONS, LTD., 116 East 16th St., New York, N.Y., 10003, Tel: 212-CA-8-6800; Sls. Mgr: M. Rubinstein

SELF-ORGANIZING SYS., INC., Box 9918, Dallas, Tex., 75214, Tel: 214-BR-6-9487; Sls. Mgr: D.N. Dukes Pg. 1790
Ariz Phoenix, B-K Assocs., 2647 Palm La. 602-272-7951
Cal Los Angeles, P. Wiley Co., 1632 Silverlake 213-663-8078
Cal Palo Alto, Testco, 941 Charleston 415-326-5320
Conn Meriden, P.R. Sturgeon Co., Box 875 203-237-1112
Fla Clearwater, Perrott, Box 4532 813-531-5513
Fla Orlando, Perrott, 1607 Forsyth 305-275-1132
Fla W. Palm Bch., Perrott, Box 6277 305-967-1770
Ill Chicago, L. F. Green, 5218 W. Diversey 312-286-6824
Ind Indpls, L. F. Green, 1111 E. 54th 317-253-2087
Mass Chestnut Hl, P. Sturgeon, 1330 Boylston 617-734-7710
Minn Mpls, L. Green & Assoc., 6225 Univ. 612-781-1611
Ohio Vandalia, W.J. Brauer, Box 35 513-898-1224
Ohio Wickliffe, W.J. Brauer, Box 305 216-943-0601
Pa Newtown Sq., Holdsworth, 8 Smedley 215-356-8550
Pa Pittsburgh, W.J. Brauer, Box 8466 412-921-3213
Wash Seattle, Testco, 219 Boeing Fld. 206-762-8220

SELL-TRONIC PRODS. CO., INC., 138-20 31st Rd., Flushing, N.Y., 11354, Tel: 212-886-4763; Sls. Mgr: I. Chernoff
SEMI ALLOYS, INC., 20 N. MacQuesten Pkwy, Mt. Vernon, N.Y., 10550, Tel: 914-664-2800; Sls. Mgr: R. Connelly
SEMICOA, 940 S. Ajax Ave., City of Industry, Calif., 91744, Tel: 213-965-2496; Sls. Mgr: M. Kalatsky
SEMICON ASSOC., INC., Box 832, Lexington, Ky., 40501, Tel: 606-255-2446; Sls. Mgr: M. Miller
SEMICON INC., 10 North Ave., Burlington, Mass., 01803, Tel: 617-272-9015, TWX: 710-326-1919; Mktg. Mgr: R.A. Irvin
SEMICONDUCTOR CIRCUITS INC., 163 Merrimac St., Woburn, Mass., 01801, Tel: 617-935-5200; Sls. Mgr: A.R. Shallow
SEMI/DYNE ELCTRNS. CORP., 44 Bennington Ave., Freeport, N.Y., 11520, Tel: 516-623-2660; Sls. Mgr: L. Michaels
SEMIMETALS, INC., 172 Spruce St., Westbury, N.Y., 11590, Tel: 516-333-8400, TWX: 510-222-8810; Sls. Mgr: M. Leavitt
SEMTECH CERAMIC CORP., 845 Rancho Conejo Blvd., Newbury Pk., Cal., 91320, Tel: 213-626-5269; Mktg: W.B. Krause

SEMTECH CORP., 652 Mitchell Rd., Newbury Pk., Cal., 91320, Tel: 213-628-5392, TWX: 910-336-1264; V.P: W.B. Krause .... Pgs. 1816-1820
Ala Huntsville, Rep., 8100 S. Memorial 205-881-9270
Ariz Phoenix, Dubblar Assoc., 2875 Sky Harbor 602-273-7387
Cal Palo Alto, Semtech, 941 E. Charleston 415-328-8025
Cal San Diego, Dawson, 7969 Engineer 714-278-9260
Fla Winter Pk., Semtech, 2304 Aloma 305-644-5404
Ga Atlanta, Rep., Inc., 1483 Monroe Dr., N.E. 404-876-1591
Ill La Grange, Semtech, 140 N. La Grange 312-352-3227
Ind Ft. Wayne, Scott Elctrns., 124 W. Wash. 219-743-1586
Ind Indianapolis, Scott Elctrns., 1300-02 N. Penn. 317-635-8951
Ky Louisville, Scott Elctrns., 366 Francis Bldg. 502-583-3220
Md Baltimore, Stemler Assoc., 6707 Whitestone Rd. 301-944-8262
Mass Weston, E.B. Butler Co., Box 168 617-891-8670
Mich Farmington, A.K. Davis, 22725 Orchard Lake Rd. 313-474-8300
Minn Minneapolis, S. Clothier Co., 7400 Lyndale Ave., S. 612-869-3231
Mo St. Louis, Coombs Assoc., 11734 Lackland Ind'l. Dr. 314-542-3399
NJ Hillsdale, M. Klein Assoc., Box 92 201-664-8711
NJ Moorestown, Semtech, 209 Chester 609-234-1244

NY DeWitt, Bowser & Sapecky, 4317 E. Genessee St. 315-446-5920
NY Forest Hills, Semtech, 116-55 Queens 212-263-3115
NY Snyder, Bowser & Sapecky, 4541 Main 716-839-4170
NM Albuquerque, Rustco, Box 11261 505-296-6477
NC Charlotte, Over & Over, 3723 Country Bridge Rd. 704-366-8601
Ohio Dayton, Scott Elctrns., 517 Hulman Bldg. 513-223-2652
Ohio Cincinnati, Scott Elctrns., 9505 Montgomery Rd. 513-791-2513
Ohio Cleveland, Scott Elctrns., 1836 Euclid 216-TO-1-2626
Pa Pittsburgh, Scott Elctrns., 313 Empire Bldg. 412-471-5233
Utah Salt Lake City, Arrowhead Sls. Corp., 49 W. Malvern 801-487-3444
Va Alexandria, Stemler, 206 N. Wash. 703-548-7818
Wash Bellevue, Western Tech. Sls., Box 902 206-454-3906
Wisc Oak Creek, Erdman Sls., 6312 S. 27th 414-761-2120
For: Can., St. Laurent, Montreal, Bourns Can. Ltd., Pl. St. Laurent, 79 Laurentian Blvd. 514-747-6626
For: Can., Toronto 16, Ont., Bourns Can. Ltd., 36 Cranfield Rd. 416-751-3880

SENNHEISER ELCTRN. CORP., 500 Fifth Ave., New York, NY, 10036, Tel: 212-LO-4-0433; Sls. Mgr: C. Hofman ....Pg. 321
Ala Fairhope, H. Sully, Jr., 300 N. Bayview St. 205-928-8998
Cal N. Hollywood, Morris-Tait Assocs., 4260 Lankershim Blvd. 213-877-4424
Colo Denver, J.A. Gedney Co., 7955 W. 16th Ave. 303-238-3112
Conn W. Haven, R.S. Reiss Assocs., 70 Jessie Dr. 203-933-8542
Ga Chamblee, Tech. Sys. Reps., 3770 Montford Dr. 404-457-0426
Ill Skokie, I.W. Rose Assocs., 4334 Oakton Ave. 312-674-6790
Ind Indianapolis, Blind & Assocs., 1060 E. 86th St. 317-846-5441
Md Bethesda, G. Rosen & Assocs., 9501 Wadsworth Dr. 301-365-5113
Mich Plymouth, J. Malcolm Flora, 165 W. Liberty 313-453-4296
Mo Kansas City, Forristal-Young Sls. Co., 9010 E. 50 Hwy. 816-358-6771
NY New York, Sir Sales, Inc., Box 335 516-621-7485
o Cleveland, R.W. Peters Co., 630 E. 222nd St. 216-261-2330
Tex Dallas, B. Amos & Assocs., 916 Green Hill Rd. 214-741-3674

SENSOR CORP., 97 Indian Field Rd., Greenwich, Conn., 06830, Tel: 203-661-5600; Sls. Mgr: G. Mordwinkin

SENSOR DYNAMICS, INC., 129 Laura Dr., Addison, Ill., 60101, Tel: 312-543-6203, TWX: 910-651-4955; Sls. Mgr: B.C. Davis

SENSOR TECH., 7118 Gerald Ave., Van Nuys, Cal., 91406, Tel: 213-781-2154; Sls. Mgr: F. Heim Pg. 1638
Cal Los Angeles, Southern Engrg. Liaison Assocs., 8921 Sepulveda Blvd. 213-641-6001
Cal Tarzana, Smolen Assoc., 18455 Burbank Blvd. 213-881-4667
Fla St. Petersburg, Orbe, Inc., 4110 Central Ave. 813-894-0687
Ill Chicago, M & S Sls., 4750 N. Milwaukee Ave. 312-545-1771
Mass Worcester, W. Porter Sls., Box 591 617-757-1263
Mich Detroit, A. Blumenberg Assoc., Box 25, College Pk. 313-341-4737
NJ Cherry Hill, Bi-Tech, Inc., Box 224 609-667-7374
NY DeWitt, Bowser & Sapecky Assoc., 4317 E. Genesee St. 315-446-5920
NY Great Neck, Cooper Simon & Co., 38 Middle Neck Rd. 516-487-1142
Ohio Cleveland, Baehr Greenleaf Assoc., Inc., 14700 Detroit Ave. 216-221-9030
Wash No. Seattle, Fleehart & Sullivan, 3826 Woodland Pk. Ave. 206-633-4969

SENSOTEC, INC., 1400 Holly Ave., Columbus, Ohio, 43212, Tel: 614-294-5436; Gen'l Mgr: C.J. Easton

SENTRY EQUIP. CORP., Box 127, Oconomowoc, Wisc., 53066, Tel: 414-567-7256; Sls. Mgr: V. Kitzrow

SERVO CORP. AMERICA, Servo Dynamics Div., 111 New South Rd., Hicksville, N.Y., 11802, Tel: 516-938-9700, TWX: 510-221-1872; Mgr. Instrs. & Comps: J.H. Wagner

SERVO DEV. CORP., 2 Willis Ct., Hicksville, N.Y., 11802, Tel: 516-681-4343, TWX: 510-221-1844; Sls. Mgr: A. Douglas

SERVO PRODS. CO., Box B, Altadena, Cal., 91001, Tel: 213-798-0515; Sls. Mgr: S. Webb

SERVO-TEK PRODS. CO., 1086 Goffle Rd., Hawthorne, N.J., 07506, Tel: 201-427-3100; Sls. Mgr: J.L. Duffy Pg. 1632
Cal Van Nuys, Servo-Tek Calif., 6741 Sepulveda 213-786-0690
Mass Salem, Forbes Engrg. Co., 19 Flint St. 617-744-1693
Ohio Centerville, Albrecht Engrg. Sls., Box 93 513-885-3888

SERVOMETER CORP., 82 Industrial, E., Clifton, N.J., 07012, Tel: 201-773-0474; V.P. Sls: R.F. Stockton, III

SERVOTRONICS, INC., 3901 Union Rd., Buffalo, N.Y., 14225, Tel: 716-633-5990, TWX: 710-523-1855; Sls. Mgr: F.J. Illig

SERVWELL PRODS. CO., 16309 Friend Ave., Cleveland, Ohio, 44137, Tel: 216-663-9024; Sls. Mgr: S.J. Winters

SETHCO MFG. CORP., One Bennington Ave., Freeport, N.Y., 11520, Tel: 516-623-4220; Sls. Mgr: J.T. Litt

SETON NAME PLATE CORP., 592 Boulevard, New Haven, Conn., 06519, Tel: 203-772-2520, TWX: 203-772-0107; Sls. Mgr: G. Goodhart

SEVEN ASSOCS., 568 San Xavier Ave., Sunnyvale, Calif., 94086, Tel: 408-736-9488; Sls. Mgr. R. Niedzwiecki

SEVERNA OPERATION, Bunker Ramo Corp., 45 Glenwood Pl., East Orange, N.J., 07017, Tel: 201-676-2288; Sls. Mgr: W.M. Young ....Pg. 2814
(Refer to Amphenol Sales Div for Sales Office information)

SEXTON CAN CO., INC., 31 Cross St., Everett, Mass., 02149, Tel: 617-387-2500, TWX: 710-348-0474; Sls. Mgr: C.A. Whitman

SGL INDS., INC., G-L Electronics Div., 300 Harvard Ave., Westville, N.J., 08093, Tel: 609-456-7300, TWX: 609-456-6429; Nat'l. Sls. Mgr: J.L. Brooks ......Pg. 2774
Ala Huntsville, W. Brown, 1314 Burford N.W. 205-539-4411
Cal Anaheim, E. Cox, 2037 Eugene St. 714-530-1409
Cal Palo Alto, B & M Elctrns., 2902 Ash St. 415-328-0134
Colo Broomfield, Arrowhead, 7943 W. 98th Ave. 303-222-6462
Conn Meriden, Eagle Assocs., Box 921 203-237-5527
Fla Ft. Lauderdale, W. Brown, 961 N.W. 53rd 305-564-8000
Fla Ft. Walton Beach, W. Brown, 98 Miracle Strip Pkwy. 904-243-6424
Fla Orlando, W. Brown, 222 Weber Ave. 305-425-5505
Ga Tucker, W. Brown, 1590 Cooledge Rd., N.W. 404-939-1674
Ill Chicago, P. Pitt, 6001 N. Keystone Ave. 312-478-3124
Ind Ft. Wayne, Tri-State, 3220 Broadway 219-456-3567
Mich Farmington, W. Hummon, Box 501 313-474-0661
Minn St. Paul, R. Ragon, 1136 W. Larpenteur Ave. 612-488-0201
NM Albuquerque, Arrowhead, Box 243 505-855-4561
NY Rochester, H. Johnson, 111 Mt. Hope Ave. 716-232-2688
NY Williamsville, H. Johnson, 8 Los Robles St. 716-632-7880
NC Winston-Salem, W. Brown, 1108 Burke St. 919-725-5384
Ohio Cincinnati, Tri-State, 1717 Section Rd. 513-631-5060
Pa Pittsburgh, H. Johnson, 636 Moreland Dr. 412-923-2877
Tex Addison, Parvin Sls., Box 307 214-239-9148
Utah Salt Lake City, Arrowhead Sls., 49 W. Malvern 801-855-4561
Wash Seattle, National Co., 69 Marion 206-623-7060
EXP: Fla., N. Miami Bch., Man Rep Assoc., Box 68 305-949-6391
For: Can., Mississauga, Ont., Anbak Sls., 3208 Lenworth Dr. 416-625-1061
For: Can., Ile Perrot Sud, Que., Anbak Sls., 2180 Blvd. Perrot 514-453-6375

SHAKEPROOF DIV., Illinois Tool Works, St. Charles Rd., Elgin, Ill., 60120, Tel: 312-741-7900, TWX: 910-251-3364; Sls. Mgr: R.W. Stoecklein

SHALLCO, INC., Box 1089, Smithfield, N.C., 27577, Tel: 919-934-3135, TWX: 510-939-1455; Sls. Mgr: M.D. Sutton Pgs. 1950,1951
Cal Hawthorne, W C V Co., 14125 Inglewood 213-772-4479
Colo Englewood, Vinson, 3600 S. Lincoln 303-789-2203
Fla Orlando, Ridge Instr., 2227 Seely 305-293-4711
Kans Shawnee Mission, Thomas & Modricin, 5450 Buena Vista 913-432-2131
Mass Brockton, Forsberg Sls., 646 Summer St. 617-522-6300
Minn Mpls., Tech. Assocs., 6121 Excelsior 612-929-6721
NJ So. Orange, Simberkoff, 71 Valley 201-763-7900
NY Pittsford, Dan Hurley, Box 26 716-586-6159
NC Smithfield, Byrd & Barbour Sls., Box 30 919-934-8136
Ohio Cincinnati, A. C. Wahl, Box 15220 513-821-3270
Pa Fairview Vlg., Danco, Germantown Pike 215-275-2600
Tex Houston, Unidyne, Inc., 5700 Savory La. 713-782-0218
Wash Seattle, Underwood & Underwood, Box 66581 206-243-2133

SHALLCROSS, Sub. Cutler Hammer, E. Preston St., Selma, N.C., 27576, Tel: 919-965-2341, TWX: 510-920-0740; Sls. Mgr: J. Bailey Swertfeger Pgs. 555,2880,2881
Cal Hawthorne, W.C.V. Co., 14125 Inglewood 213-772-4479
Cal Mountain View, W.C.V. Co., 2015 Latham 415-961-5096
Conn Fairfield County, ERA, Inc., 330 Great Neck Rd. 516-482-9320
Fla Oviedo, Conley, Box 668 305-365-3284
Ill Chicago, Berndt, 6414 W. Belmont 312-283-0713
Iowa Cedar Rapids, H. R. Brown Sls., 3400 Indian 319-366-0635
Kans Leawood, H.C. Heyde, 9221 Wenonga 913-649-8628
Md Bethesda, Warren Mount, 7735 Old Georgetown 301-657-9312
Mass Belmont, Vector Sls., 774 Pleasant 617-489-1400
Minn Mpls, Carlson-Berthe Sls., Box 27265 612-336-2236
NY Great Neck, ERA, Inc., 330 Great Neck Rd. 516-482-9320
NY Rochester, F. Young Assocs., 555 Winton 716-482-1555
NC Smithfield, Byrd & Barbour, Box 30 919-934-8136
Ohio Cincinnati, A.C. Wahl, Box 15220 513-821-3270
Pa Jenkintown, Warren Mount Co., Fox Pavillion Bldg. 215-886-0383
Tex Dallas, Dunbar Assocs., Box 30511 214-239-7151
Wash Seattle, Underwood & Underwood, 12422 Eight Ave., S. 206-243-7070
EXP: Wisc., Milwaukee, CHICA, 4201 N. 27th St. 414-442-7800

SHAMBAN, W.S. & CO., 11543 W. Olympic Blvd., Los Angeles, Calif., 90064, Tel: 213-397-2195, TWX: 910-336-1261; Sls. Mgr: R. Bell

SHANDA LABS., Div. G. Callahan & Co., Box 24, Closter, N.J., 07624, Tel: 201-768-1209; Pres: M. Sanzari

SHANE INDS., 608 Vaqueros Ave., Sunny Vale, Cal., 94086, Tel: 408-245-7320; Sls. Mgr: H.E. Shane

SHANNON LUMINOUS MAT'LS., 7356 Santa Monica Blvd., Hollywood, Cal., 90046, Tel: 213-876-2660; P.A: I. Bear

SHARPE AUDIO DIV., Scintrex Inc., Amherst Ind'l. Pk., Tonawanda, N.Y., 14150, Tel: 716-691-6910; Mktg. Mgr: A.H.S. Pickburn

SHEPARD DIV., Vogue Instr. Corp., 131st St. & Jamaica Ave., Richmond Hill, N.Y., 11418, Tel: 212-641-8800, TWX: 710-582-4796; Dir. Peripheral Prods: B. Wagner

SHEROLD CRYSTAL PRODS., Tyco Labs., 1510 McGee Trafficway, Kansas City, Mo., 64108, Tel: 816-842-9792, TWX: 910-771-2181; Sls. Mgr: M. Putthoff

SHERWOOD ELCTRN. LABS., 4300 N. California Ave., Chicago, Ill., 60618, Tel: 312-IR-8-7300; Sls. Mgr: R. Cousins

SHIBADEN CORP. AMER., 58-25 Bklyn-Queens Expwy., Woodside, N.Y., 11377, Tel: 212-898-1261, TWX: 710-582-2495

SHIGOTO INDS., LTD., 350 Fifth Ave., New York, N.Y., 10001, Tel: 212-695-0200; Sls. Mgr: M.N. Rubin

SHOTEC INC., Box 678, Clearlake Oaks, Cal., 95423, Tel: 707-998-3381

SHOWA MUSEN KOGYO CO., LTD., 5-5 6-Chome Togashi, Shinagawa-Ku Tokyo 141, Japan, Tel: 785-1111 ....Pg. 2715

SHUR-LOK CORP., 1300 E. Normandy Pl., Santa Ana, Calif., 92711, Tel: 714-547-8891, TWX: 910-595-1544; Sls. Mgr: D.B. Kreider

SHURE BROS., INC., 222 Hartrey Ave., Evanston, Ill., 60204, Tel: 312-328-9000, TWX: 910-231-0048; Sls. Mgr: C.L. McCabe

SHURITE METERS, 428 Chapel St., New Haven, Conn., 06508, Tel: 203-787-5824; Sls. Mgr: W.A. Oliver
(Refer to J-B-T Instrs. for Sales Office Information)

SIBLEY CO., Haddam, Conn, 06438, Tel: 203-345-4523; Sls. Mgr: J.C. Wheeler

SIEMENS CORP., Comps. Div., 186 Wood Ave., S., Iselin, N.J., 08830, Tel: 201-494-1000; Adv. Mgr: D. Kobes

SIEMENS CORP., Measuring Instrs. Div., 186 Wood Ave., S., Iselin, N.J., 08830, Tel: 201-494-1000, TWX: 710-998-0588; Div. Mgr: Mr. B. Thiele
SIEMENS CORP., Power Equip. Div., 186 Wood Ave., S., Iselin, N.J., 08830, Tel: 201-494-1000; Sls. Mgr: H. Stadlbauer
SIEMENS CORP., Comm. Eq. Div., 186 Wood Ave., S., Iselin, N.J., 08830, Tel: 201-494-1000, TWX: 710-998-0588; Div. Mgr: D. Seidel
SIERRA ELEC., Div. Sola Basic Inds., 15100 S. Figueroa St., Gardena, Calif., 90248, Tel: 213-321-1000; Sls. Mgr: L. Keeshen

SIERRA SYS., 2255 Old Middlefield Way, Mountain View, Cal., 94040, Tel: 415-969-3056; Sls. Mgr: B. Doberty ....Pg. 872
Colo Boulder, J. Smith & Assocs., Box 3257 303-449-7509
Md Arnold, Lecco Sls. Co., 724 Carlisle Dr. 301-757-4785
Mass Newburyport, Gilway Sls. Co., Box 584 617-465-7568
NM Albuquerque, J. Smith, Box 8412 505-255-2111
Tex Richardson, C. Tinch, First Bank & Trust Bldg. 214-231-1322
SIFCO METACHEMICAL, Div. Steel Improvement & Forge Co., 935 East 63rd St., Cleveland, Ohio, 44103, Tel: 216-881-8600, TWX: 810-421-8464; Sls. Mgr: J.N. Popely
SIGMA INSTRS., INC., 170 Pearl St., Braintree, Mass., 02185, Tel: 617-843-5000, TWX: 617-848-0532; Pres: L.R. Flynn
SIGMA SYS. CORP., 3163 Adams Ave., San Diego, Calif., 92116, Tel: 714-283-3193; Sls. Mgr: T. Stewart
SIGNAL ANALYSIS INDS. CORP., Saicor, 595 Old Willets Path, Hauppauge, N.Y., 11787, Tel: 516-234-5700; Pres: E. Levine

SIGNAL TRANSFORMER, 1 Junius St., Bklyn., N.Y., 11212, Tel: 212-498-5111; Sls. Mgr: A. Leibowitz Pgs. 2971-2982

SIGNALITE, Div-Gen. Instr. Corp., 1933 Heck Ave., Neptune, N.J., 07753, Tel: 201-775-2490, TWX: 201-775-2255; Sls. Mgr: C.R. Dougherty Pgs. 1492,1952
Ariz Phoenix, Williams Assocs., 2250 N. 16th 602-254-6085
Cal Los Altos, W. Posey, 175 S. San Antonio 415-984-7771
Cal Glendale, Signalite, 229 N. Central 213-247-6190
Colo Denver, Williams Assocs., 4971 Jackson 303-388-4391
Ga Atlanta, J. Joyner, Box 10678 404-758-7496
Ill Elk Grove Vlg., J. Twist, 1301 Higgins Rd. 312-593-0200
Ind Ft. Wayne, R. Whitesell, 3426 Taylor St. 219-432-5591
Ind Indianapolis, R. Whitesell, 6691 E. Wash. 317-359-9283
Ky Louisville, R. Whitesell, 3620 Lexington 502-893-7303
Md Baltimore, Component Sls., 7 Church 301-484-3647
Mass Newton, Techmar, 56 Elmwood 617-444-8130
Mich St. Joseph, R. Whitesell, Shepard & Benning Bldg. 616-983-7337
Mich Southfield, R. Whitesell, Southfield Ctr. Bldg. 313-358-2020
Minn St. Paul, E. Melius, 3758 N. Dunlap 612-484-8541
Mo St. Louis, L. Harry, Box 12608 314-872-3183
Mo Grandview, L. Harry, Box 288 816-763-3634
NM Albuquerque, Williams, 420 Washington S.E. 505-255-1638
NY Penfield, J.E. Blair, 15 Stone Island La. 716-586-2030
NC Charlotte, B. Henry, 1043 Providence 704-375-8958
Ohio Cincinnati, R. Whitesell, 1172 W. Galbraith 513-521-2290
Ohio Cleveland, R.O. Whitesell & Assoc., 21139 Lorain Ave. 216-333-2585
Ohio Dayton, R. Whitesell, 4133 S. Dixie 513-298-9546
Pa Lafayette Hill, M. Lader, 628 Ridge Pike 215-825-3177
Pa Pittsburgh, R. Whitesell, 201 Penn Ctr. Blvd. 412-242-0100
Tex Dallas, J. Guenther, 5121 McKinney 214-528-6286
Tex Houston, J. Guenther, Box 55525 713-468-0232
Wash Seattle, Blum & Assoc., 2300 N.W. 97th 206-782-1600
Wisc Waukesha, J. Twist, 540 Catskill Rd. 414-786-6330
For: Can., Scarborough, Ont., Lake Engrg., 123 Manville 416-751-5980
SIGNATECTION, INC., 225 Crescent St., Waltham, Mass., 02154, Tel: 617-894-5671; Sls. Mgr: P.J. Costigan
SIGNATRON, INC., 27 Hartwell Ave., Lexington, Mass., 02173, Tel: 617-861-1500; Sls. Mgr: R.L. Murphy
SIGNETICS CORP., 811 E. Arques Ave., Sunnyvale, Calif., 94086, Tel: 408-739-7700, TWX: 910-339-9220; Sls. Mgr: I. Cooper
SIGNETICS MEAS/DATA, 341 Moffett Blvd., Mountain View, Cal., 94040, Tel: 415-961-9384, TWX: 910-379-6939; Sls. Mgr: R. Prescott
SILICON GEN'L., INC., 7382 Bolsa Ave., Westminster, Cal., 92683, Tel: 714-839-6200, TWX: 910-596-1804; Sls. Mgr: W.D. Bell

SILICON TRANSISTOR CORP., East Gate Blvd., Garden City, N.Y., 11530, Tel: 516-PI-2-4100, TWX: 510-222-8258; Mktg. Mgr: L. Harrison Pgs. 1822-1835
SILICONE SEALS, 3694 Milwaukee Ave., Chicago, Ill., 60641, Tel: 312-282-3787; Sls. Mgr: L.E. Brown
SILICONIX, INC., 2201 Laurelwood Rd., Santa Clara, Cal., 95054, Tel: 408-246-8000, TWX: 910-339-9216; Sls. Mgr: L. Lynberg
SILLCOCKS-MILLER CO., 350 W. Parker Ave., Maplewood, N.J., 07040, Tel: 201-762-6171; Sls. Mgr: J.F. Herslow
SILVER, G.H. & ASSOCS., Box 21, Newtonville, Mass., 02160, Tel: 617-332-7747; Sls. Mgr: G.H. Silver
SIMMONDS PRECISION PRODS., INC., Rockingham Rd., Bellows Falls, Vt., 05101, Tel: 802-463-4576, TWX: 710-227-0714; Cust. Svc. Mgr: J.M. Corliss
SIMONDS SAW & STEEL, Div. Wallace-Murray Corp., Intervale Rd., Fitchburg, Mass., 01420, Tel: 617-343-3731; Dir. of Mktg: P. Scott
SIMPLATROL PRODS. CORP., 675 Plantation St., Worcester, Mass., 01605, Tel: 617-791-6308; Gen. Mgr: H. Peterson

SIMPSON ELEC. CO., 5200 W. Kinzie St., Chicago, Ill., 60644, Tel: 312-379-1121; Sls. Mgr: M. Buehring Pgs. 556,557
Alas Anchorage, H. Lang, 1406 W. 47th 279-5741
Cal Burlingame, W. Purdy, 770 Airport Bl. 415-347-7701
Cal Fair Oaks, W. Purdy, 7650 Ward La. 916-961-8894
Cal Monrovia, Simpson Sls., 232 W. Maple 213-359-8132
Colo Denver, R. Bowen, 1440 S. Santa Fe 303-722-4641
Conn Meriden, P. Sturgeon, 99 Colony St. 203-237-1112
DC Wash., S. MacDonald, 3308 14th St. N.W. 202-265-3938
Fla N. Miami Bch., Cartwright & Bean, 20100 N.E. 25th 305-945-2962
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek Ave. 305-425-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill Pl., N.W. 404-237-2273
Haw Honolulu, Earl Assocs., 2825-B Ualena St. 847-3028
Ill Chicago, Simpson Elec., 5200 W. Kinzie 312-379-1121
Ind Indpls., Thomas & Sukup, 2060 E. 54th 317-251-4574
Kans Shawnee Mission, Kathrins, Kelly, Boswell, 5460 Buena Vista 913-722-0000
La Metairie, Cartwright & Bean, 7010 Magnolia 504-887-5225
Md Baltimore, S. MacDonald, 5500 Hartford 301-254-3380
Md Wheaton, A. Swanson, 11501 Georgia 301-020-9027
Mass Chestnut Hill, P. Sturgeon, 1330 Boylston 617-734-7710
Mich Detroit, R. Merchant, 18411 W. McNichols 313-535-6000
Mich St. Joseph, R. Merchant, 505 Pleasant 616-983-7378
Minn Mpls., M. Foster, 228 S. Cedar Lake Rd. 612-374-2612
Mo St. Louis, Kathrinus, Kelly, Boswell, 2427 Brentwood Blvd. 314-962-5627
NM Albuquerque, C. Carlberg, 2611 Quincy NE 505-265-1579
NY Great Neck, Simpson Instr. Sls. & Svc., 130 Cutter Mill Rd. 516-HU-2-3103
NY N. Syracuse, L. Allen, 426 S. Main St. 315-458-7470
NY Snyder, L. Allen, 176 Mt. Vernon 716-839-3300
NC Charlotte, Cartwright & Bean, 625 Harwyn 704-333-6457
NC Raleigh, Cartwright & Bean, 1016 Belfast 919-834-8106
Ohio Cincinnati, Baehr, Greenleaf, 9505 Montgomery 513-891-3826
Ohio Cleveland, Baehr, Greenleaf, 14700 Detroit 216-221-9030
Ohio Columbus, Baehr, Greenleaf, Box 5722 614-486-4046
Ohio Xenia, Baehr, Greenleaf, 925 Factory 513-426-5485
Ore Portland, Earl & Brown, 2041 S.W. 58th 503-292-9145
Pa Phila., S. MacDonald, 1531 Spruce 215-545-1205
Pa Pittsburgh, S. MacDonald, 7805 McKnight 412-366-2643
Tenn Memphis, Cartwright & Bean, 560 S. Cooper 901-276-4442
Tex Dallas, J. Schoonmaker, 2995 Ladybird 214-357-8481
Tex Houston, J. Schoonmaker, 8619 Mayridge Cir. 713-498-5778
Tex San Antonio, J. Schoonmaker, 107 Winnetka 512-342-0251
Utah Salt Lake City, R. Bowen, 1380 W. North Temple 801-364-4632
Wash Seattle, Earl & Brown, 2047 14th Ave., W. 206-284-1121
Wisc Milwaukee, E. Dickinson, 3612 N. Green Bay 414-264-1080
EXP: Ill., Chicago, Simpson Elec., 5200 W. Kinzie 312-379-1121
For: Can., Downsview, Ont., Bach-Simpson, 101 Oakdale 416-742-5151
For: Can., London, Ont., Bach-Simpson, 1255 Brydges 519-451-9490
SINCLAIR RADIO LABS., 122 Rayette Road, Maple, Ont., Can., Tel: 416-889-8800; Sls. Mgr: W.M. Peace
SINGER CO., Diehl Div., Finderne Ave., Somerville, N.J., 08876, Tel: 201-725-2200, TWX: 710-480-9325; Sls. Mgr: S.D. Jaffe
SINGER-GENERAL PRECISION, INC., Kearfott Div., 1150 McBride Ave., Little Falls, N.J., 07424, Tel: 201-256-4000, TWX: 710-988-5700; Sls. Mgr: W. Quigley

SINGER INSTRUMENTATION LOS ANGELES OPER., 3111 S. LaCienega Blvd., Los Angeles, Cal., 90016, Tel: 213-870-2761, TWX: 910-340-6350; Sls. Mgr: W. Becher Pg. 562
(Refer to Singer Instr. Palo Alto Oper. for Sales Office information)

SINGER INSTRUMENTATION PALO ALTO OPER., 3176 Porter Dr., Palo Alto, Cal., 94304, Tel: 415-493-3231, TWX: 910-373-1765; Sls Mgr: P. Fulton ....Pg. 562
Ala Huntsville, Gentry Assocs., 2109 W. Clinton Ave. 205-534-9771
Ariz Phoenix, Williams Assocs., 2250 No. 16th
Cal Pasadena, Ward-Davis Assocs., 770 S. Arroyo Pkwy. 213-684-2840
Cal San Diego, Ward-Davis Assocs., 9045 Balboa Ave. 714-277-8081
Cal Santa Clara, Ward-Davis Assocs., 3000 Scott Blvd. 408-246-9202
Colo Denver, Williams Assocs., 4971 Jackson St. 303-388-4391
Fla Orlando, Gentry Assocs., 550 N. Bumby Ave. 305-841-7740
Ill Chicago, Carter Elctrns., 4919 W. 63rd St. 312-585-5485
Ind Indpls., Carter Elctrns., 6333 Hollister Dr. 317-293-0696
Kans Leawood, Poly-Onics, 4434 W. 90 Terr. 913-648-4173
Md Kensington, Elctrn. Mktg., 11501 Huff Ct. 301-881-5300
Mass Waltham, Meas. Consultants, 195 West St. 617-899-4400
Mich Detroit, WKM Assocs., 1474 E. Outer Dr. 313-892-2500
Minn Mpls., Carter Elctrns., 1025B Evergreen La. 612-544-9393
Mo Hazelwood, Poly-Onics, 47 Village Sq. Ctr. 314-837-0597
NJ Union, SBM Assocs., 1519 A Stuyvesant Ave. 201-687-8737
NM Albuquerque, Williams Assocs., 420 Washington, S.E. 505-255-2638
NY Rochester, SBM Assocs., 4515 Culver Rd. 716-206-1400
NC Burlington, Gentry Assocs., 116 E. O'Neal Ave. 919-227-2581
Ohio Cleveland, WKM Assocs., 16141 Puritas Ave. 216-267-0445
Ohio Dayton, WKM Assocs., 6073 Far Hills Ave. 513-434-7500
Ore Hillsboro, Showalter-Judd, 1445 N. E. Arrington 503-648-6372
Pa King of Prussia, Elctrn. Mktg., 210 Goodard Blvd. 215-265-1600
Pa Pittsburgh, WKM Assocs., 90 Clairton Blvd. 412-892-2953
Tex Houston, Data Mktg. Assocs., 3925 C Dacoma St. 713-686-9627

Tex Dallas, Data Mktg. Assocs., 10048 Monroe St. 214-358-4643
WashSeattle, Showalter-Judd, 1806 So. Bush Pl. 206-324-7911
Wisc Milwaukee, Carter Elctrns., 6400 W. Capitol Dr. 414-464-5555
For: Can., Mississauga, Ont., Al Crawford Assocs., 6427 Northam Dr. 416-678-1500
For: Can., Ottawa, Ont., Al Crawford Assocs., 376 Churchill Ave. 613-725-3354
For: Can., Longueuil, Que., Al Crawford Assocs., 157 Rue St. Charles W. 514-670-1212
For: Can., Vancouver, B.C., Al Crawford Assocs., 1820 Pandora St. 604-253-7136

SINGER - TELE-SIGNAL, 250 Crossways Pk. Dr., Woodbury, N.Y., 11797, Tel: 516-921-9400; Dir. Comm. Mktg: W.A. Werber

SITCO ANTENNAS, 10330 N.E. Marx St., Portland, Ore., 97220, Tel: 503-253-2000; Pres: G. Berliner

SJOBERG, C. & SON, INC., 415 Station St., Cranston, R.I., 02910, Tel: 401-461-8220; Sls. Mgr: C. Sjoberg, Jr.

Advertisement

We specialize in the development and manufacture of terminals, "Little Gem" connector clips, strain reliefs, etc. together with the machines and dies for applying. Special terminals and related hardware will be developed to your satisfaction, or to your specifications if our stock items do not meet your requirements. Requests for samples, catalogs, and quotations are invited.

SKG ASSOCS., INC., 206 Eustis St., Boston, Mass., 02119, Tel: 617-442-3300; Sls. Mgr: D.C. Brayshaw

SKINNER ELEC. VALVE DIV., Skinner Precision Inds., Inc., 95 Edgewood Ave., New Britain, Conn., 06050, Tel: 203-225-6421, TWX: 203-225-2591; V. P. Mktg: A.H. Nichols

SKINNER POLYNOID DIV., Skinner Precision Inds., Inc., 95 Edgewood Ave., New Britain, Conn., 06050, Tel: 203-225-6421, TWX: 203-225-2591; V.P. Mktg: A.H. Nichols

SKOTTIE ELCTRNS., INC., Line St., Archbald, Pa., 18403, Tel: 717-876-1686; Sls. Mgr. & V.P: R. Aldana

SKURKA ENGRG. CO., 4002 N. Mission Rd., Los Angeles, Calif., 90032, Tel: 213-221-6113; Sls. Mgr: W.L. Stockstill

SKYDYNE, INC., River Rd., Port Jervis, N.Y., 12771, Tel: 914-856-6658, TWX: 510-260-1249; Sls. Mgr: W.F. MacCallum

SLAUGHTER CO., Moore & Hailey Sts., Ardmore, Okla., 73401, Tel: 405-223-4773, TWX: 405-223-6832 Pgs. 558,559

Advertisement

Manufacturers of Test Equipment... Insulation Testers. . .Cable and Harness Testers. . .Megohmmeters. . .Stroboscopes. . .Coil and Winding Testers. . .Automatic Test Systems. . .For Production and Engineering.

SLEPIAN, ARTHUR & CO., 412 Housatonic Ave., Bridgeport, Conn., 06608, Tel: 203-366-5294; Sls. Mgr: M.L. Madow

SLOAN CO., 7704 San Fernando Rd., Sun Valley, Cal., 91352, Tel: 213-875-1123; Sls. Mgr: R.L. Lloyd Pgs. 1494-1499

Ala Huntsville, 20th Century Mktg., Inc., Box 6127 205-772-9237
Ariz Scottsdale, Artec, Inc., 403 N. Old Scottsdale 602-947-6304
Cal Palo Alto, R. Banks, 1032 Elwell Ct. 415-964-4464
Colo Denver, Elctrn. Sls., Inc., Box 22011 303-771-6300
Conn Meriden, Eagle Assoc., Box 921 203-237-5527
Fla Altamonte Sprgs., W.M.M. Assoc., 515 Tivoli Ct. 305-831-4645
Fla Clearwater, W.M.M. Assoc., 1260A S. Highland 813-446-0075
Fla Pompano Bch., W.M.M. Assoc., 721 SE 6th Ter. 305-943-3091
Ill Morton Grove, E. Flaxman, 9202 Waukegan Rd. 312-965-3988
Kans Wichita, L. Florence, 2900 Woodland 316-838-7226
Md Bethesda, W. Mount, 4924 St. Elmo Ave. 301-657-9312
Minn St. Paul, Cahill Assocs., 3000 Hudson Rd. 612-739-8445
Mo Kansas City, L. Florence, 406 W. 34th St. 816-561-7222
NJ Cherry Hill, Quality Components, Box 583 609-428-6266
NY New York, E. Glass, 250 W. 57th St. 212-586-8440
NY Syracuse (DeWitt), H. Murray, 6585 Kinne 315-446-5555
Ohio Rocky River, Compar, 21010 Center Ridge Rd. 216-333-4120
Tex Dallas, W. Reese, 3131 Stemmons Expwy. 214-638-6575
Tex Houston, W. Reese, 2400 W. Loop S 713-621-3134
WashSeattle, Electro Reps. Inc., 2047 14th W 206-282-7944
Wisc Milwaukee, Ed Flaxman Assoc., 1225 N. Water St.
For: Can., Downsview, Ont., Whittaker Electrns., 43 Troutbrook Dr. 416-247-7454
For: Can., Ottawa, Ont., Whittaker Elctrns., 42 Howden Ave. 613-224-1221
For: Can., Roxboro, Que., Whittaker Elctrns., Box 216 514-683-3621

SLOAN TECHNOLOGY CORP., 535 E. Montecito St., Santa Barbara, Calif., 93103, Tel: 805-963-4431; Mktg. Mgr: W. Stevenson

SMALLWOOD, S.G., LTD., 391-397 King St., E., Kitchener, Ont., Canada, Tel: 519-745-9583; Sls. Mgr: S.G. Smallwood

SMITH, HERMAN H., INC., 812 Snediker Ave., Bklyn., N.Y., 11207, Tel: 212-272-9400, TWX: 212-763-8070; Sls. Mgr: S. Fleischman ....Pgs. 2716,2717

Cal Los Angeles, E.E. Strassner Co., 3121 Los Feliz Blvd.
Cal San Carlos, E.E. Strassner Co., 601-03 County Rd.
Colo Denver, Koether-Cox Co., 1327 S. Inca St.
Haw Honolulu, Earl Assocs., Box 2845
Ill Chicago, J.J. McBride Sls. Co., 6054 Touhy Ave.
Ind Indianapolis, Schroeder-Loomis, 810 E. 64 St.
Md Silver Spring, M.F. Taylor Co., 9431 Georgia Ave.
Mass Needham, Coakley, Boyd & Abbett, Inc., 1424 Highland
Mich Ferndale, Shalco, Inc., 23529 Woodward Ave.
Minn Minneapolis, C.R. Gibb Co., 1311 W. 25th St.
Mo St. Louis, Lowell, Kangas & Assoc., Box 26
NY No. Syracuse, L.D. Allen, Inc., Box 205
NY Yonkers, J. Brown Assocs., 207 Rosedale Rd.
Ohio W. Richfield, N. Bear Corp., 3435 Streetsboro Rd.
Pa Phila, D.E.S. Component Sls., 4733 N. Marshall
Pa Pittsburgh, M. Wolfson, 201 Penn Ctr. Blvd.
Tex Dallas, McKinney Sls., Co., 1303 Chemical St.
EXP: N.Y., New York, Morhan Export Co., 458 Broadway
For: Can., Toronto, Ont., Atlas Radio Corp., 50 Wingold Ave.

SMITH, JUDSON A. CO., Boyertown, Pa., 19512, Tel: 215-367-2021; Sls. Mgr: D.T. MacNair

SMITH-MEEKER ENGRG. CO., 157 Chambers St., New York, N.Y., 10007, Tel: 212-WO-4-5510

SMITH, ROBERT ELEC. CO., Instr. Div., 70 Edwards St., Hartford, Conn., 06120, Tel: 203-522-7245; Sls. Mgr: H.J. Smith

SMOOTH-ON, INC., 1000 Valley Rd., Gillette, N.J., 07933, Tel: 201-647-5800; Vice Pres: G.T. Morse

SNAP-ON TOOLS CORP., 8120 28th Ave., Kenosha, Wisc., 53140, Tel: 414-654-8681; Sls. Mgr: G. Harrington

SNC MFG. CO., INC., P.O. Box 470, Oshkosh, Wisc., 54901, Tel: 414-231-7370; Sls. Mgr: V.H. Young

SNELGROVE, C. R. LTD., 141 Bond Ave., Don Mills, Ont. Can., Tel: 416-447-8531, TWX: 610-492-1354 Pg. 1428

Cal Agoura, JBAssocs., Box 364
Fla Eau Gallie, J.J. Smith & Assocs., Box 1506
Mass Waban, QRC Co., 134 Upland Rd.
NY Great Neck, F. Tylinski Co., 425 Northern Blvd.
Ohio Cleveland, Component/Insulation, 14235 Detroit Ave.

SO-LOW ENVIRONMENTAL EQUIP., 1743 Cleneay Ave., Cincinnati, Ohio, 45212, Tel: 513-631-8903; Sls. Mgr: W.J. Schum

SODERBERG MFG. CO., INC., 628 S. Palm Ave., Alhambra, Cal., 91803, Tel: 213-283-7676; Sls. Mgr: L.P. Appelman

SOLA ELEC. DIV., Sola Basic Inds., 1717 Busse Rd., Elk Grove Village, Ill., 60007, Tel: 312-HE-9-2800, TWX: 910-222-2858; Adv. Mgr: D.E. Fullam

SOLAR ELCTRNS. CO., 901 N. Highland, Hollywood, Calif., 90038, Tel: 213-462-0806; Sls. Mgr: A.T. Parker

Advertisement

A unique line of instruments, components and accessories to assist the RFI/EMC engineer in complying with MIL-1-6181D, MIL-1-16910C, MIL-STD-826A and MIL-STD-461. Transient generators, audio power sweep generators, LISNs, current probes, isolation transformers, EMI power meters, feed-thru capacitors, EMI filters and wave filters.

SOLATRON ENTERPRISES, 421 E. Beach Ave., Inglewood, Calif., 90302, Tel: 213-678-4981; Sls. Mgr: D.S. Rathje

SOLDER REMOVAL CO., 1077 E. Edna Pl., Covina, Cal., 91722, Tel: 213-331-0985; Sls. Mgr: J.C. Hood

SOLID CONTROLS, INC., 6405 Cambridge St., Minneapolis, Minn., 55426, Tel: 612-920-9500; V.P. Sls: R. Kokesh

SOLID POWER CORP., 440 Eastern Pkwy., Farmingdale, N.Y., 11735, Tel: 516-694-2883; V.P. Mktg: G.A. Hildebrand

SOLID STATE DEVICES, 12741 Los Nietos Rd., Santa Fe Springs, Cal., 90607, Tel: 213-698-0529, TWX: 910-586-1881; Sls. Mgr: A.N. Applebaum Pgs. 1836-1840

Ala Birmingham, Tech. Mktg., Box 5971 205-871-5431
Ariz Phoenix, C.G. Assocs., Box 15566 602-947-6480
Cal Mountain View, Nor-Cal, 2680 Bay Shore Frontage 415-961-8121
Cal San Diego, Earle, 4433 Convoy St. 714-278-5441
Cal Tustin, RMS Assocs., 13652 Fairmont Way 714-541-3295
Colo Boulder, J. Smith, 310 Seminole 303-449-7509
Fla Hallandale, Tech. Mktg., Box 127 305-563-8585
Fla Orlando, Tech. Mktg., 1511 E. Robinson 305-843-2500
Fla St. Petersburg, Tech. Mktg., Box 12196
Ga Marietta, Tech. Mktg., Box 1152 404-435-0079
Ill Chicago, Comm. Engrs., 7106 N. Western 312-761-0548
Ind Franklin, Comm. Engrs., 1624 Roberts 317-783-7143
Mass Brookline, Tech. Prods., 233 Harvard St. 617-731-0858
NJ Riverdale, Comp-Tech Sls., Box 50 201-835-0332
NM Albuquerque, J. Smith, 401-B San Pedro, N.E. 505-255-2111
NY Lynbrook, Comp-Tech, Box 384 516-593-2628
NY Manlius, A.L. Perkins, Box 217 315-682-5005
NC Greensboro, Tech. Mktg., Box 6664 919-274-2570
Ohio Dayton, Comm. Engrs., 34 N. Clinton St. 513-434-6871
Pa Phila., Schibley, 11110 Autobonn 215-676-9885
Va Fairfax, Schibley, 10604 Warwick Ave. 703-591-3008

SOLID STATE ELCTRNS., 15321 Rayen St., Sepulveda, Cal., 91343, Tel: 213-894-2271; Sls. Mgr: E.Y. Politi Pgs. 954,2006

Ill Chicago, LGS Elctrns., 5642 W. Diversay 312-622-8183
Pa Philadelphia, WF Assocs., Box 8821 215-KI-6-4121

SOLIDSTATE CONTROLS, INC., 600 Oakland Park Ave., Columbus, Ohio, 43214, Tel: 614-263-1886

Advertisement

SCI specializes in static inverters and completely uninterruptible power systems ranging from 1/2 to over 500 KVA single and three phase, for providing transient-free, completely no-break power to critical instrumentation and computer loads. Long, reliable experience as "state-of-the-art" leader in wide range of highly selective industries concentrated in utilities, oils, chemicals, pipelines, process industries.

SOLITRON DEVICES, INC., 8808 Balboa Ave., San Diego, Cal., 92123, Tel: 714-278-8780, TWX: 910-335-1221; Sls. Mgr: F. Feldman

SOLITRON DEVICES, 256 Oak Tree Rd., Tappan, N.Y., 10983, Tel: 914-359-5050, TWX: 710-576-2654; Sls. Mgr: K. Seybold

SOLITRON DEVICES, INC., 1177 Blue Heron Blvd., Riviera Bch., Fla., 33404, Tel: 305-848-4311, TWX: 510-952-6676

SOLTEC CORP., 10747 Chandler Blvd., No. Hollywood, Cal., 91601, Tel: 213-984-1100; Sls. Mgr: M.R. Solomon

SOMERSET RADIATION LAB., Box 814, Arlington, Va., 22216, Tel: 703-525-4255; Sls. Mgr: K. Schomaker

SONEX, INC., 2337 Philmont Ave., Bethayres, Pa., 19006, Tel: 215-947-6100, TWX: 510-665-5485; Mktg. Mgr: E.B. Campbell ....Pg. 955
Ala Huntsville, Currie Aerospace Assocs., Box 1424 205-536-5650
Ariz Phoenix, PLS Assocs., 901 W. McDowell Rd. 602-258-0067
Colo Englewood, PLS Assocs., 8080 E. Union Ave. 303-771-0140
Fla Orlando, Currie Aerospace Assocs., Box 13229 305-855-0843
Md Silver Spring, Sel-Tronics, 721 Ellsworth Dr. 301-589-3391
Mass Wellesley, Reptron, Box 275 710-326-1413
Minn Hopkins, Beta Engrg. Co., 128 Jackson Ave., N. 612-938-2551
NM Albuquerque, PLS Assocs., 4300 H. Silver Ave., S.E. 505-255-2330
NY Melville, Astrorep, Inc., 1175 Walt Whitman Rd. 516-423-2266
NC Winston-Salem, Currie Aerospace, Box 13029 Salem Sta. 919-725-1927
Tex Dallas, True Technology, 12016 Fieldwood La. 214-AD-9-7741
Utah Salt Lake City, PLS Assocs., 5219 Major St. 801-262-2866

SONOBOND CORP., Sub. Aeroprojects, Inc., 310 E. Rosedale Ave., West Chester, Pa., 19380, Tel: 215-696-4710; Sls. Mgr: D.D. Kirkpatrick

SONOTONE CORP., Oper. Unit Gould, Inc., Elmsford, N.Y., 10523, Tel: 914-592-9600, TWX: 914-592-8361; Sls. Mgr: M. Berke

SORENSON LIGHTED CONTROLS, 530 Oakwood Ave., W. Hartford, Conn., 06110, Tel: 203-236-3267, TWX: 710-425-0034; Sls. Mgr: F.C. Kundahl ....Pg. 1493
Cal Van Nuys, Pacific Switch, 14048 Burbank 213-873-4802
Conn W. Hartford, Atlantic Switch, 520 Oakwood Ave. 203-523-5259
Ga Doraville, Switch Controls, 5299 Buford 404-451-3258
Ill Wheaton, Conectrix, 201 N. Gables 312-653-1460
Tex Dallas, Texaswitch, 2942 Congressman 214-357-1768

SOSHIN ELEC. CO., 1-18-18 Nakamogome, Ota-Ku, Tokyo, Japan ....Pg. 2442

SOSTMAN H. E., & CO., 347 E. Lincoln Ave., Cranford, N.J., 07016, Tel: 201-272-5750; Sls. Mgr: R.W. Coxson

SOUTH SHORE METAL PRODS., INC., 88-90 Allen Blvd., Farmingdale, N.Y., 11735, Tel: 516-249-3322; Sls. Mgr: A.G. Bauer

Advertisement

S.S. offers a stock size line of deep drawn cans trimmed to customer's length requirement at no extra cost. Will also produce special sizes and shapes complete with mounting brackets, studs, etc. - mumetal and other shielding type enclosures are regularly shipped. Tape control drilling and machining available for panel boards, plug in strips, etc. Quality control program to MIL-1-45208.

SOUTHERN AVIONICS CO., Box 5345, Beaumont, Tex., 77702, Tel: 713-842-1717; Sls. Mgr: J.B. Goodhue

SOUTHERN ELCTRNS., 150 W. Cyress Ave., Burbank, Cal., 91502, Tel: 213-846-9302, TWX: 910-498-2207; Sls. Mgr: C. Hornblower .... Pgs. 1548,1549,2444-2473

SOUTHWEST PRODS. CO., 1705 S. Mountain Ave., Monrovia, Calif., 91016, Tel: 213-358-0181; Sls. Mgr: K.V. Hackman

SPACE AGE MICROCIRCUITS, Box 335, Long Valley, N.J., 07853, Tel: 201-852-7373; Sls. Mgr: J. Williams

SPACE DIVERSITY SYS., Box 167, Totowa, N.J., 07512, Tel: 201-271-1800; Sls. Mgr: G. Snedecor

SPACE PRODS., INC., 6631 Sarnia Ave., Long Beach, Calif., 90805, Tel: 213-NE-6-6161; Sls. Mgr: R. Rubley

SPARGO WIRE CO., Box 229, Rome, N.Y., 13440, Tel: 315-337-4300; Sls. Mgr: J.A. Spargo III

SPARKS COMMUNICATIONS, INC., 114 Ft. Brown, Brownsville, Tex., 78520, Tel: 512-546-2821; Sls. Mgr: E.W. Sparks

SPARTA MFG. CO., Dover, Ohio, 44622, Tel: 216-878-5521; Sls. Mgr: H.F. Burkholder

SPARTON CORP., Elctrns. Div., 2400 E. Ganson St., Jackson, Mich., 49202

SPARTON SOUTHWEST, INC., 9621 Coors Rd., N.W., Albuquerque, N.M., 87103, Tel: 505-898-1150, TWX: 505-243-8368; Contract Adm: R. Majeski

SPATRON INC, 715 South Raymond Ave, Alhambra, Calif., 91803, Tel: 213-283-8831; Pres: J.R. Singleton

SPAULDING FIBRE CO., INC., Sub. Monogram Inds., Inc., 310 Wheeler St., Tonawanda, N.Y., 14150, Tel: 716-692-2000, TWX: 716-530-1535; V.P. Mktg: E.C. Leitz

SPEC PLASTICS, 10717 Chandler Blvd., No. Hollywood, Cal., 91601, Tel: 213-980-2601; Sls. Mgr: T.W. Reid

Advertisement

SPEC PLASTICS manufactures in thermoset and thermoplastic materials a wide variety of components and hardware for the electronics industry. Transistor Insulators and Lead Spreaders, P.C. Card Guides, Bobbins, Encapsulation Shells. Custom molded parts can be delivered fast and cheap with our universal tooling concepts.

SPECIAL MICROWAVE DEVICES OPER., Raytheon Co., 130 Second Ave., Waltham, Mass., 02154, Tel: 617-899-8080, TWX: 710-324-6568; Mktg. Mgr: W.C. Jones

SPECIALTY CONNECTOR, 3560 Madison Ave., Indpls., Ind., 46227, Tel: 317-787-6368; Sls. Mgr: J.M. Sayre

SPECIFIC PRODUCTS, 1237 S. Shamrock Ave., Monrovia, Cal., 91016, Tel: 213-359-6636; Sls. Mgr: J. Van Gross ....Pg. 325
Cal Downey, Wieler, 10842 S. Paramount 213-TO-1-9223
Cal Sunnyvale, Wieler, 405 S. Sunnyvale 408-736-6098
Mass Lexington, W. Hague, 10 Muzzey St. 617-862-5700
NJ Ridgewood, Data-Rep., 1250 E. Ridgewood 201-445-5389
NY Huntington Sta., Data-Rep., Box 164 516-423-7677
Pa Norristown, Data-Rep., Box 349 215-279-8210
Tex Dallas, Vidal Elct., 3403 High Bluff 214-241-4491
Va Annandale, Nine Assocs., 7753 A2 Patriot 703-256-9105

SPECTRA-PHYSICS, INC., 1250 W. Middlefield Rd., Mountain View, Calif., 94040, Tel: 415-961-2550, TWX: 910-379-6941; Sls. Mgr: G. Brill

SPECTRA SONICS, 770 Wall Ave., Ogden, Utah, 84404, Tel: 801-392-7531; Sls. Mgr: A.V. Siniscal

SPECTRA-STRIP CORP., Box 415, Garden Grove, Cal., 92642, Tel: 714-892-3361, TWX: 910-596-1314; Sls. Mgr: Frank W. Hanna ....Pgs. 3054-3056
Ala Huntsville, W.A. Brown Comps., 1314 Buford 205-539-4411
Ariz Scottsdale, Carter, 201 W. 1st St. 602-947-4355
Cal Hayward, V. Wyman, Box 6021, Southland 408-736-2870
Cal San Diego, Earle, 4433 Convoy 714-278-5441
Cal Tustin, RMS Assocs., 13652 Fairmont 714-541-3295
Colo Denver, I.W. Strong, 635 Canosa 303-292-6900
Conn Staffordville, Spectra-Strip, (Sub), Swanda Mfg. Ctr. 203-684-4237
Conn Wethersfield, Com/Pak, 104 Apple Hill 203-563-4784
Fla Ft. Lauderdale, W. Brown Comps., 961 N.W. 53rd 305-566-5697
Fla Orlando, W. Brown Comps., 222 Weber 305-425-5505
Ill Chicago, Proctor Sls., 2538 Peterson 312-973-5300
Ind Ft. Wayne, Scott Elctrns., 124 W. Wash. St. 219-743-1586
Ind Indpls., Scott Elctrns., 1300-02 N. Penn. Ave. 317-635-8951
Mass Needham Hgts., Com/Pak, 77 Wexford St. 617-444-1259
Minn Mpls., F. B. Hill Co., 7317 Cahill 612-941-5270
NY Fayetteville, M. P. Andrews, 319 Mott 315-637-3144
NY Tuckahoe, L-C-A Sls., 76 Main St. 914-961-4700
NC Winston-Salem, W.A. Brown Comps., 1108 Burke St. 919-725-5384
Ohio Cincinnati, Scott Elctrns., 9505 Montgomery Rd. 513-791-2513
Ohio Cleveland, Scott Elctrns., 1836 Euclid Ave. 216-861-2626
Ohio Columbus, Scott Elctrns., 79 E. State 614-228-2313
Pa Philadelphia, L-C-A Sls., 2109-3600 Conshohocken Ave. 215-477-2725
Pa Pittsburgh, Scott Elctrns., 1050 Freeport Rd. #7 412-471-5233
Tex Dallas, P. Kreager, 9230 Cliffmere 214-348-3521
Tex Houston, E. Smith Sls. Co., Box 12583 713-649-5756
Utah Salt Lake City, P. Bowthorpe Agency, 143 S. 4th E. 801-328-8173
Va Annandale, L-C-A Sls., 3505 Epsilon Pl. 703-560-9485
Wash Edmond, J. Chase Co., 406 Main 206-774-3586

SPECTRAL DYNAMICS CORP. SAN DIEGO, Box 671, San Diego, Cal., 92112, Tel: 714-278-2501, TWX: 910-335-2022; Sls. Mgr: W.M. Hawkins, Jr.

SPECTRAN ELCTRNS., Div. Novatronics, Inc., P.O. Box 878, Pompano Beach, Fla., 33061, Tel: 305-942-5200, TWX: 510-956-9878; Sls. Mgr: J.A. Cianciarulo

SPECTROL ELCTRNS., 17070 E. Gale Ave., City of Industry, Cal., 91745, Tel: 213-964-6565, TWX: 910-584-1314; Dir. Mktg: T.A. Stenglein Pgs. 2924,2925
Ala Huntsville, Bostick, 3322 S. Memorial 205-881-3677
Ariz Phoenix, Howe & Howe Sls., Inc., 4109 N. 18th St. 602-264-7971
Cal Burlingame, W. J. Purdy, 770 Airport 415-347-7701
Cal City of Industry, Spectrol, 17070 E. Gale 213-964-6565
Colo Denver, Lindberg, 5498 E. Evans 303-758-9033
Conn No. Haven, Kitchen & Kutchin, Inc., 22 Broadway 203-239-0212
DC Washington, Rep-Tron, 8525 Colesville 301-588-1595
Fla Clearwater, Dyne-A-Mark Corp., 1665 Magnolia Dr. 813-446-3229
Fla Fern Pk., Dyne-A-Mark Corp., 525 E. State Rd. 436, Box 128 305-831-5100
Fla Pompano Bch., Dyne-A-Mark Corp., 1010 E. Atlantic Blvd. 305-942-5870
Ill Chicago, Gassner & Clark Co., 6644 N. Western Ave. 312-764-6121
Iowa Cedar Rapids, J. Vrbik, 3-50th St. 319-377-8244
Md Silver Spring, Rep-Tron, 8525 Colesville 301-588-1595
Mass Lexington, Kitchen & Kutchin, Inc., 17 Waltham St. 617-862-8230
Mich Southfield, R. C. Nordstrom & Co., 29431 Southfield Rd. 313-444-4417
Minn Minneapolis, F.B. Hill Co., 7317 Cahill Rd. 612-941-5270
Mo Kansas City, Harris-Hanson, 7916 Paseo 816-444-9494
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood 314-962-0111
NJ Haddonfield, Sunday-O'Brien, 15 Potter 609-429-4013
NY Oceanside, Bittan Assocs., 400 Merrifield 516-678-6222
NY Syracuse, I.A. Hotze Co., 112 DeWitt 315-479-6641
NC Raleigh, Mount & Co., 4120 Camelot Dr. 919-787-8731
Ohio Cincinnati, Luebbe Sls., 2649 Erie Ave. 513-871-4211
Ohio Cleveland, Luebbe Sls., 21330 Ctr. Ridge 216-734-4242
Ohio Dayton, Luebbe Sls. Co., 3490 S. Dixie 513-294-0426
Okla Oklahoma City, Ammon & Champion, 7012 Commanche 405-721-6417
Pa Pittsburgh, R.F. Clark, 10517 Lindberg 412-242-9500
Tex Dallas, Ammon & Champion Co., 733 Blanton Tower 214-357-8441
Tex Houston, Ammon & Champion Co., 601 Westbury Sq. 713-729-1233
Wash Bellevue, N. R. Schultz Co., 855 106th St. 206-454-5224
For: Can., Montreal, Quebec, Aeromotive Engrg. Prods., Ltd., 147 Hymus Blvd. 514-695-6413
For: Can., Toronto, Ont., Aeromotive Engrg. Prods., Ltd., 1912A Avenue Rd. 416-783-4288
For: Can., Vancouver, B.C., N. R. Schultz Co., 855 106th St. 206-454-5224

SPECTRUM CONTROL, INC., 152 E. Main St., Fairview, Pa., 16415, Tel: 814-474-5593; Sls. Mgr: J.R. Lane

SPECTRUM DYNAMICS, INC., 2300 E. Oakland Pk. Blvd., Ft. Lauderdale, Fla., 33306, Tel: 305-566-2547; Sls. Mgr: D.L. Sheesley

SPECTRUM INSTRS., INC., 35 Grand St., New Rochelle, N.Y., 10801, Tel: 914-632-4655; Sls. Mgr: J. Ericksen

SPECTRUM TECHNOLOGY, Bldg. 240, Box 948, Goleta, Cal., 93017, Tel: 805-964-7791, TWX: 910-334-1176; Sls. Mgr: R. Land ....Pg. 1429
Cal Mountain View, Daniels-Padgett, 2620 Bayshore Frontage 415-969-1700
Colo Denver, D. Padgett, 2785 N. Speer 303-433-7181
Conn Milford, Todino Engrg., 132 N. Haven 203-874-6643
Fla Orlando, Buchanan & Abrams, Box 6026 305-423-8995
Iowa Cedar Rapids, Tech. Assocs., 110 31st 319-365-9162
Md Beltsville, Snow Co., 10442 Baltimore 301-345-2211

Mass Needham Hgts., Todino Engrg. Sls. Co., 50 Kearney Rd. 617-444-7925
Mich Southfield, Luebbe Sls., 20905 Greenfield 313-357-0355
Minn Mpls, Tech. Assoc., 4915 W. 35th St. 612-929-6721
NY Hicksville, Salsbury, 331 W. John St. 516-938-1080
Ohio Cincinnati, Luebbe Sls., 2649 Erie Ave. 513-871-4211
Tex Dallas, Texas Avionics, 4515 Prentice 214-368-3566
Wash Mercer Is., Northwest Mfrs. Agts., Box 476 206-284-7002
EXP: N.Y., NY, A. Johnson, 110 E. 59th St. 212-758-3200

SPELLMAN HIGH VOLTAGE ELCTRNS. CORP., 1930 Adee Ave., Bronx, N.Y., 10469, Tel: 212-671-0300; Sls. Mgr: S.M. Skeist ....Pgs. 873-877
Cal Mountain View, Repex, 2015 Latham St. 415-969-9200
Cal Pasadena, A-F Sls. Engrg., 1000 E. Walnut 213-681-5631
Cal San Diego, A-F Sls. Engrg., 12032 Caminito Cadena 714-277-2784
Colo Denver, Cleveland Entprs., 2120 S. Hally 303-758-2409
Ill Chicago, Midwest Elctrn. Sls., 5707 W. Division St. 312-626-0030
Ind Indianapolis, Midwest Elctrn. Sls., 4000 Meadows Dr.
NM Albuquerque, Cleveland Enterprises, Inc., Box 11314 505-298-7671
Wisc Waukesha, Midwest Elctrn. Sls., 1317 Garfield

SPENCER-KENNEDY LABS., INC., 2 Lowell Ave., Winchester, Mass., 01890, Tel: 617-729-5800; Sls. Mgr: B.W. Hughes, Jr.

SPEREX CORP., 2239 Pontius Ave., Los Angeles, Calif., 90064, Tel: 213-478-1541; Sls. Mgr: D.A. Borre'

SPERRY ELCTRN. TUBE, Sperry Rand, Gainesville, Fla., 32601, Tel: 904-372-0411; Sls. Mgr: R.A. Wood

SPERRY MARINE SYS., Sperry Rand, Rte. 29 N. & Hydraulic Rd., Charlottesville, Va., 22901, Tel: 703-973-3371, TWX: 510-587-5463; Sls. Mgr: L.W. Gibson

SPERRY MICROWAVE ELCTRNS., Sperry Rand, Box 4648, Clearwater, Fla., 33518, Tel: 813-855-4471, TWX: 813-855-4505; Sls. Mgr: F.J. Lavelle

SPIRAS SYS., INC., 332 Second Ave., Waltham, Mass., 02154, Tel: 617-891-7300, TWX: 710-324-6699; Pres. J.T. Regan

SPIVEY, JAMES S., INC., Box 6298, Washington, D.C., 20015, Tel: 202-363-1580; Sls. Mgr: J.S. Spivey

SPRAGUE ELEC. CO., 481 Marshall St., No. Adams, Mass., 01247, Tel: 413-664-4411, TWX: 710-369-1360; V.P. Sls: Carroll G. Killen ....Pg. 2474
Ala Huntsville, Sprague Elec. Co. (Oper.) WX 4000
Ariz Tempe, Sprague Elec., 1047 W. Univ. 602-279-5435
Cal Burlingame, W. J. Purdy, 770 Airport Blvd. 415-347-7701
Cal Los Angeles, Sprague Elec. Co., 12870 Panama St. 213-870-0161
Cal San Diego, KCE Corp, 8855 Balboa Ave. 714-278-7640
Colo Denver, Sprague Elec., 1780 S. Bellaire 303-756-3611
Colo Littleton, W. J. Purdy, 1449 W. Littleton 303-794-4283
Conn Trumbull, Sprague Elec. Co., 935 White Plains Rd. 203-261-2551
DC Wash, Sprague Elec., 3900 Wisc. 202-244-6006
Fla Orlando, Sprague Elec. Co., Box 530 305-831-3636
Ill Schiller Pk., Sprague Elec. Co., 9950 W. Lawrence Ave. 312-678-2262
Ind Indpls, Sprague Elec., 2421 Willowbrook 317-253-4247
Md Baltimore, Sprague Electric, 3900 Wisconsin Ave., N.W. 202-244-6006
Mass Newton, Sprague Elec. Co., 343 Washington St. 617-969-2520
Mass No. Adams, Sprague Elec. Co., 481 Marshall St. 413-664-4411
Mich Jackson, Sprague Elec. Co., 515 S. West Ave. 517-787-3934
Minn Minneapolis, HMR, Inc., 9 E. 22nd St. 612-335-7734
Mo St. Ann, Sprague Elec. Co., 500 Northwest Plaza 314-291-2500
NJ Cherry Hill, Sprague Elec. Co., 1050 N. Kings Hwy. 609-667-4444
NJ Cherry Hill, Trinkle Sls, Inc, 500 N Kings Hwy 609-667-3500
NJ Wayne, Sprague Elec. Co., 1479 Rte. 23 201-696-8200
NM Albuquerque, C.T. Carlberg & Assocs., Box 3177, Sta. D 505-265-1579
NY Eastchester, W. Rutt, Inc., 475 White Plains Rd. 914-698-8600
NY Melville, Sprague Elec. Co., 60 Broad Hollow Rd. 516-549-4141
NY Syracuse, Sprague Elec. Co., 2002 Teall Ave. 315-437-7311
NC Winston-Salem, Elctrn. Mktg. Assocs., 928 Burke St. 919-722-5151
Ohio Chagrin Falls, Sprague Elec. Co., 24 N. Main St. 216-247-6488
Ohio Dayton, Sprague Elec. Co., 4977 Northcutt Pl. 513-278-0781
Pa Philadelphia, Sprague Elec. Co. 215-467-5252
Tenn Winston-Salem, N.C., Elctrn. Mktg. Assocs., 928 Burke St. 919-722-5151
Tex Richardson, Sprague Elec. Co., First Bank & Trust Bldg. 214-235-1256
Wash Seattle, Sprague Elec. Co., 4601 Aurora Ave., N. 206-632-7761

SPRAYON PRODS., INC., Ind'l. Supply Div., 26300 Fargo Ave., Bedford Hgts., Ohio, 44146, Tel: 216-292-7400; V.P: D.B. Powers

SPRENGNETHER, W.F. INSTR. CO., INC., 4567 Swan St., St. Louis, Mo., 63110, Tel: 314-535-1682; Sls. Mgr: K.D. Scott

SPRING CITY ELEC. MFG. CO., Hall & Main Sts., Spring City, Pa., 19475, Tel: 215-948-4000; Sls. Mgr: M. Kanter

SPRINGER AIRCRAFT RADIO CO., RR #2, Box 98, Shelleyville, Ind., 46176, Tel: 317-835-7757; Sls. Mgr: E.W. Springer

SPRUCE PINE MICA CO INC., 108 Greenwood Rd., Spruce Pine, N.C., 28777, Tel: 704-765-4241; Pres: H.M. Wiseman

SQUARE D CO., Dept. SA - 711, Milwaukee, Wisc., 53201, Tel: 414-432-2000; Sls. Mgr: C.E. Quentel Pg. 1347

SQUARE D CO., 205 S. Northwest Hwy., Park Ridge, Ill., 60068, Tel: 312-774-9200; Pres: M.P. Kartalia

SRC DIV., Moxon, Inc., 2222 Michelson Dr., Newport Bch., Cal., 92664, Tel: 714-833-2000, TWX: 910-596-1362; Sls. Mgr: J.E. Heyer .... Pgs. 560,561,871,1992-1994
Ala Huntsville, Mekco, Holiday Off. Ctr. #90 205-881-3721
Ariz Phoenix, Moxon Elctrns., 15 N. 40th Pl. 602-273-7363
Cal L. A., Moxon Elctrns., 2311 Pontius 213-272-9311
Cal San Diego, Moxon, 2054 Garnet 714-274-6525
Cal Sunnyvale, Moxon, 1259 Birchwood 408-734-4352
Colo Denver, BFA Corp., 1309 S. Inca 303-744-3301
Fla Orlando, Mekco, 3165 McCrory Rd. 305-841-2215
Ill Rosemont, Cozzens & Cudahy, 9501 W. Devon 312-825-1144
Ind Indianapolis, Cozzens & Cudahy, 21 Beachway 317-244-2456
Md Rockville, Farrell, 230 N. Wash. 301-424-9460
Mass Belmont, Vector Sls., 774 Pleasant 617-489-1400
Mich Southfield, S. Sterling, 21251 Civic Ctr. 313-355-3030
Minn Mpls., Cozzens & Cudahy; 7450 France S. 612-920-1022
Mo Edmundson, Cozzens & Cudahy, 10534 Natural Bridge 314-423-1234
NJ Freehold, Moxon Elctrns., Box 649 201-446-4820
NM Las Cruces, BFA Corp., 1st Natl. Bank 505-523-0601
NY DeWitt, db Assocs., 3307 Erie Blvd. 315-446-0220
NC Burlington, Mekco, 1349 S. Church 919-226-7177
Ohio Medina, Cozzens & Cudahy, 735 S. Court 216-725-5660
Tex Euless, Data-Aids, Box 429 817-268-3505
Tex Houston, Data-Aids, Box 1602 713-473-0155
Wash Seattle, R. Drake, 6133 Maynard 206-763-2755

SSCO STANDARDS LAB., INC., 12800 Northend Ave., Detroit, Mich., 48237, Tel: 313-398-2100; Mgr: D.P. Pyko

SSR INSTRS. CO., 1001 Colorado Ave., Santa Monica, Cal., 90404, Tel: 213-451-8701; Sls. Mgr: J. Campbell

ST. MARYS CARBON CO., 1939 State Rd., St. Marys, Pa., 15857, Tel: 814-434-2844; Sls. Mgr: E.W. Smith

STA-WARM ELEC. CO., 116 N. Chestnut St., Ravenna, Ohio, 44266, Tel: 216-296-6461; Sls. Mgr: E. Littrell

STACKPOLE CARBON CO., CARBON DIV., Stackpole St., St. Marys, Pa., 15857, Tel: 814-834-1521, TWX: 510-693-4511; Sls. Mgr: G. Pauline

STACKPOLE CARBON CO., Elctrn. Comps. Ferrites, St. Marys, Pa., 15857, Tel: 814-834-1521, TWX: 510-693-4511; Sls. Mgr: D. Almquist

STACKPOLE CARBON CO., Elctrn. Comps. - Resistors, Kane, Pa., 16735, Tel: 814-837-7000, TWX: 510-695-8404; Sls. Mgr: J.J. Sennett ....Pg. 2877
Ariz Phoenix, Dorton Entprs., Box 16127 602-263-0414
Cal Los Angeles, Black & Strong, 1728 S. Lacienega Blvd. 213-870-9191
Cal San Carlos, Melchior Assocs., 820B Cherry St. 415-591-7383
Cal San Diego, Black & Strong, S., 7961 Engineer Rd. 714-279-6363
Colo Littleton, Simpson Assocs., 2552 Ridge Rd. 303-798-8439
Conn W. Hartford, S. C. Hooker, Box 369 203-233-8000
Fla Orlando, Gra-Mar, Box 20493 305-841-2330
Ga Atlanta, J.A. Creighton, Lakeridge Cir. S.W. 404-344-6185
Ill Chicago, A.A. Woods & Assocs., 5511 W. Montrose Ave. 312-283-7400
Ind Bloomington, R.E. Riggs, Box 846 812-339-6166
La Baton Rouge, R.F. Gallagher, 1388 Sierra Vista Dr. 504-924-4995
Md Kensington, Brown-Frederick & Assocs., 3519 Raymoor Rd. 301-949-1707
Mass Winchester, S.C. Hooker, Box 352 617-729-5482
Mich Birmingham, J.E. Vollmer Jr., 31516 Robinhood Dr. 313-644-3571
Mich Roseville, D. J.Mohr, 17040 Eleven Mile Rd. 313-777-8839
Minn Minneapolis, HMR Inc., 9 E. 22nd St. 612-335-7734
Mo Grandview, L.R. Harry & Assocs., Box 288 816-763-3634
Mo St. Louis, L.R. Harry & Assocs., Box 12608 314-872-3183
NJ Englewood Cliffs, Sprung/Nussbaum, 120 Sylvan Ave. 201-947-6767
NY Buffalo, R.W. Mitscher, 496 Ellicott Sq. Bldg. 716-854-2517
NY Fayetteville, R.W. Mitscher, 310 Churchill 315-637-9575
NY Pittsford, R.W. Mitscher, 22 Latchmere Ct. 716-381-9115
NC Raleigh, R.W. Mitscher, Box 10541 919-828-0575
Pa Oreland, Brown-Frederick & Assocs., Box 300 215-887-1325
Pa Pittsburgh, H.S. Swoyer, 3640 Ridgewood Dr. 415-823-1611
Tenn Nashville, R.W. Mitscher, 2508 Stones River Ct. 615-883-2220
Tex Dallas, M.N. Herbst, 7733 Indian Springs Rd. 214-239-2497
Va Virginia Bch., R.W. Mitscher, 3100 Basin Ct. 703-464-0500
Wash Bellevue, Vantage, 300 120th Ave., N.E. 206-455-3460
For: Can., Toronto, Ont., Canadian Stackpole, 550 Evans Ave. 416-255-2373
EXP: N.Y., New York, Ad Auriema, 120 Liberty St. 212-349-8220

STACKPOLE CARBON CO., Magnet Div., Kane, Pa., 16735, Tel: 814-837-7000, TWX: 510-695-8360; Sls Mgr: V.D. Benigni

STACKPOLE COMPS. CO., Box 14466, Raleigh, N.C., 27610, Tel: 919-828-6201, TWX: 510-928-0520; Sls. Mgr: C.F. Robison ....Pg. 1953
Ariz Phoenix, Dorton Enterprises, Box 16127 602-263-0414
Cal Los Angeles, Black & Strong, Inc., 1728 S. LaCienega Blvd. 213-870-9191
Cal San Carlos, Melchior, 820B Cherry 415-591-7383
Cal San Diego, Black & Strong, Inc., 7961 Engineer Rd. 714-279-6363
Colo Littleton, Simpson, 2552 Ridge 303-798-8439
Conn W. Hartford, S.C. Hooker, Box 369 203-233-8000
Fla Orlando, Gra-Mar, Box 20493 305-841-2330
Ga Atlanta, J.A. Creighton, Lakeridge Cir., S.W. 404-344-6185
Ill Chicago, A.A. Woods, 5511 W. Montrose 312-283-7400
Ind Bloomington, R. E. Riggs, Box 846 812-339-6166
La Baton Rouge, R.F. Gallagher, 1388 Sierra Vista Dr. 504-924-4955
Md Kensington, Brown-Frederick & Assoc., 3519 Raymoor Rd. 301-949-1707
Mass Winchester, S.C. Hooker, Inc., Box 352 617-729-5482
Mich Birmingham, J. E. Vollmer, Jr., 31516 Robinhood Dr. 313-644-3571
Mich Roseville, D.J. Mohr, 17040 Eleven Mile Rd. 313-777-8839
Minn Minneapolis, HMR, Inc., 9 E. 22nd St. 612-335-7734
Mo Grandview, L. R. Harry, Box 288 816-763-3634
Mo St. Louis, L.R. Harry & Assocs., Box 12608 314-872-3183
NJ Englewood Cliffs, Sprung/Nussbaum, Inc., 120 Sylvan Ave. 201-947-6767
NY Buffalo, R. W. Mitscher Co., 496 Ellicott Sq. Bldg. 716-854-2517
NY Fayetteville, R.W. Mitscher, 310 Churchill La. 315-637-9575

NY Pittsford, R.W. Mitscher, 22 Latchmere Ct. 716-381-9115
NC Raleigh, R.W. Mitscher, Box 10541 919-828-0575
Pa Oreland, Brown-Frederick & Assocs., Inc., Box 300 215-887-1325
Pa Pittsburgh, H. S. Swoyer, 3640 Ridgewood Dr. 412-823-1611
Tenn Nashville, R.W. Mitscher, 2508 Stones River Ct. 615-883-2220
Tex Dallas, M. N. Herbst, 7733 Indian Springs 214-239-2497
Va Virginia Beach, R.W. Mitscher, 3100 Basin Ct. 703-464-0500
Wash Bellevue, Vantage Corp., 300 120th Ave., N.E. 206-455-3460
EXP: N.Y., N.Y., Ad Auriema, 120 Liberty St. 212-349-8220
For: Can., Toronto, Ont., Canadian Stackpole Ltd., 550 Evans Ave. 416-255-2373

STACO, INC., 2240 E. 3rd St., Dayton, Ohio, 45403, Tel: 513-253-1191, TWX: 810-459-1798; Sls. Mgr: W.D. James Pg. 2983
Cal Diablo, Thomas Assocs., Box 684 415-837-8411
Cal Los Angeles, E. Strassner, 3121 Los Feliz 213-666-1511
Colo Broomfield, Arrowhead, 7943 W. 98th 303-222-6462
Conn Hamden, Impact Sls., 60 Connolly 203-248-9368
Fla Winter Pk., Hawkins-Hutto, 501 Park 305-647-7407
Ga Atlanta, Millar Elctrns., 3110 Maple 404-261-6060
Ill Skokie, Saffro & Assocs., 3736 Dempster 312-JU-8-0905
Ind Angola, Southern Sls., 105 Lakeshore 219-665-3961
Ind Indpls, Southern Sls., 1111 E. 54th 317-253-3359
Kans Leawood, Poly-Onics, Inc., 4434 W. 90th 913-648-4173
Ky Louisville, Southern, 212 Republic Bldg. 502-583-6902
Md Landover Hills, Eastern Comps., Inc., 6200 Annapolis Rd. 301-322-1412
Mass Waltham, Impact Sls., 223 Crescent 617-893-2850
Mich Dearborn, Villani-Pitcher, Inc., 20233 Ann Arbor Trail 313-271-4600
Minn Mpls, C. Gibb Co., 1311 W. 25th St. 612-FR-7-1200
Mo Hazelwood, Poly-Onics, Inc., 47 Village Sq. Shop. Ctr. 314-837-0597
NM Albuquerque, Arrowhead Sls., Box 243 505-855-4562
NY Buffalo, R.F. Lamb Co., 1865 Kenmore 716-874-4900
NY Kingston, R.F. Lamb Co., 259 Fair St. 914-338-8833
NY Rochester, R.F. Lamb Co., 63 Norcrest 716-544-5580
NY Syracuse, R.F. Lamb Co., E. Molloy Rd. 315-454-2469
NY Valley Stream, Levison Sls. Co., 5 Sunrise Plaza 516-LO-1-9696
NC Raleigh, Millar Elctrns., N. Hills Off. Mall 919-787-9564
Ohio Cleveland, Marlow, 4486 Mayfield 216-381-4500
Pa Phila, Eastern Comps., 1349 Cheltenham 215-WA-7-6362
Tex Bellaire, Brice Co., 5000 Terminal St. 713-666-1788
Utah Salt Lake Cy, Arrowhead Sls., 1966 W. 6255, S. 801-298-2751

STACOR CORP., 285 Emmet St., Newark, N.J., 07114

STACOSWITCH, INC., 1139 Baker St., Costa Mesa, Cal., 92626, Tel: 714-549-3041, TWX: 910-595-1507; Sls. Mgr: G. Kuehn

STAFFALL, INC., 7 Woodland St., Providence, R.I., 02908, Tel: 401-351-8282; Pres: A.A. Crivellone

Advertisement

Staffall, Inc. are designers, engineers and manufacturers of presision molded insulated standoffs, feed-thrus, coil forms, multi-pin headers, encapsulation cases, PCB connectors and "Arc-Trap" surge arrestors, Tip-Jacks to military specification MIL-39024. IC Sockets, NAFI Headers and NAFI Standard Hardware. available Custom Molding and Toolmaking facilities.

STAHLIN BROS., INC., 500 Maple St., Belding, Mich., 48809, Tel: 616-794-0700

STAINLESS, INC., 3rd St., N. Wales, Pa., 19454, Tel: 215-699-4871; Sls. Mgr: H.J. Guzewicz

STAKE FASTENER CO., 9835 Dupree St., S. El Monte, Calif., 91733, Tel: 213-442-4700; Pres: J.N. Dupree

STANCIL-HOFFMAN CORP., 921 N. Highland Ave., Hollywood, Calif., 90038, Tel: 213-464-7461; Dir. Mktg: W.V. Stancil

STANCOR, Essex Int'l., Inc., 3501 W. Addison St., Chicago, Ill., 60618, Tel: 312-463-7400, TWX: 910-221-5466; Sls. Mgr: R.J. Reigel

STANDARD CABINET CO., INC., 392 Minnisink Rd., Totowa, N.J., 07512, Tel: 201-256-2200; Sls. Mgr: A.D. Beugless

STANDARD CONDENSER CORP., 1065 W. Addison St., Chicago, Ill., 60613, Tel: 312-327-5440; Sls. Mgr: R.T. McLean ....Pg. 2475
Cal Campbell, Deere Elctrn., Box 95 408-377-6441
Cal Costa Mesa, J. Cutts, 2803 Europa 714-557-3040
Fla Eau Gallie, J.J. Smith, 17 Babcock 305-254-4206
Ill Chicago, Rinaldi, 6319 N. Central 312-763-4848
Ind Indianapolis, R.H. Newson, 6320 Woburn 317-849-4442
Mich Farmington, Davis-Martensen, 22725 Orchard Lake 313-474-8300
Minn Mpls., Scott Elctrn., 5209 W. 60th 612-929-2985
NJ Pitman, Colrud Co., 601 Ardmore 609-589-5866
NY Port Washington, P.D. Aaron, Box 511 516-767-2600
NY Syracuse, J.V. Costello, 2030 Erie Blvd. 315-472-0322
Ohio Cleveland, Weschler Elec., 4250 W. 130th 216-251-4609
Tex Richardson, P.J. Scanlon, 724 C S. Sherman 214-231-4661

STANDARD CONTROLS, 2401 S. Bayview St., Seattle, Wash., 98144, Tel: 206-723-1705; V.P. Mktg: R. Waude

STANDARD CRYSTAL CORP., 1111 S. Fremont Ave., Alhambra, Cal., 91803, Tel: 213-284-4176; Sls. Mgr: J.B. Fisher

STANDARD ELEC. MFG. CO., Haddon Ave., W. Berlin, N.J., 08091, Tel: 609-767-0207; Pres: H.A. Cohen

STANDARD ELEC. TIME CORP., 89 Logan St., Springfield, Mass., 01101, Tel: 413-732-1141; Sls. Mgr: T.H. Drury

STANDARD ELCTRNS. CORP., Box 677, Freehold, N.J., 07728, Tel: 201-446-7611; Sls. Mgr: W.H. Zillger

STANDARD GLOVE CO. OF N.J., 27 Havnes Ave., Newark, N.J., 07114, Tel: 201-248-3344; Sls. Mgr: C. De Jonqe

STANDARD GRIGSBY CO., 920 Rathbone Ave., Dept. J, Aurora, Ill., 60507, Tel: 312-897-8417, TWX: 910-232-3138; Sls. Mgr: J.A. Udisches Pgs. 1954,1955
Ariz Scottsdale, OEM Spec., 6625 E. MacDonald 602-946-4617
Cal Inglewood, V & L Assocs., 3412 W. Century 213-671-7688
Cal San Lorenzo, W. Parks, Box 36 415-357-4240
Colo Denver, Waugaman, 4643 Wadsworth 303-423-1020
Conn New Haven, Gerber Sls., Box 2917 203-777-6279
Fla Orlando, Irby-Connolly, Inc., Box 6034B 305-423-8270
Ind Angola, Southern Sls., 105 Lakeshore 219-665-3961
Ind Bloomington, Temco, 118 S. Rogers St. 812-332-3377
Ind Indianapolis, Southern Sls., 1111 E. 54th 317-253-3359
Iowa Cedar Rapids, Elctrn. Sls., 1310 Hertz 319-364-4342
Md Bethesda, Mount & Co., 4853 Cordell 301-652-5612
Mass E. Longmeadow, Gerber Sls., Box 447 413-525-3059
Mass Waltham, Gerber Sls., 176 Second 617-891-8040
Mich Farmington, Carter, McCormic & Peirce, 23995 Freeway Pk. 313-477-7700
Minn St. Paul, R. Ragon, 1136 W. Larpenteur 612-488-0201
Miss Meridian, Herron Assocs., Box 3008 601-482-1878
NJ Mountain Lakes, Comps. Elct., 60 Midvale 201-334-2921
NY Buffalo, McDonough & Assoc., 4541 Main 716-839-2044
NY DeWitt, Bowser & Sapecky, 4317 E. Genesee 315-446-5920
NC Raleigh, Mount & Co., Box 17365 919-787-8731
Ohio Cleveland, Carter, McCormic & Peirce, 21380 Lorain 216-333-5650
Ohio Dayton, Carter, McCormic & Peirce, 5423 Webster 513-278-5873
Pa Ambler, D. Quinlan Sls. Co., 242 E. Butler 215-646-7250
Pa Pittsburgh, Carter, McCormic & Peirce, 201 Penn Ctr. 412-824-3760
Tex Dallas, Stevens Sls., Box 34493 214-350-2476
Wisc Milwaukee, E. Dickinson, 3612 N. Green Bay 414-264-1080

STANDARD LOGIC, 1630 S. Lyon St., Santa Ana, Cal., 92705, Tel: 714-835-5466, TWX: 910-595-1707; Sls. Mgr: B. Billington

STANDARD MEMORIES, INC., 15130 Ventura Blvd., Sherman Oaks, Cal., 91403, Tel: 213-788-3010, TWX: 910-495-1738; Dir. Sls. & Mktg. J.A. DeVine

STANDARD PNEUMATIC MOTOR CO., Box 745, Whittier, Calif., 90608, Tel: 213-945-1211, TWX: 213-685-6433; Sls. Mgr: A.V. Sampsel ....Pg. 2943
Cal Whittier, S.P. Mktg. Co., 12468 E. Lambert Rd. 213-945-1391
Colo Denver, Pneumatics Ultd., 1010 Yuma St. 303-222-4858
Ill Glen Ellyn, H.F. Wilson Engrg., 21 W. 173 Hill Ave. 312-469-8473
RI E. Providence, Market Dev., 1365 Wampanoag Trail 401-433-4404

STANDARD RELAY CORP., 40 Dale St, W. Babylon, N.Y., 11704, Tel: 516-694-4436; Sls. Mgr: H. Berger

STANDARD SCREW CO., Stanscrew Fasteners, 2701 Washington Blvd., Bellwood, Ill., 60104, Tel: 312-LI-4-3500, TWX: 910-234-2076; Sls. Mgr: T.R. Veech

STANDARD-THOMSON CORP., Aircraft Div., 152 Grove St., Waltham, Mass., 02154, Tel: 617-894-7310; Sls. Mgr: S.S. Signa

STANDARD WINDING CO., Div. Ovitron Corp., 44-62 Johnes St., Newsburgh, N.Y., 12550, Tel: 914-561-1541; Sls. Mgr: K. Drake

STANDARD WIRE & CABLE, 3440 Overland Ave., Los Angeles, Cal., 90034, Tel: 213-870-9231, TWX: 910-340-6758; Sls. Mgr: M.E. Harris ....Pg. 3057
Ariz Phoenix, Standard Wire & Cable Co., Box 14707 602-272-0571
Cal Los Angeles, Standard Wire & Cable Co., 3440 Overland Ave. 213-870-9231
Cal Palo Alto, Standard Wire & Cable Co., 644 Emerson St. 415-328-3082
Fla Indian Rocks Bch., Tech. Rep., Box 415 813-595-2834
Fla Melbourne, Tech. Rep. Assocs., Box 2095 305-723-9140
Ga Jonesboro, Tech. Rep. Assocs., Box 955 404-753-0111
Md Baltimore, R. Wafer Assoc., 3809 Victoria Ave. 301-655-1565
Mass Attleboro, Standard Wire & Cable Co., Box 875 617-226-1500
Mass Attleboro, T.A.P. Elctrn. Sls., 2 Liberty 617-222-6749
Ohio Cleveland, V. O'Neill, 1090 Homeland 216-331-4273
Pa Pittsburgh, T. McDonough, 1601 Penn. 412-241-6927
Wash Bellevue, Standard Wire & Cable, 11109 N.E. 3rd Pl. 206-454-0995
EXP: Cal., Los Angeles, Standard Wire & Cable Co., 3440 Overland Ave. 213-870-9231

STANFORD APPLIED ENGRG., 340 Martin Ave., Santa Clara, Cal., 95050, Tel: 408-243-9200, TWX: 910-338-0132; Sls. Mgr: A.I. Mandel

STANFORD INT'L., Box 266, San Carlos, Cal., 94070, Tel: 415-592-5958; Sls. Mgr: F. Dobbs

STANLEY IND'L. COMPS. DIV., Stanley Works, Forestville, Conn., 06010, Tel: 203-582-9541; Sls. Mgr: F.R. Downs, Jr.

STANLEY IND'L. HARDWARE DIV., Stanley Works, New Britain, Conn., 06050, Tel: 203-225-5111; Sls. Mgr: J.J. Grcevic

STANLEY TOOLS, New Britain, Conn., 06050, Tel: 203-225-5111; Sls. Mgr: C.L. Lohmeyer

STANPAT PRODS., INC., 366 Main St., Port Washington, N.Y., 11050, Tel: 516-883-8400; Sls. Mgr: F. Nolan

STANTON MAGNETICS, INC., Terminal Dr., Plainview, N.Y., 11803, Tel: 516-OV-1-0200; Nat'l Sls. Mgr: J.S. Woodstock

STANTRON, Wyco Metal Prods., Box 9158 V.C., No. Hollywood, Cal., 91609, Tel: 213-875-0800, TWX: 910-499-2177; Sls. Mgr: L. Turner ....Pg. 2325
Ala Huntsville, Murphy & Cota, 904 Bob Wallace Ave. 205-536-9121
Ariz Phoenix, Shefler-Kahn, Box 1587 602-258-7893
Cal Oakland, F. Moulthrop, 1530 E. 12th 415-261-7676
Cal San Diego, J. Colbert, 2501 Via Viesta 714-454-1500
Colo Denver, Robbins & Assoc., 700 Poplar St. 303-399-6618
Fla Orlando, Murphy & Cota, 712 W. Vassar St. 305-424-2407
Ga Atlanta, Murphy & Cota, 500 Plasamour 404-875-2525
Haw Honolulu, Har Kom Hawaii, Inc., 630 Pilkai St. 808-538-7178

Ill Chicago, Berndt Assoc., 6200 N. Hiawatha 312-283-0713
Kans Shawnee Mission, M.E.Bettis, 5915 B. Woodson 913-362-0772
Mich Detroit, Burcaw Co., 18236 W. Mc Nichols 313-533-7700
NH Hampton, E.M. Assoc., Woodbury Bldg. 603-926-8510
NJ Mountain Lakes, Components for Elctrns., Box 176 201-334-2921
NM Albuquerque, Shefler-Kahn, 405 Ortiz 505-265-7077
NC Winston-Salem, Murphy & Cota, 1106 Burke St. 919-724-0750
NY Liverpool, Rayelco Elctrns., Box 189 315-652-5272
Ohio Cleveland, J. Olsen Co., 16201 Shaker 216-752-5444
Pa Glenside, ARA Elctrns., 501 Edge Hill 215-887-5250
Tex Dallas, Berry Co., 3011 Hood St. 214-528-0461
Wash Seattle, J.K. Dooley, 4110 Stone Way 206-ME-2-1618

STAR ENTERPRISES-DIV., Box 1098, Lowell, Mass., 01853, Tel: 617-692-4842; Sls. Mgr: M.L. Green

STAR PORCELAIN CO., 71 Muirhead Ave., Box 1267, Trenton, N.J., 08638, Tel: 609-392-3154; Sls. Mgr: C.A. Lawton

STAR STAINLESS SCREW CO., Box 222, Totowa, N.J., 07512, Tel: 201-CL-6-2300; Sls. Mgr: A.R. Strike

STARK ELCTRN. INSTRS., LTD., 180 Station St., Ajax, Ont., Canada, Tel: 416-942-2121; Ind'l Mktg Mgr: G.R. Snowdon

STARRETT, L.S. CO., 1-165 Crescent St., Athol, Mass., 01331, Tel: 617-249-3551, TWX: 617-249-4040; Pres: D.R. Starrett

STATE LABS, INC., 215 Park Ave., S., New York, N.Y., 10003, Tel: 212-OR-7-8400; Sls. Mgr: L. Farrar

STATES CO., 19 New Park Ave., Hartford, Conn., 06106, Tel: 203-233-6232

STATHAM INSTRS., INC., 2230 Statham Blvd., Oxnard, Cal., Tel: 805-487-8511, TWX: 65923

STAUFFER-WACKER SILICONE CORP., Sutton Rd., Adrian, Mich., 49221, Tel: 313-263-5711; Sls. Mgr: R. Flewwilling

STAVER CO., INC., 41 N. Saxon Ave., Bay Shore, N.Y., 11706, Tel: 516-MO-6-8000; Sls. Mgr: J.B. Lazarus

STEEL HEDDLE MFG. CO., 2100 W. Allegheny Ave., Philadelphia, Pa., 19132, Tel: 215-227-5500; Sls. Mgr: L.B. Spengler

STERLING INSTR., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., NY, 11040, Tel: 516-328-3300, TWX: 510-223-0642; Sls. Mgr: J.J. Baron

Advertisement

Sterling Instrument is a leading manufacturer of "off-the-shelf" precision electromechanical components. Products include; gears of every type, electronic hardware, breadboard components, clamps, counters, couplings, dials, differentials, fasteners, gearheads, knobs, limit stops, magnetic clutches and brakes, slip clutches, speed reducers and stand-offs. Write for Master Catalog 80 and New Products Catalog 81

STERLING TRANSFORMER CORP., 510 Driggs Ave., Brooklyn, N.Y., 11211, Tel: 212-782-4200; Sls. Mgr: P.H. Odessey

STERLING, Div. Reichhold Chems., Inc., Sewickley, Pa., 15143, Tel: 412-766-7600, TWX: 710-668-3877; Pres: W.T. McClelland

STETTNER-TRUSH INC., 67 Albany St., Cazenovia, N.Y., 13035, Tel: 315-655-8141; Sls. Mgr: P.M. Kip

Advertisement

Ceramic disc and tubular variable trimmer capacitors: Ceramic H.F. components: Sub-miniature ceramic fixed capacitors: Carbon film resistors - 1/30, 1/20, 1/8, 1/4 and 1/2 watt: Mylar-polycarbonate-paper-tantalum and electrolytic capacitors: Popular values in stock for immediate shipment.

STEVENS-ARNOLD, INC., 7 Elkins St., So. Boston, Mass., 02127, Tel: 617-268-1170 ....Pg. 2007

Advertisement

Stevens-Arnold has Sales Engineering Representatives in principal cities of the United States and Canada. For immediate referral to your nearest representative, please call collect, 617-268-1170, and ask for "Customer Service". See our advertisement on page 2007.

Foreign Representatives in Australia, Benelux Countries, France, Germany, India, Israel, Sweden, and Switzerland.

STEVENS PRODS., INC., 128 N. Park St., E. Orange, N.J., 07019, Tel: 201-672-2140; Sls. Mgr: J. Thomson

STEVENSON-BRO & CO., INC., 1039 W. Venango St., Phila., Pa., 19140, Tel: 215-223-2600; Sls. Mgr: F. Fenimore

STEVENSON ENGRG. & MFG., 3102 S.W. 87th Ave., Portland, Ore., 97225, Tel: 503-292-9201; Pres: J.D. Stevenson

STEWARD, D.M. MFG., Box 510, Chattanooga, Tenn., 37401, Tel: 615-624-9055; Sls. Mgr: R.N. Palmquist

STEWART-WARNER MICROCIRCUITS, DIV., 730 E. Evelyn Ave., Sunnyvale, Cal., 94086, Tel: 408-245-9200, TWX: 910-339-9210; Sls. Mgr: J.O. Coffey

STICHT, HERMAN H. CO., INC., 27 Park Pl., New York, N.Y., 10007, Tel: 212-732-8163; Sls. Mgr: A.H. Volker Pg. 563

Ala Birmingham, J. Spader, 2805 Crescent 205-879-1366
Cal Emeryville, Pacific Coast Instr., 1310 65th 415-654-8290
Cal Los Angeles, C.L. Repp, 12121 Wilshire 213-820-1715
Fla Ft. Laud, Ward Engrg., 1718 N.E. 28 Dr. 305-564-4883
Fla Jacksonville, Ward Engrg., 2727 Phyllis 904-388-7656
Fla Orlando, Ward Engrg., 7040 Lake Ellenor 305-851-0725
Ga Atlanta, Hooker Reid Co., Box 11754 404-237-9385
Ill Westchester, Murphy & Dickey, 10001 Derby La. 312-344-5660
La New Orleans, Mid-South Sls. Co., Inc., 4414 Calliope St. 504-822-3030
Md Lutherville, T. Closs, 6202 White Manor 301-661-5700
Mich Berkley, G.R. Peters, 3347 Coolidge 313-564-6325
Minn Mpls, Volco Co., 831 S. Sixth St. 612-336-6631
Mo St. Louis, C. Leaver, 2800 S. Brentwood 314-968-1500
NY Buffalo, R.F. Lamb, 1865 Kenmore 716-874-4900
NY Latham, T. Carse Sls. Co., Inc., Box 71 518-785-5844
NY Rochester, R.F. Lamb Co., 4515 Culver Rd. 716-544-5580
NY Syracuse, R.F. Lamb Co., Box 28 315-454-2469
NC Matthews, W.K. Hile Co., Inc., Box 1015 704-847-9125
Ohio Cincinnati, Beedle Equip., 6900 Silverton 513-793-0140
Ohio Cleveland, Martin-Rettger, 11955 Shaker 216-791-8787
Ore Portland, J. Kearns Co., Box 13303 503-236-1165
Pa Bala Cynwyd, Wistex, One Belmont Ave. 215-839-7086
Pa Pittsburgh, R.F. Clark, 10517 Lindberg 412-242-9500
Tex Bellaire, Brice Co., 5000 Terminal 713-666-1788
Wisc Milwaukee, M. Jacobs Co., Box 5544 414-962-7070

STIMPSON CO., INC., 900 Sylvan Ave., Bayport, N.Y., 11705, Tel: 516-472-2000; Sls. Mgr: J. Larson

STOCK DRIVE PRODS., Div. Designatronics, Inc., 55 S. Denton Ave., New Hyde Pk., N.Y., 11040, Tel: 516-328-0200; Sls. Mgr: J.J. Baron

Advertisement

Stock Drive Products specializes in providing the widest selection of small, commercial quality, drive components from stock - at the right price. You select from the 9 most needed product categories - gear products, speed reducers, motors and motor controls, couplings, chain and belt drives, shafts, bearings, counters, fasteners and vibration mounts. The services of SDP's thoroughly experienced application engineering staff is available to you in the form of technical assistance. A 520-page SDP Handbook of Commercial Drive Components (Catalog 71) is available on request.

STOELTING CO., 424 N. Homan Ave., Chicago, Ill., 60624, Tel: 312-SA-2-3833; Sls. Mgr: J. Heger, Jr.

STONE IND'L. CORP., Tubular Prods. Div., 900 Franklin St., N.E., Washington, D.C., 20017, Tel: 202-832-5000

STOP COMPONENTS, INC., 100 Commercial St., Freeport, N.Y., 11520, Tel: 516-868-0142; Mkt. Mgr: A. Wurschinger

STORED ENERGY SYSTEMS, 2271 Mora Dr., Mountain View, Calif., 94040, Tel: 415-961-7500; Sls. Mgr: H.R. Kaewert

STOW LABS., INC., Kane Ind'l. Dr., Hudson, Mass., 01749, Tel: 617-562-9347, TWX: 710-390-0346; Mktg. Mgr: J.D. Kelly

Advertisement

PITRAN PRESSURE TRANSISTORS

Linear ranges available from 0.1 to 15 psi. FEATURES: Small Size - TO-46 can. High Output - 2 volt linear range for all models. Fast Response - 10 microsecond rise time. Resonant Frequency - above 100 kHz. Overload - 5 X range, minimum. APPLICATIONS: industrial controls, counter, rate sensor, tape/film loop control, biomedical sensor, switch, fluidic interface, meteorological accelerometer, force, flow, leak. Electronics for static or dynamic measurements available, and D.C. power supplies. Quantity pricing for production applications.

STOW MFG. CO., 101 Shear St., Binghamton, N.Y., 13902, Tel: 607-723-6411; V.P: J.L. Dickinson

STRAINSERT CO., 24 Summit Grove Ave., Bryn Mawr, Pa., 19010, Tel: 215-525-0685; Pres: A.U. Kutsay

STRANDBERG ENGRG. LABS., INC., 1001 S. Elm St., Greensboro, N.C., 27406, Tel: 919-274-0121; Sls. Mgr: C.F. Strandberg, Jr.

STRAZA INDS., Div. Ametec, Inc., 790 Greenfield Dr., El Cajon, Calif., 92022, Tel: 714-442-3451, TWX: 910-331-1162; Gen'l Mgr: G.G. Loehr

STROBLITE CO., INC., 29 W. 15th St., New York, N.Y., 10011, Tel: 212-255-5450; Sls. Mgr: R. Andersen

STROMBERG CARLSON CORP., 100 Carlson Rd., Rochester, N.Y., 14603, Tel: 716-482-2200, TWX: 510-253-0694; Sls. Mgr: J.G. Hagen

STROMBERG DATAGRAPHIX, Sub. Gen'l. Dynamics, Box 2449, San Diego, Cal., 92112, Tel: 714-283-6531

STRONG ELEC. CORP., Box 1003, Toledo, Ohio, 43601, Tel: 419-248-3741; Mktg. Mgr: N.E. Alexander

STRUTHERS-DUNN, INC., Lamb's Rd., Pitman, N.J., 08071, Tel: 609-589-7500, TWX: 510-686-7510; Sls. Mgr: W.L. Capewell

STRUTHERS-DUNN, INC., Sys. Div., 1114 State St., Bettendorf, Iowa, 52722, Tel: 319-359-0318, TWX: 910-525-1176; Ass't. to Pres: M.T. MacFarland

STRUTHERS ELCTRNS. CORP., Douglas Microwave Div., Railroad Pl., Mamaroneck, N.Y., 10543, Tel: 914-OW-8-3000; Sls. Mgr: W. V. Enator

STURDILITE SCI. FURNITURE SYS., 100 Acorn St., Plainwell, Mich, 49080, Tel: 616-685-6400; Sls. Mgr: B. Taugner

SUBMINIATURE INSTRS. CORP., 3236 Kansas Ave., Riverside, Calif., 92507, Tel: 714-684-7133; Sls. Mgr: J.F. Shea

SUMMIT ENGRG. CORP., Box 938, 1820 S. 7th Ave., Bozeman, Mont., 59715, Tel: 406-587-0636, TWX: 910-975-1950; Sls. Mgr: R.A. Hall ....Pg. 1565

SUN CAPACITORS, 2554 Lawrence, Chicago, Ill., 60625, Tel: 312-561-4975; Sls. Mgr: W. Timmings

SUN ELECTRIC CORP., Instr. Div., 6323 Avondale, Chicago, Ill., 60631, Tel: 312-631-6000, TWX: 910-221-2928; Sls. Mgr: R.L. Esvang

SUNAIR ELCTRN., INC., 3101 Southwest 3rd Ave., Ft. Lauderdale, Fla., 33315, Tel: 305-525-1505; Sls. Mgr: G. Charlton

SUNBEAM EQUIP. CORP., 212 Mercer St., Meadville, Pa., 16335, Tel: 814-336-1131; Sls. Mgr: G.J. Heisler
SUNDSTRAND DATA CONTROL, Sub. Sundstrand, Overlake Ind'l. Pk., Redmond, Wash., 98052, Tel: 206-885-3711, TWX: 910-449-2860; V.P. Gen'l. Mgr: A.H. Rooks
SUNSHINE SCI. INSTRS., INC., 1810 Grant Ave., Philadelphia, Pa., 19115, Tel: 215-OR-3-5600; Sls. Mgr: A. Stiles
SUPEREX ELCTRNS. CORP., 151 Ludlow St., Yonkers, N.Y., 10705, Tel: 914-965-6906; Sls. Mgr: C. Ray
SUPERIOR CARBON PRODS., INC., 9115 George Ave., Cleveland, Ohio, 44105, Tel: 216-883-4880; Pres: E.H. Salter
SUPERIOR CONTINENTAL CORP., Box 489, Hickory, N.C., 28601, Tel: 704-328-2171, TWX: 510-934-1495; Sls. Mgr: J. English
SUPERIOR ELEC., 1000 Middle St., Bristol, Conn., 06010, Tel: 203-582-9561, TWX: 710-454-0682; Sls. Mgr: B.G. Deming
SUPERIOR FLUX & MFG., 1536 St. Clair Ave., Cleveland, Ohio, 44114, Tel: 216-781-9373; Pres: B.J. Garfinkel
SUPERIOR INSULATED WIRE CORP., Box 188, Stony Point, N.Y., 10980, Tel: 914-942-1433; Sls. Mgr: J.T. Miller
SUPERIOR STEATITE & CERAMIC CORP., 88 W. Forest Ave., Englewood, N.J., 07631, Tel: 201-568-4555
SUPERIOR SWITCH CO., 1001 W. Broad St., Richmond, Va., 23220, Tel: 703-355-1447; Sls. Mgr: W.R. McAlister
SUPERIOR SWITCHBOARD & DEVICES DIV., Union Metal Mfg. Co., Box 590, Canton, Ohio, 44701, Tel: 216-455-5358; Sls. Mgr: C.E. Botos
SUPERIOR TUBE CO., Box 191, Norristown, Pa., 19404, Tel: 215-275-2070, TWX: 510-660-6410; Sls. Mgr: W.C. Hanna
SUPREME PUBLICATIONS, 1760 Balsam Rd., Highland Park, Ill., 60035, Tel: 312-831-9330; Sls. Mgr: J. Lynch
SURFACE CONDUCTION, INC., 1501 Broadway, New York, N.Y., 10036, Tel: 212-244-8620; Pres: T. Hafner
SWING-O-LITE, INC., 13 E. Moonachie Rd., Hackensack, N.J., 07601, Tel: 201-DI-2-5887; Sls. Mgr: W. Rosen
SWISS JEWEL CO., Lafayette Bldg., Philadelphia, Pa., 19106, Tel: 215-WA-5-2867; Sls. Mgr: P.N. Steel, Jr.

Advertisement

Jewel bearings, of sapphire and ruby - all types: Ring, Vee, Endstones, Cups, double cups, balls and orifices. Also sapphire windows, lenses, machinery guides, styli and blanks. Shipped from large inventory of stock standard sizes or custom made to individual specification. Technical assistance for design engineers working with prototype quantities. Stock list available along with special design aide brochure - at no charge.

SWITCHCRAFT, INC., 5555 N. Elston Ave., Chicago, Ill., 60630, Tel: 312-792-2700, TWX: 910-221-5199; Sls. Mgr: C.J. Schultz

SYLVANIA, See GTE Sylvania
SYMBOLIC DISPLAYS, INC., 1188 N. Batavia St., Orange, Calif., 92667, Tel: 714-633-8580, TWX: 910-593-1342; Sls. Mgr: W.J. Lang
SYNCHRO-START PRODS., 8151 N. Ridgeway, Skokie, Ill., 60076, Tel: 312-267-1730; Sls. Mgr: T.A. Neyfeldt
SYNCOR PRODS. CO., INC., 44 Eastern Ave., Malden, Mass., 02148, Tel: 617-322-7160; Sls. Mgr: S. Prost
SYNCRO CAPACITOR, Meuse-Argonne Rd., Hicksville, Ohio, 43526, Tel: 419-542-2711, TWX: 810-490-2550; Sls. Mgr: C. Carroll
SYNTEC CORP., 1611 East Ave., Austin, Tex., 78702, Tel: 512-478-5918; Sls. Mgr: D.R. Malone
SYNTHANE CORP, 12 River Rd., Oaks, Pa., 19456
SYNTHANE TAYLOR CORP., Alco Standard Co., Valley Forge, Pa., 19481, Tel: 215-666-0300, TWX: 215-666-0659; V.P. Mktg: J.W. Pool
SYNTRON DIV., FMC Corp., 264 Lexington, Homer City, Pa., 15748, Tel: 412-479-8011, TWX: 412-585-9477; Sls. Supv. H.D. Wood

SYNTRONIC INSTRS., INC., 100 Industrial Rd., Addison, Ill., 60101, Tel: 312-543-6444, TWX: 910-651-2191; Sls. Mgr: P. Evans ....Pg. 2499
Cal Arcadia, Ash M. Wood Co., Box 1-A 213-447-3511
Cal Menlo Pk., Frauman Assocs., Box 969 415-322-8461
Colo Wheatridge, Waugaman Assocs., Inc., 4643 Wadsworth 303-423-1020
Conn New Canaan, W. Couch, 115 Bald Hill Rd. 203-966-4630
Fla Jupiter, Massey Assocs., Box 877 305-746-4591
Fla St. Petersburg, Massey, Box 13577 813-347-6183
Fla Winter Pk., Massey Assocs., Box 1201 305-855-4510
Ill Northfield, Torkelson, 540 W. Frontage 312-446-9085
Ind Indianapolis, Torkelson, 3512 Rockville 317-244-7867
Md Reisterstown, Massey Assocs., Dover Rd. 301-833-2039
Mass Norwood, S. Pierce, Inc., 24 Linden St. 617-762-3164
Minn Mpls., Torkelson, 4820 W. 77th St. 612-920-1046
NJ Union City, Bressler, 4808 Bergenline 201-864-9577
Pa Havertown, Massey, 1325 W. Chester Pike 215-789-2320
Tex Houston, Space Elctrns., 4007 Belaire 713-667-5903
Tex Irving, Space Elctrns., Irving Bank Tower 214-631-0905
EXP: N.Y., N.Y., Sylvan Ginsbury, 425 Park, S. 212-689-5212

SYRACUSE ELCTRNS. CORP., Box 566, Syracuse, N.Y., 13201, Tel: 315-488-4911; Sls. Mgr: R.W. Shutt Pg. 1348
Cal Los Angeles, I. Nizam, Box 25662 213-395-2637
Conn Sharon, Adcour, One Summer St. 617-784-3996
Fla Orlando, G. W. Fenton, Box 7387 305-423-5720
Haw Honolulu, Atecs, 156 Mokauea St. 808-841-6644
Ill Chicago, Automation Equip., 6645 N. Oliphant 312-631-9673
Ind Angola, Southern Sls., 105 Lakeshore Dr. 219-665-3961
Ind Indianapolis, Southern Sls., 1111 E. 45th St. 317-253-3359
Minn Lakeville, Caco, Inc., Box 517 612-469-2151
Miss Meridian, Herron Assocs., Box 3008 601-483-7891
Mo St. Louis, Elec. Controls, 2732 S. Brentwood 314-961-6777
NY Baldwinsville, Scibetta Reps., 7484 River 315-622-3993
Ohio Cleveland, Marlow Assocs., 4486 Mayfield 216-381-4500
Pa Ardmore, Rothenheber, 53 Cricket Ave. 215-642-6911
Pa Pittsburgh, Trymac Co., 201 Penn Ctr. 412-823-8400
Tex Houston, Myles Summers, 2920 Weslayan 713-667-6900
Wash Seattle, D. Miller, 7821 Fremont N. 206-784-6800
Wisc Mequon, Automation Equip., 12740 N. River 43W 414-242-1520
SYSCON INT'L., INC., 205 Sycamore St., So. Bend, Ind., 46622, Tel: 219-287-5916; Sls. Mgr: R.E. Ekstrom
SYSTEMS ENCLOSURES, 200 N. Anets Dr., Northbrook, Ill., 60062
SYSTEMS ELCTRNS., 9801 Walford Ave., Cleveland, Ohio, 44102, Tel: 216-651-8208; Sls. Mgr: E.F. Bedford
SYSTEMS ENGRG. LABS., Box 9148, Ft. Lauderdale, Fla., 33310, Tel: 305-587-2900, TWX: 510-955-9825; Sls. Mgr: J.H. Geers
SYSTEMS ENGINEERING, LTD., Grouse Creek, Utah, 84313, Tel: 801-747-3228; Sls. Mgr: N.L. May
SYSTEMS INSTRS. RESCH., INC., 331 Luckie St., N.W., Atlanta, Ga., 30313, Tel: 404-525-2434; Sls. Mgr: R.G. Thackston

Advertisement

SIR provides complete data acquisition systems, matched to the customer's requirements and guaranteed compatible with the customer's computer. Systems are assembled from standard sub-systems and selected components to provide the best solution to the customer's problem.
SIR also designs and manufactures Ebert Spectrophotometers and other custom spectro-optical instruments.
Sales representatives have been established in most sections of the country to work with our customers.

SYSTEMS RESCH. LABS., 7001 Indian Ripple Rd., Dayton, Ohio, 45440, Tel: 513-426-6000; Mktg. Mgr: R.J. McGowan

SYSTRON-DONNER CORP., One Systron Dr., Concord, Cal., 94520, Tel: 415-682-6161, TWX: 910-481-9479; Mktg. Dir: J.R. Cunningham ....Pgs. 564,565
Ala Huntsville, Sci. Devices-S.E., 703 Watts Dr., S.E. 205-536-1969
Ariz Scottsdale, Sci. Devices-S.W., 8202 E. Sheridan St. 602-946-0333
Cal Los Angeles, Sci. Devices-Cal., 8621 Bellanca Ave. 213-641-4800
Cal Mountain View, Sci. Devices-Cal., 655 W. Evelyn Ave. 415-964-4230
Cal San Diego, Sci. Devices-Cal., 8098 Engineer Rd. 714-279-6642
Colo Littleton, Sci. Devices-S.W., 4943 E. Geddes Ave. 303-771-9037
Conn Hamden, Sci. Devices-N.E., 2315 Whitney Ave. 203-248-9361
Fla Pompano Bch., Sci. Devices-S.E., Box 2083 305-933-7373
Fla Orlando, Sci. Devices-S.E., 707 E. Colonial Dr. 305-424-7932
Fla Indpls, Sci. Devics-Midwest, 2920 Shelby Ave. 317-783-2111
Kans Lenexa, Sci. Devices-S.W., 14144 Santa Fe Dr. 913-888-2050
Mass Wakefield, Sci. Devices-N.E., 591 North Ave. 617-246-0920
Mich Birmingham, Sci. Devices-Midwest, 6773 Pine Eagle La.
Minn Minneapolis, Sci. Devices-Midwest, 5730 Duluth St. 612-544-1616
NJ Englewood, Sci. Devices-E., 95 Cedar La. 201-871-3916
NM Albuquerque, Sci. Devices-S.W., 4328 Mesa Grande, S.E. 505-268-6729
NY Hyde Pk., Sci. Devices-N.E., 158 S. Albany Post Rd. 914-229-5655
NY Syracuse, Sci. Devices-N.Y., 140 Pickard Bldg. 315-457-7420
NC Cary, Sci. Devices-S.E., 121 Woodland Dr. 919-832-2567
Ohio Dayton, Sci. Devices-Midwest, 3300 S. Dixie Dr. 513-298-9904
Pa Plymouth Meeting, Sci. Devices-Phil., Box 201 215-825-9515
Tex Houston, Sci. Devices-S.W., 3827 Richmond Ave. 713-623-4250
Tex Richardson, Sci. Devices-S.W., 312 N. Central Expwy. 214-231-8106
Va Springfield, Sci. Devices-Wash., D.C., 6615 Backlick Rd. 703-451-6500
Wash Bellevue, Sci. Devices-N.W., 854 106th Ave., N.E. 206-454-0900
For: Can., Downsview, Ont., BRH Assocs., 580 Supertest Rd., Sec. #9 416-630-4025
For: Can., Montreal, Que., BRH Assocs., 6338 Victoria Ave. 514-733-5331
For: Can., Ottawa, Ont., BRH Assocs., 1300 Carling Ave. 613-728-0113

SYSTRON-DONNER ALPHA DIV., 460 Roland Way, Oakland, Cal., 94621, Tel: 415-635-2700; Mktg. Mgr: William Dawes ....Pg. 565

SYSTRON-DONNER CONCORD INSTR. DIV., 888 Galindo St., Concord, Cal., 94520, Tel: 415-682-6161, TWX: 910-481-947; Mktg. Mgr: E. Niebuhr Pgs. 564,565

SYSTRON-DONNER DATAPULSE DIV., 10150 Jefferson Blvd., Culver City, Cal., 90230, Tel: 213-836-6100 Ext: 268, TWX: 910-340-6766; Sls. Mgr: H.W. Mette ....Pg. 564

Advertisement

Datapulse Division of Systron-Donner Corporation is a leading manufacturer of automatic, semi-automatic and manually operated pulse, data, and waveform generation equipment and systems. Product line reflects sophisticated design with exemplary accuracy and reliability, plus unusually high speed parametric performance capabilities where needed. Comprehensive selection of products is extremely flexible and compatible with other makers' systems/components. Included in the line are manual and fully programmable pulse generators, function generators, data generators, character generators, trigger program generators, PCM simulators, output plug-in units, and a useful range of instrumentation accessory options.

SYSTRON-DONNER INERTIAL DIVISION, 200 San Miguel Rd., Concord, Cal., 94520, Tel: 415-682-6161, TWX: 910-481-9478; Mktg. Mgr: B. Sage

SYSTRON-DONNER KRUSE ELCTRNS. SUB., 790 Hemmeter La., Mountain View, Cal., 94040, Tel: 415-967-2299, TWX: 910-379-6559; Mktg. Mgr: G. Hackley ....Pg. 565
SYSTRON-DONNER MICROWAVE DIV., 14844 Oxnard St., Van Nuys, Cal., 91409, Tel: 213-786-1760, TWX: 910-495-1786; Mktg. Mgr: John Becker

SYSTRON DONNER TRYGON ELCTRNS. SUB., 111 Pleasant Ave., Roosevelt, N.Y., 11575, Tel: 516-378-2800, TWX: 510-225-3664; V.P. Sls. H. Rait Pgs. 564,933

S Y T CORP., 2212 E. Yandell, El Paso, Tex, 79903, Tel: 915-542-1711; Sls. Mgr: G. Doolittle

T-M VACUUM PRODS., Warrington & Rowland, Riverton, N.J., 08077, Tel: 609-829-2000; Sls. Mgr: H.O. Walp, Jr.

T-BAR INC., 141 Danbury Rd., Wilton, Conn., 06897, Tel: 203-762-8351; Sls. Mgr: A.H. Morgan ....Pg. 1697

Cal Newport Beach, Elctrn. Controls, 4341 Birch 714-546-2714/5
Cal Palo Alto, P. Nurches, 999 Commercial 415-326-7842
Colo Denver, Engrg. Resch., 231 Detroit 303-377-8306
Ill Chicago, R. Weisz, 3008 N. Calif. Ave. 312-588-7474
Tex Houston, Unidyne, 5700 Savoy 713-782-0218

T & T CONTROLS CO., Box 171, Media, Pa., 19063, Tel: 215-LO-6-8270; Sls. Mgr: R.H. Maxwell

TA MFG. CORP., Viking Inds. Co., 4607 Alger St., Los Angeles, Cal., 90039, Tel: 213-245-3748, TWX: 910-497-2065; Gen'l. Pl. Mgr: J.L. Fargo

TABET MFG. CO., 1336 Ballentine Blvd., Norfolk, Va., 23504, Tel: 703-622-1973; Sls. Mgr: H.D. Burton

TAC TECH. INSTR. CORP., Scotch Rd., Mercer Airport, Trenton, N.J., 08628, Tel: 609-882-2894; Sls. Mgr: W.I. Shepley

TACHTRONIC INSTRS., INC., 1500 N. Front St., New Ulm, Minn., 56073, Tel: 507-354-3105, TWX: 910-565-2251

TACO DIV., Gen'l. Instr. Corp., One Taco St., Sherburne, N.Y., 13460, Tel: 607-674-2211, TWX: 510-261-7440; Dir. Mktg: J. Severinsen

Advertisement

Total antenna capability - VLF thru SHF, 5KHz thru 30 GHz. Complete antenna systems engineered furnished and installed; omni or directional ground station, airborne and vehicular. Applications include point-to-point, long-haul, tropo and satellite telecommunications, air traffic control, TV, telemetry, ECM and EW. Types include blades, stubs, spirals, yagis, log-periodics, helicals, parabolics, horns, collinear arrays and discones plus mounts, radomes, towers, transmission line and shelters.

TAFT ELECTROSYSTEMS, INC., Box 43, Metuchen, N. J., 08840, Tel: 201-549-9200, TWX: 710-998-0593; Sls. Mgr: M. Clavien

TALK-A-PHONE CO., 5013 N. Kedzie Ave., Chicago, Ill., 60625, Tel: 312-KE-9-1100; Sls. Mgr: D.F. Kagan

TALL JOEL, INC., 158 S. Terrace Ave., Mt. Vernon, N.Y., 10550, Tel: 914-MO-8-0388

TANDBERG OF AMERICA, INC., 8 Third Ave., Pelham, N.Y., 10803, Tel: 914-PE-8-0772; Sls. Mgr: R.J. Bowman, Jr.

TANGER ELCTRNS., Div. Tanger Inds., 12600 Daphne St., Hawthorne, Cal., 90250, Tel: 213-757-9161, TWX: 910-321-5767; Sls. Mgr: A. Starr

TANNOY (AMERICA), LTD., 1756 Ocean Ave., Bohemia, N.Y., 11716, Tel: 516-567-0770; Sls. Mgr: A.F. Hill

TANSITOR ELCTRNS., INC., West Rd., Bennington, Vt., 05201, Tel: 802-442-5473, TWX: 710-360-1782; Sls. Mgr: R.M. Andersen

TAPECON, INC., 475 River St., Rochester, N.Y., 14612, Tel: 716-621-8400; Sls. Mgr: W.C. Frykberg

Advertisement

Tapecon Inc. Quality source for EMI and RFI shielding materials, narrow web laminates, pressure sensitive foil, nameplates, pressure sensitive labels, printed tape.

Tapecon tapeability - unique - engineering and manufacturing skills directed toward mass production of specialized tape products. Can your product be improved or lowered in cost through incorporation of Tapecon's precision laminating, embossing, diecutting, and printing technology?

TAPESWITCH CORP. AMER., 320 Brd. Hollow Rd., Farmingdale, N.Y., 11735, Tel: 516-694-6312; Mktg: F. Dale ....Pg. 1956

Cal Los Angeles, Littrell Western Sls., Inc., 3121 E. 12th St. 213-261-0164
Cal So. San Francisco, Littrell Western Sls., Inc., 100 Produce St. 415-822-5595
Colo Denver, J. Dawson Co., 536 Kalamath St. 303-255-7194
Mass Braintree, Bordewieck Engrg. Sls. Co., 221 Grove St. 617-843-0845
Mich Grosse Pointe Pk., J. Miner, 15318 Mack 313-886-5878
NY N.Y., Tapeswitch Corp. Amer. 212-895-8713
Ohio Cleveland, Midwest Sls., 7409 Pearl 216-234-9200
Pa Media, W. Reeves, 2973 N. Providence 215-LO-6-6709
Tex Dallas, Techno Assocs., Box 20544 214-FL-7-9213
Wash Seattle, Electro Reps., 2047 14th, W. 206-AT-2-7944

TASK CORP., Box 3999, Anaheim, Calif., 92805, Tel: 714-774-3100, TWX: 910-591-1165; Sls. Mgr: R.L. Trax

TAU-TRON, INC., 685 Lawrence St., Lowell, Mass., 01852, Tel: 617-458-6871; Sls. Mgr: J.J. Slomski

Advertisement

Tau-Tron, Incorporated designs and manufactures a broad line of extremely high speed digital test systems. Products fall into three testing categories: General Purpose, Digital Communications, and Semi-Conductor Memory. General Purpose--Single and multiple channels, 8 bit to 96 bit word lengths, 1 Hz to 330 MHz. Digital Communications--Pseudo-random patterns, self-synchronization, bit-by-bit error detectors, and display, 1 Hz to 330 MHz. Semi-Conductor Memory--Manual and computer programmable, waveshape control, data control, bit fields from 8 x 8 to 24 x 256, 1 Hz to 120 MHz, self-contained error check systems.

TAURUS CORP., Academy Hill, Lambertville, N.J., 08530, Tel: 609-397-2390; Sls. Mgr: J.D. Kreuter Pg. 381

Cal Los Angeles, R. Sweet, 11150 Tenn Ave. 213-477-4517
Cal Pasadena, Sci. Sls., Box 5324 SY 1-3778
Conn New Haven, Forsberg Sls. 203-239-5111
Fla Clearwater, Brennan Assoc., 211 Ewing 813-446-5006
Ill Norridge, Gianaras Sls., 7051 W. Wilson 312-774-4600
Ind Ft. Wayne, Hoeming Sls., Butler Ct. 219-483-6913
Mass Brockton, Forsberg Sls., 646 Summer St. 617-522-6300
NJ Cherry Hill, H.S. Bancroft, Rockhill 609-UL-4-8000
NJ Ft. Lee, K. Hughes, 2175 Lemoine Ave. 201-944-1600
NY Hauppauge, Box 193 212-227-5816
Ohio Wickliffe, W.J. Brauer, 29029 Euclid 216-943-0601
Pa Pittsburgh, W.J. Brauer, Box 8466 412-921-3213
Tex Houston, R. Clarke, Box 13231 713-526-4908

TAYLOR ELEC., Div. Taylor Inds., Inc., Fisher Rd., Howell, Mich., 48843, Tel: 517-546-0450; Sls. Mgr: D. Duncan

TAYLOR INSTR. PROCESS CONTROL DIV., Sybron Corp., 95 Ames St., Rochester, N.Y., 14601, Tel: 716-235-5000, TWX: 716-235-4893; Sls. Mgr: R.S. Peterson

TAYLOR MILLWORK & STAIR CO., INC., 1305 W. 132 St., Gardena, Cal., 90247, Tel: 213-FA-1-2750

TAYLOR-WINFIELD CORP., 1052 Mahoning Ave., N.W., Warren, Ohio, 44482, Tel: 216-399-8861; Sls. Mgr: L.J. Murto

TDC DIV., Chu Assocs., Box 365, Littleton, Mass., 01460, Tel: 617-456-3374 V.W. Storey

TDK ELCTRNS. CORP., 23-73 48th St., Long Island City, N.Y., 11103; Sls. Mgr: H. Karamura

TE COMPANY, 505 E. Montecito St., Santa Barbara, Cal., 93103, Tel: 805-966-7136; Sls. Mgr: R. J. Washburn

TEAC CORP. OF AMER., Technical Prods., 2000 Colorado Ave., Santa Monica, Cal, 90404, Tel: 213-394-0240; Dir. Mktg: K.M. Williamson

TEALE MACHINE CO., Box 936, Rochester, N.Y., 14603, Tel: 716-CH-4-6700, TWX: 510-253-2344; Sls. Mgr: S. Travis

TEC, INC., 6700 S. Washington Ave., Eden Prairie, Minn., 55343, Tel: 612-941-1100, TWX: 910-576-2860

TECH-ETCH, INC., 10 Ind'l. Pk. Rd., Hingham, Mass., 02043, Tel: 617-749-0993; Sls. Mgr: R. Gurwitch

TECH LABS., INC., Bergen & Edsall Blvds., Palisades Pk., N.J., 07650, Tel: 201-944-2221, TWX: 201-947-0825; Gen'l. Sls. Mgr: K.K. Garrison ....Pg. 1957

Cal Inglewood, V/L Assocs., 3412 W. Century 213-671-7688
Cal Los Altos, Held & Mollard, Inc., 175 S. San Antonio Rd. 415-941-6041
Conn Cheshire, E. Lane, 350 So. Main St. 203-272-6081
Ill Lombard, Quadtron Assocs., Box 306 312-775-5717
Ind Ft. Wayne, Hoemig Sls., 3405 Butler 219-483-6913
Md Towson, Habco Elctns., 603 Alleghany Ave. 301-825-9637
Mass Waltham, Selmark Assoc., 181 West 617-899-8110
Mich Jackson, N. Scroggs Co., 2221 Arbor Hills 517-782-5211
Minn Mpls., R. Sledare Assoc., 4724 42nd 612-533-2294
Mo St. Charles, M.L. Seyffert, 910 Jefferson 314-723-1185
NJ Haddonfield, F.W. Churchill, Box 43 609-429-7871
NJ Livingston, A. A. Budde, Box 226 201-994-1210
NY Fayetteville, J.K. Savage, Box 95 315-637-8441
NY Manhasset, Everett Mktg., 115 Easkins Rd. 516-627-7750
Ohio Cleveland, Midwest Sls., 7409 Pearl 216-234-9200
Pa Pittsburgh, R. Clark Co., 10517 Lindberg 412-242-9500
Tex Houston, Oeler & Menelaides, 6243 Braesheather 713-772-0730
Tex Richardson, Oeler & Menelaides, Box 4008 214-239-1121
Wash Seattle, J. McClamrock, 127 S.W. 156 206-244-9391

TECH-OHM ELCTRNS., INC., 36-11 33rd St., Long Island City, N.Y., 11106, Tel: 212-786-2274; Sls. Mgr: B.E. Futch

TECHFORM LABS., INC., Box 509, Venice, Cal., 90291, Tel: 213-396-4219; Sls. Mgr: J.A. Woolf

TECHMAR CORP., 2232 S. Cotner Ave., Los Angeles, Cal., 90064, Tel: 213-478-0046; Sls. Mgr: A. Rader Pg. 2327

TECHMETRIC CO., 2449 Harding Ave., Redwood City, Calif., 94062, Tel: 415-365-2545; Sls. Mgr: D.E. Hanson

TECHNI-RITE ELCTRNS., Techni-Rite Ind'l. Pk., E. Greenwich, R.I., 02818, Tel: 401-884-6800, TWX: 710-387-1500 ....Pgs. 596,597

Ala Huntsville, E.G. Holmes, 4862 Governors 205-837-6900
Cal Inglewood, Techni-Rite Elctrns., 724-1/2 E. Manchester 213-678-8991
Colo Littleton, Hilleary, 2552 Ridge Rd. 303-794-4279
Fla Orlando, E.G. Holmes, 316-1/2 S. Bumby 305-241-2128
Ga Chamblee, E.G. Holmes, 4185 Clairmont 404-451-6161
Mich Royal Oak, Satullo, 4514 N. Woodward 313-549-3910
Mo St. Louis, Palatine Engr., 1573 N. Warson 314-426-7055
NJ Metuchen, Techni-Rite Elctrns., 212 Durham 201-548-2800
NY Liverpool, R&D Assocs., 109 Woods Path 315-622-2350
Ohio Cleveland, Satullo, 16801 Euclid 216-486-2800
Ohio Dayton, Satullo, 2801 Far Hills 513-293-7061
Tex Dallas, Kemp Engrg., 2618 Manana 214-357-6663
Tex Houston, Kemp Engrg, 6001 Gulf 713-928-5426

TECHNI-TOOL, INC., 1216 Arch St., Philadelphia, Pa., 19107, Tel: 215-LO-8-4457; Sls. Mgr: W. Bezar

TECHNIBILT CORP., 1 W. Alameda Ave., Burbank, Cal., 91502, Tel: 213-849-3171; Sls: F. Host

TECHNIC, INC., Box 965, Providence, R.I., 02901, Tel: 401-781-6100, TWX: 401-944-1455; Sls. Mgr: A.M. Weisberg

TECHNICAL CONSULTANTS CORP., Resch. Engrg. Div., RR 1 Rte 83 Sommers Rd., Ellington, Conn., 06029, Tel: 203-875-1629; Sls. Mgr: E.J. Steffens

TECH. DEVICES CO., 11242 Playa Ct., Culver City, Calif., 90230, Tel: 213-870-3751; Sls. Mgr: D.N. Winther

TECHNICAL INSTRS., INC., 441 Washington Ave., No. Haven, Conn., 06473, Tel: 203-239-2501; Sls. Mgr: J. Maynard

TECHNICAL MAT'L., 700 Fenimore Rd., Mamaroneck, N.Y., 10543, Tel: 914-698-4800, TWX: 710-566-1100; Sls. Mgr: N.H. DePasquale

TECHNICAL SVC. CORP., 2618 South 4th St., Louisville, Ky., 40208, Tel: 502-636-1496; Sls. Mgr: M.R. Snead

TECHNICAL TAPE CORP., 1 Le Fevre La, New Rochelle, N.Y., 10801, Tel: 914-BE-5-1000; V.P: J.G. Shuman

TECHNICAL WIRE PRODS., INC., 129 Dermody St., Cranford, NJ, 07016, Tel: 201-272-5500, TWX: 710-996-5951; Sls. Mgr: E. Steel

TECHNICAL WIRE PRODS., INC., Western Div., 417 Olive St., Santa Barbara, Cal., 93101, Tel: 805-963-1867, TWX: 910-334-1184; Sls. Mgr: H. Evans

TECHNIPOWER, Benrus Ctr., Ridgefield, Conn., 06877, Tel: 203-438-0333, TWX: 710-467-0666 ....Pgs. 905-928

Ariz Phoenix, Aztec Enterprises Dail Oper. Enterprise 607
Cal Pasadena, Luscombe, 610 S. Arroyo 213-684-2000
Cal San Mateo, Lunscombe, 225 E. Third 415-342-7057
Colo Littleton, Aztec Entprs., 1449 W. Littleton 303-798-4573

Conn Meriden, Abbott-Allison Co., Box 467 203-237-9232
Fla Orlando, Floyd-Fausett, 2213 Merritt Pk. 305-424-0701
Ga Smyrna, Floyd-Fausett & Co., Box 878 404-436-5169
Ill Wilmette, Crest Assocs., 505 Fourth St. 312-256-5202
Md Baltimore, Whitcomb, 730 Deepdene 301-889-1245
Mass No. Andover, Abbott-Allison Co., Box 96 617-245-0250
Mich Livonia, Chandler, 32401 W. Eight Miles 313-476-5800
Minn Minneapolis, R-J, Inc., 7100 S. France 612-922-1425
Mo Kansas City, K & M Sls., 1627 Main St. 816-471-1355
NJ Ridgewood, Instr. Sls. Co., Box 403 201-GI-5-5210
NM Albuquerque, Aztec Entprs., 829 Penn. N.E. 505-255-2440
NY Endicott, Advanced Comps., Box 645 607-785-3191
NY No. Syracuse, Advanced Comps., Box 248 315-699-2671
NY Scottsville, Advanced Comps., Box 142 716-889-1429
NY Whitesboro, Advanced Comps., Box B 315-736-9195
Ohio No. Olmsted, Chandler, 23202 Lorain 216-734-4747
Ore Portland, R. Legg, 4475 S.W. Scholls Ferry 503-292-8824
Pa New Britain, Kastle Assocs., 434 E. Butler 215-348-4466
Tex Houston, Scientific Sls., 6400 Westpark 713-781-2711
Tex Richardson, Sci. Sls., 777 S. Central 214-AD-1-6541
For: Can., Toronto, Ont., Wilson Entprs., 386 Bering [illegible]
For: Can., Roxboro, Que., Wilson Entprs., Box 115 514-684-0383

TECHINQUES, INC., 235 Jackson St., Englewood, N.J., 07631, Tel: 201-569-5900; Sls. Mgr: L.O. Silvan

TECHNO-COMPS. CORP., 7803 Lemona, Van Nuys, Cal., 91405, Tel: 213-781-1642, TWX: 910-495-2015; Sls. Mgr: R.H. Broadston ....Pgs. 2926,2927

Ariz Phoenix, Southwest Engrg., Box 9185 602-944-1521
Cal Inglewood, Oak Electro/Netics Corp., 5005 W. Century Blvd. 213-678-4108
Cal Los Altos, Oak Electro/Netics Corp., 960 N. San Antonio Rd. 415-941-1237
Colo Denver, Checkmate Sls., Box 22411 303-771-4920
Conn W. Haven, Comark Assocs., Box 567 203-933-0900
Fla Ft. Lauderdale, Oak Electro/Netics Corp., 1040 Bayview Dr. 305-563-2681
Ill Chicago, Lightner, 6322 N. Milwaukee 312-774-1500
Md Towson, Marktron, Inc., 202 W. Penn. 301-825-8222
Mass Belmont, Vector Sls., 774 Pleasant St. 617-489-1400
Mich Farmington, W. Hummon, Box 501 313-474-0661
Minn Mpls, L. Murphy Assocs., 730 Chicago 612-333-4511
NJ Pompton Lakes, R. Horne Assoc., Box 31 201-835-7400
NY No. Syracuse, Advanced Comps., Box 248 315-699-2671
Ohio Centerville, EMA, Inc., Box 191 513-433-2800
Tex Ft. Worth, W. Fralia, 6100 Camp Bowie 817-738-2394
Wash Seattle, C. Lyle Reeve Mktg., Box 7087 206-542-5889

TECHNOGRAPH, INC., P.O. Box 5376, Ardmore Sta., Winston-Salem, N.C., 27103, Tel: 919-723-0767; Pres: H.L. Shortt

TECHNOLOGICS INC, Sub of KDI Corp, Box 667, Ormond Beach, Fla., 32074, Tel: 904-677-1771, TWX: 810-832-6226; Sls. Mgr: R.H. Gardey

TECHNOLOGY/VERSATRONICS, 506 S. High St., Yellow Springs, Ohio, 45387, Tel: 513-767-7365, TWX: 810-450-2620

TECHRON CORP., 20 Simmons St., Boston, Mass., 02120, Tel: 617-HI-5-2150; Pres: G. Ganjian

TECHSONICS, Box 251, El Prado, N.M., 87529, Tel: 505-758-4555; Sls. Mgr: J.C. Freeman

TECNETICS, INC., Box 910, Boulder Ind'l. Pk., Boulder, Colo., 80302, Tel: 303-442-3837, TWX: 910-940-3246; Sls. Mgr: V. Brown ....Pgs. 880-885

Ala Huntsville, W.A. Brown Comps., 1314 Buford St., N.W. 205-539-4411
Cal Inglewood, L & M Engrg., 9911 Inglewood Ave. 213-674-6850
Cal Santa Clara, L & M Engrg., 3242 McKinley Dr. 408-243-2891
Colo Littleton, RADCO, 2552 Ridge Rd. 303-794-4546
Conn E. Hartford, Measurement Equip. Co., Box 8192 203-528-8192
Conn New Canaan, S. Pierce, 115 Bald Hill Rd.
Fla Ft. Lauderdale, W.A. Brown Comps., 961 N.W. 53rd St. 305-566-5697
Fla Orlando, W.A. Brown Comps., 222 Weber St. 305-425-5505-T
Ill Northfield, Torkelson Assocs., 540 W. Frontage Rd. 312-446-9085
Ind Indianapolis, Torkelson Assocs., 3512 Rockville Rd. 317-244-7867
Iowa Cedar Rapids, Engrg. Svcs. Co., 1026 3rd Ave., S.E. 319-366-1591
Iowa Marion, ENSCO-REP, 888 Tenth St. 319-377-6313
Kans Overland Pk., ENSCO-REP, 8001 Conser 913-381-7557
Kans Prairie Village, Engrg. Svcs. Co., 7924A State Line 913-649-4000
Mass Wakefield, Meas. Equip. Co., 591 North Ave. 617-245-4870
Minn Minneapolis, Torkelson Assocs., 4820 W. 77th St. 612-920-1046
Mo St. Louis, Engrg. Svcs. Co., 6717 Vernon Ave. 314-PA-6-2233
Mo St. Louis, ENSCO-REP, 11714 Lackland Ind'l Dr. 314-542-3935
NJ Morristown, Graydon Sherman, 230 Madison 201-538-9246
NJ Westwood, Clarfield-Stollmack, 175 Westwood 201-666-8989
NY Fayetteville, Graydon Sherman, Davis Bldg. 315-637-9861
NC Winston-Salem, W.A. Brown Comps., 1108 Burke St. 919-725-5384
Ohio Dayton, J.C. Hofstetter Co., 3330 S. Dixie Ave. 513-298-0662
Ohio Medina, J.C. Hofstetter Co., 5168 Valley View Dr. 216-241-4880
Pa Yeadon, Graydon Sherman, 811 Connell 215-MO-4-7316
Tex Dallas, R. Thomas, 8616 N.W. Plaza Dr. 214-363-8591
Va Annandale, Nine Assocs., 7753 Patriot 703-256-9105
Wash Seattle, Datacom Assocs., 2207 Fairview E. 12 206-329-2989
EXP: N.Y., New York, Machine & Prods. Co., 52 Wall St. 212-944-4370
For: Can., Downsview, Ont., Whittaker Elct., 43 Troutbrooke 416-247-7454
For: Can., Ottawa, Ont., Whittaker Elct., 42 Howden 613-224-1221
For: Can., Roxboro, Que., Whittaker Elct., Box 216 514-683-3621
For: Can., W. Vancouver, B.C., Whittaker Elct., 1144 Millstream 604-926-3411

TEDFORD CRYSTAL LABS., 4914 Gray Rd., Cincinnati, Ohio, 45232, Tel: 513-542-5555, TWX: 810-461-2476; Gen'l. Mgr: J.A. Vella

TEKFORM PRODS. CO., 2780 Coronado St., Anaheim, Cal., 92806, Tel: 714-630-2340; Sls. Mgr: G. Clark

TEKNA PRODS. CO., 82 St. Paul St., Rochester, N.Y., 14604, Tel: 716-232-1291; Sls. Mgr: J.B. Kling

TEKNI-LABELS CO., 8160 Orion, Van Nuys, Calif., 91406, Tel: 213-782-9901; Sls. Mgr: R.G. Andrew

Advertisement

Manufacturer of the Micrajust Model 20, a dependable, rigidly built, attractively finished, inexpensive, manually operated screening jig. It features lightning fast setup with high precision. Most useful for screening resists for etching and plating electronic printed circuits, for screening panels and resists for panel etching and for general screening of terminal boards, parts and components. Provides means for turning out work of the highest precision at a faster rate, using present personnel and facilities. An experienced screen operator will require no retraining or additional instruction to operate Micrajust.

TEKTRONIX, INC., Box 500, Beaverton, Ore., 97005, Tel: 503-644-0161; Sls. Mgr: C. Bouffiou ....Pg. 566

Ala Huntsville, 3322 S. Memorial Pkwy. 205-881-2912
Ariz Scottsdale, 7045 E. Camelback Rd. 602-946-4273
Cal Alhambra, 1525 S. Garfield Ave. 213-576-1601
Cal Concord, 2339A Stanwell Cir. 415-687-8350
Cal Orange, 1722 E. Rose Ave. 714-633-3450
Cal Palo Alto, 3750 Fabian Way 415-326-8500
Cal San Diego, 6150 Mission Gorge Rd. 714-283-6225
Cal San Jose, 1725 De La Cruz Blvd. 408-296-3010
Cal Santa Barbara, 1310 Santa Barbara St. 805-963-1848
Cal Van Nuys, 16930 Sherman Way 213-987-2600
Colo Denver, 2120 S. Ash St. 303-757-1249
Conn E. Hartford, 809 Main St. 203-289-8695
Conn Stamford, 125 Strawberry Hill Ave. 203-325-3817
Fla Ft. Lauderdale, 1871 W. Oakland Pk. Blvd. 305-731-1220
Fla Orlando, 1010 Executive Ctr. Dr. 305-841-2382
Fla Pensacola, Ste. T1, Fairfield Plaza 904-434-2785
Ga Atlanta, 1680 Tullie Cir., N.E. 404-633-0344
Ill Des Plaines, 2590 E. Devon 312-298-6666
Ill Hinsdale, 119 E. Ogden Ave. 312-325-3050
Ind Indianapolis, 6121 E. 30th St. 317-546-2408
Kans Mission, 6025 Lamar 913-432-1003
Md Lutherville, 1526 York Rd. 301-825-9000
Md Rockville, 1500 E. Jefferson 301-881-6133
Mass Methuen, 240 Pleasant St. 617-685-1511
Mass Natick, 209 W. Central St. 617-655-5131
Mass Waltham, 244 Second Ave. 617-894-4550
Mich Southfield, 22132 W. Nine Mile Rd. 313-358-3122
Minn Minneapolis, 7515 Wayzata Blvd. 612-545-2524
Minn St. Paul, 3775 N. Dunlap St. 612-484-7255
Mo St. Louis, 119 N. Harvey Ave. 314-524-0900
Nev Las Vegas, 5128 W. Charleston Blvd. 702-870-8201
NJ Cherry Hill, 905 Kings Hwy., N. 609-667-4333
NJ Springfield, 964 S. Springfield Ave. 201-379-1670
NM Albuquerque, 1258 Ortiz Dr., S.E. 505-268-3373
NY Buffalo, 965 Maryvale Dr. 716-633-7861
NY Endwell, 3214 Watson Blvd. 607-748-8291
NY Latham, 678 Troy Rd. 518-785-3353
NY Poughkeepsie, 1 Old Mill Rd. 914-462-4670
NY Roslyn Hgts., 125 Mineola Ave. 516-484-2300
NY Syracuse, 112 Pickard Bldg. 315-455-6666
NC Greensboro, 1011 Homeland Ave. 919-274-4647
Ohio Cleveland, 5562 Pearl Rd. 216-884-6558
Ohio Dayton, 3309 Office Pk. Dr. 513-293-4175
Ohio Worthington, 12 W. Selby Blvd. 614-888-4040
Okla Oklahoma City, 901 Office Pk. Plaza 405-848-3361
Ore Tigard, 8845 S.W. Center Ct. 503-639-7691
Pa Bala-Cynwyd, 126 Presidential Blvd., N. 215-839-3111
Pa Monroeville, 3834 Northern Pike 412-351-3345
RI Warwick, 2845 Post Rd. 401-739-4771
Tex Dallas, 4315 Alpha Rd. 214-233-7791
Tex Houston, 3723 Westheimer 713-622-8141
Tex San Antonio, 8031 Broadway 512-826-0686
Utah Salt Lake City, 65 West 2950, S. 801-484-8501
Va Alexandria, 5249 Duke St. 703-751-6096
Va Hampton, 1310 Todds La. 703-826-4020
Wash Seattle, 410 Baker Blvd. 206-243-2494
Wisc Milwaukee, 2421 N. Mayfair Rd. 414-476-6850
For: Can., Downsview, Ont., 1177 Finch Ave., W. 416-638-6404
For: Can., Montreal, Que., 900 Selkirk St. 514-697-5340
For: Can., Ottawa, Ont., 1792 Courtwood Crescent 613-225-2850
For: Can., Vancouver, B.C., 10 E. 2nd Ave. 604-879-0986

TEL-INSTR. ELCTRNS. CORP., 728 Garden St., Carlstadt, N.J., 07072, Tel: 201-933-1600; Sls. Mgr: E.W. Brinkerhoff

TEL LABS., 1050-1060 Second St., Manchester, N.H., 03102, Tel: 603-625-8994, TWX: 710-220-1844; Sls. Mgr: G. Steady ....Pgs. 2882,2883

Ala Huntsville, Beacon Elctrns, 3322 S. Memorial Pkwy 205-881-5031
Cal Mountain View, Daniels-Padgett Assocs., 2620 Bayshore Frontage Rd. 415-969-1700
Cal San Diego, Dorado Elctrns., 1253 Univ. Ave. 714-298-4877
Cal Van Nuys, Dorado Elctrns., 13615 Victory 213-873-4124
Colo Denver, Daniels-Padgett, 2785 N. Speer 303-433-7181
Conn Madison, A & M Elctrn. Rep., Ailene 203-245-1031
Conn Meriden, A & M Elctrn. Rep., 595 Bee St. 203-235-3943
Fla Ft. Lauderdale, Beacon Elctrns., 651 NE 45th St. 305-564-4298
Fla Maitland, Beacon Elctrns., Box 1278 305-647-3498
Ga Atlanta, Beacon Elctrns., 2285 Peachtree Rd. NE 404-351-3654
Ill Highland Pk., Feller Assocs., 940 Auburn 312-433-3651
Mass Needham, A & M Elctrn., 1492 Highland 617-444-8170

Mich Southfield, Weschler Elec. Corp., 28165 Greenfield Ave. 313-358-4690
Minn St. Paul, Cahill Assocs., 3000 Hudson Rd. 612-739-8445
NJ Collingswood, K. Randall, 250 Haddon 609-854-3323
NY Great Neck, Rand Assocs., Box 445 516-482-4040
NY Kingston, Ossmann Comp. Sls., 411 Wash. 914-338-5505
NY Rochester, Ossmann Comp. Sls., 280 Metro 716-442-3290
NY Syracuse, Ossmann Comp., 132 Pickard 315-454-4477
NY Vestal, Ossmann Comp., 1901 Vestal 607-785-9949
Ohio Cleveland, Weschler Elec. Corp., 4250 W. 130th St. 216-251-4609
Ohio Dayton, Weschler Elec., 1700 Needmore 513-274-6972
Tex Dallas, Unidyne, 13310 Spring Grove 214-239-4141
Tex Houston, Unidyne, Inc., 5700 Savoy La. 713-782-0218
Vt Vergennes, A & M Elctrn. Rep., 192 Main 802-877-3232

TELAUTOGRAPH CORP., 8700 Bellanca Ave., Los Angeles, Cal., 90045, Tel: 213-776-5022, TWX: 910-328-6117; Sls. Mgr: F. May

TELECTRO SYS. CORP., 96-18 43rd Ave., Corona, N.Y., 11368, Tel: 212-651-8900; Sls. Mgr: H. Sussman

TELEDYNE ADCOM, 808 Memorial Dr., Cambridge, Mass., 02139, Tel: 617-868-1000, TWX: 710-320-0586; Sls. Mgr: S. Baghdady

TELEDYNE CAMERA SYS., 131 N. Fifth Ave., Arcadia, Cal., 91006, Tel: 213-359-6691; V.P. Mktg: C.G. Holzapfel

TELEDYNE GEOTECH, Box 28277, Dallas, Tex., 75228, Tel: 214-271-2561; Mktg. Mgr: R.R. Ryder ....Pg. 950
Cal Long Beach, Teledyne Geotronics, 725 E. Third St. 213-435-8326
Va Alexandria, Teledyne Geotech, Box 334 703-836-3882

TELEDYNE GURLEY, 514 Fulton St., Troy, N.Y., 12181, Tel: 518-272-6300

TELEDYNE INET, 711 W. Knox St., Gardena, Cal., 90248, Tel: 213-327-0913; Mktg. Mgr: H.D. Bissell

TELEDYNE KINETICS, 410 S. Cedros Ave., Solana Beach, Cal., 92075, Tel: 714-755-1181, TWX: 910-322-1135; Mktg. V.P: L.R. Lingenfelter

TELEDYNE MEC, 3165 Porter Dr., Palo Alto, Cal., 94304, Tel: 415-493-1770, TWX: 910-373-1746; Sls. Mgr: J. Vance

TELEDYNE MECCA, Box 36393, Houston, Tex., 77036, Tel: 713-772-2811; Sls. Mgr: M.L. Denney

TELEDYNE MICRONETICS, 7155 Mission Gorge Rd., San Diego, Calif., 92120, Tel: 714-583-3525, TWX: 910-335-2085; Sls. Mgr: P.N. Migdal

TELEDYNE MICROWAVE, 815 Stewart Dr., Sunnyvale, Cal., 94086, Tel: 408-245-8550, TWX: 910-339-9291; Dir. Mktg: K.W. Mills

TELEDYNE PENN-UNION ELEC., Box 723, Edinboro, Pa., 16412, Tel: 814-734-1631; Sls. Mgr: W.R. Hendrickson

TELEDYNE PHILBRICK, Allied Dr. at Rte. 128, Dedham, Mass., 02026, Tel: 617-329-1600, TWX: 710-348-6726; Sls. Mgr: J.N. Forster ....Pg. 1294
Ala Huntsville, W.A. Brown Instr., 1314 Buford St., N.W. 205-539-4411
Ariz Phoenix, Hytronic Meas., 1017 N. Third St. 602-253-6104
Cal Saratoga, Teledyne Philbrick, Box 512 408-243-6116
Cal W. Los Angeles, Teledyne Philbrick, 11941 Wilshire Blvd. 213-451-8636
Colo Denver, Hytronic Meas., 4940 E. 39th Ave. 303-388-4081
Fla Ft. Lauderdale, W.A. Brown Instr., 961 N.W. 53rd St. 305-564-8000
Fla Ft. Walton Beach, W.A. Brown Instr., 18 Chelsea Dr. 904-243-6424
Fla Orlando, W.A. Brown Instr., Box 513 305-425-5505
Ga Tucker, W.A. Brown Instr., 1682 Weymouth Ct. 404-939-1674
Haw Kailua, Oahu, Pactron Sys., 133 Mookua St. 808-261-1224
Ill Chicago, Pivan Engrg., 3535 W. Peterson Ave. 312-539-4838
Ind Indianapolis, Pivan Engrg., 1259 W. 86th St. 317-253-1681
Kans Shawnee Mission, Pivan Engrg., 5801 Outlook 913-722-1030
Md Kensington, Elctrn. Mktg. Assocs., 11501 Huff Ct. 301-881-5300
Mass Dedham, Teledyne Philbrick, Allied Dr., Rte. 128 617-239-2030
Mich Farmington, Carter, McCormic & Pierce, 23995 Freeway Pk. Dr. 313-477-7700
Minn Minneapolis, Pivan Engrg., 3307 N. Hwy. 100 612-537-4501
Mo St. Louis, Pivan Engrg., 725 Old Ballas Rd. 314-872-8424
NM Albuquerque, Hytronic Meas., 205 San Pablo, S.E. 505-268-3941
NY Elmont, Crane & Egert Corp., 146 Meacham Ave. 516-488-2100
NY New Hartford, KLM Assocs., One Nouvelle Pk. 315-735-8525
NY No. Syracuse, KLM Assocs., 401 S. Main St. 315-458-6214
NY Rochester, KLM Assocs., 39 Saginaw Dr. 716-422-0820
NC Winston-Salem, W.A. Brown Instr., 1108 Burke St., N.W. 919-725-5384
Ohio Cleveland, Carter, McCormic & Pierce, 21380 Lorain Rd. 216-333-5650
Ohio Dayton, Carter, McCormic & Pierce, Box 1472 513-278-5873
Pa King of Prussia, Elctrn. Mktg. Assocs., 210 Goddard Blvd. 215-265-1600
Pa Pittsburgh, Carter, McCormic & Pierce, 201 Penn Ctr. Blvd. 412-824-3760
Tex Dallas, Teledyne Philbrick, 421 Preston Forest Twr. 214-239-9432
Tex Houston, Teledyne Philbrick, Box 58463 713-488-5941
Utah Salt Lake City, Hytronic Meas., 2022 S. Main St. 801-466-4924
Wisc Brookfield, Pivan Engrg., 3055 N. Brookfield Rd. 414-786-1940

TELEDYNE POSITIVE CONNECTOR, 6488 River Rd., Ansonia, Conn., 06401, Tel: 203-735-7831; V.P: R.M. Combs

TELEDYNE RELAYS, Teledyne Co., 3155 W. El Segundo Blvd., Hawthorne, Cal., 90250, Tel: 213-679-2205, TWX: 910-325-6600; Mktg Mgr: M. Field ....Pgs. 1788,1789
Ala Huntsville, Bostick & Assocs., 3322 So. Memorial Pkwy. 205-881-3679
Ariz Phoenix, Dubblar Assocs., 2875 Sky Harbor Blvd. 602-273-7387
Cal Mtn. View, G.C. Woempner Co., 1101 San Antonio Rd. 415-964-5454
Colo Denver, Todd Assocs., 1260 S. Inca St. 303-744-2313
Ill Rolling Meadows, Sumer, Inc., 5105 Tollview Dr. 312-392-7370
Ind Indpls., R.F. Specialists, 6410 Woodwind Dr. 317-783-7630
Mich Birmingham, J.C. Hofstetter Co., 2100 Maple E. 313-642-0590
Minn Mpls., Sumer, Inc., 7710 Computer Ave. 612-920-8414
Mo Kansas City, Pem Sls. Co., 635 E. 74th St. 816-333-6012
Mo St. Louis, Pem Sls. Co., 9451 Lackland Rd. 314-HA-7-7200
NJ Eatontown, C.E. Stalker, 42 Monmouth Rd. 201-542-6884
NM Albuquerque, Bennewitz Assocs., 623 Wyoming S.E. 505-255-8733
Ohio Dayton, J.C. Hofstetter Co., 3300 S. Dixie Dr. 513-298-0662
Ohio Medina, J.C. Hofstetter Co., 5168 Valley View Dr. 216-241-4880
Pa Pittsburgh, J.C. Hofstetter Co., 176 Reed Dr. 412-922-3890
Tex Houston, Vista Engrg., 3003 Yale St. 713-869-0109
Tex Richardson, Vista Engrg., 777 Cen. Expwy. 214-235-4547
Wash Bellevue, Western Tech. Sls., 10843 N.E. 8 St. 206-454-3906

TELEDYNE SEMICONDUCTOR, 12515 Chadron Ave., Hawthorne, Cal., 90250, Tel: 213-772-4551, TWX: 910-325-6217; Sls. Mgr: W.B. Houston

TELEDYNE TABER, 455 Bryant St., No. Tonawanda, N.Y., 14120, Tel: 716-694-4000, TWX: 710-262-1264; Sls. Mgr: D. Flavin

TELEDYNE WESTERN WIRE & CABLE, 2425 E. 30th St., Los Angeles, Cal., 90058, Tel: 213-587-7103; V.P. Gen'l. Mgr: W. Drolet, Jr.

TELEMODEM, INC., 98-05 217th St., Queens Village, N.Y., 11429, Tel: 212-479-0099; V.P. Dir. Mktg: J.O. Erickson

TELEPHONE COMPS., INC., 9 Norfolk Dr., Northport, N.Y., 11768, Tel: 516-757-1826; Sls. Mgr: P. Costa

Advertisement

Telephone Components manufactures a complete line of plain or switch type Handsets. Also Headsets with boom mike and single or double earphone; Hook switches and Hangers with selective switching arrangements; Noise-Canceling carbon transmitters to fit all makes standard Handsets. We specialize in supplying our products wired and assembled to your specific drawings and requirements.

TELEPHONE DYNAMICS CORP., 1333 Newbridge Rd., N. Bellmore, N.Y., 11712, Tel: 516-CA-1-9870; Sls. Mgr: L. Young

Advertisement

Manufacturers several models of automatic telephone answering and recording equipment. Direct "in-line" connection to your telephone, means positive action. Answers your phone promptly and takes orders, dictation, and technical and complicated messages. Record both sides of phone conversations.

TELEQUIPMENT, LTD., Sub. of Tektronix, Inc., Box 500, Beaverton, Ore., 97005, Tel: 503-644-0161; Sls. Mgr: C. Boufflou ....Pg. 566
(Refer to Tektronix, Inc. for sales office information.)

TELESCIENCES, 351 New Albany Rd., Moorestown, N.J., 08057, Tel: 609-235-6227; V.P. Mktg: E. Hoeg

TELETRONICS, INC., 760 N. Main St., Orange, Calif., 92667, Tel: 714-532-1044; Sls. Mgr: F. Klein

TELETYPE CORP., 5555 Touhy Ave., Skokie, Ill., 60076, Tel: 312-982-2000, TWX: 910-223-3611; Dir. Mktg: D.F. Corkle

TELEVISION MICROTIME INC., Blue Hills Ave., Bloomfield, Conn., 06002, Tel: 203-242-0761; Sls. Mgr: R. McLean

TELEX COMM. DIV., 9600 Aldrich Ave., S., Minneapolis, Minn., 55420, Tel: 612-884-4051; V.P. Mktg: James Arrington

TELMAR, INC., 810 W. Third Ave., Columbus, Ohio, 43212, Tel: 614-299-2165; Sls. Mgr: C.B. Zehnder

TELONIC INDS., INC., Box 277, Laguna Beach, Calif., 92652, Tel: 714-494-9401, TWX: 910-596-1320; V.P. Mktg: R.J. Aaron

TELREX LABS., Asbury Park, N.J., 07712, Tel: 201-775-7252; Sls. Mgr: R. Ercolino

TELVAC INSTR. CO., 14614 Raymer St., Van Nuys, Cal., 91405, Tel: 213-994-9471; Sls. Mgr: J. Wheeler

TEM-PRES RESEARCH DIV., Carborundum Co., 1401 S. Atherton St., State College, Pa., 16801, Tel: 814-237-7631, TWX: 510-691-2670; Mktg. Mgr: H.J. Nearhoof

TEMPEL STEEL CO., 5353 N. Elston Ave., Chicago, Ill., 60630, Tel: 312-282-8400

TEMPIL DIV., Hamilton Blvd., So. Plainfield, N.J., 07080, Tel: 201-757-8300; Sls. Mgr: E.J. Schlueter

TEMPLEMAN, D.R. CO., 8 Park St., Plainville, Conn., 06062, Tel: 203-747-2709; Sls. Mgr: D.R. Templeman, Jr.

TEMPLET IND., INC., 201 E. Bethpage Rd., Plainview, N.Y., 11803, Tel: 516-694-7780; Sls. Mgr: H.R. Twergo

TEMPO INSTR., Div. Allen Elec. & Equip. Co., 1478 Old Country Rd., Plainview, N.Y., 11803, Tel: 516-694-4400, TWX: 510-224-6421; Ind. Grp., Sls. Mgr: H. White

TEMPO/UTI DIV., Allen Elec. & Equip. Co., 9135 Independence Ave., Chatsworth, Cal., Tel: 213-882-7722; Sls. Mgr: D.F. Ogle ....Pgs. 384,1349
Ariz Phoenix, Rowe Sls., 323 E. McDowell Rd. 602-254-3148
Cal Los Angeles, Western Datolog, 815 Moraga Dr. 213-476-1931
Conn Essex, Lafage Assocs., Box 146 203-767-0465
Fla Orlando, Dost Assocs., Box 17057 305-831-1118
Ill Northfield, Adcon Assocs., 466 Central Ave. 312-446-6486
Md Baltimore, Stemler Assocs., Inc., 6707 Whitestone Rd. 301-944-8262
Mo St. Louis, PEM Sls., 9451 Lackland Rd. 314-427-7200
NJ Fairfield, KLS Assocs., Inc., 387 Passaic Ave. 212-233-4849
Ohio Dayton, Dynel Co., Box 7 513-434-6467
Tex Houston, P.J. Scanlon Co., Rte 2, Box 1643 713-466-6897
Tex Richardson, P.J. Scanlon Co., 724 S. Sherman St. 214-231-4661

TEMPRESS INDS., INC., 980 University Ave., Los Gatos, Calif., 95030, Tel: 408-356-8151, TWX: 910-597-5392; Mktg. Mgr: H.C. Jones, Jr.

TEN BOSCH, M., INC., Vermilyea St., Pleasantville, N.Y., 10570, Tel: 914-769-3000; Sls. Mgr: P. Ten Bosch

TENATRONICS, LTD., 3001 Chester Ave., Cleveland, Ohio, 44114, Tel: 216-781-7136; Sls. Mgr: J.L. Fine

TENNEY ENGRG., INC., 1090 Springfield Rd., Union, N.J., 07083, Tel: 201-686-7870, TWX: 710-985-4725; Mktg. Mgr: R.H. Brown

Advertisement

Environmental and Space simulation equipment-all sizes to meet extreme specifications. Standard units include TENNEY JR. bench model; TH models of temperature humidity chambers, STR models combine altitude, temperature and humidity. Space simulators feature pressure of 1-10 torr, cryogenic heat-sinks, Environmental rooms and Incubators.

TENOR CO., INC., 17020 W. Rogers Dr., New Berlin, Wisc., 53151, Tel: 414-782-3800; Sls. Mgr: R. Turnbull

TENSITRON, INC., P.O. Box 185, Dept. EEM, Harvard, Mass., 01451, Tel: 617-456-3511

TENSOLITE, Div. Carlisle Corp., W. Main St., Tarrytown, N.Y., 10591, Tel: 914-631-2300, TWX: 710-567-1202 Pg. 3059

Ariz Scottsdale, C. Hower & Co., Box 1627 602-947-4204

Colo Denver, Todd Assocs., 1393 S. Inca St. 303-777-4381

Conn Canaan, Hathaway Elctrns., Ducillo Bldg. 203-824-7721

Fla W. Palm Beach, Kinnally, 2706 Bahia Rd. 305-967-3541

Ill Chicago, J. Golten, 4319 W. Irving Pk. 312-725-7870

Ind Greenwood, V. Schillinger Co., Box 242 317-888-2260

Mass Arlington, Hathaway Elctrns., 7-11 Mystic 617-646-1380

Mo St. Charles, Buse Sls., 212 Second 314-724-6667

NY Rochester, J. Lazor, 39 Saginaw Dr. 716-473-8337

NY Tarrytown, F. Wroblewski, W. Main St. 914-631-2300

NC. Winston Salem, G. Bickford, 191-7 Dalwood Dr. 919-765-9255

Pa Ambler, Griffin-Campbell, 25 Skippack 215-646-7535

Tex Dallas, Blackburn Assocs., Box 20073 214-FL-1-9991

TERADO CORP., 1068 Raymond Ave., St. Paul, Minn., 55108, Tel: 612-646-2868; Sls. Mgr: D. Munson

TERADYNE, INC., 183 Essex St., Boston, Mass., 02111, Tel: 617-426-6560, TWX: 710-321-1055; Sls. Mgr: A. D'Arbeloff

TEST EQUIP. CORP., Box 20215, Dallas, Tex., 75220, Tel: 214-357-6271; Sls. Mgr: R.L. Mills

TESTEX INC., 161 San Lazaro Ave., Sunnyvale, Cal., 94086, Tel: 408-732-0461; Sls. Mgr: W. J. Smith

TESTING EQUIP. & SUPPLIES CORP., 6 Huron Dr., Natick, Mass., 01760, Tel: 617-653-5950; Sls. Mgr: A. Greene

TEXAS INSTRUMENTS, INC., Box 6015 M/S 561, Dallas, Tex., 75222, Tel: 214-238-6433, TWX: 910-867-4702; Prog. Mgr: H. Elliott

TEXAS INSTRUMENTS, Components Grp., Box 5012, Dallas, Tex., 75222, Tel: 214-238-3732; Sls. Mgr: C.M. Clough

TEXAS INSTRUMENTS, INC., 34 Forest St., Attleboro, Mass., 02703, Tel: 617-222-2800, TWX: 617-222-1259; Mktg. Mgr: B.O. Haun, Jr.

TEXAS INSTRUMENTS, INC., Digital Sys. Div.-Houston, Box 66027, Houston, Tex., 77006, Tel: 713-494-5115; Sls. Mgr: Sawyer

TEXSCAN CORP., 2446 N. Shadeland Ave., Indianapolis, Ind., 46219, Tel: 317-357-8781, TWX: 810-341-3184; Sls. Mgr: L.C. Dolan ....Pg. 578

Cal Los Angeles, RF Assocs., 1621 Pontius 213-478-1586

Cal Palo Alto, RF Assocs., 800 San Antonio 415-327-5531

Colo Boulder, A.L.S. Elctrns., 1932 14th St. 303-447-2436

Conn Hamden, Instrs. Conslts., 2381 Whitney 203-248-4174

Ill Northfield, Torkelson, 540 W. Frontage 312-446-8450

Ind Indpls., Torkelson, 3512 Rockville 317-244-7867

Kans Overland Pk., Palatine Engrg. Sls., Inc., 7520 W. 63rd St. 913-262-5643

Md Bethesda, S & S Assocs., 7720 Wisc. 301-654-1434

Mass Waban, Instrs. Conslts., 81 Wyman 617-969-9881

Mich Ypsilanti, Micro Sls. Corp., 650 Greenlawn 313-482-1229

Minn Mpls., Torkelson Assocs., 4820 W. 77th 612-920-1046

Mo St. Louis, Palatine Engrg. Sls., Inc., 8622 St. Charles Rock Rd. 314-426-7055

NM Albuquerque, A.L.S. Elctrns., Box 11626 505-298-2575

NY Greenvale, B. D. Aaron, 55 Northern 516-621-0630

NY Syracuse, Labtronics, 130 Pickard Bldg. 315-454-9314

NC Raleigh, Tech. Mktg. Assoc., 5100 N. Glen 919-787-7244

Ohio Dayton, Micro Sls., 1250 W. Dorothy 513-298-3033

Pa King of Prussia, S & S, Boro Line 215-265-3450

Tex Dallas, Dannemiller-Smith, Inc., 2712 W. Mockingbird La. 214-357-8249

Tex Houston, Dannemiller-Smith, 5760 Rice 713-668-4461

Tex San Antonio, Dannemiller-Smith, Inc., 7077 San Pedro 512-341-1356

Wash Seattle, Dewar & Assocs., 6361 1st 206-763-2233

TEXSCAN MICROWAVE PRODS., 2446 N. Shadeland Ave., Indianapolis, Ind., 46219, Tel: 317-357-8781, TWX: 810-341-3184; Sls. Mgr: R. Shevlot

TEXTOOL PRODS., INC., 1410 Pioneer Dr., Irving, Tex., 75060, Tel: 214-ME-1-5585; Sls. Mgr: J. Stoddart

THER ELEC. & MACH. WORKS, 17 S. Jefferson St., Chicago, Ill., 60606, Tel: 312-FR-2-9855; Sls. Mgr: E.R. Ther

THERM-O-LAB CORP., 6940 Farmdale Ave., N. Hollywood, Calif., 91605, Tel: 213-875-0105; Sls. Mgr: D. Page

THERMAL AMER. FUSED QUARTZ, Change Bridge Rd., Montville, N.J., 07045, Tel: 201-334-7770; Sls. Mgr: J.F. von Sternberg

THERMAL IND'L. PROD., Box 405, Atchison, Kans., 66002, Tel: 913-367-1934; Sls. Mgr: T. Moorhead

THERMAL SYS., Div. Axial Corp., 13920 S. Broadway, Los Angeles, Cal., 90061, Tel: 213-FA-1-4350, TWX: 910-346-6774; Sls. Mgr: J.E. Houck

THERMALLOY CO., 8719 Diplomacy Row, Dallas, Tex., 75247, Tel: 214-637-7333, TWX: 910-861-4410; V.P. Mktg: B. Bates

Advertisement

ELECTRONIC COOLING SPECIALISTS and Semiconductor Accessories manufacturers - Heat Sinks, Forced Air Coolers, Liquid Systems, S/C Mounting Pads and Insulators, Card Rack and Guides.

THERMAX WIRE CORP., 32-02 Linden Place, Flushing, N.Y., 11354, Tel: 212-939-8300, TWX: 710-582-2551; Sls. Mgr: R.R. Prusak

THERMO ELEC. CO., INC., 109 Fifth St., Saddle Brook, N.J., 07662, Tel: 201-843-5800, TWX: 710-990-5108; Sls. Mgr: L. A. Watson

THERMO SYS., INC., 2500 Cleveland Ave., N., St. Paul, Minn., 55113, Tel: 612-633-0550; Sls. Mgr: J. Lerich

THERMOMETRICS, INC., 15 Jean Pl., Edison, N.J., 08817, Tel: 201-548-2299

THERMOSEN, INC., 375 Fairfield Ave., Stamford, Conn., 06904, Tel: 203-324-6125; Gen'l. Mgr: N.H. Magida

THERMOTECH COIL FORMS & COMPS. DIV., 1202 S. 5th St., Hopkins, Minn., 55343, Tel: 612-938-7671; Sls. Mgr: E. Ostergard ....Pgs. 2766-2773

Ariz Phoenix, D. Dick, 4710 N. 15th Ave. 602-277-9740

Cal Burbank, Secna, 1613 W. Burbank Bl. 213-849-6848

Cal San Leandro, R. Meade, 14622 Wicks Blvd. 415-357-1150

Conn W. Hartford, D. Kelley, 28 Whiting La. 203-233-0870

Fla St. Petersburg, Fla. Div., 3200 Tyrone Blvd. 813-347-2191

Conn West Simsburg, Anchor Engrg. Corp., 6 Arrowhead Drive 203-658-6261

Ill Chicago, J. Robinson, 1721 W. Division 312-252-3400

Ill Norridge, B. Reynolds, 5135 N. Monterey 312-457-1190

Ind Ft. Wayne, R. McCampbell, 3715 Nokomis 219-747-9697

Iowa Des Moines, F. Wilcox Co., Inc., Box 1056 515-255-8416

Kans Mission, Inland Assocs., 6047 Howe Dr. 913-362-2366

Mass Wellesley Hills, Anchor Engrg., 40 Wash. 617-235-6330

Mich Detroit, G. Hall, 10432 W. McNichols Rd. 313-864-1368

Mich Farmington, L, George, 32500 Grand River 313-474-1505

Minn Mpls., B. Houlihan, 6030 Wayzata Blvd. 612-545-2538

Mo St. Louis, E. Monnig, 3 Laymont 314-991-2512

NJ Roselle, Midlantic Plastic Sls., 208 Columbus Ave. 201-241-3875

NY Manhasset, Kaelber & Mack, 75 Plandome 516-627-6620

NY Rochester, P. Schumacher, Box 8399 716-235-2135

NC Greensboro, Mfrg. Sls., Co., Box 20005 919-274-2474

Ohio Cleveland, G. Richards, 14237 Detroit Ave. 216-221-3634

Okla Tulsa, T.J. Ray Co., Box 45191 918-627-1515

Ore Portland, C. Riggs, 422 N.W. 8th 503-226-3286

Pa Ardmore, Midlantic Plastic Sls., 125 Coulter Ave. 215-649-2436

Wash Seattle, J. Noll, 314 2nd Ave., S. 206-623-5709

Wisc Butler, D. Jensen, 5170 N. 125th St. 414-781-2260

THERMOTECH PLASTICS, CO., 1202 S. 5th St., Hopkins, Minn., 55343, Tel: 612-938-7671; Sls. Mgr: E. Ostergard ....Pgs. 2766-2773

Ariz Phoenix, D. Dick, 4710 North 15th Ave. 602-277-9740

Cal Burbank, Secana Co., 1613 W. Burbank Blvd. 213-849-6848

Cal San Leandro, C. Crisler, 14622 Wicks Blvd. 415-357-1150

Conn W. Hartford, D. Kelley, 28 Whiting La. 203-233-0870

Conn W. Simsburg, Anchor Engrg., 6 Arrowhead Dr. 203-658-6261

Fla St. Petersburg, Florida Div., 3200 Tyrone Blvd. 813-347-2191

Ill Chicago, J. Robinson, 1721 W. Division St. 312-252-3400

Ill Norridge, B. Reynolds, 5135 N. Monterey Dr. 312-824-4129

Ind Fort Wayne, R. McCampbell, 3715 Nokomis Rd. 219-747-9697

Iowa Des Moines, F. F. Wilcox, Box 1056 515-255-8416

Kans Mission, Inland Assocs., 6047 Howe Dr. 913-362-2366

Mass Wellesley Hills, Anchor Engrg., 40 Washington St. 617-235-6330

Mich Detroit, G. Hall, 10432 W. McNichols Rd. 313-864-1368

Mich Farmington, L. George, 32500 Grand River Rd. 313-474-1505

Minn Mipls, W.J. Houlihan, 6030 Wayzata Blvd. 612-545-2538

Mo St. Louis, E. Monnig, #3 Laymont 314-991-2512

NJ Roselle, Midlantic Plastic Sls. Co., 208 Columbus Ave. 201-241-3875

NY Manhasset, Kaelber & Mack, 75 Plandome Rd. 516-627-6620

NY Rochester, P. B. Schumacher, Box 8399 716-235-2123

NC Greensboro, Mfrs. Sls., Box 20005 919-274-2474

Ore Portland, C. E. Riggs, 422 N.W. 8th Ave. 503-226-3286

Okla Tulsa, T.J. Ray Co., Box 45191 918-627-1515

Wash Seatlle, J. Noll, 314 2nd Ave. S. 206-623-5709

Pa Ardmore, Midlantic Plastic Sls., 125 Coulter Ave. 215-649-2436

Wisc Butler, D. Jensen, 5170 N. 125 St. 414-787-2260

THERMOTRON CORP., 937 Washington Ave., Holland, Mich., 49423, Tel: 616-392-1492, TWX: 810-292-6164; Sls. Mgr: K.L. Dadd

THERMOTRONIC DEVICES, INC., Forest & Hector Sts., Conshohocken, Pa., 19428, Tel: 215-828-4790; Sls. Mgr: J.W. Brown

THETA INSTR. CORP., 24 Dwight Pl., Fairfield, N.J., 07006, Tel: 201-227-1700; Sls. Mgr: T. Villano

THIOKOL CHEMICAL DIV., 780 N. Clinton Ave., Trenton, N.J., 08607, Tel: 609-396-4001, TWX: 510-685-9590; Bus. Mgr. Elec. Prod: J.P. McLusky

THOMAS & BETTS CO., 36 Butler St., Elizabeth, N.J., 07206, Tel: 201-354-4321, TWX: 201-354-6621; Sls. V.P: B. Conner

THOMAS ELCTRNS., INC., 100 Riverview Dr., Wayne, N.J., 07470, Tel: 201-696-5200, TWX: 710-988-5836; Sls. Mgr: B. Setticase

THOMAS INSTRUMENT CO., Route 1, Phoenix, N.Y., 13135, Tel: 315-695-5134; Sls. Mgr: S.M. Thomas

THOMAS & SKINNER, INC., 1100 East 23rd St., Indianapolis, Ind., 46205, Tel: 317-923-2501; Sls. Mgr: J.R. Hansen

THOMSON-CSF ELECTRON TUBES, 50 Rockefeller Plaza, N.Y., N.Y., 10020, Tel: 212-489-0400; Mktg. Mgr: W. McLaughlin

cont'd

cont'd

Advertisement

Thomson-CSF Electron Tubes, Inc. markets a complete line of electron tubes:

Power grid tubes for industrial equipment and radar and TV broadcasting.

High power pulsed tubes are also used for low frequency radars, linear particle accelerators and switching applications.

Microwave tubes such as magnetrons, crossed-field amplifiers, high power and reflex klystrons, traveling wave tubes, backward-wave oscillators. Two new developments are the Teratron (wide-band klystron) and the Carpitron (locked BWO for amplifying a frequency-modulated signal).

Image and storage tubes such as cathode-ray tubes for radar and computer displays and instrument use, scan-converters, barrier-grid and direct-view storage tubes. Two new developments are a 150-MHz cathode-ray tube for high frequency oscilloscopes and a dual-color storage tube for radar display.

In addition to these three families of tubes, the Electron Tube Group of Thomson-CSF is also very active in the field of X-ray image intensifiers and gas lasers.

THOMSON-CSF INC., 50 Rockefeller Plaza, New York, N.Y., 10020, Tel: 212-489-0400; V.P: M. Boxberger

THOMSON GEN'L. CORP., 161 Pleasant St., Lynn, Mass., 01901, Tel: 617-598-4900; Sls. Mgr: E.E. Alexander

THOR ELCTRNS. CORP., 741 Livingston St., Elizabeth, N.J., 07207, Tel: 201-354-2420; Sls. Mgr: J. Rose

3M CO. ELECTRO PRODS. DIV., 3M Center, St. Paul, Minn., 55101, Tel: 733-1110; Sls. Mgr: C.H. Carter

3M CO., 3M Center, St. Paul, Minn., 55101, Tel: 612-733-1110, TWX: 910-563-3712

3M CO., DM & S Div., 5178 Crookshank Rd., Cincinnati, Ohio, 45238, Tel: 513-922-0941; Gen'l. Mgr: O.T. Shird

THUNDER INT'L. CORP., 64 Tuttle Rd., Middletown, Conn., 06457, Tel: 203-347-8536; Pres. B.L. Mack Pgs. 886-895
Cal Encino, Cardinal Assocs., 16161 Ventura Blvd. 213-788-4540
Cal Esondito, Cardinal Assocs., 1926 Summit Ridge 714-746-3946
Conn Canaan, G. M. Hathaway Elctrns., Ducillo Bldg. 203-824-7215
Fla Clearwater, W. Wimberly, 532 S. Ft. Harrison 813-446-7072
Fla Orlando, W. Wimberly, 500 S. Osceola St. 305-425-3083
Mass Arlington, G. Hathaway Elctrns., 7-11 Mystic 617-646-1380
Mo St. Louis, Zak & Assocs., 629 N. New Ballas 314-872-3191
NY Massapequa, C.B. Hopkins Co., Box 192 516-796-0066
Ohio Cleveland, Automated Equip. & Engrg., 12417 Cedar Rd. 216-371-5244
Pa Flourtown, Avenir, Inc., Box 234 215-836-4400
Pa Pittsburgh, Automated Equip. & Engrg., 648 Center Ave. 412-931-7616
Tex Dallas, Evans-McDowell, Box 35093 214-351-1839
Va Norfolk, Avenir, Inc., One Executive Dr. 703-497-1961

THWING-ALBERT INSTR. CO., 10960 Dutton Rd., Philadelphia, Pa., 19154, Tel: 215-NE-7-0100; Sls. Mgr: T. Roache

TICKLE, ARTHUR ENGRG. WORKS, INC., 21 Delevan St., Brooklyn, N.Y., 11231, Tel: 212-MA-5-4200; Sls. Mgr: N.P. Harvey

TILDEN TOOL MFG., Deming Ind'l. Area, Box 351, Deming, N.M., 88030, Tel: 505-546-9631; Pres: C. Tilden

TIMBER-TOP, INC., 199E N. Main St., Freeport, N.Y., 11520, Tel: 516-FR-9-0850; Sls. Mgr: W.E. Fischer

Advertisement

TTI's SYNCLAMPS are the ONLY quick-releasing, self-locking and INSTANT NULLING SYNCHRO-CLAMPS! Their INTEGRAL STOPS permit component mounting and nulling (techniques that can save 70% OR MORE of the mounting and nulling time!). SYNCLAMPS meet the MAXIMUM MIL SHOCK AND VIBRATION: 2000 ft-lbs/2000 cps! They also have the LOWEST INSTALLED COST of any type of clamp! A size and style for ANY size component and ANY application!!

TIME-O-MATIC, INC., P.O. Box 850, Danville, Ill., 61832, Tel: 217-442-0611; Sls. Mgr: W.A. Mureiko

TIMES WIRE & CABLE, Sub. INSILCO Corp., Int'l Silver, 358 Hall Ave., Wallingford, Conn., 06492, Tel: 203-269-3381, TWX: 710-476-0763; Sls. Mgr: A.M. Kushner

TIMING SYS., INC., 22 Sewall St., Marblehead, Mass., 01945, Tel: 617-631-0335; Sls. Mgr: P. Zorzy

TINNERMAN DIV., Eaton, Yale & Towne, Inc., Cleveland, Ohio, 44101, Tel: 216-523-5000, TWX: 810-421-8678; Mktg. Mgr: E.E. Griger

TITAN TOOL SUPPLY CO., INC., 68 Comet, Buffalo, N.Y., 14216, Tel: 716-873-9907; Sls. Mgr: T. Kahn

TITCHENER, E.H. & CO., 8 Titchener Pl., Binghamton, N.Y., 13902, Tel: 607-772-1161, TWX: 510-252-1985; V.P-Sls: L.A. Satterlee

T.J. ELCTRNS., Box 3057, Ft. Worth, Tex., 76105, Tel: 817-261-6002; Sls. Mgr: T. Jeter

TMC SYSTEMS (ARIZ.), 930 West 23rd St., Unit 26, Tempe, Ariz., 85281, Tel: 602-967-7874, TWX: 910-950-1943; Mktg. Mgr: D.R. Robinson Pgs. 1430,1431
Cal Mtn. View, IFM-North, 2269 Old Middlefield 415-961-2828
Cal Van Nuys, Homer, 14436 Sherman Way 213-781-1236
Conn Branford, R.H. Sturdy, 225 Montowse St. 203-488-2200
Fla Ft. Lauderdale, Lynch-Gentry, 6340 NE 20th 305-933-9936
Fla St. Petersburg, Lynch-Gentry, Box 13248 813-347-5131
Ind Indianapolis, Gassner & Clark, 1843 N. German Church 317-894-2421
Ill Chicago, Gassner & Clark, 6644 N. Western 312-764-6121
Md Lutherville, J. R. Daniel Co., Inc., Box 124 301-825-3330
Mass Wellesley Hills, R. Sturdy, 204 Worcester 617-235-2330
NY Syracuse, Naylor Elec., 1718 E. Erie 315-472-9183
Pa Glenside, J. R. Daniel Co., Inc., Box 3 215-887-0551
Tex Ft. Worth, Dyna-Reps., Box 11436 817-926-3344
Wash Seattle, Underwood & Underwood, Box 66581 206-243-7070

TOBE DEUTSCHMANN LABS., INC., Box 74, Canton, Mass., 02021, Tel: 617-828-3366; Pres: T. Deutschmann Pg. 2476
Cal Inglewood, C. Fowler, 9911 Inglewood 213-678-5211
Cal Menlo Pk., C. Fowler, 845 Oak Grove 415-322-5374
Colo Boulder, C.W. Fowler Co., 1345 Spruce 303-449-2141
NM Albuquerque, C. Fowler, 2622 San Mateo 505-299-7676
Tex Dallas, V.J. Sykes, 13333 N. Central 512-AD-5-5289
Wash Bellevue, C.W. Fowler, 845-106th 206-454-8600
For: Can., Toronto, Ont., DataComp Elctrns., Ltd., 15 Coldwater Rd., Don Mills 416-445-2423

TOCCO DIV., Park-Ohio Inds., 3800 Harvard Ave., Cleveland, Ohio, 44105, Tel: 216-341-2300; Mktg. Mgr: H.B. Osborn, Jr.

TODD PRODS., 123 Milbar Blvd., Farmingdale, N.Y., 11735, Tel: 516-293-3440, TWX: 510-224-6584; Sls. Mgr: Pgs. 929-931
Ala Huntsville, Tech. Assocs., Box 4088 205-881-8494
Ariz Scottsdale, Bennewitz, 532 N. Brown 602-947-7379
Cal Gardena, Key Instr., 1520 W. Rosecrans 213-321-5891
Cal San Carlos, Elctrn. Engrg., 1293 Laurel 415-593-2189
Colo Denver, Bennewitz, 2801 E. Colfax 303-399-1132
Fla Orlando, TA Instrs., 4314 Lake Underhill 305-424-3030
Ill Chicago, SEA, Inc., 4210 W. Irving Pk. Rd. 312-282-6694
Ind Carmel, SEA, 620 S. Range Line 317-846-2593
Mass Braintree, Bordewieck Engrg., 221 Grove 617-843-0845
Minn Mpls., SEA, 7601 N. Kedtucky 612-425-4455
Mo Kansas City, Harris-Hanson, 7916 Paseo 816-444-9494
Mo St. Louis, Harris-Hanson, 2814 S. Brentwood 314-962-9895
NJ Woodcliff Lake, F & F Assocs., 58 Arcadia 201-778-6767
NM Albuquerque, Bennewitz, 9720 Candelaria, N.E. 505-298-6775
NY Flushing, F & F Assocs., 71-30 Kissena 516-334-1160
Ohio Cincinnati, J. O. Olsen, 5539 Stokeswood 513-922-2176
Ohio Cleveland, J. O. Olsen, 16201 Shaker 216-752-5444
Pa Pittsburgh, J. O. Olsen, 104 Elatan 412-279-2550
SC Spartansburg, Tech. Assocs., Box 5583 803-585-3864
Wash Seattle, R. Drake, 6133 Maynard S. 206-763-2755
Wisc Waukesha, SEA, 420 W. Ravenswood Hills 414-782-3388

TODD SYSTEMS, 4 Radford Pl., Yonkers, N.Y., 10701

TOHOKU METAL INDS., LTD., No 13-10, 7-chome, Ginza, Chuo-ku, Tokyo, Japan, Tel: Tokyo 542-6171; Sls. Mgr: K. Suzuki ....Pg. 2501

TOKYO ELEC. CO., LTD., 14-8, 1-chome, Uchi-Kanda, Chiyoda-ku, Tokyo, Japan, Tel: 292-1011; Export Mgr: H. Hayashi ....Pg. 1350
Cal Los Angeles, Tec America, 10680 W. Pico Blvd.

TOLEDO COMMUTATOR CO., Owosso, Mich., 48867, Tel: 517-725-8192; Sls. Mgr: L.H. Crane

TOLEDO SCALE, Div. Reliance Elec. Co., 5225 Telegraph Rd., Toledo, Ohio, 43612, Tel: 419-478-5811, TWX: 419-379-0284; Sls. Mgr: D.J.Boudinot

TOPAZ ELCTRNS., 3855 Ruffin Rd., San Diego, Cal., 92123, Tel: 714-279-0111, TWX: 910-335-1526; V.P. & Tech. Dir: C.R. Carter ....Pgs. 896-904
Ala Huntsville, Ridge Instr., 7220 Governor's 205-837-3211
Ariz Phoenix, Williams-Assocs., 2250 N. 16th 602-254-6085
Colo Denver, Williams-Assocs., 4971 Jackson 303-388-4391
Conn Hartford, Instr. Assocs., 234 Murphy 203-525-9367
Fla Melbourne, C.E.S. Assocs., Box 1152 305-254-2183
Ga Atlanta, Ridge Instr., 3094 Mc Cully 404-939-1554
Ill Chicago, Pivan Engrg., 3535 W. Peterson 312-539-4838
Ind Indpls., Pivan Engrg., 8545 Northcrest Ct. 317-253-1681
Iowa Cedar Rapids, Pivan Engrg., Box 1274 319-365-6635
Kans Mission, Pivan Engrg. Co., 5920 Nall Ave. 913-772-1030
Md Bethesda, Bartlett, 4405 E.-W. Hwy. 301-656-3061
Mass Arlington, Instr. Assocs., 30 Park Ave. 617-648-2922
Mich Royal Oak, Satullo, 4514 N. Woodward 313-549-3910
Minn Mpls., Pivan Engrg., 3307 N. Hwy. 100 612-537-4501
Mo St. Louis, Pivan Engrg., 725 Old Ballas 314-872-8424
NM Albuquerque, Williams, 420 Wash. 505-255-1638
NY White Plains, Bartlett, 470 Mamaroneck 914-949-6476
Ohio Cleveland, Satullo Co., 16801 Euclid Ave. 216-486-2800
Pa Wayne, Bartlett, 130 W. Lancaster 215-877-7071
Tenn Oak Ridge, Ridge Instr., 140 E. Div. Rd. 615-483-1311
Tex Dallas, R. Martin Assocs., Box 64513 214-358-3704
Tex Houston, R. Martin Assocs., Box 19291 713-468-3877
Wisc Brookfield, Pivan Engrg. Co., 3055 N. Brookfield Rd. 414-786-1940

TOPFLIGHT CORP., 160 East 9th Ave., York, Pa., 17404, Tel: 717-843-9901, TWX: 510-657-4849; Mktg. Dir: P.F. Masterson

TOPPER MFG. CO., INC., 889 Northern Blvd., Great Neck, N.Y., 11023, Tel: 516-466-3889; Sls. Mgr: F. Greil

TORELCO INC., 51 Smith St., Box 108, Irvington, N.J., 07111, Tel: 201-374-8641; Sls. Mgr: R. Hillebrand

TORIN CORP., 100 Franklin Dr., Torrington, Conn., 06790, Tel: 203-482-4422, TWX: 710-439-2343; M.M: K.E. O'Shaughnessy

TORIT CORP., 1133 Rankin St., St. Paul, Minn., 55116, Tel: 612-698-0391; Sls. Mgr: T.G. Ranheim

TORNGREN CO., Div. Standard Int'l. Corp., 236 Pearl St., Somerville, Mass., 02145, Tel: 617-666-3250; Sls. Mgr: K.A. Casavant

TOROTEL, INC., 13402 S. 71 Hwy., Grandview, Mo., 64030, Tel: 816-SO-1-6314, TWX: 910-777-7037; Sls. Mgr: R. Osborne
Pgs. 1432,1529,2502-2505,2984,2985
Ariz Scottsdale, C. Fink, Box 434 602-992-9884
Cal Los Altos, Parsons Co., One First St. 415-941-4745
Cal Los Angeles, El-Com Sls., 5134 Valley 213-223-1351
Colo Littleton, R. G. Entprs., 7272 S. Lincolnway 303-794-6164
Md Silver Sps., Mechtronics, 11700 Old Columbia Pike 301-622-2420
Fla No. Miami, Barrett, 300 N.W. 123rd 305-681-4957
Fla Orlando, Barrett Assocs., Box 14205 305-277-2857
Ill Chicago, Gassner & Clark, 6644 N. Western 312-764-6121
Kans Shawnee Mission, Florence & Meyer, 5812 Roeland 913-722-5210
Mass Weston, J.J. Goode, 44 Ledgewood Rd. 617-235-3900
Mich Detroit, H. Teplitz, 26847 Grand River 313-537-9058
Minn St. Paul, H.A. Cullen, 1595 Selby Ave. 612-646-7371
Mo St. Louis, Florence & Meyer, 8650A Airport 314-521-6800
NY DeWitt, E.W. Hoyer, Box 51 315-446-3523
NY Manhasset, Win-Cor Elctrn., 75 Plandome 516-627-9474
NC Charlotte, A.E. Over, 3723 Country Ridge 704-366-8601
Ohio Cleveland, H. Teplitz, 3945 Meadowbrook 216-371-2044
Ohio Dayton, H. Teplitz, 3718 Salem 513-277-6531
Pa Birchrunville, Jadelectronics, Box 126 215-647-5151
Tex Dallas, Norvell Assocs., Box 20279 214-FL-7-6451
Tex Houston, Norvell, 6440 Hillcroft Ave. 713-774-2568
Wash Bellevue, Western Tech. Sls., Box 902 206-454-3906
For: Can., Toronto, Ont., Wilson Entprs., 386 Bering 416-231-7536

TOROTRON, 150 S. Terrace Ave., Mt. Vernon, N.Y., 10550, Tel: 914-664-2050; Sls. Mgr: O. Zanger

TORR LABS., 2228 Cotner Ave., Los Angeles, Cal., 90064, Tel: 213-477-1224, TWX: 213-490-3972; Sls. Mgr. Len Mc Curley

TORRINGTON CO., Box 1008, Torrington, Conn., 06790, Tel: 203-482-4441, TWX: 710-439-2525; Sls. Mgr: C.R. Kuile

TORSION BALANCE CO., 35 Monhegan St., Clifton, N.J., 07013, Tel: 201-473-6900; Sls. Mgr: C.T. Kasline

TORWICO ELCTRNS., INC., Rte. 70, Lakewood, N.J., 08701, Tel: 201-364-1800, TWX: 201-363-1611; Sls. Mgr: S. Karr .... Pgs. 2506,2507,2987
Cal Tarzana, R. Capell, 18376 1/2 Ventura 213-987-2233
Fla Orlando, Gra-Mar, Inc., 3113 Lawton Rd. 305-841-2330
Ill Deerfield, W. Krueger, 1150 North Ave. 312-945-4738
Kans Overland Pk., Buse Sls., 6920 W. 83rd St. 913-649-1913
Md Baltimore, Shiplett-Warrington, Box 6789 301-823-8759
Mass Needham Hgts., Stickney & Prouty, 32 Kearney Rd. 617-449-3733
Mo St. Charles, Buse Sls., Box 68 314-724-6667
NJ Haddonfield, TAI Assocs., 138 Haddon Ave. 609-854-3011
NY Fayetteville, H.C. Johnson, Box 215 315-NE-7-9383
NY Great Neck, Trionic, 320 Northern Blvd. 516-466-2300
NY Larchmont, Montclair Elctrns., 7 Woodland 914-834-8905
NY Rochester, H.C.Johnson, 111 Mt. Hope 716-HA-6-1090
NY Schenectady, H.C. Johnson, Box 86 518-FR-4-5901
NY Williamsville, H.C. Johnson, 8 Los Robles 716-632-7880
Ohio Kent, Norco Ind'l, 501 Cougler Ave. 216-678-8462
Tex Dallas, Bellingham, 1002 Burlington 214-WH-2-6595

TOUCHMASTER LABS., 6750 Selma Ave., Hollywood, Calif., 90028, Tel: 213-466-6664

TOWER MFG. CORP., 158 Pine St., Providence, R.I., 02903, Tel: 401-331-2380; Sls. Mgr: L.J. Shatkin

TOWNSEND CO., Cherry Rivet Div., P.O. Box 2157, Santa Ana, Calif., 92707, Tel: 714-545-5511, TWX: 910-595-1500; Sls. Mgr: D.J. Sauser

TOWNSEND CO., Fabricated Prods. Div., West Newton, Pa., 15089, Tel: 412-872-6200, TWX: 710-789-3880; Sls. Mgr: J. Stargle

TRA-CON, INC., 55 North St., Medford, Mass., 02155, Tel: 617-391-5550; Sls. Mgr: A. Swartz

TRACOR, INC., 6500 Tracor La., Austin, Tex., 78721, Tel: 512-926-2800, TWX: 910-874-1372; Mktg. Dir: C.D. Anderson

TRAID CORP., 900 Grand Central, Glendale, Cal., 91201, Tel: 213-247-3000; Sls. Mgr: R.W. King

TRAK MICROWAVE, 4726 Eisenhower Blvd., Tampa, Fla., 33614, Tel: 813-884-1411; Reg. Sls. Mgr. T.G. Toth

TRANEX, INC., 1599 Stierlin Rd., Mountain View, Cal., 94040, Tel: 415-968-9292; Sls. Mgr: R.D. Bailey

TRANS-MET ENGRG., 611 E. Lambert Rd., La Habra, Cal., 90631, Tel: 213-691-2266; Sls. Mgr: D.R. Hornbaker

TRANS-SONICS, INC., P.O. Box 326, Lexington, Mass., 02173, Tel: 617-272-1000, TWX: 710-332-1635; Sls. Mgr: J.P. Phillips

TRANS-TECH, Box 457, Gaithersburg, Md., 20760, Tel: 301-948-3800, TWX: 710-828-0549; Sls. Mgr: E.T. Fleming

TRANSCO PRODS., INC., 4241 Glencoe Ave., Venice, Cal., 90291, Tel: 213-821-7911, TWX: 910-343-6469; Sls. Mgr: M. Sawyer, Jr. .... Pg. 613
Ga Doraville, Transco Prods., Inc., 3093 Wanda Woods Dr. 404-436-7544
Md Laurel, VPI Assoc., 13001 Mistletoe 301-792-7631
Mass Stoneham, VPI Assoc., Inc., 422 Main St. 617-438-3113
NY Great Neck, VPI Assoc., 300 Northern 516-482-8387
Ohio Middletown, Transco Prods., Inc., Box 129 513-423-0332
Pa Montgomeryville, VPI Assoc., Box 452 215-474-3200
Tex Ft. Worth, Carey-Wolf Co., Box 12425 817-738-1702
Tex Houston, Carey Wolfe Co., Box 60338 713-643-2114
VA Falls Church, Transco Prod., Box 569 703-532-2355

TRANSCON MFG. CO., 2655 Perth St., Dallas, Tex., 75220, Tel: 214-357-8301; Sls. Mgr: J. Clifford
Pgs. 1844,1845,3060-3067
Ala Huntsville, Reynolds, 904 Bob Wallace 205-536-1941
Ariz Phoenix, Toward Engrg., 3514 E. Indian School 602-955-3193
Cal Inglewood, V & L, 3412 W. Century 213-671-7688
Fla Melbourne, Reynolds, 822 E. Strawbridge 305-727-3205
Fla Orlando, Reynolds, 2903 Timberlake 305-859-2470
Fla Plantation, Reynolds, 320 S.W. 75th 305-581-6611
Ga Atlanta, Reynolds, 175 W. Wieuca 404-252-5360
Kans Overland Pk., Lowell, Kangas & Assoc., Box 4116 913-888-3200
Mo St. Louis, Lowell, Kangas & Assoc., Box 12526 314-647-1111
NY Buffalo, M. Farber Assocs., 203 Jackson 716-856-5526
NC Greensboro, Reynolds, 412 W. Market 919-275-3725
Ohio Cleveland, Loesch Assocs., One Public Sq. 216-241-4581
Ore Portland, J. BeLusko, 2355 N.W. Quimby 503-222-4279
Tenn Memphis, A. Engelman Co., Box 12091 901-275-3680
Wisc Wauwatosa, Larsen, 10855 W. Potter 414-258-0529

TRANSDUCER CONTROLS CORP., 737 N. Dodsworth, Covina, Calif., 91722, Tel: 213-331-0917; Mktg. Mgr: A.A. Isford

TRANSDUCER SYSTEMS, INC., Easton & Wyandotte Rds., Willow Grove, Pa., 19090, Tel: 215-657-0655; Sls. Mgr: B.F. Drill

TRANSDUCERS, INC., 11971 E. Rivera Rd., Santa Fe Springs, Calif., 90670, Tel: 213-693-2711, TWX: 910-586-1899; Sls. Mgr: R.E. Nordstrom

TRANSFORMER DESIGN, 7377 N. 76 St., Milwaukee, Wisc., 53223, Tel: 414-353-8017; Pres: R.B. Lesgold

TRANSFORMER MFRS., INC., 7051 W. Wilson Ave., Chicago, Ill., 60656, Tel: 312-SP-4-4600, TWX: 910-221-5223; Sls. Mgr: R.S. Fenton

TRANSFORMER TECH., INC., 4447 W. Armitage Ave., Chicago, Ill., 60639, Tel: 312-276-3110; Sls. Mgr: A. Werner

TRANSIDYNE-GENERAL CORP., 462 S. Wagner Rd., Ann Arbor, Mich., 48103, Tel: 313-663-9329; Biomedical M/M: P.M. Llewellyn

TRANSISTOR DEVICES, 85 Horsehill Rd., Cedar Knolls, N.J., 07927, Tel: 201-267-1900; Sls. Mgr: J.A. Gilson

TRANSITRON ELCTRN. CORP., 168 Albion St., Wakefield, Mass., 01880, Tel: 617-245-4500, TWX: 710-348-6718; Sls. Mgr: H. Zoolalian

TRANSMAGNETICS INC., 210 Adams Blvd., Farmingdale, N.Y., 11735, Tel: 516-293-3100, TWX: 510-224-6420; Sls. Adm: J. Patanella
Pgs. 382,383,1874,1875
Cal Inglewood, Transmagnetics, Box 3455 213-671-6851
Fla Winter Pk., Great Lake Ind'l Sls., 1701 Lee Rd. 305-645-2009
Mass Waltham, Resco, 181 West St. 617-899-6618
NY Syracuse, Nycom, Inc., 2002 Teall Ave. 315-437-8343
Ohio Dayton, Berberich & Assoc., 4130 Linden Ave. 513-252-9981
Tex Dallas, Jacobson Co., 8609 N.W. Plaza Dr. 214-363-7584
For: Can., Pierrefonds, Que., Avotronics, 13189 Shelborne 514-626-6511
For: Can., Willowdale, Ont., Avotronics Inc., 5 Allenbury Gdns. 416-225-7494

TRANSREX DIV., Gulton Inds., 2001 W. Artesia Blvd., Torrance, Cal., 90504, Tel: 213-327-9224; Sls. Mgr: M. Anderson

TRANSYSTEMS ELCTRN. CO., 2200 Central Rd., Fort Lee, N.J., 07024, Tel: 201-WI-7-7648; Sls. Mgr: N. Fine

TRENT, INC., 201 Leverington Ave., Philadelphia, Pa., 19127, Tel: 215-482-5000; Sls. Mgr: D.A. Miller

TREPAC CORP. AMERICA, 30 W. Hamilton Ave., Englewood, N.J., 07631, Tel: 201-567-3810, TWX: 201-567-4977; Sls. Mgr: H. Trenner

Advertisement

"SOLID STATE ELECTRONICS FOR TELE-COMMUNICATIONS" Transistorized and Solid State Telegraph Keying Relays Teleprinter Magnet Drivers and Automatic Motor Controls Transistroized Tone Operated and Time Delay Relays Transistorized TELETYPE/Computer Interfaces & Repeaters DATATONE - Tone Transmitters & Tone Receivers for TELETYPE, Selective Calling, Switching & Control (AM & FSK)-Filters-D.C. to A.C. Frequency and Voltage Regulated Inverters.

TRESCO AN AYDIN CO., 3824 Terrace St., Phila., Pa., 19128, Tel: 215-IV-3-1383; Sls. Mgr: T. Hall

TRG PRODS., Control Data Corp., 400 Border St., E. Boston, Mass., 02128, Tel: 617-569-2110, TWX: 710-329-6639; Sls. Mrg: W.A. Johnson

TRI-COM, INC., 12216 Parklawn Dr., Rockville, Md., 20852, Tel: 301-881-9050; Sls. Mgr: O.J. Strock

TRI-DEX CO., 2146 E. Main St., Visalia, Calif., 93277, Tel: 209-732-7415; Pres: K.B. Howard

TRI-EX TOWER CORP., 7182 Rasmussen Ave., Visalia, Calif., 93277, Tel: 209-732-8383; Sls. Mgr: C.C. Blyleven

TRI-POINT INDS., INC., One Trilon Way, Commack, N.Y., 11725, Tel: 516-543-1600; Sls. Mgr: P.F. Leaper

TRI-STATE ELCTRNS. CORP., Broadway & Jefferson Sts., Camden, N.J., 08104, Tel: 609-365-6884; Sls. Mgr: L.R. Mehr

TRI-TRONICS CO., 619 Enterprise Dr., Oak Brook, Ill., 60521, Tel: 312-654-3255; Pres: W.J. Ahlswede

TRI-TRONICS LAB., Box 638, Euless, Tex., 76039, Tel: 817-267-1366; Sls. Mgr: J.D. Mattox

TRIAC ELCTRN. SYS., 200 Park Ave. Ste 303E, N.Y., N.Y., 10021, Tel: 212-687-0620; Sls. Mgr: J. Rostow
Pg. 1351
NJ Newark, Triac Elctrn. Sys., 1223 Nat'l. Newark Bldg. 201-623-4258

Advertisement

We invite you to explore with us the exciting world of the thyristor (TRIAD, SCR, UJT, CUJT, SUS, SCS, DIAC, SBS, CSCR, LASCR and LASCS) as it may pertain to your applications and our product line as follows:

• Power Supplies, Constant VAC, Auto Transformers • Solid State Relays, Sensitive Relays • High Current Static Switches • Zero Voltage Controls • Phase Controls • Soft Start and/or Stop (Up ramp, down ramp) • Over Voltage Crowbars • Transient Suppressors, Snubber Networks • Threshold Detectors • Over Current Breakers • Motor Speed Controls • Welding Controls and Timers • Electronic Precision Timers • Latching Switches, Memories, Logic Boards • Shift Registers, Counters, Ring, Preset • Converters, Inverters, Cyclo-Converters • Pulse Modulators, Transformers, Triggers • Lighting Controls • Traffic Appliances • Automotive • Alarm Logic, Boiler Water Level Controls • Electro Mechanical Hybrids • Temperature, Pressure Controls • Steam, Hydraulic, Pneumatic Flow Systems • Sensors, Probes, Thermistors, Transducers • Proximity Controls, Sensors • Burglar Alarms

TRIAD DISTRIBUTOR DIV., Litton Inds., Inc., 305 N. Briant St., Huntington, Ind., 46750, Tel: 219-356-6500, TWX: 810-333-1532; Sls. Mgr: P.N. Cook

TRIAD-UTRAD, Div. Litton Sys., 305 N. Briant St., Huntington, Ind., 46750, Tel: 219-356-7100, TWX: 810-333-1532; Sls. Mgr: J.A. Tracy

TRICO FUSE MFG. CO., 2948 North 5th St., Milwaukee, Wisc., 53212, Tel: 414-264-3410; Sls. Mgr: F.G. Masek

TRICRAFT PRODS., Div. Hi-Lo Mfg. Corp., 1124 W. Newport, Chicago, Ill., 60657, Tel: 312-935-5383; Sls. Mgr: A. Klancnik

TRIDAIR 'INDS., Fastener Div., 3000 W. Lomita Blvd., Torrance, Calif., 90505, Tel: 213-775-7151, TWX: 910-347-6239; Sls. Mgr: J.T. Rohleen

TRIMM, INC., 400 W. Lake St., Box 489, Libertyville, Ill., 60048, Tel: 312-362-3700; Sls. Mgr: P.A. Bottorff Pg. 2718

- Cal Los Angeles, Trimm, 1338 S. Atlantic Blvd. 213-261-9176
- Cal Palo Alto, J.M. Assocs., 415 Cambridge, Ste. 5 415-327-1260
- Fla Winter Pk., Hawkins-Hutto, Box 1509 305-647-7407
- Ga Atlanta, Millar-Elctrns., Box 12137, Northside Sta. 404-261-6160
- Ind Ft. Wayne, Paul Sls., 3501 Fairfield Ave. 219-744-0589
- Md Kensington, F-M Elctrn., 3519 Raymoor Rd. 301-949-1707
- Minn Mpls., Kirkeby & Assocs., 821 2nd Ave., N. 612-377-3239
- NY Manhasset, Win-Cor Elctrn., 75 Plandome Rd. 516-627-9474
- NY Melville, Rocke Int'l., 80 Marcus Dr. 516-694-7800
- NY Albany, T. Ferguson Sls., 1654 Central Ave. 518-869-0405
- NY New York, H.F. Smith, 259 W. 14th St. 212-242-2398
- NY Rochester, T. Ferguson Sls., Box 3893 716-482-7757
- NC Raleigh, Millar Elctrns., Box 17173 919-787-9564
- Ore Portland, J.W. Eckersley Co., 3150 S.W. Hamilton 503-246-3183
- Pa Havertown, F-M Elctrn., 206 Bewley Rd. 215-446-1962
- RI Cumberland, M.F. Perry, Rosewood La., R.D. 2 401-333-5054
- Tex Dallas, Techno Assocs., Box 20544 214-357-9213
- EXP: Ill., Libertyville, Trimm, Inc., 400 W. Lake St.

TRINDL PRODS., INC., 1807 S. Clark St., Chicago, Ill., 60616, Tel: 312-842-7716; Sls. Mgr: J.R. Maloney

TRIO LABS, INC., 80 Dupont St., Plainview, N.Y., 11803, Tel: 516-681-0400, TWX: 510-221-1861 ....Pg. 932

- Cal Palo Alto, B. Oppenheim, Inc., 2179 Park Blvd. 415-321-7323
- Cal So. Pasadena, QPL, Inc., 1015 Fremont Ave. 213-682-3705
- Fla Maitland, Greenstein Assocs., 1205 Winston 305-838-5607
- Ill Chicago, Data Elctrns. Co., Inc., 5505 N. Menard 312-774-1452
- Md Silver Spring, RL Engrg., 11215 Oak Leaf Dr. 301-656-1999
- Mass Burlington, Research Instrs., Inc., 87 Terrace Hall Ave. 617-272-1800
- Mich Farmington, Carter, McCormic & Peirce, Inc., 23995 Freeway Pk. Dr. 313-477-7700
- Minn Mpls., Data Elctrns., 821 2nd Ave. N. 612-377-8383
- NJ Englewood Cliffs, Power Conversion & Control, Box 1251 201-569-0015
- NC Bethania, Candor Co. 919-924-1480
- Ohio Cleveland, Carter, McCormic & Peirce, Inc., 21380 Lorain Rd. 216-333-5650
- Ohio Dayton, Carter, McCormic & Peirce, Inc., Box 1472 513-278-5873
- Pa Pittsburgh, Carter, McCormic & Peirce, Inc., 201 Penn Ctr. Blvd. 412-824-3760
- Tenn Bristol, Candor Co., Inc. 615-764-6215
- Tex Dallas, Norvell Assocs., Inc., 10210 Monroe Dr. 214-FL-7-6451
- Tex Houston, Norvell Assocs. Inc., 6440 Hillcroft Ave. 713-774-2568

TRIO MFG. CO., Griggsville, Ill., 62340, Tel: 217-833-2395; Sls. Mgr: W. Bradshaw

TRIO-TECH, INC. OF CALIF., 2435 N. Naomi St., Burbank, Calif., 91504, Tel: 213-846-9200, TWX: 910-498-2709; Sls. Mgr: J. Guy

TRION, INC., 1000 Island Ave., McKees Rocks, Pa., 15136, Tel: 412-331-3300; V.P: H.E. Carr

TRIPLE-A SPECIALTY CO., 5750 West 51st St., Chicago, Ill., 60638, Tel: 312-458-7200; Sls. Mgr: Mr. Bernes

TRIPLETT ELEC. INSTR. CO., 280 Harmon Rd., Bluffton, Ohio, 45817, Tel: 419-358-5015, TWX: 810-490-2400; Sls. Mgr: N.A. Triplett ....Pgs. 567-577

- Ariz Phoenix, Shefler-Kahn Co., Box 1587 602-258-7893
- Cal Inglewood, J. Berman, 9000 Bellanca 213-678-1281
- Cal Millbrae, Polach & Bensinger, Inc., 231 E. Millbrae Ave. 415-697-2525
- Colo Denver, Shefler-Kahn, 2422 S. Downing 303-733-6330
- Fla Winter Pk., Hawkins-Hutto, 501 Park 305-647-7407
- Ga Atlanta, Millar Elctrns., 3110 Maple 404-261-6161
- Haw Honolulu, B. Kolans, Box 2098 811-628
- Ill Oak Pk., G. Petitt, 6332 Roosevelt 312-369-8940
- Ind Ft. Wayne, W. Bieberich, 801 Leesburg 219-432-2537
- Kans Overland Pk., T. Dowell, 8151 Marty 913-649-6069
- Md Reisterstown, Massey Assocs., Dover Rd. 301-833-2039
- Mich Grosse Pt. Woods, Elko Sls., 970 N. Oxford 313-884-7893
- Minn Mpls., Heimann, 5603 Lyndale 612-861-6051
- NM Albuquerque, Shefler-Kahn, Box 8342 505-265-7077
- NY DeWitt, F. Taylor, 4455 E. Genesee 315-446-0422
- NY Woodside, D. Tobias & Co., 40 01 31 St. 212-726-4551
- NC Raleigh, Millar Elctrns., N. Hills Off Mall 919-787-9564
- Ohio Rocky River, C. Dolfuss, Jr., 19035 Detroit 216-333-7504
- Pa Havertown, Snyder & Massey, 1325 W. Chester Pike 215-789-2320
- Pa Pittsburgh, G.S. Root, 809 Wainwright 412-561-4125
- RI Lincoln, Adams-McGregor, 66 Lakeview 401-726-1300
- Tex Dallas, Lund & Co., 2616 Manor Way 214-358-4335
- Wash Seattle, J. Backer, 221 W. Galer 206-285-1300
- For: Can., Downsview, Ont., L. Finkler, Ltd., 25 Toro 416-630-9130
- For: Can., Winnipeg, Manitoba, Smith-Patterson, 1550 Erin St. 204-774-1855

TRIPP RESEARCH CORP., 841 Warrington Ave., Redwood City, Cal., 94063, Tel: 415-365-2828; Sls. Mgr: A. Iversen

TRISH ENERGETICS, Pond Rd., Harvard, Mass., 01451, Tel: 617-456-3909; Sls. Mgr: J Yarlott

TROMPETER ELCTRNS., 8936 Comanche Ave., Chatsworth, Cal., 91311, Tel: 213-882-1020, TWX: 910-494-1210 ....Pgs. 1958,2719

- Ala Huntsville, Currie Aerospace, 2603 Artie 205-536-5650
- Ariz Phoenix, Aztec Entprs., 15 No. 40th Pl. 602-267-8103
- Cal Chatsworth, Trompeter Elctrns., 8936 Comanche 213-882-1020
- Cal Redwood City, Long, 505 Middlefield 415-369-3324
- Colo Littleton, Aztec Entprs., 1449 W. Littleton 303-798-4574
- Fla Orlando, Currie Aerospace, 2907 McCoy 305-855-0843
- Ill Elmhurst, Scott Assoc., 663 Fairview Ave. 312-279-5681
- Md Silver Spring, Sel Tronics, 721 Ellsworth 301-589-3391
- Mass Belmont, Vector Sls., 774 Pleasant St. 617-489-1400
- Minn St. Paul, Wagner Comp. Conslts., 542 S. Snelling Ave. 612-698-0331
- Mo Kansas City, Harris-Hanson, 7916 Paseo 816-HI-4-9494
- Mo St. Louis, Harris-Hanson, 2814 S. Brentwood 314-962-0111
- NJ Saddlebrook, L & M Assoc., 511 Victor 201-843-8700
- NM Albuquerque, Aztec Entprs., 829 Penn. Ave., N.E. 505-255-2440
- NY Brentwood, L & M Assocs., 7 Mayflower Ct. 516-231-8363
- NY Fayetteville, M. P. Andrews, 319 Mott Rd. 315-637-3144
- NC Winston-Salem, Currie Aerospace, Box 10329 919-764-0682
- Ohio Cincinnati, J. Olsen, 5539 Stokeswood 513-922-2176
- Ohio Cleveland, J. O. Olsen, 16201 Shaker 216-752-5444
- Ore Portland, McLaren-Topp, 5319 S.W. Westgate 503-297-2248
- Pa Andalusia, L & M, 965A Bristol Pike 215-639-3100
- Pa Pittsburgh, J. O. Olsen, 104 Elatan Dr. 412-279-2550
- Tex Austin, A. Barnes Co., 7920 Rockwood La. 512-454-4457
- Tex Houston, A. Barnes Co., 3801 Kirby Bldg. 713-523-7333
- Tex Richardson, A. Barnes, 740 S. Sherman 214-235-4541
- Wash Bellevue, McLaren-Topp, 13547 S.E. 26th St. 206-746-5750
- For: Can., Ottawa 7, Ont., L. Albert Assocs., 281 Palace St. 613-746-0021
- For: Can., Vancouver 9, B.C., Westronic Engrg. Sls., Ltd., 1641 W. 2nd Ave. 604-732-5033
- For: Can., Winnipeg Bch., Man., Westronic Engrg. Sls., Ltd., 41 Makinak Bay 888-6502

Advertisement

"Special cable, connectors, patching and switching for Video, T.V., data, and instrumentation systems. Patching includes patch panels, patch cords, and many special accessories in coax, triax, twinax, and quadrax noise-rejecting cable systems. Switching includes custom built matrices and multipole - multithrow relays including complete control for coax, isolated coax, triax and twinax cable systems. Frequencies from D.C. up through 3 GHz. Technical discussion of noise rejecting cable systems in catalog."

TRONIC CORP., Box 247-E, Belmont, Calif., 94002, Tel: 415-593-1487; Sls. Mgr: G. Dale Hetrick

TRU-CONNECTOR CORP., 245 Lynnfield St., Peabody, Mass., 01960, Tel: 617-532-0775, TWX: 710-347-6683; Sls. Mgr: R.F. Hoff

TRUCO, INC., Truco Engrg. Co. Div., P.O. Box 95, Simsbury, Conn., 06070, Tel: 203-658-0200 C.H. Pierson

TRUMP-ROSS IND'L. CONTROLS, INC., 265 Boston Rd., Billerica, Mass., 01862, Tel: 617-663-3451; Mkt. Mgr: S. Futran

TRUTONE ELCTRNS., INC., 14660 Raymer St., Van Nuys, Calif., 91405, Tel: 213-873-5751; Sls. Mgr: M.N. Leventhal

TRW CAPACITOR DIV., 112 W. First St., Ogallala, Neb., 69153, Tel: 308-284-3611, TWX: 910-620-0321; Sls. Mgr: A.C. Elles

TRW HOME ENTERTAINMENT DIV., See Elctrn. Functions Div. TRW Inc.

TRW INC., See Globe Div. TRW Inc., Holyoke Wire & Cable Div. TRW Inc., IRC Boone Div. TRW Inc., IRC Burlington Div. TRW Inc., IRC Philadelphia Div. TRW Inc., IRC St. Petersburg Div. TRW Inc.

TRW INSTRS., 139 Illinois St., El Segundo, Cal., 90245, Tel: 213-535-0854, TWX: 910-348-6676; Sls. Mgr: M.W. Jacobs

TRW SEMICONDUCTOR DIV. TRW INC., 14520 Aviation Blvd., Lawndale, Cal., 90260, Tel: 213-679-4561, TWX: 910-325-6206; Sls. Mgr: W. Sebastian

TRYGON ELCTRNS., See Systron Donner

TT ELCTRNS., INC., Box 180, Culver City, Cal., 90230, Tel: 213-870-6001; Sls. Mgr: J.F. Sodaro Pgs. 1530,1531
Cal Culver City, Sodaro, 3753 Robertson 213-838-5272

TUCKER ELCTRNS. CO., 1717 S. Jupiter Rd., Garland, Tex., 75040, Tel: 214-348-8800; V. P. Sls: G.J. Freund

Advertisement

Tucker Electronics sells and services all types of commercial and military test equipment. Complete calibration laboratory with NBS traceability. Stock includes wide variety of overhauled and calibrated equipment such as Tektronix 530/540 series oscilloscopes. Hewlett Packard 606A, 608A/B/C/D, 612A, 620A, 623B generators. Hewlett Packard frequency counters and plug-ins. Hewlett Packard 400D/H and 410B voltmeters. General radio 874 series coaxial items, unit oscillators and bridges. Stoddart, Measurements, Weston and many other types stocked. We also stock military test equipment such as TS-510A/U, TS-497B/U, SG-13, SG-1, MD-83.

Write or call for test equipment catalog or calibration quotation. We also buy and trade quality used equipment.

TUR-BO JET PRODS. CO., INC., 5025 N. Earle St., Rosemead, Calif., 91770, Tel: 213-283-5191; Gen'l. Mgr: W. M. Locke

TURNER DIV., See Conrac Corp.

TURNER MICROPHONE CO., 909 17th St., N.E., Cedar Rapids, Iowa, 52402, Tel: 319-365-0421; Sls. Mgr: T.H. Moss

TWIN CITY METALSEAL, INC., 825 11th Ave. S.E., Minneapolis, Minn., 55414, Tel: 612-331-1700; Gen'l. Mgr: H.G. Knight

TWIN LOCK INC., 13115 Washington Blvd., Los Angeles, Cal., 90066, Tel: 213-397-7745; Sls. Mgr: L.M. Ford

TYCO INSTR. DIV., 223 Crescent St., Waltham, Mass., 02154, Tel: 617-899-5600, TWX: 710-324-6988; Sls. Mgr: M. Green

TYCO PRECISION FABRICATORS DIV., 200 Broadway, Garden City Park, N.Y., 11040, Tel: 516-741-1100; Gen. Mgr: P. Stranger

TYLAN CORP., 4203 Spencer St., Torrance, Calif., 90503, Tel: 213-370-3521, TWX: 910-344-6420; Sls. Mgr: C.F. Drexel

W. S. TYLER INC., 8200 Tyler Blvd., Mentor, Ohio, 44060, Tel: 216-255-9131

TYTON CORP., 3330 W. Cameron Ave., Milwaukee, Wisc., 53209, Tel: 414-462-0810, TWX: 910-262-3151; Sls. Mgr: R. Kendall

UBER GRAFIC INSTRS., Box 4, Palo Alto, Calif., 94302, Tel: 415-327-4732; Sls. Mgr: D. Kroener

UID ELCTRNS. CORP., 4105 Pembroke Rd., Hollywood, Fla., 33021, Tel: 305-981-1211, TWX: 510-954-9810; Mgr: A. M. Pichitino ....Pg. 1959
Ala Huntsville, Powertronics, Box 3384 205-852-6347
Ariz Phoenix, Barnhill Five, 337 E. Osborn 602-263-1250
Ark El Dorado, Dick Bellew Sls., Box 1835 501-863-8325
Cal Los Angles, Galaxie Sls., Int'l., 1930 Wilshire 213-483-0910
Cal Redwood Cy., Long & Assocs., 505 Middlefield 415-369-3324
Colo Denver, Barnhill Five, 1170 S. Sheridan 303-934-5505
Conn Manchester, H. Mandell, Box 509 203-646-4443
Fla Altamonte Spg., W.M.M. Assocs., 515 Tivoli 305-831-4645
Fla Clearwater, W.M.M. Assocs., 1260-A S. Highland 813-446-0075
Fla No. Miami Beach, Man Rep. Corp., Box 68 305-949-6391
Fla Pompano Beach, W.M.M. Assocs., 721 S.E. 6th Terr. 305-943-3091
Ill Chicago, J. G. Twist, 1301 Higgins Rd. 312-593-0200
Ind Ft. Wayne, R. O. Whitesell, 3426 Taylor 219-432-5591
Ind Indpls., R. O. Whitesell, 6691 E. Washington 317-359-9283
Ind Kokomo, R. O. Whitesell, 3827 S. Lafontain Sq. 317-453-6868
Kan Overland Pk., Lowell-Kangas, Box 4116 913-888-3200
Ky Louisville, R. O. Whitesell, 3620 Lexington 502-893-7303
La Metairie, D. Bellew Sls., 3017-D 18th 504-833-6496
Md Elkridge, J. Bresson, 5600 Main 301-796-5220
Mass Revere, Herb Mandell, Box 24 617-289-3787
Mich Detroit, Rathsberg, 16621 E. Warren 313-882-1717
Minn Mpls., R. J., Inc., 7100 S. France 612-922-1425
Mo St. Louis, Lowell-Kangas, Des Peres Bldg., 12015 Manchester 314-821-4050
NM Albuquerque, Barnhill Five, 1410-D Wyoming, N.E. 505-299-7658
NY Jamaica, S. J. Sls., 148-05 Archer Ave. 212-291-3232
NY N. Y., Singer Prods., Elctrn. Div., 30 Church 212-349-8100
NY Rochester, L. Hart, Box 8398 716-244-3253
NC Raleigh, Powertronics, 2911 Essex Cir., #13 919-787-9090
NC Thomasville, Powertronics, Box 403 919-476-4257
Ohio Dayton, J. C. Hofstetter, 3300 S. Dixie 513-298-0662
Ohio Medina, J. C. Hofstetter, 5168 Valley View 216-241-4880
Pa Narbarth, J. Bresson, 107 Forrest 215-839-6770
Pa Pittsburgh, J. C. Hofstetter, 175 Reed 412-922-3890
Tenn Bristol, R. O. Whitesell, 340 Edgemont 615-968-4195
Tex Dallas, E. B. Robertson, 1339 Plowman 214-942-2711
Tex Houston, E. B. Robertson, 6362 Windswept 713-785-6800
Va Lynchburg, J. Bresson, Box 4115 703-237-0829
Wash Seattle, R. Johnston, 1011 N.E. 69th 206-524-5170
Wisc Waukesha, J. G. Twist, 540 Catskill 414-786-6330
EXP: Toronto 19, Ontario, Can., Atlas Elctrns., 50 Wingold Ave. 416-781-6174
EXP: Montreal 261, Que., Can., Atlas Elctrns., 3333 Cavendish 514-489-8495

ULANO PRODS. CO. INC., 210 East 86 St., New York, N.Y., 10028, Tel: 212-628-7960; Sls. Mgr: Marian Ulano Prince

ULTEK DIV., Perkin-Elmer Corp., Box 10920, Palo Alto, Calif., 94303, Tel: 415-321-4117, TWX: 910-373-6442; Sls. Mgr: R.H. Yarbrough

ULTRA AUDIO PRODS., Box 921, Beverly Hills, Calif., 90213, Tel: 213-CR-6-2726; Pres: O. Berliner

ULTRA CARBON CORP., Box 747, Bay City, Mich., 48706, Tel: 517-893-4575; Sls. Mgr: R. Baney

ULTRA SONIC INDS., 800 Albany Ave., Lindenhurst, N.Y., 11757, Tel: 516-884-9610; Sls. Mgr: C. Saginario

ULTRA-VIOLET PRODS., INC., 5114 Walnut Grove Ave., San Gabriel, Cal., 91778, Tel: 213-285-3123; Sls. Mgr: P.B. Warren

ULTRONIX, INC., 461 N. 22nd St., Grand Junction, Colo., 81501, Tel: 303-242-0810, TWX: 910-929-6965; Sls. Mgr: B. Moore

UMC ELECTRONICS CO., Beau Motor Div., 462 Sackett Point Rd., North Haven, Conn., 06473, Tel: 203-288-7731; V.P. Sls: F. H. Rehm

UNDERWOOD ELEC. & MFG., 148 South 8 Ave., Maywood, Ill., 60153, Tel: 312-MU-1-2970; Sls. Mgr: R.G. Futterer

UNDERWRITERS SAFETY DEVICE CO., 4332 N. Kedzie Ave., Chicago, Ill., 60618, Tel: 312-583-4080; Sls. Mgr: H.R. Ege

UNEX LABS., INC., 321 Newbury St., Hathorne, Mass., 01937, Tel: 617-774-3300; Exec. V.P: J.O. Woodbridge

UNGAR, Div. Eldon Inds., Inc., 233 E. Manville St, Compton, Calif., 90220, Tel: 213-774-5950; Pres: W.L. Nehrenz

UNHOLTZ-DICKIE CORP., 3000 Whitney Ave., Hamden, Conn., 06518, Tel: 203-288-3358; Pres: J.A. Dickie

UNIBRAZE CORP, 455 Knollwood Rd, White Plains, N.Y., 10603, Tel: 914-428-3441, TWX: 710-568-1398; Sls. Mgr: A. Aster

UNIFORM TUBES, Collegeville, Pa., 19426, Tel: 215-539-0700, TWX: 510-660-6107; Sls. Mgr: G.B. Hattersley ....Pg. 3068
Cal Los Altos, Marketek, Inc., One First St. 415-941-0882
Cal Newport Bch., Uniform Tubes, 2172 Dupont 714-833-1470
Colo Denver, Crump Co., 1971 W. 12th Ave. 303-534-5183
Conn Meriden, J. Anderson, 166 Converse Ave. 203-269-1812
Fla Clearwater, Perrott Assocs., Box 4532 813-531-5513
Fla Orlando, Perrott Assocs., 1607 Forsyth 305-275-1132
Fla W. Palm Beach, Perrott Assocs., Box 6277 305-967-1770
Ill Park Ridge, R. F. Specialists, 118 W. Higgins 312-698-2044
Ill Schiller Pk., 4849 Scott St. 312-671-2717
Ind Indpls., Thomas & Sukup, 2060 E. 54th 317-251-4574
Mass Newburyport, J. Murphy, 5 Eagle 617-465-0304
Mass Seekonk, J. Murphy, 30 Sunset Dr. 617-SO-1-7153
Mich Dearborn, Villani-Pitcher, 20233 Ann Arbor 313-271-4600
Minn Hopkins, Applied Sls. Engrg., 12401 Minnetonka 612-935-3491
Minn Mpls., R. F. Specialists, 4542 4th St. NE 612-560-1222
NY Fairport, L. Bagley, 88 Nettlecreek Rd. 716-377-2059
NY Staten Isl., Box 421 GPO 212-442-3733
NC Charlotte, J. H. Smith, 6512 War Eagle 704-394-4210
Ohio Cleveland, R. Reich, 21010 Ctr. Ridge 216-331-0541
EXP: N.Y., New York, Ad. Auriema, Inc., 85 N. Broad St.
EXP: Can., Nobleton, Ont., Braydon Electro, Box 57 416-859-0712
EXP: Can., Toronto, Ont., Braydon Electro, 1912A Avenue Rd. 416-787-1941

UNIMAX SWITCH CORP., Riker-Maxson Sub., Ives Rd., Wallingford, Conn., 06492, Tel: 203-269-8701, TWX: 710-476-1397; V.P. Mktg: A.J. Schweitzer ......Pg. 1960
Ala Huntsville, Rep., Inc., 8100 S. Memorial 205-881-9270
Ariz Phoenix, Hytronic Meas., 1017 N. 3rd St. 602-253-6104
Cal Los Altos, Ewing-Foley, 900 N. San Antonio 415-941-4525
Cal LA, M.A. Stolaroff, 4622 W. Slauson Ave. 213-295-7781
Colo Denver, Hytronic Meas., 4940 E. 39th 303-388-4081
Conn Bloomfield, Zaslow Sls., 6 Newberry Rd. 203-242-7781
Fla Oviedo, Conley & Assoc., W. Broadway 305-365-3283
Ga Atlanta, Rep., Inc., 1483 Monroe Dr., N.E. 404-876-1591
Ill Chicago, Wasson-Gallagher 312-261-7517
Ill Oak Pk., Wasson-Gâllagher, 1024 North 312-383-6572
Ind Marion, O.H. Bromberg, 1723 Overlook 317-664-5384
Ky Louisville, O. H. Bromberg, 10306 Hartley 502-245-8916
Md Silver Spring, L.G. White, 1100 Fidler La. 301-585-3141
Mass Lowell, Zaslow Sls., 339 Middlesex St. 617-458-8452
Mass Northboro, Zaslow Sls., 371 Howard St. 617-393-8150
Mich Detroit, Skip Greiner, 15318 Mack Ave. 313-882-7570
Minn Mpls., Jos-Co. Sls. Engrg., 4520 Gilford Dr. 612-927-5858
Mo St. Louis, Hill & Co., 915 Buder Bldg. 314-621-1818
NM Albuquerque, Hytronic Meas., 205 San Pablo, SE 505-268-3941
NY Oceanside, Tech. Liaison, 3095 Lawson Blvd. 516-764-9003
NY Sodus, A.E. DeCew Agency, 27 State St. 315-483-4061
NC Winston-Salem, L.G. White, 1020 Brooktown 919-725-3612
Ohio Cincinnati, O.H. Bromberg, 561 Reading 513-381-5728
Ohio Medina, J. Hofstetter, 5168 Valley View 216-241-4880
Pa Narberth, L. White, 100 Essex Ave. 215-664-6505
Tenn Memphis, Ransom Sls., 4230 Hwy. 51 S. 901-332-0036
Tex Dallas, R M C Engrg., 2415 Converse St. 214-631-0276
Utah Salt Lake City, Hytronic Meas., Inc., 2022 S. Main 801-466-4924
Wash Mercer Island, J. H. Andersen, Box 637 206-232-0484
For: Can., Burlington, Ont., Motion Control Dev., 1254 Plains 416-637-9369

UNIMETRICS, INC., 23 W. Mall, Plainview, N.Y., 11803, Tel: 516-694-9171; Pres: M. Shapiro

UNION CARBIDE, Carbon Prods. Div., 270 Park Ave., New York, N.Y., 10017

UNION CARBIDE, CHEMICALS & PLASTICS, 270 Park Ave., New York, N.Y., 10017, Tel: 212-551-4641

UNION CARBIDE, Consumer Prods., 270 Park Ave., New York, N.Y., 10017, Tel: 212-551-2345; Mgr: R.J. Price ....Pg. 710
Cal El Monte, 9530 E. Telstar Rd. 213-579-0401
Cal San Francisco, One California 415-765-1400
Ga Atlanta, 17 Executive Pk. Dr. N.E. 404-633-6161
Ill Chicago, East Central Div., 120 S. Riverside Plaza 312-822-7233

Ill Chicago, West Central Div., 120 S. Riverside Plaza 312-822-7445
Kans Shawnee Mission, 6901 W. 63rd St. 913-362-2200
Mass Needham Hts, 300 1st Ave. 617-444-5400
Minn Mpls, 324 N. 1st St. 612-333-0415
NJ Cherry Hill, 1050 Kings Hwy. 609-235-6200
NJ Westwood, 99 Kenderkamock Rd. 201-664-7400
Ohio Cleveland, 1300 Lakeside Ave. 216-621-4207
Ore Portland, 1233 N.W. 12th Ave. 503-223-7175
Tenn Memphis, 165 Madison Ave. 901-526-7421
Tex Dallas, 2710 Stemmons Frwy. 214-631-0010

UNION CARBIDE CORP., Mat'ls. Sys. Div., Comps. Dept., Box 5928, Greenville, S.C., 29606, Tel: 803-963-7421, TWX: 810-287-2536; Sls. Mgr: R.G. Hughes ....Pgs. 2424-2427
Ariz Phoenix, UCC-Comps. Dept., 100 W. Clarendon 602-264-7332
Cal Mountain View, 2680 Bayshore Frontage 415-969-9390
Cal San Diego, Celtec Co., 3821 4th Ave. 714-291-4955
Cal Whittier, 13601 E. Whittier Blvd. 213-698-8077
Colo Denver, Elctrn. Comp. Sls., 4783 S. Quebec St. 303-771-6200
Fla Orlando, G.F. Bohman, 6990 Lake Ellenor Dr. 305-865-0274
Fla Orlando, U. C. C.-Comps. Dept., 999 Woodcock 305-843-8210
Fla Palm Beach Gardens, G.F. Bohman Assoc., 10249 N. Military Trail 305-842-7188
Ill Chicago, D. Dolin Sls., 6232 N. Pulaski 312-286-6200
Ill Chicago, U. C. C-Comps. Dept., 7151 W. Gunnison 312-867-6060
Ind Indpls., L. M. De Voe Co., 665 E. 61st 317-257-1227
Md Lutherville, Daniel & Co., Box 124 301-825-3330
Mass Needham Hgts., 300 First Ave. 617-444-5400
Mich Detroit, R.C. Merchant Co., 18411 W. McNichols Rd. 313-535-6000
Mich St. Joseph, R.C. Merchant, 505 Pleasant 616-983-7378
Minn Mpls., S. Clothier Co., 7400 Lyndale 612-869-3231
Mo Kansas City, Harris-Hanson, 7916 Paseo 816-444-9494
Mo St. Louis, Harris-Hanson Co., 2814 S. Brentwood Blvd. 314-962-0111
NJ Lakewood, Baehr, Greenleaf & Assocs., 14700 Detroit 216-221-9030
NY Tarrytown, U. C. C-Comps. Dept., Tarrytown Tech. 914-345-2047
NY Liverpool, U. C. C-Comps. Dept., 300 Tulip 315-451-0720
Ohio Cincinnati, Baehr, Greenleaf & Assocs., Inc., 9505 Montgomery Rd. 513-891-3826
Ohio Columbus, Baehr, Greenleaf & Assocs., Box 5722 614-486-4046
Ohio Dayton, Baehr, Greenleaf & Assocs., 3350 Maplewood 513-426-5485
Ohio Cleveland, 11901 Madison Ave. 216-221-0600
Okla Tulsa, Ammon & Champion, Box 4682 918-627-7670
Okla Oklahoma City, Ammon & Champion Co., Box 12274 405-942-8222
Ore Beaverton, Arneson, 4175 S.W. Cedar Hills 503-646-3416
Pa Glenside, Daniel & Co., 231 S. Easton 215-887-0550
SC Greenville, Box 5928 803-963-7421
Tex Addison, Parvin Sls., Box 307, Addison 214-239-9148
Tex Dallas, Ammon & Champion, Box 34555 214-233-5591
Tex Houston, Ammon & Champion, Box 35552 713-729-1233
Utah Salt Lake City, Elctron. Comp. Sls., 445 E. 2nd St.
Wash Seattle, Arneson Assocs., 5950 Sixth 206-762-7664
For: Can., Mont., Que., Deskin Sls., 1565 Louvain St. W. 514-384-1420
For: Can., Toronto 570, Ont., Deskin Sls., 78 Six Pt. 416-239-4329
EXP: S.C., Greenville, U. C. C-Comps. Dept., Box 5928 803-963-7421

UNION CARBIDE, Mat'ls. Sys. Div., Crystal Prods., 8888 Balboa Ave., San Diego, Cal., 92123, Tel: 714-279-4500 J.J. Beeman

UNION CARBIDE, Mat's. Sys. Div., Coatings Serv., 1500 Polco St., Indpls., Ind., 46224, Tel: 317-241-2311; Sls. Mgr: R. E. Barnhart

UNION INSULATING CO., Box B, Parkersburg, W. Va., 26101, Tel: 304-422-4571; Sls. Mgr: T.E. Graham III

UNION ULTRA-SONICS CORP., 576 Lawrence St., Lowell, Mass., 01852, Tel: 617-458-0066, TWX: 617-458-6396; Sls. Mgr: R.C. Gosselin

UNIQUE WIRE WEAVING CO., 759 Ramsey Ave., Hillside, N.J., 07205, Tel: 201-688-4600; Sls. Mgr: R.D. Purdy

UNIROYAL, INC., 1230 Ave. of Americas, New York, N.Y., 10020, Tel: 212-CI-7-5000, TWX: 212-640-4171

UNISEM, Sub. United Aircraft, Box 11569, Philadelphia, Pa., 19116, Tel: 215-355-5000, TWX: 510-667-1717; Dir. Mktg.: M. Morin .... Pgs. 1550,1551,1846,1847
Ariz Phoenix, Hecht-Henschen, 2435 E. University Dr. 602-275-4411
Cal. Cupertino, Trident Assoc., 10470 Ainsworth Dr. 408-245-7884
Conn Hamden, Impact Sls., 60 Connelly Pkwy. 203-248-9368
Ill Chicago, L-Tec, 5808 W. Higgins 312-286-1500
Mass Waltham, Impact Sls., 223 Crescent St. 617-893-2850
NJ Riverdale, Comp-Tech Sls., Box 50 201-835-0332
NY New Hyde Pk., Comp-Tech Sls., Box 237 516-593-2628
Tex Richardson, Thornton-Leeper, Box 111 214-231-6891
Wash Kirkland, Compar, N.W., 12610 N.W. 104th St. 206-822-4191

UNIT PROCESS ASSEMBLIES, 53-15 37th Ave., Woodside, N.Y., 11377, Tel: 212-899-9090; Sls. Mgr: S.S. Como

UNITED AIRCRAFT CORP., Norden Div., Helen St., Norwalk, Conn., 06856, Tel: 203-838-4471, TWX: 710-468-0788; Sls. Mgr: J.J. Cronan

UNITED AMERICAN METALS DIV., Anchor Alloys, Inc., 970 Meeker Ave., Brooklyn, N.Y., 11222, Tel: 212-ST-2-7090; Sls. Mgr: D. McCann

UNITED DETECTOR TECH., 1732 21st St., Santa Monica, Cal., 90404, Tel: 213-393-3785 Ext. 11; Sls. Mgr: P.H. Davis ....Pg. 1639
Ala Huntsville, Beacon Elctrn., 3322 S. Memorial 205-881-5031
Fla Ft. Lauderdale, Beacon Elctrn., 651 N.E. 45th 305-564-4298
Fla Maitland, Beacon Elctrn., Box 1278 305-647-3498
Ga Atlanta, Beacon Elctrn., 2285 Peachtree NE 404-351-3654
Mich Detroit, Lowry Dietrich, 600 Michigan Bldg. 313-961-4540
NJ Englewood, Scien. Devices-E., 95 Cedar 201-871-3916
NM Albuquerque, Southwestern Engrg. & Equip., 707 1st Nat'l. Bank Blvd., E. 505-265-6775
Ohio Cleveland, Lowry Dietrich, 319 Marion Bldg. 216-781-1855
Ohio Dayton, Lowry Dietrich, 333 W. First St. 513-223-6042
Pa Pittsburgh, Lowry Dietrich, 90 Clairton Blvd. 412-892-2992
Tex Dallas, Southwestern Engrg. & Equip., 6300 N. Central Expwy 214-FM-3-6501
Tex Houston, Southwestern Engrg. & Equip., 4242 Richmond 713-623-2580
Va Falls Church, Beacon Elctrn., 207 Park 703-534-1673

UNITED ELEC. CONTROLS CO., 85A School St., Watertown, Mass., 02172, Tel: 617-WA-6-1000, TWX: 617-092-2445; Sls. Mgr: A.W. Reis, Jr.

UNITED ELCTRN. MFG. CORP., 542 39th St., Union City, N.J., 07087, Tel: 201-UN-5-4452; Pres: C.M. Wolf

UNITED ELCTRNS. CO., 42 Spring St., Newark, N.J., 07104, Tel: 201-484-6300; Pres: M.T. Gasparik

UNITED MINERAL & CHEM. CORP., 129 Hudson St., New York, N.Y., 10013, Tel: 212-966-4330, TWX: 710-581-5799

UNITED-PAGE, 481 Getty Ave., Patterson, N.J., 07503, Tel: 201-279-7500, TWX: 710-988-5917; Sls. Mgr: R. Habermann ....Pg. 1856
Fla Orlando, Scott & Assoc., 1010 Executive Ctr. Dr. 305-841-4840
Ga Tucker, B. Brown, Box 407 404-939-7075
Haw Honolulu, Gene Piety Factors, Box 2903 808-841-0185
Ill Des Plaines, S. Sterling, 1001 E. Touhy Dr. 312-298-4830
Mich Detroit, Hufferd, 16257 Meyers Rd. 313-UN-3-2665
Minn St. Paul, F. Wagner, 542 S. Snelling 612-698-0331

UNITED PRODS. CO., 55 S. Denton Ave., New Hyde Pk., N.Y., 11040, Tel: 516-328-3300; Sls. Mgr: J. Keith Pg. 2508
Cal Milbrae, Melvin Sls., 113 El Camino Real 415-697-6922
Cal Tarzana, R. Capell, Box 723 213-987-2233
Fla Orlando, Barrett Assocs., 1616 N. Orange 305-277-2859
Fla No. Miami, Barrett Assocs., 300 N.W. 123rd St. 305-681-4957
Ill Chicago, Croyden Elctrns., 1915 N. Harlem 312-237-4343
Kans Mission, Midland Engrg., 5460 Buena Vista 913-CO-2-6565
NH No. Conway, D & P Engrg., Ledgeview Dr. 603-356-5908
NY Great Neck, ERA, 330 Great Neck Rd. 516-HU-2-9320
NY Rochester, L. G. Marchese, 999 Ridge Rd. E. 716-342-7664
Tex Dallas, Evans & McDowell, Box 35093 214-351-1839
Wash Seattle, R. Johnston, 1011 N.E. 69th St. 206-524-5170

Advertisement

United Products Company manufactures a complete line of the finest quality electronic components and hardware. Products include; coil forms, solder terminals, resistor bobbins, terminal boards, Sub-miniature PC, IF-RF can assemblies metalized and ceramin components and custom-made assemblies. Write for Master Catalog UP-118 and Solder Terminal Catalog UP-119

UNITED RESCH. LAB., CORP., 681 Fifth Ave., New York, N.Y., 10022, Tel: 212-PL-1-4663; Sls. Mgr: A. Adams

UNITED SENSOR & CONTROL CO., 85 School St., Watertown, Mass., 02172, Tel: 617-296-1000, TWX: 617-092-2445; Sls. Mgr: A.W. Reis, Jr.

UNITED STATES STEEL CORP., 600 Grant St., Pittsburgh, Pa., 15230, Tel: 412-433-1121; Sls. Mgr: M.D. Mann

UNITED SYS. CORP., 918 Woodley Rd., Dayton, Ohio, 45403

UNITED TELECONTROL ELCTRNS., 3500 Sunset Ave., Asbury Park, N.J., 07712, Tel: 201-922-1000; Sls. Mgr: W.A. Wheatley

UNITED TRANSFORMER CO. DIV. OF TRW INC., 150 Varick St., New York, N.Y., 10013, Tel: 212-255-3500, TWX: 710-581-2722 .... Pgs. 1533,2988,2989
Ariz Scottsdale, TRW, 77 W. 3rd Ave. 602-947-5791
Cal Danville, Straube, 401 S. Harte Ave. 415-837-8151
Cal Los Angeles, TRW Elctrns. Sls. Off., 5410 W. Imperial 213-673-5262
Cal San Diego, Transdynamics, 3108 5th Ave. 714-298-8215
Colo Boulder, Straube Assocs., Inc., Box 1649 303-443-8600
Conn New Haven, Gerber Sls. Co., Inc., 31 Broadway 203-777-6279
Fla Orlando, TRW, 3203 Lawton Rd. 305-841-2982
Ill Chicago, J. G. Twist Co., 5222 W. Diversey Ave. 312-777-2250
Iowa Cedar Rapids, Lorenz Sls., Inc., 4403 First Ave. 319-366-0774
Md Hyattsville, L.D. Lowery, Inc., 6200 Annapolis Rd. 301-773-4977
Mass Waltham, Gerber Sls. Co., Inc., 176 Second Ave. 617-891-8040
Minn St. Paul, Northport Engrg., Inc., 2027 Grand Ave. 612-698-3841
Mo Clayton, L.R. Harry & Assoc., Inc., 7603 Forsyth 314-727-6123
Mo Grandview, L.R. Harry & Assoc., Inc., Box 288 816-763-3634
NY Garden City, Comtronic Assocs., 370 Old Country Rd. 516-741-8966
NY Rochester, TRW, Box 9962
Ohio Cincinnati, R.O. Whitesell & Assocs., Inc., 1172 W. Galbraith 513-521-2290
Ohio Dayton, R. O. Whitesell & Assocs., 4133 S. Dixie Ave. 513-298-9546
Pa Broomall, L.D. Lowery, Inc., 2801 W. Chester Pike 215-356-5300
Pa Pittsburgh, R. O. Whitesell & Assocs., 201 Penn Ctr. Blvd. 412-242-0100
Tex Houston, Vista Engrg., 1614 S. Post Oak Rd. 713-622-5680
Tex Richardson, Vista Engrg., 777 S. Central Expwy. 214-235-4547
Wash Bellevue, N.R. Schultz, Box 157 206-454-0300
For: Can., Agincourt, Ont., A.C. Simmonds & Sons, Ltd., 285 Yorkland Blvd. 416-445-9111

UNITEK CORP., Weldmatic Div., 1820 S. Myrtle Ave., Monrovia, Calif., 91016, Tel: 213-358-0123, TWX: 910-585-3236; Mktg. Mgr: D.B. Dik

UNITRODE, 582 Pleasant St., Watertown, Mass., 02172, Tel: 617-926-0404, TWX: 710-327-1296; Sls. Mgr: W. Schromm ....Pgs. 1566,1848-1855
Ala Huntsville, 20th Century Mktg., Box 6127 205-772-9237

Ariz Scottsdale, Compar Rocky Mtn., 7106 First 602-947-4336
Cal Burbank, Compar L.A., 2908 Naomi Ave. 213-843-1772
Cal Burlingame, Compar San Fran., 820 Airport 415-347-5411
Colo Denver, Compar Rocky Mtn., 4600 E. Asbury 303-757-7621
Colo Littleton, Simpson Assoc., 2552 Ridge 303-798-8439
Conn Hamden, Compar New England, 2531 Whitney Ave. 203-288-9276
Conn No. Haven, Kitchen & Kutchin, 22 Broadway 203-239-0212
Fla Oviedo, Conley & Assocs., Box 668, W. Broadway 305-365-3283
Fla Tampa, Conley & Assocs., 2821 Kimberly La. 813-933-3183
Ill Chicago, Carlson Elctrns., 7448 N. Harlem 312-774-0277
Md Lutherville, Daniel & Co., Box 124 301-825-3330
Mass Lexington, Kitchen & Kutchen, 17 Waltham St. 617-862-8230
Mich Grand Rapids, Urban-Ferris Co., Box 7391 616-245-0511
Mich Southfield, Urban-Ferris Co., 21711 W. Ten Mile Rd. 313-354-9066
Mass Newton Highlands, Compar New England, 88 Needham St. 617-969-7140
Minn Mpls., Compar Twin Cities, Box 16095 612-922-7011
Mo St. Louis, Carlson Elctrn. Sls. Co., 453 N. Lindbergh 314-991-0262
NJ Clifton, Compar N.Y., 404 Clifton Ave. 201-473-2660
NM Albuquerque, Compar Rocky Mountain, 2129 San Mateo Blvd., N.E. 505-265-1020
NY Albany, Compar Albany, 6 Highland Ave. 518-489-7408
NY Endwell, Compar Albany, Box 135 607-723-8743
NY Fairport, Compar Albany, 42 Winding Brook Dr. 716-271-2230
NY Cicero, Compar Albany, 5850 Glendora 315-471-3356
NC Burlington, P.J. Nahser, 2709 Amherst Ave. 919-226-8053
Ohio Cleveland, Gibson Elec. Mktg., 26100 Brush Ave. 216-731-8330
Ohio Dayton, Gibson Elec. Mktg., 122 W. Park 513-433-4055
Pa Glenside, Daniel & Co., 231 So. Eastern Rd. 215-887-0550
Tex Dallas, Compar Southwest, 8609 N.W. Plaza Blvd. 214-363-1526
Tex Houston, Compar Southwest, 5757 Bellaire Blvd. 713-667-3420
Wash Kirkland, Compar Northwest, 12610 N.E. 104th 206-822-4191
For: Can., Downsview, Ont., Kaytronics Engrg., 1001 Finch Ave., W. 416-638-5511
For: Can., Montreal 267, Que., Kaytronics Engrg., 7370 Cote St. Luc 514-487-3434

UNITRODE CORP., Microwave Div., 580 Pleasant St., Watertown, Mass., 02172, Tel: 617-926-0404, TWX: 710-327-1296 .... Pgs. 1566,1848-1855
Ariz Scottsdale, Compar Rocky Mtn., 7106 First St. 602-947-4336
Cal Arcadia, J.E. Hachten Co., 650 W. Duarte Rd. 213-681-2361
Cal Palo Alto, J.E. Hachten Co., 800 Welch Rd. 415-326-1252
Colo Littleton, Simpson Assocs., 2552 Ridge Rd. 303-798-8439
Fla Oviedo, Conley & Assocs., Box 668 W. Broadway
Fla Tampa, Conley & Assocs., Box 18662 813-822-0161
Ill Park Ridge, R.F. Specialists, 118 W. Higgins Rd. 312-698-2044
Ind New Haven, R.F. Specialists, 610 Professional Park Dr. 219-749-0379
Md Laurel, V.P.I. Assocs., 13001 Mistletoe Spring Rd. 301-792-7631
NM Albuquerque, Compar Rocky Mtn., 2129 San Mateo Blvd. NE 505-265-1020
NY Dewitt, db Assocs., Box 14 315-446-0220
NY Great Neck, V.P.I. Assocs., 300 Northern Blvd., Suite 17 516-482-8388
Ohio Cleveland, Gibson Elec. Mktg., 26100 Brush Ave. 216-731-8330
Ohio Dayton, Gibson Elec. Mktg., 122 W. Park Rd. 513-433-4055
Pa Montgomerville, V.P.I. Assocs., Box 542 215-474-3200
Tex Dallas, Vidal Elctrns., 11411 N. Central Expwy. 214-369-6404
Wash Kirkland, Compar NW, 12610 N.E. 104th St. 206-822-4191
EXP: Can., Downsview, Ont., Kaytronics Engrg., 1001 Finch Ave. W. 416-638-5511
EXP: Can., Montreal 267, Que., Kaytronics Engrg., 7370 Cote St. Luc 514-487-3434

UNITRON, Div. Elec. Mach. Mfg. Co., 1624 N. First St., Box 1331, Garland, Tex., 75040, Tel: 214-276-8591, TWX: 910-860-5195; Sls. Mgr: W.L. Ford .... Pgs. 935-937
UNITRON INDS. CORP., 61-1 NanKing West Rd., Taipei, Taiwan, Republic of China, Tel: 513216; V.P: A. Chew

Advertisement

Unitron of Formosa will fabricate and assemble Solid-State components and electromechanical devices for you now at the lowest competitive price with prompt delivery. Guaranteed 85% minimum assembly yield of semiconductor devices in various packages including cerdip, plastic, flatpack, metal can, and epoxy. Unitron also manufactures IC function tester, IC die bonder, core memory plane, regulated power supply, electric clock, electronic counter and other electronic equipment and subsystems.

UNITRON INSTR. CO., 66 Needham St., Newton Highlands, Mass., 02161, Tel: 617-969-8600; Sls. Mgr: H. Keys

UNIVERSAL AD-YU ELCTRNS., INC., 249-259 Terhune Ave., Passaic, N.J., 07055, Tel: 201-472-5622; Gen'l. Mgr: W. Timm .... Pgs. 579,2752
Cal Burbank, R. Olander, Box 1485 213-843-5200
Cal Santa Clara, R. Olander, 1400 Coleman 408-247-1788
Conn Southport, E.E. Specialists, 134 Old Post Rd. 203-327-3275
Ill Northfield, Laub Engrg., Box 8 312-446-4166
Kans Leawood, G. Vasen, 8005 Ensley La. 913-649-0679
Md Landover Hills, E C I, 6200 Annapolis Rd. 301-322-1412
Mass Acton, E. E. Specialists, Inc., Box 956 617-259-9200
Mich Ypsilanti, Micro Sls., 650 Green Lawn 313-482-0880
Minn St. Paul, Electro Prods., Griggs-Midway Bl. 612-690-1146
Mo St. Louis, G. Fixman, 8160 Stanford 314-725-5219
NM Albuquerque, Elctrn. Entprs., 5206 Constitution 505-256-3561
NM Las Cruces, Elctrn. Enterprises, Box 116 505-524-0126
Ohio Cleveland, Micro Sls. Corp., 2000 Lee Rd. 216-371-0522
Ohio Dayton, Micro Sls., 1250 W. Dorothy 513-298-3033
Pa Philadelphia, E C I, 1349 W. Cheltenham 215-927-6262
Utah Salt Lake City, Applied Engrg. Prods. Co., 6375 Emigration Canyon 801-364-4942
Wash Seattle, Dewar & Assocs., 6361 First Ave. 206-763-2233
UNIVERSAL-AUTOMATIC CORP., 2064 S. Mannheim Rd., Des Plaines, Ill., 60018, Tel: 312-296-6181; Sls. Mgr: W.D. Moyer
UNIVERSAL DRAFTING MACH., 5200 Richmond Rd., Bedford Hgts., Ohio, 44146, Tel: 216-292-7550; Sls. Mgr: R.C. Kielpinski
UNIVERSAL ELEC. CO., Sub. ESB, 300 E. Main St., Owosso, Mich., 48867, Tel: 517-723-7866; Dir. Mktg: A.E. Kerscher

UNIVERSAL ELCTRNS. CO., 17811 Sky Park Cir., Irvine, Cal., 92664, Tel: 714-540-5249; Sls. Mgr: E. Lacey Pgs. 938,939
Ariz Scottsdale, Elctrn. Entprs., 45 W. First Ave. 602-946-9860
Cal Irvine, Universal Elctrns., 17811 Sky Park Cir. 714-540-5249
Ind Ft. Wayne, Scott Elctrns., 124 W. Wash. 219-743-1586
Ind Indianapolis, Scott Elctrns., 1300 N. Penn. Ave. 317-635-8951
Ky Louisville, Scott Elctrns., 334 Francis Bldg. 502-583-3220
Minn Mpls., Tec-Sls., 9906 Chicago Ave. S. 612-884-1180
NH Salem, Bilowich Entprs., 96A Forest La. Pk. 603-898-5408
NM Albuquerque, Elctrn. Entprs., 5206 Constitution Ave., N.E. 505-524-0126
NY Buffalo, J.M. Glass Assocs., 220 Delaware Ave. 716-856-9272
Ohio Cincinnati, Scott Elctrns., 9595 Montgomery Rd. 513-791-2513
Ohio Cleveland, Scott, 1836 Euclid Ave. 216-861-2626
Ohio Columbus, Scott, 79 E. State 614-228-2313
Ohio Dayton, Scott, 517 Hulman 513-223-2652
Pa Phila., W.F. Assocs., Box 8821 215-224-4120
Pa Pittsburgh, Scott, 313 Empire Bldg. 412-471-5233
Wisc Greefield, Richter Assocs., Box 5873 414-281-6798

Advertisement

Universal Electronics' Techni-Kit Division offers the only complete line of DC power supply kits on the market. Over 450 models, regulated & unregulated, are available with ratings from 0-125 vdc @ 0-75A. They are easily assembled at savings of 50%. Integrated circuits used exclusively. Wired modules also available.

UNIVERSAL INSTRS., 139 E. Frederick St., Binghamton, N.Y., 13902, Tel: 607-772-1710, TWX: 510-252-1990; Sls. Mgr: G.C. Mayo
UNIVERSAL MFG. CO., INC., 1168 Grove St., Irvington, N.J., 07111, Tel: 201-374-9800, TWX: 710-995-4647; Sls. Mgr: U. Rachner
UNIVERSAL MOTOR DIV., Medalist Inds., Box 180, 1552 Harrison St., Oshkosh, Wisc., 54902, Tel: 414-231-7440; Sls. Mgr: J.J. Salas
UNIVERSAL PRODS. ENGRG., 1230 Racine St., Racine, Wisc., 53403, Tel: 414-637-2527
UNIVERSAL RELAY CORP., 42 White St., New York, N.Y., 10013, Tel: 212-925-6900, TWX: 710-581-4461; Sls. Mgr: S. Soloway
UNIVERSAL RESCH. LABS., 2436 Delat La., Elk Grove Village, Ill, 60007, Tel: 312-766-0612; Sls. Mgr: E.L. Polanek
UNIVERSAL SHELLAC & SUPPLY CO., INC., 495 W. John St., Hicksville, NY, 11861, Tel: 516-935-4000; Sls. Mgr. T. T. Klos
UNIVERSAL TRANSISTOR PRODS., Div. Link, 380 Oak St., Copiague, N.Y., 11726, Tel: 516-MY-1-8055; Sls. Mgr: A.D. Kott

UNIVERSAL VOLTRONICS CORP., 27 Radio Cir. Dr., Mt. Kisco, N.Y., 10549, Tel: 914-241-1300; Sls. Mgr: B. Ressler .... Pgs. 940,941
Cal Inglewood, C. Fowler, 9911 Inglewood 213-678-5211
Cal Menlo Pk., C. Fowler, 845 Oak Grove 415-322-5374
Colo Boulder, C. W. Fowler Co., 1345 Spruce 303-449-2141
Ill N. Chicago, Torkelson Assoc., 540 W. Frontage 312-446-9085
Ind Indpls., Torkelson, 3512 Rockville 317-244-7867
Iowa Clear Lake, W.M. Bachman, Box 107 515-357-4664
Mass Lexington, W. Hague 10 Muzzey 617-862-5700
Minn Mpls., R.J. Sls., Box 6172 612-922-1425
NM Albuquerque, C. Fowler, 2622 San Mateo 505-299-7676
Pa King of Prussia, Letronix, 251 W. DeKalb 215-265-1020
Va Falls Church, Jay, 2914 Annandale 703-534-7800
Wash Bellevue, C. Fowler, 845 106th 206-454-8600
UNIVERSITY SOUND, Altec Div. LTV Ling Altec, 1515 S. Manchester, Anaheim, Cal., 92803, Tel: 405-SU-9-1220, TWX: 714-774-0251; Dist. Sls. Mgr: F. Jones
U.O.P. INSTRS. DIV., Box 2001, Greenwich, Conn., 06830, Tel: 203-531-8400, TWX: 710-579-2924
UPPCO, INC., 900 S. Des Plaines, Chicago, Ill., 60607, Tel: 312-HA-7-4805; Sls. Mgr: D. Swin
UP-RIGHT SCAFFOLDS, Div. Up-Right, Inc., 1013 Pardee St., Berkeley, Calif., 94710, Tel: 415-843-0770, TWX: 415-891-9272; Sls. Mgr: R.L. Esken
UPSON TOOLS, INC., P.O. Box 4750, Rochester, N.Y., 14612, Tel: 716-663-5373; Sls. Mgr: H.H. Velepec

USCC/CENTRALAB, ELCTRNS. DIV., Globe-Union, Inc., 2151 N. Lincoln St., Burbank, Cal., 91504, Tel: 213-843-4278, TWX: 910-498-2222; Sls. Mgr: F. Fry Pgs. 1532,2477
Ala Huntsville, Rep., Inc., 8100 S. Memorial 205-881-9270
Ariz Phoenix, Jarko, 2032 N. 27th Ave. 602-272-2684
Cal Santa Clara, Cal-Tronix, 916 DiGiulio 408-296-1366
Colo Denver, Brown Tech., 130 S. Yarrow 303-233-0863
Fla Pompano Bch., Dyna-Mark, 1010 E. Atlantic 305-942-4041
Ga Atlanta, Rep., Inc., 1483 Monroe Dr., 404-876-1591
Ill Chicago, H.S. Tollaksen, 304 S. Halstead 312-236-2964
Iowa Cedar Rapids, Tech. Assocs., 110 31st 319-365-9162
Kans Shawnee Mission, Thomas-Modrcin, 5450 Buena Vista 913-432-2131
Md Glen Burnie, Faion Lott, Box 534 301-744-4611
Mass Needham, Hatch, 1233 D Highland Ave. 617-444-3310

Minn Mpls., Technical Assocs., 6121 Excelsior 612-929-6721
NJ Haddonfield, Thomas, 138 Haddon 609-854-3011
NY Great Neck, E.R.A., 330 Great Neck 516-482-9320
NY N. Syracuse, Advanced Comps., S. Bay 315-699-2671
Ohio Dayton, R.G. Sidnell, 330 S. Dixie 513-293-1194
Tex Richardson, J.R. Lavender, 725 S. Central 214-231-5040
Wash Bellevue, H.S. Thorpe Co., Box 1117 206-454-0667

U.S. ELCTRNS., 321 Orient Way, Lyndhurst, N.J., 07071, Tel: 201-438-2400; Sls. Mgr: S. Horbach

U.S. POLYMERIC, Hitco Co., Canal & Ludlow Sts., Stamford, Conn., 06904, Tel: 203-324-7545, TWX: 910-595-1130; Sls. Mgr: R. Izzi

U.S. SCIENTIFIC INSTRS., 36 Pleasant St., Watertown, Mass., 02172, Tel: 617-923-0940; Sls. Mgr: S. Eric Kondi

U.S. TERMINALS, INC., 7502 Camargo Rd., Cincinnati, Ohio, 45243, Tel: 513-561-8145, TWX: 810-461-2290; Sls. Mgr: G. Stepp

U.S. TESTING CO., INC., 1415 Park Ave., Hoboken, N.J., 07030, Tel: 201-792-2400; Sls. Mgr: A.F. Maxfield

USM CORP., Fastener Div., 510 River Rd., Shelton, Conn., 06484, Tel: 203-735-3391, TWX: 710-451-3734; Gen'l. Mgr: W.F.G. Dawson

USM CORP., Gear Sys. Div., 81 Bay State Rd., Wakefield, Mass., 01880, Tel: 617-245-4900, TWX: 710-347-1393; Sls. Mgr: A.V. Fitzwater

UTAH ELCTRNS., Div. Utah American Corp., 1124 E. Franklin St., Huntington, Ind., 46750, Tel: 219-356-5800; Sls. Mgr: T. Pyle

UTICA TOOL CO., INC., Cameron Rd., Orangeburg, S.C., 29115, Tel: 803-534-7010, TWX: 810-664-2460; Sls. Mgr: R.L. Carlson

UTILITIES SVC. CO., P.O. Box 627, Allentown, Pa., 18105, Tel: 215-434-9541; Gen'l. Mgr: E.J. Danko

V-M CORP., 305 Territorial Rd., Benton Harbor, Mich., 49022, Tel: 616-925-8841, TWX: 616-925-3557; Mktg. Mgr: M.B. Cain

VAC-OHM ELCTRNS. CO., P.O. Box 444, Haddonfield, N.J., 08033, Tel: 609-428-0001; Sls. Mgr: N. Williams

VACCO ELECTRONICS, 10350 Vacco St., S. El Monte, Calif., 91733, Tel: 213-283-0331, TWX: 910-587-3441; Sls. Mgr: G. Kay

VACO PRODS. CO., 510 N. Dearborn St., Chicago, Ill., 60610, Tel: 312-467-0123, TWX: 910 221 2231; Sls. Mgr: B. Broude ....Pg. 2944

VACTEC, 2423 Northline Ind'l. Blvd., Maryland Hgts., Mo., 63043, Tel: 314-872-8300; Sls. Mgr: M.D. Levy Pg. 1640
Cal Encino, King-Way Assocs., 17100 Ventura 213-788-4124
Cal Santa Barbara, E.B. Schwerin, 4922 La Gama Way 805-967-7317
Colo Broomfield, Arrowhead, R.R. 1, Box 335 303-222-6462
Conn Madison, A & M Elctrn. Reps., Ailene Dr. 203-245-1031
Fla Orlando, Buchanan & Abrams, Box 6026 305-423-8995
Ill Chicago, T.B. Hunter, 5653 W. Irving Pk. 312-777-2500
Ind Ft. Wayne, Tech. Line, 2512 East Dr. 219-743-5371
Iowa Cedar Rapids, Engrg. Svcs., 1026 3rd 319-366-1591
Kans Prairie Village, Engrg. Svcs. Co., 7924 A State Line 913-649-4000
Md Baltimore, R. L. Wilkinson, 707 Stevenson LA. 301-377-7800
Mass Needham, A & M Elctrn. Reps., 1492 Highland Ave. 617-444-8170
Mich Detroit, H. Mysing, 18450 W. McNichols 313-537-5460
Minn Mpls., M. Foster, 228 S. Cedar Lake Rd. 612-374-2612
Mo St. Louis, Engrg. Svcs., 6717 Vernon 314-726-2233
NM Albuquerque, Arrowhead Sls., Box 243 505-855-4561
NY Syracuse, C.W. Beach, 120 Ramsey Ave. 315-446-9587
Ohio Cleveland, E. Frost, 30170 S. Woodland 216-831-1442
Pa Willow Grove, Tech. Parts, 81 Old York 215-657-0100
Tex Dallas, Allied Comps., Box 38009 214-348-6660
Tex Houston, Allied Comps., 6400 Westpark 713-782-5406
Utah Salt Lake City, Arrowhead, 49 W. Malvern 801-487-3444
Va Lynchburg, Royelec Elctrns., Box 254 703-846-7717
Wash Seattle, Blair Hirsh, 4013 Leary Way 206-783-3423
EXP: Mass., Plainville, Teknis 617-695-3591
For: Can., Montreal, Que., Ben-Manis Assoc., 2690 Pitfield Blvd. 514-336-4500

VACTRONIC LAB. EQUIP., INC., 65 Brightside Ave., E. Northport, N.Y., 11731, Tel: 516-AN-1-2660; Sls. Mgr: R. Morris

Advertisement

In many cases it costs much less to order that special manifold, flange assembly, adaptor, or pumping system, than to buy the separate components required and do the assembly yourself. Either way Vactronic stands ready to service your requirement. Choose from our broad line of high vacuum components, or send us your sketch and let us quote on the complete assembly; cleaned, leak-checked, and ready for service.

VACUUM EQUIP. DIV., Norton Co., 160 Charlemont St., Newton, Mass., 02161, Tel: 617-332-5800; Sls. Mgr: J.J. Flood

VACUUM INDS., INC., Sub. GCA Corp., 34 Linden St., Somerville, Mass., 02143, Tel: 617-666-5450, TWX: 710-348-0106; Sls. Mgr: John H. Durant

VACUUM PRODS., INC., 25 Dock St., Mt. Vernon, N.Y., 10550, Tel: 914-664-7330; Sls. Mgr: G.D. Frank

VACUUM RESCH. MFG., 3100 Crow Cal. Rd., San Ramon, Cal., 94583, Tel: 415-837-7241; Sls. Mgr: N.A. Carter

VALCOR ENGRG. CORP., 365 Carnegie Ave., Kenilworth, N.J., 07033, Tel: 201-245-1665, TWX: 710-996-5976; Sls. Mgr: M. Maslow

VALIDYNE ENGRG. CORP., 18819 Napa St., Northridge, Cal., 91324, Tel: 213-886-8488; Sls. Mgr: M.J. Kopp

VALPEY CORP., 1400 Highland St., Holliston, Mass., 01746, Tel: 617-429-4322, TWX: 710-346-6700; Sls. Mgr: T. Gallagher

VALVERDE LABS., 60 Main St., Oakfield, N.Y., 14125, Tel: 716-948-3251; Sls. Mgr: F.D. Betters

VANGUARD ELCTRNS., Div. Wyle Labs., 930 W. Hyde Pk. Blvd., Inglewood, Cal., 90302, Tel: 213-678-7161, TWX: 910-328-6126; Sls. Mgr: G. McHale

VANGUARD RELAY CORP., 225 Cortland St., Lindenhurst, N.Y., 11757, Tel: 516-884-5000; Sls. Mgr: B.S. Gilman

Advertisement

VANGUARD manufactures an extensive line of general purpose relays and time delay modules covering a broad spectrum of industrial applications. Relay types from 1 to 4 poles and 2 to 20 amps. Models include open, plug-in, enclosed, printed circuit use, antenna, sensitive and contactor. Time delay relays are plug-in, enclosed units with solid state timing circuit and relay output, with some models available from stock. All VANGUARD products are quality engineered and produced, competitively priced with dependable deliveries. Full literature available upon request.

VANTON PUMP & EQUIP. CORP., 201 Sweetland Ave., Hillside, N.J., 07025, Tel: 201-688-4120; Sls. Mgr: G. Ryan

VAR-LAC-OID CHEMICAL CO., 666 S. Front St., Elizabeth, N.J., 07202, Tel: 201-289-3630; Sls. Mgr: I.E. Behrman

VARADYNE PACKAGING & MAT'LS., Div. Varadyne, Inc., 2110 Broadway, Santa Monica, Cal., 90404, Tel: 213-394-0271 Ext. 240, TWX: 910-343-6856; Sls. Mgr: D. Herrell

VARADYNE POWER SYS., Div. Varadyne, 19749 Bahama St., Northridge, Cal., 91324, Tel: 213-882-9311 Pg. 934

VARADYNE SYSTEMS, Div. Varadyne, 1020 Turnpike St., Canton, Mass., 02021, Tel: 617-828-6395, TWX: 710-348-0135 ....Pg. 385
Ala Huntsville, Col-Ins-Co., Box 4246 205-539-1771
Cal Burlingame, Dynamic Assocs., 822 Airport Blvd. 415-344-2521
Cal Culver City, JSH Elctrns., Box 407 213-870-4616
Cal Los Angeles, Dynamic Assocs., 2500 S. La Cienega Blvd. 213-837-0123
Cal San Diego, Dynamic Assocs., 836 E. Washington St. 714-291-1391
Colo Denver, Space Sys. Sls. & Engrg., 5810 W. 38th Ave. 303-424-5574
Conn Naugatuck, J & J Assocs., 80 Heritage Rd. 203-624-7800
Fla Orlando, Col-Ins Co., Box 13189 305-423-7615
Ill Chicago, Megatek Inc., 1915 N. Harlem Ave. 312-889-1277
Kans Leavenworth, McGraw Engrg., 512 McDonald Rd. 913-651-2929
Mass Burlington, J & J Assocs., 12 Cambridge St. 617-272-2606
Mich Detroit, Hocker Assocs., 26847 Grand River Ave. 313-531-1403
Minn Hopkins, Megatek Inc., 128 N. Jackson St. 612-935-5243
Mo Florissant, McGraw Engrg., Box 511 314-831-0342
NJ Ft. Lee, TMA, 4 Horizon Rd. 201-224-6911
NM Albuquerque, Base Sys. Sls. & Engrg., 4005 University Blvd S.E. 505-255-7058

VARFLEX CORP., 514 W. Court St., Rome, N.Y., 13440, Tel: 315-336-4400; Sls. Mgr: J.H. Finnegan ....Pg. 2813
Ariz Phoenix, Elec. Specialty, 202 SO. 29th St. 602-275-5739
Cal Los Angeles, Electrical Spec. Co., 2820 E. 12th St. 213-269-9511
Cal So. San Francisco, Electrical Spec. Co., 213 E. Harris Ave. 415-589-9611
Colo Denver, Elec. Specialty, 2026 Arapahoe St. 303-244-4588
Ga Chamblee, Prehler Elec. Insulation, 6030 Peachtree Rd. 404-451-4266
Ill Chicago, Prehler Elec. Insulation, 2300 N. Kilbourn Ave. 312-384-6100
Ky Louisville, E & H Elec. Supply, 804 S. 5th 502-587-0991
Mass Nahant, F.H. Hart, 115 Pond St. 617-581-0381
Minn St. Paul, Prehler Elec. Insulation, 935 Bush 612-776-1541
Mo University City, E.P. Gund, 6403-15 Maple 314-862-1650
NY Carle Pl., W. R. Murphy, Box 177 516-333-6122
NY Liverpool, W.T. Elliott, 16 Forester Rd. 315-652-3690
Ohio Cleveland, Prehler Elec. Insulation, 12200 Brookpark Rd. 216-267-2650
Ore Portland, Elec. Specialty, 2360 N.W. Quimby 503-227-3601
Pa Ardmore, Martin Elec. Co., 118 Valley Rd. 215-649-6332
Pa Phila., Prehler Elec. Insulation, 5698 Rising Sun 215-725-5913
Pa Pittsburgh, E.B. Beach Co., Verona Rd. 412-242-0400
Wash Seattle, Elec. Specialty, 2442 1st Ave., S. 206-682-3434
For: Can., Toronto, Ont., Elec. Insulation & Fibre Co., Ltd., 24 Mendota Rd. 416-251-1174

VARI-L CO., INC., 3883 Monaco Pkwy., Denver, Colo., 80207, Tel: 303-321-1511, TWX: 910-931-0590; Sls. Mgr: J.H. Kiser .... Pgs. 1534,1568-1570,2509,2990,2991
Cal Los Altos, Parsons Co., One First St. 415-941-4745
Cal San Diego, Interstate Mktg., 4440 Ranier 714-283-7519
Cal Woodland Hills, Interstate Mktg., 22030 Ventura 213-883-7606
Colo Denver, Bennewitz, 2801 E. Cofax 303-399-1132
Kans Leawood, H.C. Heyde, 9221 Wenonga 913-649-8628
Md Beltsville, C.E. Snow, 10442 Baltimore 301-345-2211
Fla Ft. Lauderdale, C.E. Snow, 3109 N.E. 25th 305-563-2448
Mass Burlington, Tritek, 165A Bedford 617-272-4550
Mich Southfield, T. Luebbe, 20905 Greenfield 313-357-0355
NM Albuquerque, Bennewitz, 532 N. Brown 505-299-8651
NY Fayetteville, Graydon-Sherman, Davis Bldg. 315-637-9861
NY Hicksville, Salsbury, 337 W. John St. 516-938-1080
Ohio Cincinnati, Luebbe Sls., 2649 Erie Ave. 513-871-4211
Pa Phila., Applied Engrg., 8605 Bayard 215-247-9007
Tex Dallas, Texas Avionics, 4515 Prentice 214-EM-3-6324
Wash Seattle, D. Smith, 2320 N. 45th St. 206-633-3160
EXP: N.Y., NY, S. Ginsbury, 425 Park S. 212-689-5212

VARI-LIGHT CORP., Sub. Polacoat Inc., 9770 Conklin Rd., Cincinnati, Ohio, 45242, Tel: 513-791-6330

VARIAN AEROGRAPH, 2700 Mitchell Dr., Walnut Creek, Calif., 94598, Tel: 415-939-2400, TWX: 910-385-6301; Mktg. Mgr: R.H. Thompson

VARIAN ASSOCS., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-326-4000, TWX: 910-373-1731

VARIAN ASSOCS., Analytical Instr., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-326-4000, TWX: 910-373-1731; Sls. Mgr: W. Wright
VARIAN ASSOCS., Eastern Tube Div., 8 Salem Rd., Beverly, Mass., 01915, Tel: 617-922-6000, TWX: 710-347-1394; Sls. Mgr: R.W. Andrews
VARIAN ASSOCS.ELECTRON TUBE & DEVICE GRP., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-326-4000, TWX: 910-373-1731; Sls. Mgr: R.T. Orth
VARIAN ASSOCS., Radiation Div., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-326-4000; Sls. Mgr: R. Lavine
VARIAN ASSOC., Solid State Div., Micro-Link Prods., 8 Salem Rd., Beverly, Mass, 01915, Tel: 617-922-6000, TWX: 710-347-1394; Sls. Mgr: D.D. Milne
VARIAN ASSOCS., Travel Wave Tube, 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-326-4000, TWX: 910-373-1731; Sls. Mgr: R. Wolfe
VARIAN ASSOCS., Vacuum Div., 611 Hansen Way, Palo Alto, Cal., 94303, Tel: 415-326-4000, TWX: 910-373-1731; Mktg. Mgr: M. McGarr
VARIAN DATA MACHINES, 2722 Michelson Dr., Irvine, Cal., 92664, Tel: 714-833-2400, TWX: 910-596-1358; V.P. Mktg: H. Stover

Advertisement

VARIAN AEROGRAPH manufactures analytical gas and liquid chromatographs, and a complete line of supporting accessories including strip chart recorders, X-Y recorders, electronic digital integrators, computer-based data processing systems for multiple unit chromatograph laboratories, chemicals and supplies for these instruments.

VARIAN DATA MACHINES, Graphics & Data Sys., 611 Hansen Way, Palo Altu, Cal., 94304, Tel: 415-326-2535, TWX: 910-373-1731; Sls. Mgr: R.A. Pecotich
VARIAN, Solid State Div., Salem Rd., Beverly, Mass., 01915, Tel: 617-922-6000, TWX: 710-347-1394; Sls. Mgr: T. Soldano, Jr.
VARIED IND'L. PRODS., INC., 445 Fifth Ave., Paterson, N.J., 07514, Tel: 201-279-2334; Pres: E. Nemeth
VARO, INC., Electrokinetics Div., 402 E. Gutierrez St., Santa Barbara, Cal., 93102, Tel: 805-963-2055, TWX: 910-334-1177; Mktg. Mgr: N.G. Otis
VARO, INC., Electron Devices Div., 2203 Walnut St., Garland, Tex., 75040, Tel: 214-272-3561, TWX: 910-860-5194; Sls. Mgr: C.M. Wood
VARO, INC., Semiconductor Div., 1000 N. Shiloh Rd., Garland, Tex., 75040, Tel: 214-272-4551, TWX: 910-860-5178; Sls. Mgr: H. Hess
VARO, INC., Texas Div., 2201 Walnut, Garland, Tex., 75040, Tel: 214-276-6141, TWX: 910-860-5093; Mktg. Mgr: L.C. Woodhouse

VECTOR ELCTRN. CO., INC., 12460 Gladstone Ave., Sylmar, Cal., 91342, Tel: 213-365-9661, TWX: 910-496-1539; Sls. Mgr: F.L. Hill ....Pg. 2722
EXP: Cal., Santa Monica, Trans-World Trade, Box 1037

VECTOR ENGRG., 58 Brown Ave., Springfield, N.J., 07081, Tel: 201-379-7800, TWX: 710-983-4448; Gen'l. Mgr: M.A. Spalletta ....Pgs. 942,943
Conn Meriden, Abbott-Allison Co., Inc., Box 467 203-237-9232
Fla Orlando, E C A Assocs., 711 N. Magnolia Ave. 305-424-0701
Ga Smyma, F. Fassett & Co., Inc., Box 278 404-436-5169
Ill Chicago, Crest Assocs., Inc., 7001 N. Clark St. 274-2640
Ohio Cleveland, F.R. Sharp Co., Inc., 14904 Euclid Ave. 216-249-7000
Tex Houston, Scientific Sls. Co., 6400 Westpark Dr. 713-781-2711
Tex Richardson, Scientific Sls. Co., 777 S. Central Expwy. 214-231-6541
VECTROL, INC., 1010 Westmore Ave., Rockville, Md., 20850, Tel: 301-424-6900; Sls. Mgr: R. Mitchell

VECTRON LABS., INC., 121 Water St., Norwalk, Conn., 06854, Tel: 203-853-4433; Sls. Mgr: A.I. Camhi Pg. 1433
Ala Huntsville, FM Assocs., Box 1368 205-772-3668
Cal Los Angeles, Fetty/Schoenduve, 7407 Melrose 213-651-4050
Cal Palo Alto, Fetty/Schoenduve, 253 Town & Country Vlg. 415-321-7041
Colo Loveland, Kelley Entprs., 336 E. 4th St. 303-667-1376
Fla Orlando, FM Assocs., 5018 Mortier Ave. 305-851-5710
Ind Indianapolis, RF Specialists, 6410 Woodwind Dr. 317-783-6530
NJ Woodcliff Lake, F & F Assoc., 58 Arcadia 201-778-6767
NY Syracuse, Rep Tech, 2002 Teall Ave. 315-437-2845
NY Westbury, F & F Assoc, 461 Old Country 516-334-1160
NC Greensboro, FM Assocs., 904 Montrose Dr. 919-294-2754
Pa Newtown Sq., SWR Assocs., Box 298 215-356-8550
Va Falls Church, Jay Co., 2914 Annandale 703-534-7800
Wash Seattle, Datacom, 2207 Fairview E #12 206-329-2989
For: Can., Ville LaSalle, Que., Electrodesign Ltd., 840 LaFleur 514-363-5120
VECTRONICS MICROWAVE CORP., 276 Lincoln Blvd., Middlesex, N.J., 08846, Tel: 201-356-2377; Sls. Mgr: J.G. Vogler
VEECO INSTRS., INC., Terminal Dr., Plainview, N.Y., 11803, Tel: 516-OV-1-8300; Sls. Mgr: J. Rivlin

VEEDER-ROOT, 70 Sargeant St., Hartford, Conn., 06102, Tel: 203-527-7201; Sls. Mgr: S. Struble Pg. 1352
Cal Glendale, 1049 Grand Central Ave. 213-245-8421
Cal Placentia, Western Automation, Box 116 714-525-0273
Ill Chicago, Clarkson Engrg. Co., 5518 W. Lawrence Ave. 312-288-2314
Ill Des Plaines, 455 State St. 312-824-0188
Md Lutherville, 126 Othoridge Rd. 301-539-7018
Mich Birmingham, Electro-Mation, 1137 Cole 313-564-6517
Mich Detroit, 648 Eastland Professional Bldg. 313-372-2220
Minn Minneapolis, 2401 W. 66th St. 612-866-4811
NJ E. Orange, 51 Lincoln St. 201-673-2660
NY Rochester, Veeder-Root, 100 Allens Creek 716-244-0500
Ohio Cincinnati. 5725 Dragon Way 513-271-6200
Ohio Cincinnati, J.W. Murray, 3985 Race 513-662-1616
Ohio Cleveland, M.M. Haley, 6364 Pearl Rd. 216-884-8460
Ohio Cleveland, 12417 Ceader Rd. 216-462-2634
Pa Glenside, 139 S. Easton Rd. 215-887-0708
Pa Phila., Penn-Del Instr., 709 Bethlehem Pk. 215-247-7389
Pa Pittsburgh, Bollinger & Bradford, Box 8088 412-561-2340
SC Greenville, I-385 at Roper Mountain Rd. 803-288-2133
Tex Dallas, 9711 Broken Bow Rd. 214-747-5483
Tex Houston, Durlam Assoc., 12714 Cobblestone 713-468-4000
For: Can., Toronto, Ont., 26 Fieldway Rd. 416-239-3094

VEGA PRECISION LABS., 239 Maple Ave., Vienna, Va., 22180, Tel: 703-938-6300; Sls. Mgr: D.M. Kruchko Pgs. 614,615
Ala Huntsville, E. Christopherson, 3401 Highland S.E. 205-539-6237
Cal Chula Vista, R. Nowlan, Box 1205 Chula Vista 714-420-2024
Fla Ft. Walton Bch., E. McCann, 29 Silva Dr. 904-243-1776
NM High Rolls-Mtn. Pk., C. L. Wright, Box 12 505-682-2698
EXP: N.Y., Huntington, H. Munsey, Box 236 516-423-4824
VELONEX, Varian Div., 560 Robert Ave., Santa Clara, Calif., 95050, Tel: 408-244-7370, TWX: 910-338-0114; Sls. Mgr: E. Rudee

VEMALINE PRODS. CO., 455 W. Main St., Wyckoff, N.J., 07481, Tel: 201-891-3200; Sls. Mgr: C.J. Dawkins Pgs. 1504,1505,1857,2328,2775
Cal Costa Mesa, Repex, 1790 Pitcairn 714-540-4832
Cal Santa Clara, Ruby Sls. Corp., Box 487 408-243-1694
Colo Denver, Ruby Sls. Corp., 1200 S. Alton 303-755-1714
Conn Meriden, Electro Prods. Sls., 150 S. Broad 203-235-4040
Fla Melbourne, CES Assoc., Box 1152 305-254-2183
Ill Chicago, Ropek-Cahill, 5439 W. Division 312-287-7292
Mich Grand Rapids, ELFI Assoc., 1635 Pembroke Dr., S.E. 616-455-2920
Minn Minneapolis, J. Lee Co., 4241 Toledo Ave., S. 612-920-1525
Neb Lincoln, Mktg. Assoc., 1200 N. 79th 402-434-5244
NY Jamaica, S-J Sls., 143-05 Archer 212-291-3232
NY Rochester, Ossmann Comps. Sls. Corp., 280 Metro Pk. 716-442-3290
Ohio Cleveland, R.M. Nelson, One Public Sq. 216-241-4581
Pa Abington, IMS Co., Box 96 215-659-0444
Tex Dallas, Blackburn Assoc., 137 Walnut Vlg. 214-351-9991
EXP: N.Y., Larchmont, Montclair Elec., 7 Woodland 914-834-8905
For: Can., Montreal, Que., H.W. Brieger Sls., 5253 Decarie Blvd. 514-482-0722

VENT-RAK, INC., 525 S. Webster Ave., Indianapolis, Ind., 46219, Tel: 317-359-5407; Sls. Mgr: L.M. Vaughn
VENTRON CORP., Elctrn. Materials Div., Bradford, Pa., 16701, Tel: 814-362-3586, TWX: 510-695-5110; Gen. Sls. Mgr: C.R. Smith

VENUS SCIENTIFIC, 399 Smith St., Farmingdale, N.Y., 11735, Tel: 516-293-4100, TWX: 510-224-6588; Sls. Mgr: R. Becker ....Pgs. 944,945

Cal Pasadena, Advanced Techniques, 3760 Edgeview Dr. 213-351-9160
Mass Stoneham, VPI Assocs., 422 Main St. 617-438-3113
NY Great Neck, VPI Assocs., 300 Northern 516-482-8387
Tex Richardson, P.J. Scanlon Co., 724 S. Sherman St. 214-AD-1-4661
EXP: N.Y., NY, Sylvan Ginsbury, 425 Park 212-689-5212
For: Ville LaSalle, Que., Electrodesign, 840 LaFleur 514-363-5120
VERITRON WEST, INC., 20245 Sunburst St., Chatsworth, Calif., 91311, Tel: 213-341-7770, TWX: 910-494-1212; Sls. Mgr: C. Reese
VERNAY LABS., E. South College St., Yellow Springs, Ohio, 45387, Tel: 513-767-7261; Sls. Mgr: S. Pomeranz

VERNITRON, Control Comps., 2440 W. Carson St., Torrance, Cal., 90509, Tel: 213-328-2504, TWX: 910-349-6250; Sls. Mgr: S.W. Silverman Pgs. 386,387,1503,1634,1635

Cal Los Angeles, Halbar, 3261 W. 4th 213-387-8283
Cal San Mateo, Halbar Assocs., 3 W. 37th 415-349-4700
Conn No. Haven, Kitchen & Kutchin, 22 Broadway 203-239-0212
Fla St. Petersburg, Orbe, Inc., 4110 Central Ave., Box 12136 813-894-0687
Ill Chicago, D. Dolin Sls., 6232 N. Pulaski 312-286-6200
Kans Wichita, Thunderbird Engrg. Sls. & Svcs., Inc., 7707 E. Osie 316-684-3941
Md Baltimore, Callas Elctrns., 6409 Frederick 301-744-7711
Mass Lexington, Kitchen & Kutchin, 17 Waltham 617-862-8230
Mich Lathrup Vlg., R. C. Nordstrom, Box 32 313-444-4417
Minn Mpls., F. Peterson, 4501 Minnetonka 612-927-4453
Mo St. Louis, Thunderbird Engrg. Sls. & Svcs., Inc., Box 12849 314-542-6488
NJ Cherry Hill, A. Lanson, 112 Henfield 609-424-4670
NJ Harrington Pk., Metro Tech. Sls. Corp., 39 Bluefield Ave. 201-768-8495
NY Endicott, Tech-Mark, Professional Bldg. 607-748-7473
NY Fairport, Tech-Mark, 19 Valley Brook 716-377-5531
NY Jericho, Metro Tech., 333 N. Broadway 516-935-3330
NY New Hartford, Tech-Mark, Inc., Box 296 315-732-1602
Ohio Dayton, Rixan Assocs., 5752 Wadworth 513-278-4216
Tex Dallas, Jacobson Co., Box 9702 214-EM-3-7584
Wash Seattle, R. Johnston, 1011 N. E. 69th 206-LA-4-5170

VERNITRON CORP., Digital Prods. Div., 59 Central Ave., Farmingdale, N.Y., 11735, Tel: 516-694-5002, TWX: 510-224-6890; Sls. Mgr: F. Bowser
(Refer to Vernitron Corp. for sales office information.)

VERNITRON CORP., Motor Prods. Div., 300 Marcus Blvd., Deer Pk., N.Y., 11729, Tel: 516-586-5100, TWX: 510-227-6079; Sls. Mgr: J. Moonelis Pgs. 386,387,1503,1634,1635

Cal Los Angeles, Halbar, 3261 W. Fourth 213-387-8283
Cal San Mateo, Halbar Assocs., 3 W. 37th 415-349-4700
Conn N. Haven, Kitchen & Kutchin, 22 Broadway 203-239-0212
Fla St. Petersburg, Orbe, Inc., Box 12136 813-894-0687
Ill Chicago, D. Dolin, 3525 W. Peterson 312-JU-8-3738
Iowa Cedar Rapids, D. Dolin Sls. Co. 312-JU-8-3738
Kans Prairie Vlg., Thunderbird Eng., 4014A W. 95th 314-PE-1-4343
Mass Lexington, Kitchen & Kutchin, 17 Waltham 617-VO-2-8230
Mich Lathrup Vlg., R.C. Nordstrom, Box 32 313-444-4417
Minn Edina, W. Lieberman, 5238 France Ave. 612-926-5432
Mo Hazelwood, Thunderbird Eng., 400 Brookes 314-PE-1-4343
NJ Cherry Hill, A. C. Lanson, 112 Henfield 609-424-4670
NJ Harrington Pk., Metro Tech., 39 Bluefield 201-768-8495
NY Endicott, Tech-Mark, 101 Jefferson Ave. 607-748-7473
NY Jericho, Metro Tech., 333 N. Broadway 516-935-3330
Ohio Dayton, Rixan Assocs., 5752 Wadsworth Rd. 513-BA-2-0011
Okla Tulsa, Allied Comps., Box 4768 918-939-2848
Tex Dallas, Allied Comps., Box 38009 214-348-6660
Tex Houston, Allied Comps., 6400 Westpark Dr. 713-782-5406
Va Springfield, Dyna-Rep., 5265 Port Royal Rd. 703-321-8630
Wash Seattle, R. Johnston, 1011 N.E. 69th 206-LA-4-5170

VERNITRON, Electrical Comps., P.O. Box 878, Norwalk, Conn., 06852

VERNITRON ELEC. COMPS., Beau Prods., 117 Union Ave., Laconia, N.H., 03246, Tel: 603-524-5101, TWX: 710-364-1843; Sls. Mgr: R.K. Arbogast Pgs. 2720,2721
Cal Palo Alto, Engrg. Assoc., 999 Commercial 415-326-7842
Cal Pasadena, P. Nurches Co., 2396 Foothill Blvd. 213-681-8957
Conn Farmgtn., R. Perron, 10 Briarwood 203-673-4825
Conn Trumbull, R. Perron & Co., 36 Louis St. 203-268-9631
Fla No. Miami, Cartwright & Bean, 20100 N.E. 25th Ct. 305-945-2962
Fla Orlando, Cartwright & Bean, 601 N. Fern Creek Ave. 305-425-8284
Ga Atlanta, Cartwright & Bean, 3223 Cain's Hill Pl., N.W. 404-237-2273
Ill Oak Pk., Wasson-Gallagher, 1024 North Blvd. 312-383-6572
Ind Ft. Wayne, Scott Elctrns., Inc., 124 W. Washington St. 219-743-1586
Ind Indianapolis, Scott Elctrns., Inc., 1327 N. Pennsylvania St. 317-635-8951
Iowa Ft. Dodge, Heimann Co., 236 7th Ave. 515-576-2374
Ky Louisville, Scott Elctrns., 366 Francis Bld. 502-583-3220
La Metairie, Cartwright & Bean, Box 73336 504-887-5225
Mass Norwood, R. Perron, 159 Morse St. 617-762-8114
Mich Lathrup Village, R.C. Nordstrom & Co., Box 32 313-444-4417
Minn Minneapolis, Heimann, 5603 Lyndale Ave. 612-861-6051
Mo Kansas City, K&M Sls. Co., 1627 Main St. 816-471-1355
NH Dover, R. Perron & Co., Inc., 1 Elm St. 603-742-2321
NJ Cherry Hill, E.S. Comp. Sls., 314 Columbia Bl. 609-667-5341
NJ Short Hills, Murray Co., Box 305 201-376-3834
NY Alexander, B.H. Tollefson, Box 247 716-591-1219
NY E. Syracuse, B.H. Tollefson, Box 147 315-463-4507
NY Jackson Hgts., C. Landis, 34-28 80th St. 212-458-7900
NY Rochester, B.H. Tollefson Assocs., Inc., 110 Allen Creek Rd. 716-271-4141
NY W. Winfield, B.H. Tollefson, Box 142 315-822-5647
NC Charlotte, Cartwright & Bean, 625 Harwyn Dr. 704-333-6457
NC Raleigh, Cartwright & Bean, 1016 Belfast Dr. 919-832-7128
Ohio Cincinnati, Scott Elctrns., Inc., 9505 Montgomery Rd. 513-791-2513
Ohio Cleveland, Scott Elctrns., 1836 Euclid Ave. 216-861-2626
Ohio Columbus, Scott Elctrns., 79 E. State St. 614-228-2313
Ohio Dayton, Scott Elctrns., 120 W. Second St. 513-223-2652
Pa Pittsburgh, Scott Elctrns., 313 Empire Bld. 412-471-5233
Tenn Memphis, Cartwright & Bean, 560 S. Copper St. 901-276-4442
Tex Dallas, W. Reese Assoc., 3131 Stemmons 214-638-6575
Tex Houston, W. Reese Assoc., 2400 West Loop S. 713-621-3134
Wash Seattle, Electro-Reps., Inc., 2047 14th St. 206-AT-2-7944
For: Can., Toronto, Ont., Brimark Elctrns., 349 Carlaw Dr. 416-461-3511

VERNITRON PIEZOELECTRIC DIV., 232 Forbes Rd., Bedford, Ohio, 44146, Tel: 216-232-8600, TWX: 810-427-2274; Sls. Mgr: D. Markeson

VERNON PLATING WORKS, 33-18 57th St., Woodside, N.Y., 11377, Tel: 212-639-1124; Sls. Mgr: S.J. Guttman

VERO ELECTRONICS, INC., 171 Bridge Rd., Hauppauge, N.Y., 11787, Tel: 516-234-0400, TWX: 510-227-8890; Sls. Mgr: B. Freifeld ....Pg. 2329
Cal Los Angeles, Dyna Sls. Co., Box 6757 213-268-1175
DC Washington, J&B Assocs. EN 1-6049
Fla Orlando, Dorst Assoc., Box 17057 305-295-4440
Ga Atlanta, Electromechanical Sls., 3224 Peachtree Rd. 404-237-5563
Ill Chicago, Kennedy Engrg., 6713 N. Oriphant Ave. 312-631-8283
Ind Ft. Wayne, McDonald Sls., Box 2248 219-745-9214
Md Baltimore, J&B Assocs., 1026 Cromwell Bridge Rd. 301-823-0070
Mass Waltham, Vero Elctns., 325 Bear Hill Rd. 617-899-7793
Neb Lincoln, Mktg. Assoc., Box 53938 502-434-5244
NJ Ft. Lee, K.E. Hughes Co., 2175 Lemoina Ave. 201-944-1600
NY Rochester, Reed Elctrns., 2815 Monroe Ave. 716-473-2767
NY Syracuse, Reed Elctrns., 326 Fay Rd. 315-468-5488
NY Vestal, Reed Elctrns., Box 187 607-748-7391
Tex Houston, W. Dean, 9507 Meadowglen 713-785-7551

VERSITHERM, INC., 51 Toledo St., Farmingdale, N.Y., 11735, Tel: 516-694-6363; Sls. Mgr: S.H. Lamston

VESTAL MODERN DESIGN CORP., Vestal Pkwy., E., Vestal, N.Y., 13850, Tel: 607-785-9901; Sls. Mgr: E.D. Conner

VETTER, A.R., CO., Box 143, Rebersburg, Pa, 16872, Tel: 814-349-5461; Sls. Mgr: A.R. Vetter

VIATRAN CORP., 1720 Military Rd., Buffalo, N.Y., 14217, Tel: 716-874-3330; Sls. Mgr: D. Joslyn

VIATRON COMPUTER SYS., Rte. 62, Bedford, Mass., 01730

VIBRAC CORP., Aff. USM Corp., Alpha Ind'l. Pk., Alpha Dr., Chelmsford, Mass., 01824, Tel: 617-256-6581; Sls. Mgr: C.E. Johnson, Jr.

VICTOR MICROWAVE, INC., 38 W. Water St., Wakefield, Mass., 01880, Tel: 617-245-4472; Sls. Mgr: S.A. Parks

VICTOR WIRE & CABLE, 3601 Holdrege Ave., L.A., Cal., 90016, Tel: 213-870-9933, TWX: 910-340-6754; Mktg. Mgr: O. Olson ....Pg. 3069

VICTOREEN INSTR., 10101 Woodland Ave., Cleveland, Ohio, 44104, Tel: 216-795-8200, TWX: 810-421-8287; Mktg. V.P: W.A. McCarthy ....Pg. 2897
(Component Sales Reps.)
Cal Fullerton, R. Bloom, 740 Miramar 213-380-8513
Colo Wheatridge, Waugaman, 4643 Wadsworth 303-423-1020
Minn Mpls., R.-J., 7100 S. France 612-922-1425
NY New York, VLN Corp., 18 E. 80th St. 212-744-7646
NY Carmel, A. Schiller, 2 Darryl La. 914-225-7178
NY Rochester, W. Zimmerman, 3100 Monroe 716-586-4450
NY Syracuse, W. Zimmerman, 112 DeWitt 315-474-4889
NC Charlotte, Over & Over, 3723 Country Ridge 704-366-8601
Pa Fairview Village, Danco Corp., Box 245 215-539-9300
Tex Dallas, Southwest Elct., 621 Meadows Bldg. 214-363-1671
Tex Houston, Southwest Elct., 1405 S. Post Oak 713-621-3760
Wash Seattle, Seatronics, 5616 Fourth S. 206-767-4330
For: Can., Downsview, Ont., Kaytronics, 1001 Finch 416-638-5511
For: Can., Montreal, Que., Kaytronics, 7370 Cote St. Luc. 514-487-3434
(Nuclear Instruments Sales Reps.)
Ga Fairburn, L. Weese, Box 488 404-577-2736
Ill Mt. Prospect, Contemporary Science, Box 205 312-CL-5-3793
Md Laurel, D. Caulk, 16305 Gales St. 703-548-8446
NJ Old Bridge, R. Gans, 5 Alpine Ct. 212-744-7646
Ohio Cleveland, Victoreen Instr., 10101 Woodland 216-795-8200
Tex Rosenburg, A. Jan, Jr., 1804 West 713-774-9135
For: Can., Montreal, Que., Radionics, 195 Graveline 514-735-4565
For: Can., Downsview, Ont., Radionics, 1111 Finch 416-638-0218
For: Can., Ottawa, Ont., Radionics, 376 Churchill 613-728-4624
For: Can., Quebec City, Que., 1001 Rte. de L'Eglise 418-651-5845
For: Can., Vancouver, B.C., Radionics, 2182 W. 12th 604-732-7317

VICTORY ENGRG. CORP., 128 Victory Rd., Springfield, N.J., 07081, Tel: 201-379-5900, TWX: 710-983-4430; Sls. Mgr: S. lovin

VIDAIRE ELECTRONICS MFG. CORP., 150 Buffalo Ave., Freeport, N.Y., 11520, Tel: 516-623-6696; Sls. Mgr: M. Shapiro

VIDAR CORP., 77 Ortega Ave., Mountain View, Cal., 94040, Tel: 415-961-1000, TWX: 910-379-6933; Sls. Mgr: L. Jordan

VIDEO INDS. CO., 45 Brick Oven Rd., Port Chester, N.Y., 10573, Tel: 914-939-4919

VIDEO RESCH. CORP., 761 N. Washington St., Rockville, Md., 20850, Tel: 301-762-5999; Sls. Mgr: V. Ratner

VIEWLEX, Veteran's Mem'l. Hwy. & Broadway, Holbrook, N.Y., 11741, Tel: 516-LT-9-6600; Sls. Mgr: D. Shecter

VIGOR TOOL CO., Div. of Jadow, B. & Sons, Inc., 53 W. 23 St., New York, N.Y., 10010, Tel: 212-YU-9-5522; Sls. Mgr: H.C. Jadow

VIKING INDS., INC., 21001 Nordhoff St., Chatsworth, Calif., 91311, Tel: 213-341-4330, TWX: 910-494-2094; Sls. Mgr: H. Balderas

VIKING MODULES, 223 Cresent St., Waltham, Mass., 02154, Tel: 617-891-7898; Sls. Mgr: A. Waitt

VIKING WIRE CO., INC., Shelter Rock Rd., Danbury, Conn., 06810, Tel: 203-744-4600, TWX: 710-456-1217; Sls. Mgr: S.J. Warschauer

Advertisement

Viking Wire manufactures round film insulated copper magnet wire, 23 thru 56 ga. A.W.G. - All popular insulations including - Enamel, Polyurethane, Pyre M.L., Formvar Bondables, Isonel (Polyester) with special films made to your order. Order to NEMA, MIL, or your specification.

VIKOA, 400 Ninth St., Hoboken, N.J., 07030, Tel: 201-656-2020; Sls. Mgr: J. Mattison

VIKOA CABLE DIV., Halls Mills Rd., Freehold, N.J., 07728, Tel: 201-462-8700

VIRGINIA ELCTRNS. CO., INC., 2908 Telestar Ct., Falls Church, Va., 22042, Tel: 703-560-6500; Sls. Mgr: J. Dawson

VIRGINIA PANEL CORP., Box 1106, 1400 New Hope Rd., Waynesboro, Va., 22980, Tel: 703-942-8376; Sls. Mgr: J.E. Taylor, Jr. ....Pg. 2723
Ariz Phoenix, Howe & Howe Sls., Inc., 4109 N. 18th St. 602-264-7971
Cal Menlo Pk., Johnson Assocs., 2160 Prospect St. 415-854-3550
Conn Branford, New England Mktg. Assn., Box 151 203-488-7279
Conn Darien, Data Prods., Inc., Box 1164 203-324-4466
Fla Ormond Bch., J.R. Soblonsky, 8 San Juan Cir. 904-255-6313
Ill Chicago, Tab Prods., 5151 N. Harlem Ave. 312-631-2515
Ind Ft. Wayne, A.A. Billian Co., Box 2046 219-743-6124
Ind Indianapolis, A.A. Billian Co., Box 20289 317-253-3134
Ky Louisville, W. G. Hudgens, 2416 Frankfort Ave. 502-896-6611
Md Silver Spring, M.L. Councell, 721 Ellsworth Dr. 301-587-1755
Mass Boston, Tab Prods., 1020 Commonwealth Ave. 617-734-4130
Mich Grand Rapids, A.A. Billian Co., 260 Keeler Bldg., N.W. 616-454-3245
NJ Ridgewood, Hansen Assocs., Box 339 201-652-7055
NJ Paramus, Garden State Business Sys., 328 Rte. 4 201-343-2411

NC Winston-Salem, Kirkman Elctrns., 823 S. Marshall St. 919-724-0541
Ohio Akron, Blair Off. Sys., 132 E. Voris St. 216-535-7197
Ohio Cincinnati, A.B. Crock, Inc., 8286 Winton Rd. 513-521-5040
Ohio Columbus, A.B. Crock, Inc., 81 E. State St. 614-221-4888
Ohio Dayton, A.B. Crock, 3854 S. Kettering Blvd. 513-223-7777
Pa Wilkes-Barre, EDP, Supplies of Accessories, 66 Oxford St. 717-655-1000
Pa Pittsburgh, Tab Western Pa. 412-563-3322
Tex Richardson, C. Hoffman Assocs., 777 S. Central Expwy. 214-235-3600

VIRTIS CO., INC., Rte. 208, Gardiner, N.Y., 12525, Tel: 914-255-5000; Pres: C.E. Bender

VISHAY INSTRS., 63 Lincoln Hwy., Malvern, Pa., 19355, Tel: 215-647-5115, TWX: 510-668-8944; Sls. Mgr: H. Cook

VISHAY RESISTOR PROD. DIV., Vishay Intertechnology Inc., 63 Lincoln Hwy., Malvern, Pa., 19355, Tel: 215-644-1300, TWX: 510-668-8944; Mktg. Mgr: L.S. Winston .... Pgs. 2898,2899,2932

Ala Huntsville, Space Engrg. Sls., Box 5208 205-837-6060
Ariz Tempe, Saguaro Techn. Svc., 1000 E. Apache Blvd. 602-275-0431
Cal El Monte, Western Controls, 2630 Seaman 213-443-9376
Cal San Carlos, Melchior Assocs., 820B Cherry St. 415-591-7383
Colo Denver, Checkmate Sls., Box 22411 303-771-4920
Fla Clearwater, W.B. Wimberly, 532 S. Ft. Harrison 813-446-7072
Ill Chicago, Lightner Assocs., 6322 N. Milwaukee 312-774-1500
Kans Mission, Techn. Sls., 5827 Outlook 913-TE-1-2888
Md Towson, J.A. Dougherty Sls., 320 Hillen Rd. 301-823-0431
Mass Needham, Comp Rep, 1116 Great Plain Ave. 617-444-2484
Mich Lathrup Vlg., R. Nordstrom, Box 32 313-444-4417
Mich Oak Pk., W. Spenser, 21500 Greenfield Rd. 313-398-8005
Minn Mpls., Pinkney & Assocs., 957 Winnetka Ave. N. 612-544-3628
NJ Union City, Bressler Assocs., 4808 Bergenline 201-UN-4-9577
NY E. Aurora, Harries & Kershaw, 654 1/2 Main St. 716-652-1221
NC Greensboro, F. & M. Assocs., 904 Montrose Dr. 919-294-2754
Ohio Willoughby, A. H. Baier, 4399 Industrial Pkwy. 216-946-6080
Ore Portland, D. G. Weber, 1226 S.E. 7th Ave. 503-234-7671
Pa Devon, B. & A. Assocs., 237 Lancaster 215-688-5173
Tex Seabrook, Stolle-Hamilton, 1108 Meyer 713-GR-4-3155

VISUAL EDUCOM, U.S. 12 E., Michigan City, Ind., 46360, Tel: 219-879-8311, TWX: 810-296-3987; Sls Mgr: C. Bixby

VISUAL ELCTRNS. CORP., 356 W. 40th St., New York, N.Y., 10018, Tel: 212-736-5840, TWX: 710-581-2810; Sls. Mgr: L.C. Radford

VITALITY BULBS LTD., Beetons Way, Bury Saint Edmunds, Suffolk, England, Tel: 0284-2071, TWX: 81295; Sls. Mgr: F.L. Richmond

VITRAMON, INC., Box 544, Bridgeport, Conn., 06601, Tel: 203-268-6261, TWX: 710-450-3640; Nat'l. Sls. Mgr: J.A. Hatfield

VITRO LABORATORIES, 14000 Georgia Ave., Silver Spring, Md., 20910, Tel: 301-871-2531, TWX: 710-825-9642; Sls. Mgr: J.C. Kinsey

VIZ MFG. CO., 335 E. Price St., Philadelphia, Pa., 19144, Tel: 215-844-2626; Sls. Mgr: D.B. Strasburger

V. J. ELCTRNS., 622 W. Harvard Pl., Ontario, Cal., 91762, Tel: 714-986-5095; Sls. Mgr: V.W. Johnson

Advertisement

V J ELECTRONICS manufactures small, portable testers for automatically testing cables, printed circuit boards, printed wiring, printed substrates etc. Units test circuits for continuity, shorts, leakage resistance, breakdown voltage etc. Basic units are a 50 circuit and 100 circuit unit. Units can be paralleled for testing larger assemblies. Test rates to 900 tests/minute.

VLCHEK PLASTICS CO., Middlefield, Ohio, 44062, Tel: 216-632-8011; Sls. Mgr: D.R. Butler

VOAK ENGRG. CO., INC., 129 A St., Upland, Calif., 91786, Tel: 714-982-5538; Sls. Mgr: A.S. Voak

VOKAR PRODS., INC., 1925 Pauline Blvd., Ann Arbor, Mich., 48103, Tel: 313-668-6908; Sls. Mgr: R.G. Dailey

VOLKERT STAMPINGS, INC., Sub. Stanley Works, 222-34 96th Ave., Queens Village, N.Y., 11429, Tel: 212-HO-4-8400; V.P: F.F. Rimmler

VOLTARC TUBES, 102 Linwood Ave., Fairfield, Conn., 06430, Tel: 203-255-2633; Sls. Mgr: W.F. Crosby

VOLTEX CO., INC., 115 Marine St., Farmingdale, N.Y., 11735, Tel: 516-CH-9-2336; Sls. Mgr: N. Rothenberg

VOLTRON PRODS., INC., See Kratos Instr. Div.

VOLTRONICS CORP., West St., Hanover, N.J., 07936, Tel: 201-887-1517, TWX: 710-986-8253; Sls. Mgr: R.J. Newman

Advertisement

Complete line of precision trimmer capacitors, non-rotating, with glass, quartz, and air dielectrics, MIL-C-14409C styles. New sub-miniature trimmer for gigaherz, stripline, and substrate mounting. World-wide representation.

VOLTRONICS, INC., 7746 W. Addison St., Chicago, Ill., 60634, Tel: 312-625-1779; Sls. Mgr: G.R. Glorch

VU-DATA CORP., 7595 Convoy Ct., San Diego, Cal., 92111, Tel: 714-279-6572; Sls. Mgr: W.A. Kraus

VULCAN ELEC. ITT, 88 Holten St., Danvers, Mass., 01923, Tel: 617-774-1730, TWX: 710-347-0884; Sls. Mgr: J.W. Michaels

VWR SCIENTIFIC, Box 3200 Rincon Annex, San Francisco, Cal., 94119, Tel: 716-271-8200

VYTELL CORP., Box 92, Arlington Hgts., Ill., 60006, Tel: 312-253-5332; Sls. Mgr: R.W. Griesmeyer

WAAGE ELEC., INC., 820 Colfax Ave., Kenilworth, N.J., 07033, Tel: 201-245-9363; Sls. Mgr: C.W. Frantz

WABASH MAGNETICS, INC., Hi-Voltage Div., 1375 Swan St., Huntington, Ind., 46750, Tel: 219-356-8300, TWX: 219-356-8348, Sls. Mgr: P.C. Ross

WABASH METAL PRODS., 1569 Morris St., Wabash, Ind., 46992, Tel: 219-563-1184; Sls. Mgr: C.N. Brown

WABASH TAPE CORP., Sub. Wabash Magnetics, Inc., Box 128, Huntley, Ill., 60142, Tel: 312-669-5181, TWX: 910-651-1800; V.P. Mktg: E.H. Keller

WABCO AEROSPACE DEPT., Swissvale P.O., Pittsburgh, Pa., 15218, Tel: 412-242-5000, TWX: 710-664-2096; Sls. Mgr: G. A. Dawes

WABER ELCTRNS., INC., Sub. SGL Inds., 2000 N. Second St., Philadelphia, Pa., 19122, Tel: 215-NE-4-3200; Nat'l. Sls. Mgr: J.L. Brooks

WADSWORTH ELEC. MFG. CO., INC., 20 W. 11th St., Covington, Ky., 41012, Tel: 606-431-0900; Sls. Mgr: H.C. Morrison

WAGNER ELEC. CORP., Tung-Sol Div., 630 W. Mt. Pleasant Ave., Livingston, N.J., 07039, Tel: 201-WY-2-1100, TWX: 710-994-4865; Sls. Mgr: J. Emaus Pgs. 1500-1502,1841-1843

Ariz Scottsdale, Bennewitz Assoc., Inc., 532 N. Brown Ave. 602-947-7379
Cal Diablo, Thomas Assocs., Box 684 415-837-8411
Cal El Segundo, Wagner Elec. Corp., 610 Lairport St. 213-322-0708
Cal Inglewood, L & M Engrg., 9911 Inglewood Ave. 213-674-6850
Cal Santa Clara, L & M Assocs., 3242 McKinley Dr. 408-243-2891
Cal So. San Francisco, Wagner Elec. Corp., 219 Shaw Rd. 415-588-6908
Colo Denver, Walter-Engrg. Assocs., 880 Bonnie Brae Blvd. 303-777-5585
Fla N. Miami, A.J. Giammanco & Assocs., 1365 NE 135 St. 305-757-4611
Ill Elk Grove Village, Wagner Elec. Corp., 1700 Elmhurst Rd. 312-439-1810
Kans Overland Pk., T.L. Dowell, Inc., 7208 W. 80 913-649-6069
Mich Detroit, Hilltronics, 137 Puritan Ave. 313-342-3242
NM Albuquerque, Bennewitz Assoc., Inc., 623 Wyoming S.E. 505-255-8733
NC Raleigh, A.B. Andrews Co., Box 2627 919-833-5565
Ore Portland, C.K. Shanks & Assocs., 3104 S.W. 87th Ave. 503-292-5656
Tex Addison, Parvin Sls. Co., Addison Rd. 214-239-9148

WAKEFIELD ENGRG., INC., Teal & Audubon Rds., Wakefield, Mass., 01880, Tel: 617-245-5900, TWX: 710-348-6713; Sls. Mgr: R.C. Cutting, Jr.

WAKMANN WATCH CO., INC., 597 Fifth Ave., New York, N.Y., 10017, Tel: 212-751-2926

WALCO ELCTRNS. CO., Div. Walco-Linck Corp., 1234 State Hwy. #46, Clifton, N.J., 07013, Tel: 201-471-1070 H.A. Bodkin

WALD SOUND, 11131 Dora St., Sun Valley, Calif., 91352, Tel: 213-875-0480; Sls. Mgr: G. Erskine

WALDEN ELCTRNS. CORP., 223 Crescent St., Waltham, Mass., 02154, Tel: 617-899-0510; Sls. Mgr: E.B. Stevens

Advertisement

CRT display supplies custom-designed to OEM specifications. Our designs are optimized for CRT display and feature regulation to 20PPM, ripple to 10PPM, TC to 5PPM/°C, and fast response to transients with output voltage peaks held as low as 100PPM. They are entirely silicon, solid-state and absolutely silent, Short circuit and CRT-arc proof. Multiple-output designs provide all CRT voltages from the heater to 50KV. Prices as low as $70.

WALDES KOHINOOR, INC., 47-16 Austel Pl., Long Island City, N.Y., 11101, Tel: 212-392-3100, TWX: 710-582-2647; Sls. Mgr: J.F. Gearing

WALDOM ELCTRNS., INC., 4633 W. 53rd St., Chicago, Ill., 60632, Tel: 312-585-1212; V.P-Sls: Mario C. Vescovi

WALL MFG. CO., Box 3349, Dept. EEM-71, Kinston, N.C., 28501, Tel: 919-527-4186; Sls. Mgr: S. Whitfield Pg. 2945

Ala Birmingham, F. Nickerson, 1148 Cheyenne 853-3181
Cal Gardena, Bidwell, Reder, Ross, & Fetting, 17525 S. Broadway 213-770-0300
Conn Wallingford, Adams-McGregor, 77 Bayberry 203-269-5816
Fla Tampa, F.C. Nickerson, Box 13126 813-833-4321
Ga Decatur, F.C. Nickerson, 1240 Clairmont 404-377-1575
Ill Chicago, Midwest Elctrn., 5707 W. Division 312-626-0030
Kans Mission. Inland Assocs.. 6047 Howe Dr. 913-362-2366
Md Baltimore, Almco, 5962 Glen Falls Ave. 301-426-5583
Mich St. Clair Shores, J.M. Thorpe Co., 28915 Harper Ave. 313-779-6363
Minn Minneapolis, C.R. Gibb, 1311 W. 25th 612-377-1200
NJ Bergenfield, H. Gray, 20 Foster St. 201-384-3643
NY Rushville, Ellis Scovel, 865 E. Lake 315-584-6522
NC Charlotte, F. Hildebrand, 5817 Haddington 704-537-2855
Ohio Cleveland, Electro-Com, 8761 Snow Rd. 216-886-2404
Ohio Dayton, Electro-Com, 1700 Needmore Rd. 513-276-3993
RI Lincoln, Adams McGregor, 66 Lakeview 401-726-1300
Tex Dallas, Sivright, 10044 Monroe Dr. 214-357-6681
Wash Seattle, D. Miller, 7821 Fremont 206-784-6800

WALLACE & TIERNAN DIV., Pennwalt Corp., 25 Main St., Belleville, N.J., 07109, Tel: 201-PL-9-8000; Sls. Mgr: A.C. Adams

WALLER CORP., Ridgefield Box 340, Crystal Lake, Ill., 60014, Tel: 815-459-6510, TWX: 910-634-3351; Sls. Mgr: W. Sherwood

Advertisement

AM-FM TUNERS/AM-FM IF AMPLIFIERS/MULTIPLEX Individual Modules-or-a Complete Chasis, assembled and fully pre-aligned. All products DESIGNED, SOLD and SERVICED in U.S.A. Produced in our own factory in Japan. Quality minded. Competitively priced.

WALTERS, W.A., INC., 7713 S. Western Ave., Chicago, Ill., 60620, Tel: 312-778-2141; Sls. Mgr: E. O'Malley

WAND ELCTRNS., INC., 7 Vanderbilt La., Old Bethpage, N.Y., 11804, Tel: 516-249-2525; Sls. Mgr: N. Wand

Advertisement

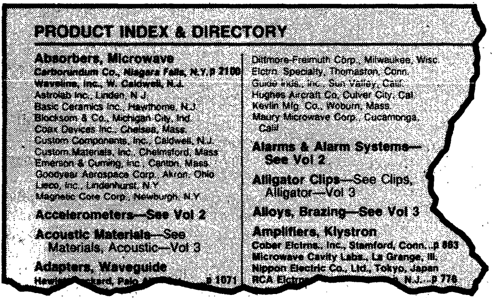
AVAILABLE NOW! MINIATURE WIDE RANGE VC0'S IN PRECISION MACHINED RFE TIGHT CASES:
P/N RANGE(MHz) Po(mW) PULLING PRICE
WB 1-110 20 ldB 10kHz 710
V1 80-260 150min 3MHz 290
V2 250-520 150min spfy 190
U7 490-1000 150min spfy 190
L1 900-1900 100min spfy 210
S1 1400-2400 100min spfy 290

WANDEL & GOLTERMANN, 6 Great Meadow La., E. Hanover, N.J., 07936, Tel: 201-887-8700, TWX: 710-986-8255; Sls. Mgr: D.E. Foreman

How to use eem

to find manufacturers of a specific product

GREEN SECTION



PRODUCT INDEX & DIRECTORY

Absorbers, Microwave
Carborundum Co., Niagara Falls, N.Y. p 2100
Wavelins, Inc., W. Caldwell, N.J.
Astrolab Inc., Linden, N.J.
Basic Ceramics Inc., Hawthorne, N.J.
Blocksom & Co., Michigan City, Ind.
Coax Devices Inc., Chelsea, Mass.
Custom Components, Inc., Caldwell, N.J.
Custom Materials, Inc., Chelmsford, Mass.
Emerson & Cuming, Inc., Canton, Mass.
Goodyear Aerospace Corp., Akron, Ohio
Lieco, Inc., Lindenhurst, N.Y.
Magnetic Core Corp., Newburgh, N.Y.
Accelerometers—See Vol 2
Acoustic Materials—See Materials, Acoustic—Vol 3
Adapters, Waveguide
Hewl ckard, Palo p 1071
Dittmore-Freimuth Corp., Milwaukee, Wisc.
Elctrn. Specialty, Thomaston, Conn.
Guide Inds., Inc., Sun Valley, Calif.
Hughes Aircraft Co., Culver City, Cal.
Kevlin Mfg. Co., Woburn, Mass.
Maury Microwave Corp., Cucamonga, Calif.
Alarms & Alarm Systems—See Vol 2
Alligator Clips—See Clips, Alligator—Vol 3
Alloys, Brazing—See Vol 3
Amplifiers, Klystron
Cober Elctrns., Inc., Stamford, Conn. ..p 883
Microwave Cavity Labs., La Grange, Ill.
Nippon Electric Co., Ltd., Tokyo, Japan
RCA Elctr N.J. ..p 778

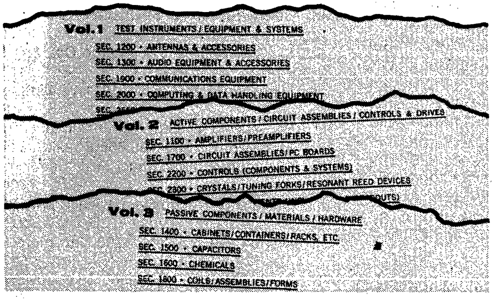
Each of the three volumes of **eem** contains a Product Index and Directory, the Green Section. This Index is a complete alphabetical listing of products. If the product you are looking for appears in the particular volume you are consulting, the green pages will provide a complete list of manufacturers who make that product. If the product is included in another volume of **eem**, the Index will provide a cross reference, directing you to the correct volume.

Boldface listings under product headings indicate that the listed manufacturer has products cataloged in **eem. Boldface** listings with page numbers indicate that this manufacturer's catalog pages include detailed data on the product indicated in the product heading.

Similar products are grouped together. For example, the many kinds of meters are listed in this manner: "Meters, Ampere," "Meters, Capacitance," "Meters, Flux" etc. To help you locate the prime product heading, there are hundreds of cross references, e.g. "Voltmeters — See Meters, Volt."

to find manufacturers' catalog information

WHITE SECTION



Vol. 1 TEST INSTRUMENTS / EQUIPMENT & SYSTEMS
SEC. 1200 • ANTENNAS & ACCESSORIES
SEC. 1300 • AUDIO EQUIPMENT & ACCESSORIES
SEC. 1900 • COMMUNICATIONS EQUIPMENT
SEC. 2000 • COMPUTING & DATA HANDLING EQUIPMENT
Vol. 2 ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES
SEC. 1100 • AMPLIFIERS/PREAMPLIFIERS
SEC. 1700 • CIRCUIT ASSEMBLIES/PC BOARDS
SEC. 2200 • CONTROLS (COMPONENTS & SYSTEMS)
SEC. 2300 • CRYSTALS/TUNING FORKS/RESONANT REED DEVICES
Vol. 3 PASSIVE COMPONENTS / MATERIALS / HARDWARE
SEC. 1400 • CABINETS/CONTAINERS/RACKS, ETC.
SEC. 1500 • CAPACITORS
SEC. 1600 • CHEMICALS
SEC. 1800 • COILS/ASSEMBLIES/FORMS

Catalog pages in **eem** are divided into three volumes based on very broad product groupings. These are:

Volume 1 — Test Instruments / Equipment and Systems

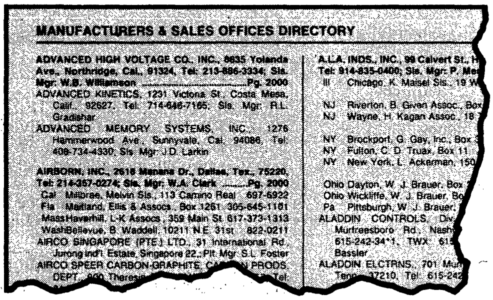
Volume 2 — Active Components / Circuit Assemblies / Controls and Drives

Volume 3 — Passive Components / Materials / Hardware

These volumes are further divided into 55 **eem** Product Sections which are assigned individually to the most appropriate volume. Within each of the 55 product sections manufacturers are arranged alphabetically, wherever possible. A complete index of all manufacturers' catalog pages is included in every volume. To locate the catalog pages of a specific manufacturer, refer to this index at the beginning of the white section in any of the three volumes. This index will provide the page numbers you require. In Volume 1, the index begins on page 302, in Volume 2 on page 1274 and in Volume 3, page 2310.

to find manufacturers' addresses, phones and sales offices

YELLOW SECTION



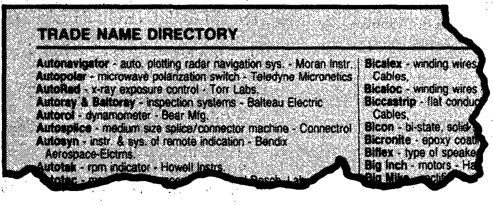
MANUFACTURERS & SALES OFFICES DIRECTORY

ADVANCED HIGH VOLTAGE CO., INC., 8635 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-886-3334; Sls. Mgr: W.B. Williamson ....Pg. 2000
ADVANCED KINETICS, 1231 Victoria St., Costa Mesa, Calif., 92627, Tel: 714-646-7165; Sls. Mgr: R.L. Gradishar
ADVANCED MEMORY SYSTEMS, INC., 1276 Hammerwood Ave., Sunnyvale, Cal. 94086, Tel: 408-734-4330; Sls. Mgr: J.D. Larkin
AIRBORN, INC., 2618 Manana Dr., Dallas, Tex., 75220, Tel: 214-357-0274; Sls. Mgr: W.A. Clark ....Pg. 2000
Cal Millbrae, Melvin Sls., 113 Camino Real 697-6922
Fla Maitland, Ellis & Assocs., Box 1261 305-645-1161
Mass Haverhill, L-K Assocs., 359 Main St. 617-373-1313
Wash Bellevue, B. Waddell, 10211 N.E. 31st 822-0211
AIRCO SINGAPORE (PTE.) LTD., 31 International Rd., Jurong Ind'l. Estate, Singapore 22.; Plt. Mgr: S.L. Foster
AIRCO SPEER CARBON-GRAPHITE C N PRODS. DEPT. 900 Theres Tel:
A.L.A. INDS., INC., 99 Calvert St., H
Tel: 914-835-0400; Sls. Mgr: P. Me
Ill Chicago, K. Maisel Sls., 19 W
NJ Riverton, B. Given Assoc., Box
NJ Wayne, H. Kagan Assoc., 18
NY Brockport, G. Gay, Inc., Box
NY Fulton, C. D. Truax, Box 11
NY New York, L. Ackerman, 150
Ohio Dayton, W. J. Brauer, Box
Ohio Wickliffe, W. J. Brauer, Bo
Pa Pittsburgh, W. J. Brauer,
ALADDIN CONTROLS, Div. Murfreesboro Rd., Nash 615-242-34*1, TWX 61 Bassler
ALADDIN ELCTRNS., 701 Mur Ten 37210, Tel: 615-242

More than 6,000 manufacturers of electronic components, materials, instruments, assemblies, systems and key services are listed in the Yellow Section. An identical Yellow Section appears in each of the three volumes of **eem**, listing addresses, phone numbers and sales managers' names. TWX numbers are also included where available. **Boldface** listings indicate that detailed information on the manufacturers' products is cataloged in the White Section of **eem. Boldface** listings also indicate that local sales offices or representatives are listed for that manufacturer.

to find trade name sources

VOLUME 1, PAGE 957



TRADE NAME DIRECTORY

Autonavigator - auto. plotting radar navigation sys. - Moran Instr.
Autopoler - microwave polarization switch - Teledyne Micronetics
AutoRad - x-ray exposure control - Torr Labs.
Autoray & Baltoray - inspection systems - Balteau Electric
Autorol - dynamometer - Bear Mfg.
Autosplice - medium size splice/connector machine - Connectrol
Autosyn - instr. & sys. of remote indication - Bendix Aerospace-Elctrns.
Autotak - rpm indicator - Howell Instrs.
Bicalex - winding wires
Cables,
Bicaloc - winding wires
Biccastrip - flat conduc
Cables,
Bicon - bi-state, solid
Bicronite - epoxy coati
Biflex - type of speake
Big Inch - motors - Ha

If you know only the trade name, brand name or trade mark of a product, you can locate it in **eem** by using the **Trade Name Directory.** This appears only in Volume 1, beginning on page 957 of the White Section. These pages can be identified by a vertical black band along the outside edge.

if you require additional assistance

contact the Editorial Department, United Technical Publications, Inc., 645 Stewart Ave., Garden City, N.Y. 11530, or phone (516) 248-9700.

WANG LABS., INC., 836 North St., Tewksbury, Mass., 01876, Tel: 617-851-7311, TWX: 710-343-6769; V.P. Mktg: W. Gossels

WANLASS DIV., AMBAC, 525 Virginia Dr., Fort Washington, Pa., 19034, Tel: 215-643-6161, TWX: 510-661-0654; Sls. Mgr: J.D. Familetti ....Pg. 946
Cal Tustin, G. Mousel, 14475 Galy St. 714-838-4419
Colo Denver, Space Sys. & Sls., 5810 W. 38th 303-414-5574
Ill Rolling Meadows, Sumer, 5105 Tollview 312-392-7370
Md Silver Spgs., R. Davies, 10 Old Post Rd. 301-487-3910
Mass Wakefield, Instr. Dynamics, Wakefiedl Ind'l. Pk. 617-245-5100
Minn Mpls., L.F. Murphy, 730 Chicago 612-333-4511
NM Albuquerque, Space Sys. & Sls., Box 9063 505-243-0458
NJ Ridgewood, Damon/Engel, 123 Prospect 201-444-1400
NY Buffalo, R.F. Lamb, 1865 Kenmore 716-874-4900
NY Syracuse, R.F. Lamb, Pickard Bldg. 315-454-2469
Ohio Dayton, Instr. Sys., 3481 Office Pk. Dr. 513-293-8095
Pa Hatboro, Damon/Engel 215-WA-2-3270
Tex Richardson, C. Hoffman, 777 S. Central Expy. 214-235-3600
Wash Bellevue, Vantage, 300 120th Ave., N.E. 206-455-3460

WARD LEONARD, Sub. Riker Corp., 31 South St., Mt. Vernon, N.Y., 10550, Tel: 914-664-1000, TWX: 710-562-0144; V.P. Mktg: W.A. Roth
WARD PRODUCTS CORP., Edson St., Amsterdam, N.Y., 12010, Tel: 518-842-7220; Sls. Mgr: F. Heeder
WARNECKE ELECTRON TUBES, INC., 175 W. Oakton St., Des Plaines, Ill., 60018, Tel: 312-299-4436; Sls. Mgr: F. Voltaggio, Jr.
WARNER ELEC. BRAKE & CLUTCH CO., Beloit, Wisc., 53511, Tel: 815-389-3771; V.P. Mktg: T. Batterman
WARREN COMMUNICATIONS, Div. Sola Basic Inds., New Town Rd., Littleton, Mass., 01460, Tel: 617-486-3575, TWX: 710-347-0650; Sls. Mgr: C.F. Cheney
WARREN COMPS. CORP., P.O. Box 848, Warren, Pa., 16365, Tel: 814-723-6200; Sls. Mgr: M. Sears
WARSAW COIL CO. INC., Box 389, Warsaw, Ind., 46580, Tel: 219-267-6041; Sls. Mgr: T. Joyner
WARWICK PRODS. CO., 7909 Rockside Rd., Independence, Ohio, 44131, Tel: 216-524-4404; Sls. Mgr: T.J. Storey
WATERBURY PRESSED METAL CO., Parts Div., 407 Brookside Rd., Waterbury, Conn., 06714, Tel: 203-756-8891; Sls. Mgr: W.H. Armstrong
WATERMAN INSTR. CORP., 400 S. Warminster Rd., Hatboro, Pa., 19040, Tel: 215-OS-2-7440, TWX: 510-665-6752; Sls. Mgr: P. Laterman
WATERS EQUIPMENT DIV., Datalight Inc., Tripp St., Framingham, Mass., 01701, Tel: 617-872-1241; Gen. Mgr: A. Frieling
WATERS INSTRS., INC., Box 6117, Rochester, Minn, 55901, Tel: 507288-7777 L.H. Witzke
WATERS MFG., INC., 533 Boston Post Rd., Wayland, Mass., 01778, Tel: 617-358-2777; Sls. & Mktg. Mgr: T.R. Benn

WATKINS JOHNSON CO., 3333 Hillview, Palo Alto, Cal., 94304, Tel: 415-326-8830, TWX: 910-373-1253; Sls. Mgr: C.C. Billat ....Pg. 1295
Ala Huntsville, Gentry Assocs., 2109 W. Clinton 205-534-9771
Ariz Scottsdale, Bennewitz Assoc., 532 N. Brown Ave. 602-947-7379
Cal Santa Clara, L & M Engrg., 3442 McKinley Dr. 408-243-2891
Cal Inglewood, L & M Engrg., 9911 Inglewood Ave. 213-674-6850
Colo Denver, Bennewitz Assoc., 2801 E. Colfax Ave. 303-399-1132
DC Washington, Eastern Instr., Inc., 5410 Indian Head Hwy. 301-839-3800
Fla Orlando, Gentry Assoc., 550 N. Bumby Ave. 305-841-7740
Ga Atlanta, Gentry Assoc., Box 13513 Sta. K 404-233-3816
Ill Pk. Ridge, R. F. Specialists, 118 Higgins Rd. 312-698-2044
Ind Indpls., R.F. Specialists, 6410 Woodwind Dr. 317-783-7360
Md Baltimore, Eastern Instr., 1002 Ingleside Ave. 301-744-3675
Mass Burlington, Lancer Assoc., 16 Adams St. 617-272-6445
Mich Southfield, S. Sterling, 21250 10⅛1/2 Mile Rd. 313-442-5656
Mo St. Louis, Kemco, Inc., 6050 Brown Rd. 314-524-0820
NM Albuquerque, Bennewitz Assoc., 9720 Candelaria 505-298-6775
NY Great Neck, Eastern Instr., 300 Northern Blvd. 516-466-9505
NY E. Syracuse, Ossmann Instr., 6666 Old Collamar 315-437-6666
NY Rochester, Ossmann Instr., 2425 Clover 716-271-4565
NY Vestal, Ossmann Instr., Vestal Pkwy., E. 607-785-9947
NY Wappinger Falls, Ossmann Instr., Box 207 914-297-7777
NC Burlington, Gentry Assoc., 116 E. O'Neal Ave. 919-227-2581
Ohio Cleveland, S. Sterling, 5827 Mayfield 216-442-8080
Ohio Dayton, S. Sterling, 2673 Culver Ave. 513-298-7573
Pa Phila., Eastern Instr., 613 Cheltenham Ave. 215-927-6269
Pa Pittsburgh, S. Sterling, No. 2 Pkwy. Ctr. 412-922-5720
Tex Irving, Kemco, Inc., Box 998 214-637-0163
Va Richmond, Eastern Instr., Ross Bldg. 703-644-6622
Wash Seattle, R. S. Drake Assocs., 6133 Maynard Ave., S. 206-763-2755
For: Can., Malton, Ont., A. Crawford Assoc., 6427 Northam Dr. 416-678-1500
For: Can., Longueuil, Que., A. Crawford Assoc., 157 St. Charles St. 514-670-1212
For: Can., Ottawa, Ont., A. Crawford Assoc., 376 Churchill Ave. 613-725-3354
For: Can., New Westminster, B.C., A. Crawford Assoc., 721 Aldford Ave. 604-524-1161

WATKINS-JOHNSON CO., Production Equip., 440 Mount Hermon Rd., Scotts Valley, Cal., 95060, Tel: 408-438-2100 EXT.217, TWX: 910-598-4403; Sls. Mgr: C.C. Billat ....Pg. 949
Ala Huntsville, Ridge Instr., 7220 Governor's Dr., W. 205-837-3211
Ariz Phoenix, Meas. Conslts., Box 11099 602-264-1279
Cal Long Bch., Scrantom Engrg., Box 6685 213-421-8951
Conn Bridgeport, Tech. Instr., 575 Broad St. 203-368-4582
Fla Orlando, Ridge Instr., 2227 Seely Dr. 305-293-4711
Ga Atlanta, Ridge Instr., 3094 McCulley, Dr., N.E. 404-939-1554
Ill Lake Villa, R.W. Venn Co., Rte. 2 Box 660 312-395-5353
Mass Wilmington, Tech. Instr., 236 Andover St. 617-944-3930
Mich Orchard Lake, Sidnell Co., 6051 Pinecroft Dr. 313-851-3518
NJ Roseland, Gawler-Knoop, 14 Beaufort Ave. 201-226-4545
NM Albuquerque, Meas. Conslts., Box 6081 505-344-3575
NY N.Y., Gawler-Knoop 212-344-2997
NY Rochester, Box 9178 716-377-6058
NY Solvay, Upstate Tech. Equip., Box 202 315-458-5573
NC Raleigh, Ridge Instr., 2400 C Wesville Ct. 919-787-7248
Ohio Dayton, Sidnell Co., 3300 S. Dixie Dr. 513-293-1194
Ohio Mentor, 7191 Dogwood La. 216-942-3304
Pa Doylestown, Box 794 215-348-4646
Tenn Oak Ridge, Ridge Instr., 140 E. Division Rd. 615-483-1311
Tex Dallas, Crockett Engrg., Box 47287 214-637-6120
Va Fairfax, Schibley Assocs., 10604 Warwick 703-591-3008
For: Can., Malton, Ont., A. Crawford Assoc., 6427 Northam Dr. 416-678-1500
For: Can., Longueuil, Que., A. Crawford Assoc., 157 St. Charles St., W. 514-670-1212
For: Can., Ottawa, Ont., A. Crawford Assoc., 6376 Churchill Ave. 613-725-3354
For: Can., New Westminster, B.C., A. Crawford Assoc., 721 Aldford Ave. 604-524-1161

WATLOW ELEC. MFG. CO., 12001 Lackland Rd., St. Louis, Mo., 63141, Tel: 314-432-4600; Sls. Mgr: L. Desloge, Jr.
WATSON MFG. CO., INC., 800 Taylor St., Jamestown, N.Y., 14701, Tel: 716-484-0171; Sls. Mgr: W.E. Smith
WAUKESHA MOTOR CO., W. St. Paul Ave., Waukesha, Wisc., 53186, Tel: 414-547-3311; VP-Mktg: J.L. Wheeler
WAVECOM, INC., 9036 Winnetka Ave., Northridge, Cal., 91324, Tel: 213-882-3010; Sls. Mgr: D. Larson
WAVEFORMS, United Recording Elctrns. Inds., 11922 Valerio St., No. Hollywood, Cal., 91605, Tel: 213-764-1500; Sls. Mgr: D. F. Morris

WAVELINE, INC., Box 718, W. Caldwell, N.J., 07006, Tel: 201-226-9100, TWX: 710-734-4324; Gen'l. Mgr: R.H. Koenig ....Pg. 1567
Ala Huntsville, Beacon Elctrn., 3322 Memorial 205-881-5031
Cal Hollywood, IFM-South, 3455 Cahuenga 213-469-1641
Cal Los Altos, IFM-North, 2235 Grant 415-961-2828
Colo Englewood, Hyer, 8101 E. Prentice 303-771-5424
Fla Ft. Laud, Beacon Elctrn., 651 N.E. 45th 305-564-4298
Fla Maitland, Beacon Elctrn. Assn., 540 S. Maitland 305-647-3498
Ga Atlanta, Beacon Elctrn., 2285 Peachtree 404-351-3654
Ill Highland Pk., Feller, 3065 Univ. Ave. 312-433-3646
Mass Wellesley, Reptron, Inc., Box 275 617-275-8585
NM Albuquerque, Hyer, 130 Alvarado 505-265-5961
NY Marcellus, Robtron, Inc., Clark Terr. E. Hill 315-673-3547
NY New York, Sylvan Ginsbury, 425 Park 212-689-5212
Pa Hatboro, Damon/Engel, Inc., Box 425 215-922-3270
SC Santee, Beacon Elctrn. Assoc., Box 31 919-454-1010
Tex Richardson, Lear Assocs., 312 N. Cen. Expwy. 214-231-7696
Utah Salt Lake City, Hyer, 2896 Main 801-487-7747
Va Springfield, Dyna-Rep., 5265 Port Royal 703-321-8630

WAVETEK, 9045 Balboa Ave., Box 651, San Diego, Cal., 92123, Tel: 714-279-2200, TWX: 910-335-2007; Sls. Mgr: T.G. Kurtz ....Pgs. 583-585
Ala Huntsville, W.A. Brown, 1314 Buford 205-539-4411
Ariz Scottsdale, B. F. A. Corp., 503 N. Brown 602-946-4215
Cal Palo Alto, Ward/Davis Assocs., 3941 E. Bayshore 415-966-7116
Cal Pasadena, Ward/Davis Assocs., 770 S. Arroyo Pkwy. 213-684-2840
Cal San Diego, Ward/Davis Assocs., 9045 Balboa Ave. 714-277-8081
Colo Denver, B. F. A. Corp., 1309 S. Inca St. 303-744-3301
Conn Hamden, J & J Assocs., 965 Dixwell Ave. 203-624-7800
DC Washington, Eastern Instr., 5410 Indian Head 202-333-8880
Fla Ft. Lauderdale, W.A. Brown, 961 N.W. 53rd 305-564-8000
Fla Ft. Walton Beach, W.A. Brown, 18 Chelsea 904-243-6424
Fla Orlando, W.A. Brown, 222 Weber 305-425-5505
Ga Tucker, W.A. Brown, 1682 Weymouth 404-939-1674
Ill Chicago, Carter Elctrns., 4919 W. 63rd 312-585-5485
Ind Indpls., Carter Elctrns., 6333 Hollister 317-293-0696
Mass Burlington, J & J Assocs., 12 Cambridge 617-272-2606
Mich Detroit, WKM Assocs., 1474 E. Outer 313-892-2500
Minn Mpls., Carter Elctrns., 1025B Evergreen 612-544-9393
NJ Nutley, Eastern Instr., Inc. 201-842-4242
Mo Hazelwood, Carter Elctrns., Inc., 400 Brookes Dr. 314-731-2237
NM Las Cruces, BFA Corp., Box 1237 505-523-0601
NY Great Neck, Eastern Instr., 300 Northern 516-466-9505
NY No. Syracuse, NACO Elctrns., Box 248 315-699-2651
NY Rochester, NACO Elctrns., 74 Park 716-244-4720
NY Schenectady, Naco Elctrns., 1032 Merlin 518-785-3750
NY Utica, NACO Elctrns., 2631 Edgewood 315-732-1801
NC Winston-Salem, W.A. Brown, 1108 Burke 919-725-5384
Ohio Cleveland, WKM, 16141 Puritas 216-267-0445
Ohio Dayton, WKM Assocs., 6073 Far Hills 513-434-7500
Pa Phila., Eastern Instr., 613 Cheltenham 215-927-7777
Pa Pittsburgh, WKM Assocs., 90 Clairton 412-892-2953
Tex Dallas, Data Mktg. Assoc., 10050 Monroe Dr. 214-358-4643
Tex Houston, Data Mktg. Assoc., 3925 C Dacoma St. 713-686-9627
Va Baltimore, Eastern Instr., Inc. 301-744-3675
Va Richmond, Eastern Instr., Inc. 703-644-6622
Wash Seattle, R.S. Drake, 6133 Maynard 206-763-2755

If you want to know

what manufacturers make what products, the **eem** green pages will solve your problem.

Product data is found

in the **eem** white pages they contain just about all the information you need to make a purchase decision.

If you're interested

in finding the address of a specific manufacturer, the **eem** yellow pages is the place to look.

Tell Them You Found It In eem

UNITED TECHNICAL PUBLICATIONS

Wisc Milwaukee, Carter Elctrns., 6400 W. Capitol 414-464-5555
For: Can., Don Mills, Ont., R-O-R Assocs., Ltd., 21 Rolark Dr. 416-291-7121

WEBBER MFG. CO., INC., Box 217, 8634 Brookville Rd., Indianapolis, Ind., 46206, Tel: 317-357-8681; Sls. Mgr: R.C. Webber

WEBSTER ELEC. CO., INC., Sta-Rite Ind., 1900 Clark St., Racine, Wisc., 53403, Tel: 414-633-3511; Sls. Mgr: H.C. Stacey

WECKESSER CO., INC., 4444 W. Irving Park Rd., Chicago, Ill., 60641, Tel: 312-282-8626, TWX: 312-265-1322; Sls. Mgr:

WEED INSTR. CO., Box 549A, 109 W. 11th St., Elgin, Tex., 78621, Tel: 512-285-3411; Sls. Mgr: G.G. Moore Pg. 1984

Cal Palo Alto, Priz-Co., 2675 Park Blvd. 415-326-9333
Fla Orlando, R.J. Cheney & Assocs., Box 14678 305-843-0491
Ga Decatur, Nell Assocs., 3124 San Juan Dr. 404-288-0404
Ill Chicago, A.D. Clark, 6560 N. Sheridan Rd. 312-274-0304
Mass Natick, Andruss-Teskin, Box 268 617-653-3919
NJ Cherry Hill, M.C.W., 901 Berlin Rd. 609-429-3753
NY Buffalo, Terryberry Engrg. Co., 5436 Main 716-632-7404
Ohio Cincinnati, Space Assocs., 1717 Section Rd. 513-631-0402
Okla Tulsa, D. Shuhart Co., 2250 E. 49th St. 918-747-4136
Tex Dallas, D. Shubart Co., 12011 Coit Rd. 214-239-0185
Tex Houston, Weed Instr. Co., Box 35484 513-285-3411
Wash Seattle, Fluid Control, Inc., 3016 N.E. Blakely 206-524-3919
For: Can., Lachine 600, Que., Microtech Assocs., 2625 Louis Pare 514-634-9919

WEINSCHEL ENGRG. CO., Box 577, Gaithersburg, Md., 20760, Tel: 301-948-3434, TWX: 710-828-9705; Sls. Mgr: W.J. Ronis .... Pg. 1571

Ala Huntsville, BCS Assocs., 3322 S. Memorial 205-881-6220
Cal Anaheim, Blair Assocs., 421 N. Brookhurst 714-635-1350
Cal Los Altos, J. Stone, 339 S. San Antonio 415-948-4563
Colo Englewood, PLS Assocs., 8080 E. Union 303-771-0140
Fla Orlando, BCS Assocs., 940 N. Fern Creek 305-843-1510
Ill Rosemont, Cozzens & Cudahy, 9501 Devon 312-825-1144
Ind Indpls., Cozzens & Cudahy, 21 Beachway 317-244-2456
Mass Burlington, Lancer Assoc., 16 Adams St. 617-272-6445
Md Kensington, Elctrn. Mktg., 11501 Huff 301-881-5300
Mich Royal Oak, Cozzens & Cudahy, 127 Edmund 313-585-5159
Minn Mpls., Cozzens & Cudahy, 7450 France S. 612-920-1022
Mo Edmundson, Cozzens & Cudahy, 10534 Natural Bridge 314-423-1234
NJ Ft. Lee, Tech. Mktg., 4 Horizon 201-224-6911
NM Albuquerque, PLS Assocs., 4300 H Silver S.E. 505-255-2330
NY Binghampton, NACO Elctrns., 3 Hastings 607-724-8288
NY No. Syracuse, Naco Elctrns., Box 248 315-699-2651
NY Rochester, Naco Elctrns., 74 Park Ave. 716-244-4720
NY Schenectady, NACO Elctrns., 1032 Merlin 518-785-3750
NY Utica, Naco Elctrns., 2631 Edgewood Rd. 315-732-1801
NC Greensboro, BCS, 1039 E. Wendover 919-273-1918
Ohio Medina, Cozzens & Cudahy, 735 S. Court 216-725-5660
Okla Tulsa, C. Wolf Co., 5546 S. 78th E. Ave. 918-622-9233
Pa King of Prussia, Elctrn. Mktg., 210 Goddard 215-265-1600
Tex Ft. Worth, C. Wolf Co., 3327 Winthrop 817-738-1702
Tex Houston, C. Wolf Co., 4031 Broadway 713-643-2114
Utah Salt Lake City, PLS Assocs., 5219 Major 801-262-2866
Wash Seattle, R. Drake, 6133 Maynard Ave. 206-763-2755

WEITERMANN ELCTRNS., 4549 North 38th St., Milwaukee, Wisc., 53209, Tel: 414-444-5097; Pres: B.R. Weitermann

WEKSLER INSTRS. CORP., 80 Mill Rd., Freeport, N.Y., 11520, Tel: 516-623-0100; Sls. Mgr: E.T. Oettinger

WELCO INDS. INC., 9027 Shell Ave., Cincinnati, Ohio, 45236, Tel: 513-891-6600, TWX: 810-461-2594; Sls. Mgr: R. Laufman

WELDOTRON CORP., Elctrns. Div., 1532 S. Washington Ave., Piscataway, N.J., 08854, Tel: 201-752-6700, TWX: 710-997-9502; Sls. Mgr: L. Siegel

WELLER, Div. Cooper Inds., Inc., 100 Wellco Rd., Easton, Pa., 18042, Tel: 215-258-5371; V.P. Sls: R.W. Brady .... Pg. 2946

Cal Danville, Straube Assocs., 401 S. Hartz 415-837-8151
Cal Inglewood, V & L, 3412 W. Century Blvd. 213-671-7688
Cal Menlo Pk., Straube Assoc., 843 Willow 415-323-2476
Colo Boulder, Straube Assoc., Box 1649 303-443-8600
Fla Clearwater, WMM, 1260A S. Highland 813-446-0075
Ill Chicago, Ellinger, 6580 Northwest Hwy. 312-763-1570
Ind Indianapolis, L. Devoe, 665 E. 61st St. 317-257-1227
Iowa Clarion, Ellinger Sls., 309 4th Ave., SE 515-532-3218
Md Lutherville-Timonium, Naudain, Box #1 301-252-5378
Mass Needham, Coakley, Boyd & Abbett, 1424 Highland 617-444-5470
Minn Mpls., D. Swanson, 2655 Brighton NE 612-789-5636
Mo St. Louis, Ellinger Sls., 4969 Bancroft 314-352-2027
NJ Mt. Laurel, Naudain Assocs., Rt. 73 & Ramblewood Pkwy. 609-235-1801
NY Great Neck, F. Tylinski, 425 Northern 516-466-9070
NY Syracuse, Carlen Reps., 3650 James 315-437-2921
NC Smithfield, Byrd & Barbour Sls., Box 30 919-934-8136
Tex Dallas, Bouillion Engrg., 1715 Matagorda 214-376-1929
Utah Morgan, Straube, RFD #1 Highlands 801-829-6448
Wash Seattle, R. Johnston, 1011 N.E. 69 St. 206-524-5170

WELLS ELCTRNS., INC., Dynablast Div., 1701 S. Main St., So. Bend, Ind., 46623, Tel: 219-287-5941; Gen'l. Mgr: D.P. Mydlach

WELLS ELCTRNS., INC., WELTEK DIV., 1701 S. Main St., So. Bend, Ind., 46623, Tel: 219-287-5941; Gen. Mgr: T. Thomas

WELSH, W.H. CO., INC., 2241 Indiana Ave., Chicago, Ill., 60616, Tel: 312-225-5454; Sls. Mgr: C.L. Matthews

WELTRONIC CO., 19500 W. Eight Mile Rd., Southfield, Mich., 48075, Tel: 313-444-4880; Sls. Mgr: L.R. Broniak

WELWYN ELEC., LTD., Bedlington, Northumberland, England, Tel: Bedlington 2181

WELWYN INT'L., INC., 811 Sharon Dr., Westlake, Ohio, 44145, Tel: 216-871-8900; Sls. Mgr: A. Askew Pg. 2900

Cal Fremont, H.K. Foraker Co., Box 1325 415-657-2213
Cal Monrovia, Simpson Sls., 232 W. Maple 213-359-8132
Conn Hamden, Impact Sls., 60 Connolly 203-248-9368
Ill Skokie, Mar-Con Assocs., 4836 Main St. 312-675-6450
Md Baltimore, White & Co., 7 Church 301-484-5400
Mass Waltham, Impact Sls., 223 Crescent 617-893-2850
Minn Mpls, Bitronics Sls., 6245 Thomas Ave. So. 612-888-7044
Ohio Lakewood, Baehr, Greenleaf & Assoc., 14700 Detroit Ave. 216-221-9030
Tex Dallas, D.G. Neely Assoc., Box 34796 214-241-6741
Wash Seattle, J. Chase Co., Box 249 206-774-3586

WEN PRODS., INC., 5810 Northwest Hwy., Chicago, Ill., 60631, Tel: 312-763-6060; Sls. Mgr: D.D. Peel

WENDELL FABRICS CORP., 1220 Broadway, New York, N.Y., 10001, Tel: 212-LA-4-1322; Sls. Mgr: W. Atkins

WENDON CO., INC., 17 Irving Ave., Stamford, Conn., 06902, Tel: 203-348-6271; Sls. Mgr: D. Bosak

WENESCO INC., Box 303 Northtown Sta., Chicago, Ill., 60645, Tel: 312-523-5455; Sls. Mgr: B. Lowe

Advertisement

Wenesco products include complete wave soldering systems to handle P.C. boards up to 20 inches wide, flow solder dippers for components and IC removal, solder pots, fluxers, preheaters, and a variety of multi purpose tanks. Compare our features and prices before you buy.

WENTWORTH LABS, INC., Rte. 7, Broadfield, Conn., 06804, Tel: 203-775-1750; Sls. Mgr: A. Evans

WER IND'L. CORP., 3036 Alt Blvd., Grand Island, N.Y., 14072, Tel: 716-773-2321; Sls. Mgr: F. Kretzschmar

WESCO ELEC. CO., INC., 27 Olive St., Greenfield, Mass., 01301, Tel: 413-774-4358; Sls. Mgr: J.R. DeSanty

Advertisement

Wesco manufactures a complete line of Mylar, metallized Mylar, polystyrene, polycarbonate and metallized polycarbonate capacitors. Precision, close tolerance, thermal cycling, stability, are all included as standard processes. Delivery on almost any value within catalog capacity spectrum, is from stock to 1 week in prototype quantities and 3 to 4 weeks in production quantities.

WEST COAST ELEC. MFG. CO., 233 W. 116th Pl., Los Angeles, Cal., 90061, Tel: 213-PL-5-1138; Sls. Mgr: W.E. Seal

WEST COAST RESCH. CORP., Box 25061, Los Angeles, Calif., 90025, Tel: 213-GR-8-8833; Gen'l. Mgr: H.M. Spivack

WEST INSTR. DIV., Gulton Inds., Inc., 3860 N. River Rd., Schiller Pk., Ill., 60176, Tel: 312-678-6400; Sls. Mgr: J. Rothenbach

WESTAMP, INC., 1542 15th St., Santa Monica, Cal., 90404, Tel: 213-393-0401; Sls. Mgr: B. Vesser

WESTBERG MFG. CO., 3400 Westach Way, Sonoma, Cal., 95476, Tel: 707-938-2121; Sls. Mgr: R.R. Westberg

WESTERN COATING CO., Box 598, Royal Oak, Mich., 48073, Tel: 313-JU-8-3311

WESTERN COIL & ELEC. CO., 215 State St., Racine, Wisc., 53403, Tel: 414-632-4741; Sls. Mgr: W.T. Lewis

WESTERN ELCTRN. PRODS. CO., 107 Los Molinos, San Clemente, Cal., 92672, Tel: 714-492-4677; Sls. Mgr: A.P. Schreiber

Advertisement

Thermal Wire Strippers assure freedom for nicked and cut wire strands. Six models available for both prototype and production line operation. Strips Teflon® as well as lower-melting plastic insulation such as vinyl, polyethylene, nylon, dacron, rayon, etc. Used on finest stranded wire as well as large coaxial cable without any adjustment. Also available are automatic measuring wire and tubing cutters as well as coaxial cable strippers. Immediate delivery. Ask for catalog.

WESTERN GEAR CORP., Electro Prods. Oper., Dept. E, 75 W. Green St., Pasadena, Cal., 91105, Tel: 213-796-4395, TWX: 213-639-6541; Sls. Mgr: J.A. Neumayer

WESTERN GOLD & PLATINUM CO., Sub. Wilbur B. Driver Co., 525 Harbor Blvd., Belmont, Cal., 94002, Tel: 415-593-3121, TWX: 415-594-8855; Sls. Mgr: H. Mason

WESTERN INDICATOR CO., 9835 Dupree St., So.. El Monte, Cal., 91733, Tel: 213-442-4700; Sls. Mgr: J.N. Dupree

WESTERN MAGNETICS, INC., 1733 Flower St., Glendale, Cal., 91201, Tel: 213-245-7311; Sls. Mgr: H.J. Litzinger

WESTERN MICROWAVE LABS., 16845 Hicks Rd., Los Gatos, Cal., 95030, Tel: 408-266-4820, TWX: 910-338-0032; Sls. Mgr: D. Sanders

WESTERN RESERVE ELCTRNS., 2150 Highland Rd., Twinsburg, Ohio, 44087, Tel: 216-425-4951; V.P. Sls. Mgr: F.W. Sawonik .... Pgs. 580,581

WESTERN SKY IND., 21300 Cloud Way, Hayward, Calif., 94545, Tel: 415-783-0600; Sls. Mgr: R.L. Henderson

WESTERN TELEMATIC, INC., 5507 Peck Rd., Arcadia, Cal., 91006, Tel: 213-442-1862; Sls. Mgr:

WESTERN TRANSFORMER CO., Box 370, Tijeras, N. M., 87059, Tel: 505-282-3118; Sls. Mgr: J. Keulen

WESTINGHOUSE ELEC. CORP., Defense Prods., P.O. Box 2278, Pittsburgh, Pa., 15108, Tel: 412-255-3800; Mktg. Mgr: H.D. Ellrod

WESTINGHOUSE ELEC., Elctrn. Tube, Box 284, Elmira, N.Y., 14902, Tel: 607-739-7951; Mktg. Mgr: J. Baker

NOTES

WESTINGHOUSE ELEC., Environmental Sys., 4300 36th St., S.E., Grand Rapids, Mich., 49508, Tel: 616-949-1050; Sls. Mgr: J. Munsey
WESTINGHOUSE ELEC., General Control, Buffalo, N. Y., 14240, Tel: 716-631-2440; Mktg. Mgr: W.J. Brown
WESTINGHOUSE ELEC., Ind'l. Equip., Box 300, Sykesville, Md., 21784, Tel: 301-787-2800
WESTINGHOUSE ELEC. CORP., Ind'l. Grp., Westinghouse Bldg., Pittsburgh, Pa., 15222, Tel: 412-255-3321
WESTINGHOUSE ELEC., Ind'l. Plastics, 1585 Lebanon School Rd., W. Mifflin, Pa., 15122, Tel: 412-256-3971; Mktg. Mgr: S.F. Guthman
WESTINGHOUSE ELEC., Lamp Div., Parts Sls., 1 Westghse Plaza, Bloomfield, N. J., 07003, Tel: 201-465-3325; Mktg. Mgr: R.M. Harris

WESTINGHOUSE ELEC. CORP., Relay-Instr. Div., Plane & Orange Sts., Newark, N.J., 07101, Tel: 201-621-9000; Mktg. Mgr: J.M. Heggy ....Pg. 582
Ala Birmingham, 1420 Bank for Savings & Trust 205-323-2411
Ala Mobile, Two Office Pk. Bldg., 273 Azalea Rd. 205-344-4373
Ariz Phoenix, 2200 N. Central 602-258-7214
Ark Little Rock, 103 W. Capital St. 501-376-3462
Cal Bakersfield, 214 Bernard St., Ste. C 805-327-7633
Cal City of Commerce, 6252 Telegraph Rd. 213-685-9420
Cal Compton, 18020 S. Santa Fe Ave. 213-638-7781
Cal Emeryville, 5815 Peladeau St. 415-652-3770
Cal Fresno, 2608 California Ave. 209-264-5091
Cal Los Angeles, 600 St. Paul Ave. 213-482-9660
Cal Riverside, 3723 Tibbetts St. 714-682-6551
Cal Sacramento, Box 15208 916-922-7071
Cal San Diego, 1365 Sixth Ave. 714-234-4651
Cal San Francisco, One Maritime Plaza 415-392-5353
Cal Sunnyvale, Hendy Ave., Bldg. 73 408-735-2191
Colo Denver, 55 W. Fifth Ave. 303-534-8121
Conn Hartford, 360 Market St. 203-249-5792
DC Washington, 1625 K St., N.W. 202-628-8843
Fla Jacksonville, 841 Miami Rd., 1115 Prudential Bldg. 904-356-5811
Fla Miami, Box 694 305-634-5461
Fla Orlando, Box 20513 305-841-3421
Fla Tampa, 5444 Bay Ctr. Dr. 813-876-5141
Ga Albany, Box 532 912-436-0144
Ga Atlanta, 1299 Northside Dr., N.W. 404-351-5200
Haw Honolulu, Box 2321 808-574-581
Idaho Boise, Box 8263 208-344-2502
Ill Aurora, 77 S. Broadway 312-897-4293
Ill Chicago, 10 S. Riverside Plaza 312-461-7200
Ill Danville, 603 N. Gilbert St. 217-442-1901
Ill Peoria, 915 N. Adams St. 309-673-0754
Ill Rockford, 2121 15th St. 815-398-3591
Ind Evansville, 403 S. Third Ave., Box 545 812-425-7146
Ind Ft. Wayne, 727 S. Clinton St. 219-742-0221
Ind Hammond, 6355 Indianapolis Blvd. 219-844-9400
Ind Indianapolis, 1560 Stadium Dr. 317-632-3301
Ind So. Bend, 2015 Western Ave. 219-287-1051
Iowa Cedar Rapids, 210 Dows Bldg. 319-366-0781
Iowa Davenport, 1531 W. River Dr., Box 3868 319-323-2761
Iowa Des Moines, 101 12th St. 515-283-2081
Kans Wichita, Box 967 316-591-3411
Ky Louisville, 1941 Bishop La. 502-459-5440
La Baton Rouge, 440 3rd St., Box 2883 504-348-5759
La New Orleans, Box 19657 504-486-6141
La Shreveport, Box 1661 318-425-2435
Me Augusta, 9 Bowman St. 207-623-4571
Md Baltimore, Instr. Specialties, 3100 Wash. 301-644-0200
Md Towson, 1055 Taylor Ave. 301-828-5400
Mass Boston, Prudential Tower Bldg. 617-542-0600
Mass Springfield, Box 1611 413-734-4936
Mass Worcester, 3 Rockdale St. 617-853-2680
Mich Detroit, 5757 Trumbull Ave. 313-872-7010
Mich Grand Rapids, 281 Leonard, N.W. 616-459-4664
Mich Jackson, 715 W. Michigan Ave., Box 746 517-787-3630
Mich Saginaw, 4855 State St. 517-793-5100
Minn Duluth, 330 S. First Ave., E. 218-727-1541
Minn Minneapolis, 3501 S. Highway 100 612-927-6551
Miss Jackson, Box 2168 601-354-2373
Mo Kansas City, 1215 W. 12th St. 816-421-7122
Mo St. Louis, 411 N. 7th Ave. 314-421-6911
Mont Butte, 949 S. Montana St. 406-792-2301
Neb Omaha, 117 N. 13th St. 402-345-8700
NJ E. Orange, 67 Evergreen Pl. 201-465-0222
NM Albuquerque, 5301 Central Ave., N.E. 505-265-6647
NY Albany, 17 Warehouse Row 518-459-1820
NY Buffalo, 700 Ellicott Sq. 716-854-3966
NY New York, 200 Park Ave. 212-692-3211
NY Olean, 309 Exchange Nat'l. Bank Bldg. 716-372-0040
NY Rochester, 711 Exchange St. 716-232-4380
NY Syracuse, 4030 New Court Rd. 315-463-9581
NY Vestal, Box 148 607-729-2258
NY Watertown, 32 The Arcade 315-788-2071
NC Charlotte, 2001 W. Morehead St. 704-377-3471
NC Greensboro, 1020 E. Wendover Ave. 919-273-5551
NC Raleigh, Box 10386 919-834-4375
Ohio Akron, 158 E. Voris St. 216-376-2171
Ohio Cincinnati, 7710 Reading Rd. 513-475-7400
Ohio Cleveland, 55 Public Sq. 216-579-2121
Ohio Cleveland, Weschler Elec. Corp., 4250 W. 130th St. 216-251-4609
Ohio Columbus, 940 Williams Ave. 614-294-5261
Ohio Dayton, 1306 Farr Dr. 513-461-3720
Ohio Toledo, 245 Summit St. 419-248-6681
Ohio Youngstown, 246 W. Wood St. 216-744-8911
Okla Oklahoma City, 120 N. Robinson St. 405-528-2911
Okla Tulsa, 915 Enterprise Bldg. 918-583-3191
Ore Eugene, 1345 Olive St. 503-342-3083
Ore Medford, Box 1487 503-773-1845
Ore Portland, Box 12265 503-224-4200
Pa Allentown, Box 59 215-432-6841
Pa Bala Cynwyd, One Decker Sq. 215-878-1300
Pa Erie, 1107 Hess Ave. 814-452-4867
Pa Johnstown, 107 Station St. 814-288-1559
Pa Pittsburgh, Box 1017 412-255-3800
Pa Wilkes Barre, 267 N. Pennsylvania Ave. 717-825-7337
Pa Williamsport, 202 Basin St. 717-322-6183
SC Columbia, 1710 Gervais St. 803-256-1511
SC Greenville, 292 Pleasantburg Bldg. 803-232-5695
Tenn Chattanooga, 305 Provident Bldg. 615-267-4361
Tenn Kingsport, 433 E. Center St. 615-247-5167
Tenn Knoxville, 808 Campbell Ave., S.E. 615-522-8101
Tenn Memphis, 1520 First Nat'l. Bank Bldg. 901-526-8546
Tenn Nashville, 110-21st Ave., S. 615-242-3505
Tex Amarillo, 301 Polk St. 806-372-3259
Tex Beaumont, 1103 Beaumont Savings Bldg. 713-838-6333
Tex Corpus Christi, Corpus Christi State Nat'l. Bldg. 512-883-9236
Tex Dallas, 8400 John W. Carpenter Frwy. 214-631-2811
Tex El Paso, Southwest Ctr., 300 E. Main St. 915-542-1744
Tex Houston, 507 Dallas Ave. 713-224-7791
Tex Houston, D. Dashiell Co., 6161 Wash. 713-869-4878
Tex Lubbock, Box 6399 806-792-2811
Tex Odessa, 300 N. Jackson St. 915-337-1822
Tex San Antonio, 201 N. St. Mary's St. 512-223-9181
Utah Salt Lake City, 1680 S. Redwood Rd. 801-486-8751
Va Richmond, 4000 W. Broad St. 703-649-9061
Va Roanoke, Box 2547 703-342-8925
Wash Seattle, 19 W. Harrison 206-623-7001
Wash Spokane, Box 2987 509-535-3521
WVa Bluefield, 704 Bland St. 304-325-7215
WVa Charleston, 1204 Kanawha Blvd., E. 304-346-9606
WVa Fairmont, 10th & Beltline 304-363-0400
WVa Huntington, 1029 7th Ave. 304-529-7146
WVa Wheeling, Box 431 304-232-4100
Wisc Appleton, 315 W. Wisconsin Ave. 414-739-2313
Wisc Madison, Box 3099 608-257-4517
Wisc Milwaukee, Box 1207 414-276-1800

WESTINGHOUSE ELEC., Semiconductor Div., Youngwood, Pa., 15697, Tel: 412-WA-5-7272, TWX: 510-468-2840; Sls. Mgr: Mauri Sardi ....Pgs. 1858-1864
Cal Los Angeles, 600 St. Paul Ave. 213-482-9660
Cal Sunnyvale, Bldg. 73, Hendy Ave. 408-735-2191
Fla Orlando, 1040 Woodcock Rd. 305-841-3421
Ill Chicago, 10 S. Riverside Plaza 312-416-7200
Ind Ft. Wayne, Anthony Wayne Bank Bldg. 219-742-0221
Md Baltimore, Box 1693 301-765-1000
Mass Boston, 800 Boylston St. 617-542-0600
Mich Southfield, 24700 Mile Rd. 313-352-9000
Minn Minneapolis, 3501 S. Hwy. 100 612-927-6551
NJ Newark, 67 Evergreen Pl. 201-465-0222
NY Mineola, 1501 Franklin Ave. 516-248-9810
NY Poughkeepsie, 50 Pershing Ave. 914-454-1024
NY Rochester, 711 Exchange St. 716-232-4380
Ohio Cleveland, Illuminating Bldg. 216-579-2174
Ohio Dayton, 1306 Farr Dr. 513-461-3720
Pa Bala Cynwyd, One Decker Sq. 215-878-1300
Pa Youngwood 412-925-7272
Tex Dallas, 8400 John Carpenter Frwy. 214-631-2811
Wisc Milwaukee, 731 N. Jackson 414-264-6400

WESTINGHOUSE ELEC., Specialty Elctrns. Div., 7800 Susquehanna St., Pittsburgh, Pa., 15221, Tel: 412-256-5175; Sls. Mgr: M.C. Ferrara
WESTINGHOUSE ELEC., Specialty Metals, R.D. #2, Box 45, Blairsville, Pa., 15717, Tel: 412-459-9400; Mktg. Mgr: R.B. MacDonald
WESTINGHOUSE ELEC., Specialty Transformer, Box 231, Greenville, Pa., 16125, Tel: 412-981-1611; Mktg. Mgr: R.B. Hart
WESTINGHOUSE ELEC. INT'L., 200 Park Ave., New York, N.Y., 10017, Tel: 212-692-3211; Pres: J. de Cubas
WESTMORELAND PLASTICS CO., 135 Gertrude St., Latrobe, Pa., 15650, Tel: 412-539-1612; Sls. Mgr: E.R. Hatfield
WESTON COMPS. DIV., Weston-Archbald, Archbald, Pa., 18403, Tel: 717-876-1500, TWX: 717-770-2928; Sls. Mgr: F.J. Butteri
WESTON HYDRAULICS, DIV., Borg-Warner Corp., 7500 Tyrone Ave., Van Nuys, Calif., 91409, Tel: 213-781-4000, TWX: 910-495-1726; Sls. Mgr: D.G. Sherman
WESTON INSTRS., INC., Daystrom Ind'l Gage Div., Archbald, Pa., 18403, Tel: 717-876-1500, TWX: 717-770-2919
WESTON INSTRUMENTS, INC., 614 Frelinghuysen Ave., Newark, N.J., 07114, Tel: 201-243-4700, TWX: 710-995-4616
WESTON INSTRS. DIV., Weston Instrs., Inc., County Line Rd., Hatboro, Pa, 19040, Tel: 215-672-1240, TWX: 510-665-6589; Mktg. Mgr: W.A. Buck
WESTON-MAGNETICS, Weston Comps. Div., Weston Instrs., Inc., Archbald, Pa., 18403, Tel: 717-876-1500, TWX: 717-770-2919
WESTON-TRANSICOIL, Weston Comps. Div., Worcester, Pa., 19490, Tel: 215-277-1300, TWX: 510-660-0132; Dir. Mktg: E.F. Hall
WESTRONICS, INC., 3605 Mc Cart St., Ft. Worth, Tex., 76110, Tel: 817-926-2621; Mktg. Mgr: J.J. Meny
WHALITE MFG. CO., Rte. #202, Montville, N.J., 07045, Tel: 201-335-1100; Sls. Mgr: N. L. Meyerson
WHARTON UNITOOLS, 8-10 Lake St., Moosup, Conn., 06354, Tel: 203-564-2254; Sls. Mgr: R.H. Rich
WHEELABRATOR CORP., Wheelabrator Div., 1478 S. Byrkit St., Mishawaka, Ind., 46544, Tel: 219-255-2141; V.P. Sales: L.J. Kohlmeyer
WHEELER LAB. OF HAZELTINE CORP., Greenlawn, N.Y., 11740, Tel: 516-261-7000; Pres. D. Westermann

WHEELOCK SIGNALS, 273 Branchport Ave., Long Branch, N.J., 07740, Tel: 201-222-6880, TWX: 201-222-7091; V.P-Mktg: H.T. Pascale ....Pg. 1791
Ariz Phoenix, Portis & Assoc., Box 15238 602-947-4379
Cal Los Angeles, E.E. Strassner, 3121 Los Feliz 213-666-1511
Cal San Jose, Intrepid Sls., 1052 W. Riverside 415-964-6881
Conn No. Haven, Comp. Rep. Assoc., 22 Broadway 203-239-9762
Fla Orlando, Gra-Mar, 3113 Lawton 305-841-2330
Ill Northfield, Ryan Sls. Co., Box 129
Ind Fort Wayne, Ryan Sls. Co., Box 2515
Md Hyattsville, Wyncote Instr., 3400 Toledo Ten. 301-779-7444
Mass Needham, Comp. Rep. Assoc., 1116 Great Plain 617-444-2484
Minn Mpls, R.W. Marshall Co., 6101 Excelsior 612-929-0457
NJ E. Orange, Masin-Esco, 263 Central 201-674-6505
NY Clarence, Rep Tech, Box 156 716-684-6250
NY Syosset, Masin-Esco, 333 Jackson 516-364-0310
NY Syracuse, Rep Tech, 2002 Teall 315-437-2845
Ohio Dayton, Mid West Mktg., 137 Lakeview 513-433-2511
Pa Ambler, Wyncote Instr., 365 E. Butler 215-643-2440
Tex Dallas, Texport Elctrn. Sls., 2837 Anode 214-631-6270
EXP: Ohio, Chagrin Falls, Midwest Mktg., 15435 Dale Rd.

WHISTLER ELCTRNS., INC., 8613 Yolanda Ave., Northridge, Cal., 91324, Tel: 213-349-7100; Sls. Mgr: D. G. McBride
WHITAKER CABLE CORP., 1301 Burlington St., N. Kansas City, Mo., 64116, Tel: 816-471-4640; Sls. Dir: C.J. Owen
WHITE INSTRS., INC., Box 698, Austin, Tex., 78767, Tel: 512-892-0752; Sls. Mgr: W. Robertson cont'd

NOTES

cont'd

Advertisement

Manufacturers of wave filters, active and passive, in the audio spectrum and below. Standard and custom low, high, band pass and reject designs-- Butterworth, Chebishev, Bessel or elliptic response characteristics-- wide range of source and load impedances. Tuned, self-contained units ready to use-- no external components to add. Rapid manufacture and delivery of production quantities. Fast prototype service.

WHITMAN CORP., 1725 Powers St., Cincinnati, Ohio, 45223, Tel: 513-541-3223; Sls. Mgr: S. Erhardt

WHITMOR WIRE & CABLE, 13161 Sherman Way, No. Hollywood, Cal., 91605, Tel: 213-764-6296, TWX: 910-499-2159; Sls. Mgr: J.J. Serago ....Pg. 3070

WHITSO, INC, 9330 Byron St., Schiller Park, Ill., 60176, Tel: 312-678-5200, TWX: 312-678-2672; Genl. Sls. Mgr: A. Paloian

WHITTAKER CORP., 10880 Wilshire Blvd., Los Angeles, Cal., 90024, Tel: 213-475-9411, TWX: 910-342-7565

WIEGAND, EDWIN L. CO., Div. Emerson Elec. Co., 7705 Thomas Blvd., Pittsburgh, Pa., 15208, Tel: 412-242-6400, TWX: 710-664-4449; Sls. Mgr: S. Campanella

WILBRECHT INC., 240 Plato Blvd., St. Paul, Minn, 55107, Tel: 612-222-2791; Sls. Mgr.: J.K. Wilbrecht Pg. 1961

Ill Chicago, Memac Sls., 4740 N. Austin 312-545-1033

WILCO CORP., 4030 W. Tenth St., Indianapolis, Ind., 46222, Tel: 317-244-2516

WILCOX PRODS. CO., Sub. ITT Thermotech, Inc., 1202 S. Fifth St., Hopkins, Minn., 55343, Tel: 612-938-7671; Sls. Mgr: E. Ostergard ....Pgs. 2766-2773

Ariz Phoenix, D. Dick, 4710 N. 15th Ave. 602-277-9740
Cal Burbank, Secana, 1613 W. Burbank Blvd. 213-849-6848
Cal San Leandro, C. Crisler, 14622 Wicks Blvd. 415-357-1150
Conn W. Hartford, D. Kelley, 28 Whiting La. 203-233-0870
Conn W. Simsburg, Anchor Engrg., 6 Arrowhead Dr. 203-658-6261
Fla St. Petersburg, Fla. Div., 3200 Tyrone Blvd. 813-347-2191
Ill Chicago, J. Robinson, 1721 W. Division 312-252-3400
Ill Norridge, B. Reynolds, 5135 N. Monterey 312-457-1190
Ind Ft. Wayne, R. McCampbell, 3715 Nokomis 219-747-9697
Iowa Des Moines, F. Wilcox Co., Inc., Box 1056 515-255-8416
Kans Mission, Inland Assocs., 6047 Howe Dr. 913-362-2366
Mass Wellesley Hills, Anchor Engrg., 40 Wash. 617-235-6330
Mich Detroit, G. Hall, 10432 W. McNichols Rd. 313-864-1368
Mich Farmington, L. George, 32500 Grand River 313-474-1505
Minn Mpls., W.J. Houlihan, 6030 Wayzata Blvd. 612-545-2538
Mo St. Louis, E. Monnig, 3 Laymont 314-991-2512
NJ Roselle, Midlantic Plastic Sls., 208 Columbus Ave. 201-241-3875
NY Manhasset, Kaelber & Mack, 75 Plandome 516-627-6620
NY Rochester, P. Schumacher, Box 8399 716-235-2123
NC Greensboro, Mfgs. Sls., Box 20005 919-274-2474
Ohio Cleveland, G. Richards, 14237 Detroit Ave. 216-221-3634
Okla Tulsa, T.J. Ray Co., Box 45191 918-627-1515
Ore Portland, C. Riggs, 422 N.W. 8th 503-226-3286
Pa Ardmore, Midlantic Plastic Sls., 125 Coulter Ave. 215-649-2436
Wash Seattle, J. Noll, 314 2nd Ave., S. 206-623-5709
Wisc Butler, D. Jensen, 5170 N. 125th St. 414-781-2260

WILD ROVER CORP., Herbert Ave., Box 205, Closter, N.J., 07624, Tel: 201-768-8393; Sls. Mgr: A.M. Adelson Pg. 1962

Ariz Phoenix, Luscombe Engrg. Co., 222 W. Osborne Rd. 602-274-1542
Cal Pasadena, Luscombe Engrg. Co., 610 S. Arroyo Pkwy. 213-684-2000
Cal San Mateo, Luscombe Engrg. Co., 220 E. Third Ave. 415-342-7057
Conn New Haven, R.H. Sturdy & Co., Box 5385 203-288-2200
Ill Chicago, Olson Engrg. & Sls., 1921 N. Harlem Ave. 312-622-9778
Md Bethesda, A.R.A. Elctrns., 7805 Old Georgetown Rd. 301-657-2585
Mass Wellesley Hills, R.H. Sturdy & Co., 204 Worcester St. 617-235-2330
Mich Detroit, Basic Service, 16544 Plymouth Rd. 313-837-8820
NJ Ridgewood, Instr. Sls., Box 403 201-445-5210
NY Hyde Pk., R. P. Kennedy Co., Inc., Green Tree Dr., N. 914-229-2269
NY Rochester, R. P. Kennedy Co., Inc., 39 Saginaw Dr. 716-271-6322
Ohio Vermillion, R. Howley Co., Box 197 216-967-7000
Pa New Britain, Kastle Assocs., 434 E. Butler Ave. 215-348-4466
Tex Dallas, E.B. Robertson, Inc., 1339 Plowman Ave. 214-942-8486
Tex Houston, E.B. Robertson, Inc., 4101 San Jocinto 713-529-3797

WILDER ENGRG. PRODS., 715 Kedzie, Chicago, Ill., 60612, Tel: 312-826-6161; Sls. Mgr: L. Lynd

WILDER MFG. CO., INC., Mechanic St. & Erie R.R., Port Jervis, N.Y., 12771, Tel: 914-856-5188

WILKENS, ALWIN FR., INC., Rte. 22, Pawling, N.Y., 12564, Tel: 914-855-5510; Pres: A.Fr. Wilkens

WILKINSON CO., 31011 Agoura Rd., Westlake Village, Cal., 91361, Tel: 213-889-0050; Sls. Mgr: R.L. Haynes

WILKINSON ELCTRNS., 1937 MacDade Blvd., Woodlyn, Pa., 19094, Tel: 215-874-5236; Sls. Mgr: G.P. Wilkinson

WILLARD LABS. (E), 4221 Redwood Ave., Los Angeles, Cal., 90066, Tel: 213-390-3626; Sls. Mgr: D. Nigro

WILLIAMS J.H. & CO., United Greenfield Div. TRW, Inc., 400 Vulcan St., Buffalo, N.Y., 14207, Tel: 716-875-3200, TWX: 710-522-1747; Sls. Mgr: W. Woodbury

WILLIAMS PRECIOUS METAL DIV., Williams Gold Refining, 2978 Main St., Buffalo, N. Y., 14214, Tel: 716-837-1000; Sls. Mgr: G. Keller

WILLIAMSON CORP., 1152 Main St., Concord, Mass., 01742, Tel: 617-369-9607; Sls. Mgr: W.R. Barron

WILMAD GLASS CO., INC., Buena, N.J., 08310, Tel: 609-697-3000; Sls. Mgr: A. Pyne

WILMER MFG. CO., 11403 Frederick Ave., Beltsville, Md., 20705, Tel: 301-474-1131; Sls. Mgr: L.E. Wright

WILMINGTON CONTROLS DIV., See Ledex, Inc.

WILTRON CO., 930 E. Meadow Dr., Palo Alto, Calif., 94303, Tel: 415-321-7428; Sls. Mgr: W. Oliver

WINATIC CORP., 409 Commerce Rd., Vestal, N.Y., 13850, Tel: 607-729-6318; Sls. Mgr: B. Howe

WINCHESTER ELCTRNS. DIV., Litton Sys., Main & Hillside Aves., Oakville, Conn., 06779, Tel: 203-274-8891, TWX: 710-478-3394; Mktg. Mgr: J.F. Bradley ....Pgs. 2724,2725

Ariz Tempe, Winchester Elctrns., 424 W. Bway. 602-968-2455
Cal No. Hollywood, Winchester Elct., 5451 Laurel Canyon 213-877-2505
Cal Sunnyvale, Winchester Elct., 1001 W. Maude 408-738-2222
Colo Littleton, Simpson, 2552 Ridge 303-798-8439
Fla Pompano Bch., Burgin-Kreh, 1010 E. Atlantic 305-942-0774
Ill Chicago, J. Lightner, 6322 N. Milwaukee 312-774-1500
Kans Overland Pk., T.L. Dowell Co., 7208 W. 80th St. 913-649-6069
Mass Waltham, Litton Inds., 395 Totten Pond 617-899-2207
Minn Mpls., Litton Inds., 2500 39th Ave., N.E. 612-789-8851
NJ Wayne, GT Assocs., 1341 Hamburg Tpke. 201-694-6040
NY E. Syracuse, GT Assocs., 6666 Old Collamer 315-437-7309
Ohio Dayton, Compass, 5899 Huberville 513-252-9939
Pa Ft. Washington, Litton Inds., 1260 Virginia 215-643-2100
Tex Dallas, BESCO, 1715 Matagorda Dr. 214-376-1929
Wash Bellevue, H. S. Thorpe, Box 1117 206-GL-4-0667
For: Can., Montreal, Que., S. Hooker, 144 Ronald 514-487-5151
For: Can., Toronto, Ont., S. Hooker, 761 Jane 416-767-7725

WINEGARD CO., 3000 Kirkwood St., Burlington, Iowa, 52601, Tel: 319-753-0121; Sls. Mgr: J.S. Ridge

WINPOWER MFG CO., 1207 First Ave., E., Newton, Iowa, 50208, Tel: 515-792-1301; Dir. Mktg: Roy Brewer

WINSLOW TELE-TRONICS, INC., 607 Industrial Way, W., Eatontown, N.J., 07724, Tel: 201-542-7000, TWX: 710-722-6682; Sls. Mgr: H.W. West

WINTERBURN MFG. CO., Box 386, Putnam, Conn., 06260, Tel: 203-928-6551; Sls Mgr: R. W. Randall

WINTRISS CONTROLS, Div. Tyco Labs., Inc., 20 Vandam St., New York, N.Y., 10013, Tel: 212-CH-2-0105; Sls. Mgr: B. Wels

WINTRON CO., INC., 9759 Rush St., S. El Monte, Calif., 91733, Tel: 213-283-6951

Advertisement

WILTRON Company produces measuring instruments for microwave, baseband and telephone line frequencies. Product line includes: Audio-video phase meters, Solid-State sweep generators 100kHz to 18GHz, VSWR bridges for 50kHz to 12.4 GHz, RF detectors 100kHz to 12.4GHz, RF Network Analyzers 2MHz to 40GHz, programmable attenuators and AM/FM Signal Generators. Also telephone line measuring sets: Echo Return Loss-Singing Point and Peak to Average Ratio (PAR) meters.

WINZELER MFG. & TOOL CO., 7355 W. Wilson Ave., Chicago, Ill., 60656, Tel: 312-867-7971; Sls. Mgr: J.H. Winzeler, Jr.

WIRE CLOTH MFRS., 666 Sussex Rd., Parsippany, N.J., 07054, Tel: 201-887-0009; Sls. Mgr: J.P. Hegarty

WIREMOLD CO., W. Hartford, Conn., 06110, Tel: 203-233-6251; Sls. Mgr: W.E. Parks ......Pgs. 2726,2727

Cal Los Angeles, Vernon Airey-Thompson, 3653 Sierra Pine 213-264-1533
Colo Denver, R.B. Schumann, 634 Gilpin St. 303-534-1058
Conn Farmington, E. Selnau, 23 Tanglewood 203-673-4979
DC Washington, T.J. Pugh, 5501 22nd Ave. 202-296-3669
Fla Tampa, J.D. Whetsell, Box 16066 813-988-5860
Ga Decatur, R.L. Pace, 5169 Covington 404-BU-4-3354
Ill Chicago, R.E. Horn, 20 N. Wacker 312-ST-2-7850
Md Bel Air, A.B. French, 26 Lake Dr. 301-825-1305
Mass Boston, R.T. Bennett, 10 High St. 617-HA-6-5693
Mich Detroit, M. Frazier, 17610 W. McNichols 313-535-0840
Minn Mpls., H.G. Schendel, 3746 Cedar 612-722-2226
Mo Kansas City, V.A. Meier, 5335 N. Jackson 816-452-9076
Mo St. Louis, A.F. Tubbesing, 10315 Golterman 314-842-2455
NJ Jersey City, P. McGovern, 172 Belmont 201-HE-3-5869
NY Babylon, A.C. Bradbury, Box 176 516-587-2318
NY Elmira, R.C. Hill, 107 Foster Ave. 607-734-5406
NY N. Y., P.F. McGovern, 11-15 Park Pl. 212-233-3328
NY N. Y., J.E. Finley, 11-15 Park Pl. 212-233-3328
NY No. Syracuse, A. Simone, 105 Lawdon 315-471-4201
NC Charlotte, H.M. Short, Box 9243 704-372-3460
Ohio Chagrin Falls, R.E. Horn, 7021 South St. 216-781-5135
Ohio Cincinnati, C.J. Wirtz, 2 Wm. Penn House 513-821-3254
Ore Portland, D.A. King, 1220 S.W. Stark St. 503-CA-8-1990
Pa Glenmore, W.A. Gibson, Box 212, R.D. 1 215-469-6453
Pa Warrington, R.B. French, 1525 Stuckert 215-887-0964
Pa Pittsburgh, W. Simon, 6334 Phillips Ave. 412-421-9491
Tex Dallas, W.R. Moseley, Box 28852 214-637-6432
Utah Salt Lake City, D. Blomquist, 328 W. Second 801-359-7074
Wash Seattle, Strohecker, 2207 First 206-623-0357
Wash Spokane, W.D. Beach, 307 Hyde Bldg. 509-624-2518

WIRING SERVICES CO, 1912 McGaw Ave., Santa Ana, Cal., 92705, Tel: 714-540-8590; Gen'l. Mgr: B.N. Brown

W.L.S. STAMPING CO., 3292 East 80th St., Cleveland, Ohio, 44104, Tel: 216-271-5100; Sls. Mgr: G.C. Wick

WOLFF INDUSTRIES, 2485 Huntington Dr., San Marino, Cal, 91108

WOLFSON, P.J. CO., 50 Kewanee Rd., New Rochelle, N.Y., 10804, Tel: 914-235-3203; Sls. Mgr: R. Wolfson

WOOD, C.N. MFG. CO., Rte. 332 E., Newtown, Pa., 18940, Tel: 215-968-4268; Sls. Mgr: R.W. Deaves

cont'd

cont'd

Advertisement

Transducers-Electrical output signal proportional to applied force or displacement. Load Cells: 2 lbs. thru 2 million lbs. Installation accessories & system instrumentation. Design and manufacture special cells to suit your requirements. Custom gaging, calibration, and repair of all strain gage load cells. We solicit your requirements for instrumentation components: Short run precision machined parts, assemblies, panels.

WOOD ELEC. CORP., Danvers Ind'l. Pk., Rte. One, Danvers, Mass., 01923, Tel: 617-774-6900, TWX: 710-347-0888; Sls. Mgr: D.E. Patton

WOOD, N. COUNTER LAB., INC., 1525 East 53rd St., Chicago, Ill., 60615, Tel: 312-FA-4-1114

WORCESTER PRESSED STEEL CO., 100 Barber Ave., Worcester, Mass., 01606, Tel: 617-853-6000; V.P. Sls: O.E. Peterson

WORKMAN ELCTRN. PRODS., INC., Box 3828, Sarasota, Fla., 33578, Tel: 813-955-4241; Sls. Mgr: S. Workman

WORLD MAGNETICS, INC., Sub. Fairchild Camera & Instr., 810 Hastings St., Traverse City, Mich., 49684, Tel: 616-946-3800; Gen'l. Mgr: W. Moehring

WORNER ELCTRN. DEVICES, Rankin, Ill., 60960, Tel: 217-397-4555; Sls. Mgr: D. Swanson

WRIGHT COMPS., INC., Broad & South Sts., Clifton Springs, N.Y., 14432, Tel: 315-462-2010; Sls. Mgr: W.C. Dunn

WRIGHT, G.F. STEEL & WIRE CO., 243 Stafford St., Worcester, Mass., 01603, Tel: 617-754-6824; Sls. Mgr: W.H. Carlson

WROUGHT WASHER MFG. CO., 2252 S. Bay St., Milwaukee, Wisc., 53207, Tel: 414-744-0771, TWX: 910-262-3101; Sls. Mgr: Walter F. Borges

WUERTH PRODS. CORP., 2334 Hollywood Blvd., Hollywood, Fla., 33020, Tel: 305-920-4111; Sls. Mgr: R.C. Worth

WYBAR ELCTRNS., INC., Oliva Dr., Box 109, Syracuse, N.Y., 13201, Tel: 315-454-3237; Sls. Mgr: J. Kemeny

WYLE LABS., 128 Maryland St., El Segundo, Calif., 90245, Tel: 213-OR-8-4251, TWX: 910-348-6283; Pres: S.A. Wainer

WYRCO PROJECTS, INC., Forsythe Ave., Owego, N.Y., 13827, Tel: 607-687-3950; Sls. Mgr: T. Coonradt

X-TRON ELECTRONICS, 1869 National Ave., Hayward, Cal., 94545, Tel: 415-783-2145; Sls. Mgr: R. M. Hossack Pg. 1434

XCELITE, INC., Thorne & Bank Sts., Orchard Park, N.Y., 14127, Tel: 716-662-4461; Gen'l. Sls. Mgr: F. Davis

Advertisement

Professional hand tools for every type of assembly and service job - pliers, wrenches, screwdrivers, nutdrivers, wire strippers, socket sets, offset screwdrivers, special tools for special applications - nationwide availability through local distributors. Send you Xcelite inquiries to 560 Bank St.

XENON CORP., 39 Commercial St., Medford, Mass., 02155, Tel: 617-395-7634; Sls. Mgr: C.R. Panico

XEROX DATA SYS., Sys. Prods. Dept., 701 S. Aviation Blvd., El Segundo, Cal, 90245, Tel: 213-679-4511, TWX: 910-325-6630; Sls. Mgr: R. Alexander

Advertisement

The System Products Department of XDS sells 16-bit minicomputers, integrated circuit digital logic modules and associated hardware, automated wiring services (listing and wrapping), medium to high performance analog instrumentation, and OEM peripheral equipment. Complete compatibility within the product line ensures "one-stop shopping" for the digital systems designer.

XINTEL CORP., 20931 Nordhoff St., Chatsworth, Cal., 91311, Tel: 213-882-8811

XYNETICS, INC., Box 1450, Canoga Pk., Cal., 91304, Tel: 213-887-1022; Sls. Mgr: R.L. Davison

Y.T. & T. CORP., P.O. Box 306, Roslyn Hgts., N.Y., 11577, Tel: 516-621-0050; Sls. Mgr: B. Yelsey

YAMASHINA SEIKI CO., LTD., Elctrn. Div., Yamashina Higashind, Higashiyama-ku, Kyoto, Japan, Tel: 075-581-1161; Sls. Mgr: Mr. Nagamori ....Pg. 1633

YASKAWA ELEC. AMERICA, INC., 100 Bliss Dr., Oak Brook, Ill., 60521, Tel: 312-654-3950; Gen'l. Mgr: M. Yokota

YELLOW SPRINGS INSTR. CO., INC., Comps. Div. EEM, Box 279, Yellow Springs, Ohio, 45387, Tel: 513-767-7242, TWX: 810-450-2730; Sls. Mgr: J. Gerdes

YEWTEC CORPORATION, 1995 Palmer Ave., Larchmont, N.Y., 10538, Tel: 914-834-3550, TWX: 710-566-1104; Pres: E. Hirano

YORK ELCTRNS., 104 S. 4th St., Brooklyn, N.Y., 11211, Tel: 212-EV-7-7110

YORK, OTTO H. CO., INC., 6 Central Ave., W. Orange, N.J., 07052, Tel: 201-677-3000; Sls. Mgr: E.W. Poppele

YORK WIRE CO., Box 982, Clifton, N.J., 07014, Tel: 201-472-8200; Sls. Mgr: R.G. Frick

YOUNGWOOD ELCTRN. METALS, INC., 302 N. Fifth St., Youngwood, Pa., 15697, Tel: 412-WA-5-7254, TWX: 510-468-2856; Pres: R.A. Domin

ZARING INDS., INC., Box 477, Carmel, Ind., 46032, Tel: 317-846-2571; Sls. Mgr: W.S. Zaring ....Pgs. 2992,2993

ZEHNTEL, INC., 1450 - 6th St., Berkeley, Calif., 94710, Tel: 415-527-5440, TWX: 910-366-7047; Sls. Mgr: D.N. Lytle

ZEIGLER CONTROLS, INC., 17810 S. Western Ave., Gardena, Cal., 90247, Tel: 213-324-2932; Sls. Mgr: R. Zeigler

ZEISS, CARL, INC., 444 5th Ave., New York, N.Y., 10018, Tel: 212-736-6070; Mgr: E. Bieber

ZELTEX, INC., Sub. Redcor Corp., 1000 Chalomar Rd., Concord, Calif., 94520, Tel: 415-686-6660 Ext. 34, TWX: 910-481-9477; Dir. Mktg: H. Boley

ZENITH CONTROLS INC., 830 West 40th St., Chicago, Ill., 60609, Tel: 312-247-6400; Sls. Mgr: V. Helford

ZENITH OPTICAL LAB., 138 Palisade St., Dobbs Ferry, N.Y., 10522, Tel: 914-OW-3-3377; Sls. Mgr: M.N. Hoffman

ZENRAD CONTROLS CO., 1575 A.P.S., Santa Barbara, Cal., 93103, Tel: 805-965-4996; Sls. Mgr: A.J. Radford

ZEPHYR MFG. CO., 201 Hindry Ave., Box 759, Inglewood, Calif., 90301, Tel: 213-OR-8-4331; Sls. Mgr: W.A. Burns

ZERO MFG. CO., Zero West Div., 1121 Chestnut St., Burbank, Cal., 91503, Tel: 213-846-4191, TWX: 910-498-2237; Sls. Mgr: M.S. Huffman

ZERO-MAX CO., 2845 Harriet Ave., S., Minneapolis, Minn., 55408, Tel: 612-827-6261; Sls. Mgr: R.A. Rood

ZETA LABS., INC., 616 National Ave., Mountain View, Calif., 94040, Tel: 415-961-9050, TWX: 910-379-6489; Sls. Mgr: C. Dudley

ZEUS IND'L. PRODS., Foot of Thompson St., Raritan, N.J., 08869, Tel: 201-526-0800, TWX: 710-480-9346; Pres: R.D. Hoyt

ZEVA ELEC. CORP., 3 Greatmeadow La., Hanover, N.J., 07936, Tel: 201-887-1399; Sls. Mgr: W. Plattner

ZIERICK MFG. CORP., Radio Circle, Mt. Kisco, N.Y., 10549, Tel: 914-666-2911; Dir. Sls: F. Decater

ZIMS MFG. CO., 26 Paine Ave., Irvington, N.J., 07111, Tel: 201-372-3650; Pres: D.C. Zimmermann

ZIPPERTUBING CO., 13000 S. Broadway, Los Angeles, Calif., 90061, Tel: 213-321-3901, TWX: 910-346-6713; Pres: W.A. Plummer

ZIRCONIUM CORP. OF AMER., Box 39217, Solon, Ohio, 44139, Tel: 216-248-0500; Sls. Mgr: A.C. Buchta

ZONIC TECH. LABS., 8927 Rossash Rd., Cincinnati, Ohio, 45236, Tel: 513-891-6390; Sls. Mgr: R. Davis

ZOOMAR, INC., 55 Sea Cliff Ave., Glen Cove, N.Y., 11542, Tel: 516-OR-6-1900; Sls. Mgr: W. Steuer

ZOPHAR MILLS, INC., 112-130 26th St., Brooklyn, N.Y., 11232, Tel: 212-SO-8-0907; Sls. Mgr: L.E. Mayer

ZORAK CO., 103 Morse St., Watertown, Mass., 02172, Tel: 617-924-1221; Sls. Mgr: W. Fehrmann

This is the Last Page of the Manufacturers and Sales Offices Directory

1971-72 eem

These are the 55 eem Product Sections grouped in 3 volumes

55 RODUCT SECTIONS IN 3 VOLUMES

TEST INSTRUMENTS EQUIPMENT & SYSTEMS	Vol. 1
ACTIVE COMPONENTS / CIRCUIT ASSEMBLIES / CONTROLS & DRIVES	Vol. 2
PASSIVE COMPONENTS MATERIALS / HARDWARE	Vol. 3

eem — Electronic Engineers Master saves you engineering, specifying and purchasing time. Manufacturers' catalogs are grouped under easy-to-remember headings.

he 55 Product Sections categorize related lectronics components, equipment, materials, instruments and systems, and fabrication services, enabling you to quickly compare and evaluate similar items.

To find a specific manufacturer's catalog pages refer to the Index of Manufacturers which precedes each Catalog Section (white pages).

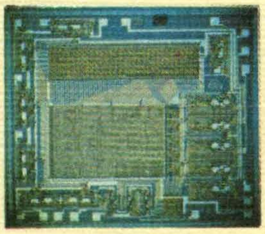
Volume Number	Product Section	Page Number	Products
2	1100	1278	Amplifiers, Audio, Operational, etc.
1	1200	307	Antennas & Accessories
1	1300	308	Audio Equipment & Accessories
3	1400	2314	Cabinets, Chassis, Containers, Racks, Boxes, etc.
3	1500	2330	Capacitors (All Types)
3	1600	2478	Chemicals (Acids, Adhesives, Coatings, Lubricants, etc.)
2	1700	1296	Circuit Assemblies, Circuit Boards & Breadboarding Kits
3	1800	2481	Coils (Inductors, Chokes), Assemblies, Forms
1	1900	322	Communications Equipment (Facsimile, Telephone, Television)
1	2000	328	Computing, Data Handling Equipment & Accessories
3	2100	2510	Connectors, Electrical (Receptacles, Sockets, Terminal Boards)
2	2200	1304	Controls, Control Components & Systems
2	2300	1353	Crystals & Mechanical Tuning Devices; Oscillators
3	2350	2728	Delay Lines (All Types)
2	2400	1435	Panel Components (Including Lighting & Readouts)
3	2500	2754	Fabricated Mechanical Parts (Bearings, Cores, Magnets, etc.)
1	2550	388	Environmental Test Equipment
3	2600	2776	Fans, Blowers & Cooling Equipment
2	2700	1506	Filters
3	2800	2809	Hardware, Non-Current Carrying (Fasteners, Washers, etc.)
1	2900	391	Instruments, Measuring & Test
1	3000	587	Instruments, Graphic Recording
3	3100	2810	Insulators, Insulating Materials & Parts
2	3130	1535	Integrated Circuits & Hybrid Microcircuits
3	3150	2814	Manufacturing, Subcontracting, Custom Fabrication
3	3200	2816	Materials, Raw (Metals, Plastics, Glass, Rubber, Cloth, etc.)
1	3300		Medical Electronic Equipment
1	3400	598	Microwave, Laser & Radar (Systems & Subsystems)
2	3450	1552	Microwave, Laser & Radar (Components/Accessories)
2	3500	1572	Motors, Rotating Components & Accessories
1	3600		Nuclear & Radiation Equipment
2	3700	1636	Photoelectric Equipment & Components
2	3800	1641	Optical Equipment & Accessories
1	4000	616	Power Supplies, Converters, Inverters, Batteries, etc.
1	4100	947	Production Machinery & Automation Equipment
3	4200		Engineering Aids (Books, Drafting Equipment, Whiteprinters)
1	4300	950	Recording Equipment (Non-Audio Types)
2	4500	1645	Relays
3	4600		Research, Development, Engineering Services
3	4700	2818	Resistors, Fixed
3	4750	2902	Resistors, Variable (Potentiometers & Rheostats)
2	4800	1794	Semiconductors & Devices, Rectifiers (Non-Tube Types)
2	4900	1865	Servomechanisms & Components
1	5000	951	Studio Equipment
2	5100	1877	Switches, Circuit Breakers, Fuses, Protective Devices
1	5200	953	Telemetering Equipment
2	5300	1963	Thermal Devices, Thermistors, Thermocouples, Thermostats, etc.
3	5400	2933	Tools (Hand & Power); Soldering Supplies
2	5500	1985	Transducers & Associated Equipment
3	5600	2948	Transformers
2	5700	1995	Tubes, Tube Parts, Shields, Inserts, etc.
1	5800		Ultrasonic, Sonic, Subsonic Equipment
1	5850		Vacuum Equipment & Accessories
2	5900	2006	Vibrators, Choppers, etc.
3	6000	2994	Wire, Cable. Harnesses & Accessories

UNITED TECHNICAL PUBLICATIONS, INC. • 645 Stewart Ave., Garden City, N.Y. 11530 • (516) 248-9700
Division of Cox Broadcasting Corporation

Since the last time you saw EEM, Unisem wrote four new chapters in semiconductor history.

MOS Memories

With devices that combine inherent bipolar compatibility (no resistors) with stable operation up to 125°C. We do it with a proprietary technology that positively prevents field inversion at high temperatures and voltages in excess of −20V. It's applied in ROM's from 1024 to 4096-bit, RAM's from 64 x 4 to 1024 x 1, and special devices like shift registers, keyboard encoders, and character generators. And it's ready for your custom devices.



Details on EEM page 1550.

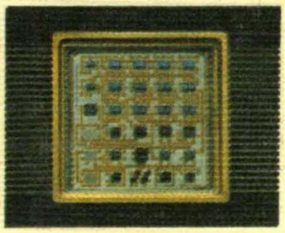
RF Power Transistors

With the first working example of tomorrow's device geometry, the broadest broadband you can get. Plug it in and it plays, anywhere from 100 MHz to 1 GHz. As soon as we back it up with a few more powerful brothers, you'll be able to cut RF power inventory down to a handful of broadbands.

Details on EEM page 1846.

Custom Multilayer Hybrids

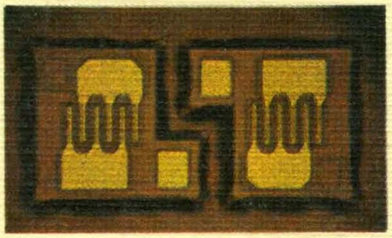
With devices like this 12-bit D/A converter that comes in a 1.25″ square flatpack and works over the full −55° to +125°C MIL temperature range. It's made with another proprietary technology that lets us deposit up to ten metallization layers on a single substrate, then fuse the whole works together into a single shock-resistant piece. The technology is available for your custom hybrids, as well as our standards.



Details on EEM page 1551.

Dual J-FET's

With the first dielectrically-isolated monolithic dual. It fits a standard 2N (6-lead) package, meets all standard 2N specs including input capacitance, and tracks within 5μV/°C. It's available in 19 standard types.



Details on EEM page 1847.

Like to make a little history of your own? Let us know. We'll be glad to help. We're the partner people.

Unisem SUBSIDIARY OF UNITED AIRCRAFT CORPORATION

Unisem Corporation, P.O. Box 11569, Philadelphia, Pa. 19116, (215) 355-5000